UNIVERSITY OF THE PHILIPPINES MANILA

COLLEGE OF ARTS AND SCIENCES

DEPARTMENT OF PHYSICAL SCIENCES AND MATHEMATICS

Combinatorial Pattern Discovery Tool
with Tutorial Module

A Special Problem

in Partial Fulfillment of

the Requirements for the Degree of

Bachelor of Science in Computer Science

Submitted by:

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April 2006

ACCEPTANCE SHEET

The Special Problem entitled "Combinatorial Pattern Discovery Tool With Tutorial Module" prepared and submitted by April O. Harina in partial fulfillment of the requirements for the degree of Bachelor of Science in Computer Science has been examined and is recommended for acceptance.

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Abstract

One of the problems arising in the analysis of biological sequences is the discovery of sequence similarity in the primary structure of related proteins or genes. Such similarity usually corresponds to residues conserved during evolution due to an important structural or functional role.

Currently there are some computer programs that find patterns in biological sequences such as protein/DNA/RNA sequences. The *Combinatorial Pattern Discovery Tool with Tutorial Module* aims to find maximal patterns given the input sequences and the required parameters using the Teiresias algorithm. The users of the system can browse through each of the maximal patterns and their corresponding offset list. The users can view the summary of results and they can also opt to save the summary of results in their hard disks. In addition, the Tutorial Module provides lectures and supplementary study materials to aid the users in understanding the concepts behind the discovery of patterns in biological sequences. A Flash animation file is included to demonstrate how the Teiresias algorithm works given a sample input. An automatically-generated self-test whose questions are taken from the database is also provided so that students can test their knowledge of the concepts.

Keywords: biological sequences, maximal patterns, offset lists

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I. Introduction

A. Background of the Study

Sequence pattern discovery is a research field aiming at developing tools and methods for finding a priori unknown patterns in a given set of sequences, patterns that are frequent, unexpected, or interesting according to some formal criteria. Patterns are formal grammatical descriptions for certain languages representing subsets of all possible sequences over a finite alphabet. Patterns can be represented using various formalisms, for example, as regular expressions, or probabilistic weight matrices. The interestingness of patterns can be interpreted in relation to the pattern description itself or in relation to the sequences being examined. For instance, if the pattern occurs significantly more frequently than expected by chance then the pattern may be considered interesting.[1]

Given a sequence of data such as a DNA, RNA or amino acid sequence, a pattern or a motif is a repeating subsequence. Such repeated subsequences often have vital biological significance and hence discovering such motifs in different biological databases turns out to be a very important problem in bioinformatics.[2]

B. Statement of the Problem

The discovery of sequence similarity in the primary structure of related proteins or genes is one of the problems arising in the analysis of biological sequences. Such similarity usually corresponds to residues conserved during evolution due to a significant structural or functional role.[3]

Over the past few years, a number of pattern-discovery algorithms have been steadily appearing in the literature and the pattern types that these algorithms are able to handle range from simple strings to quite general regular expressions.[4]

Most of the proposed approaches proceed by enumerating the solution space, that is, they generate all or most of the possible patterns and then verify, for each one, that it has sufficient support. Having sufficient support means that the pattern being considered appears in sufficiently many input sequences—the exact number is typically provided by the user. Several considerations also arise here. First, unless the nature of patterns sought is extremely simple, the problem of detecting all existing patterns is NP-hard; usually, a reduction from the longest common subsequence problem can be used to prove this.

Probable solutions include the use of heuristics which offer enhanced performance (but frequently at the expense of sacrificing the completeness of the results), and/or the structural restriction of the patterns sought (e.g. most algorithms limit the maximum length that a pattern can have). A second problem, usually overlooked, has to do with the quality of the reported results. In order to help the human expert (who is usually the recipient of the output) make sense of the results, it is desirable to generate only maximal patterns.[4]

Since the algorithm to be used in discovering patterns in biological sequences may be difficult to fathom, it is vital to provide documents for reference and an animation of the algorithm.

C. Objectives of the Study

To create an online Combinatorial Pattern Discovery (CPD) Tool that:

1. provides a module that allows the user to:

    a. input protein/DNA/RNA sequences either by uploading a text file or by copying-pasting the sequences inside a text area

    b. generate maximal pattern/s discovered in the given sequences by following these steps:

    - find elementary patterns that appear in at least K distinct sequences

    - construct the offset list of each elementary pattern

    - arrange the elementary patterns in a prefix-wise less order, positioning the pattern which is the most prefix-wise less at the beginning of the list of elementary patterns

    - mark and extend each elementary pattern starting with the most prefix-wise less to be able to construct progressively larger and larger patterns by using the convolution operation

    - if a pattern is found to be maximal, add this pattern to the list of maximal patterns otherwise, continue extending unmarked elementary patterns until such time that all the elementary patterns are marked

    c. save the text file containing the maximal pattern/s and offset lists in their hard disk

    d. browse through the input sequences and results

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2. provides the user with online tutorials needed to understand pattern discovery in biological sequences that:

    a. allows the user to view lectures on pattern discovery in biological sequences with detailed explanations on the usage of the Teiresias algorithm

    b. allows the user to download supplementary study materials about pattern discovery

    c. allows the user to take online examinations based on the lectures to test their knowledge of the material

    d. allows the Molecular Biology Expert to update lectures, supplementary study materials and exam questions on the tutorial website

D. Significance of the Study

This application, which uses the Teiresias algorithm, allows the user to find maximal patterns in biological sequences in much less computational time because it does not need to enumerate the entire solution space.[4]

The analysis of biological sequences is very essential. One important area in the analysis of biological sequences is to locate the similarities between different sequences. By the discovery of sequence similarities in the structures of genes or proteins one can have an idea about the functional behavior of that genes or proteins.[5]

The Teiresias algorithm is a two-phase, combinatorial algorithm for general-purpose pattern discovery. Due to its exceptional speed and its ability to handle very large input datasets and arbitrarily large alphabets, it is applicable to a wide spectrum of problems that include a large number of computational biology applications such as pattern discovery, DNA tandem repeat discovery, automated protein functional and structural annotation, gene discovery, etc.[6]

Since this application incorporates a tutorial portion, it can be used as a teaching supplement in computational biology, to facilitate comprehension of pattern discovery using the Teiresias algorithm.

E. Scope and Limitations

1. The sequences accepted for input are based on the 20 standard amino acids and nucleotides since these are the building blocks of protein and DNA/RNA molecules, respectively.[1]
2. The sequences accepted for input must be in FASTA format only.
3. The Molecular Biology Expert is also the System Administrator.
4. Examination questions are limited to multiple-choice type only. The exam results are not saved in the database because the exams are to be regarded as self-tests.
5. The veracity of the patterns will not be tested in the wet laboratory.
6. Lecture files are limited to .html files only while supplementary study materials ranges from .doc, .ppt, .swf, .wma, .gif and .jpeg files only.

II. Review of Related Literature

Rigoutsos and Floratos presented the Teiresias algorithm, which according to them is a novel algorithm for the discovery of patterns in biological sequences. They claimed that their algorithm is capable of detecting and reporting all existing patterns in a set of input sequences without enumerating the entire solution space and without using pairwise alignments. Those properties allow for enhanced performance. Furthermore, Rigoutsos and Floratos stated that the patterns reported are guaranteed to be maximal.[4]

Cakir[5] included in his paper a description on how Rigoutsos and Floratos applied the Teiresias algorithm in finding patterns in the two data sets, core histones (H3 and H4) and leghemoglobins. Teiresias was used to discover similarities across the weakly-related core histone families H3 and H4. In this regard, 13 sequences from H3 family and 7 sequences from H4 family were chosen. The output patterns were obtained based on the parameters, L=3, W=35 and K=7. Among the output patterns, the ones available in 19 of 20 input sequences and having at least 4 residues were considered. The patterns suitable to these conditions were searched on the protein database, SwissProt and on the database of NCBI (National Center for Biotechnology Information). For SwissProt database, these patterns were available about in 27 of 33 H3 sequences, and 19 of 20 H4 sequences. For NCBI database, the patterns were found in 79 of 81 H3 and 58 of 59 H4 sequences. Thus, it is concluded that these patterns are very specific to H3 and H4 protein families. Regarding the leghemoglobin data set, Teiresias was used to prove that all globins contain a conserved histidine signature that represents the heme-binding pocket using 22 leghemoglobin sequences as input. The parameters were set to L = 3, W = 35 and K = 10. The algorithm was successful in identifying the heme-binding pocket signature. It could also find other important patterns. When the found patterns are compared with one of the leghemoglobin sequences, LGBA_SOYBN, it is found that the discovered patterns are heavily concentrated in rightmost regions of the sequence. This is an indication that the amino acids in that region have been preserved relatively well during evolution.

Jonassen et al. presented a new method for the identification of conserved patterns in a set of unaligned related protein sequences. The method is able to discover patterns of a quite general form, allowing for both ambiguous positions and for variable length wildcard regions. It allows the user to define a class of patterns, and the method is then guaranteed to find the conserved patterns in this class scoring highest according to a significance measure defined. Identified patterns may be refined using one of two new algorithms. They presented a new (nonstatistical) significance measure for flexible patterns. The method that

they used was shown to recover known motifs for PROSITE families and is also applied to some recently described families from the literature. They have developed a program called Pratt that, given a set of unaligned protein sequences, finds patterns matching a minimum number of these sequences. The user specifies the minimum number of sequences to be matched and the class of pattern to be searched for.[7]

Roytberg[8] presented an approach to search for common patterns in many sequences. The idea is that one sequence from the set of sequences to be compared is considered as a 'basic' one and all its similarities with other sequences are found. With the use of these data, multiple similarities are then reconstructed. This approach allows one to search for similar segments which can differ in both substitutions and deletions/insertions. These segments can be found at different positions in various sequences. No regions of complete or strong similarity within the segments are required. The other parts of the sequences can have no similarity at all. The only requirement is that the similar segments can be found in all the sequences or in the majority of them, given the common segments are present in the basic sequence.

Wang et al. described a method for discovering active motifs in a set of related protein sequences.[9] The method is an automatic two step process. The first step is to find candidate motifs in a small sample of the sequences. Next, test whether these motifs are approximately present in all the sequences. They developed two optimization heuristics based on statistical estimation and pattern matching techniques to reduce the running time.

Suyama et al. developed a program called Gap Allowing Pattern Explorer (GAPE) to extract amino acid sequence motifs conserved among distantly related proteins. The GAPE program is designed to allow gaps in the sequences. First, this program generates all possible amino acid patterns comprising up to five amino acids. Sequences containing the amino acid residues in the same order as a generated pattern are selected as subsequences, where the differences in the distances between two consecutive amino acids are ignored. Next, the motifs are extracted from the subsequences under conditions in which all four distances between the five amino acids are fixed. At this stage, motifs with gaps in their subsequence are also found by relaxing one of the four fixed distances.[10]

According to Neuwald and Green, the detection of conserved sequence patterns or motifs in related proteins often yields valuable structural and functional insights. They described a method that utilizes rigorous statistics and a depth-first search procedure to

efficiently and exhaustively search a set of proteins for significant patterns up to a specified length. Additional procedures classify related patterns into groups and identify protein segments most likely to share a common motif.[11]

III. Theoretical Framework

A.   **Bioinformatics**

Bioinformatics derives knowledge from computer analysis of biological data. These can consist of the information stored in the genetic code and also experimental results from various sources, patient statistics, and scientific literature. Research in bioinformatics includes method development for storage, retrieval, and analysis of the data. Bioinformatics is a rapidly developing branch of biology and is highly interdisciplinary, using techniques and concepts from informatics, statistics, mathematics, chemistry, biochemistry, physics, and linguistics. It has many practical applications in different areas of biology and medicine.[12]

A classical definition of bioinformatics from the Bioinformatics.org states that most biologists talk about 'doing bioinformatics' when they use computers to store, compare, retrieve, analyze, predict or even simulate the composition or the structure of biomolecules. [13] Bioinformatics can also be defined as "using computers in biological research to analyze or predict the composition of molecules (nucleic acids, proteins, etc.) and model biologic systems. Bioinformatics is most prominent in the Human Genome Project, which has recorded the three billion chemical base pairs that make up the human DNA system". [14] Fredj Tekaia defines bioinformatics to be "the mathematical, statistical and computing methods that aim to solve biological problems using DNA and amino acid sequences and related information".[13]

Another definition of bioinformatics is the use of techniques from applied mathematics, informatics, statistics, and computer science to solve biological problems. Major research efforts in the field include sequence alignment, gene finding, genome assembly, protein structure alignment, protein structure prediction, prediction of gene expression and protein-protein interactions, and the modeling of evolution.[15]

B.   **Amino Acids and Nucleotides**

Amino acids are the basic structural building units of proteins. They form short polymer chains called peptides or polypeptides which in turn form structures called proteins. Twenty amino acids are encoded by the standard genetic code and are called proteinogenic or standard amino acids.[16] These 20 standard amino acids are listed in Table 1.

Name	3-letter Symbol	1-letter Symbol
Alanine	Ala	A
Arginine	Arg	R
Asparagine	Asn	N
Aspartic Acid	Asp	D
Cysteine	Cys	C

Glutamine	Gln	Q
Glutamic Acid	Glu	E
Glycine	Gly	G
Histidine	His	H
Isoleucine	Ile	I
Leucine	Leu	L
Lysine	Lys	K
Methionine	Met	M
Phenylalanine	Phe	F
Proline	Pro	P
Serine	Ser	S
Threonine	Thr	T
Tryptophan	Thr	W
Tyrosine	Tyr	Y
Valine	Val	V

Table 1. The 20 common amino acids with their corresponding 3- and 1-letter symbols.[17]

Nucleotides are the building blocks that are necessary for making new DNA and RNA. DNA is a very large molecule, and the rungs of the DNA ladder are made of a combination of two different nucleotides.[18]

Two of the bases in nucleic acids, adenine (A) and guanine (G), are purines. In DNA, these bases form hydrogen bonds with their complementary pyrimidines namely: thymine (T) and cytosine (C). In RNA, the complement of adenine is uracil (U) instead of thymine. [19]

One of the most fascinating languages being studied by mankind is the genetic code of living organisms, the DNA, RNA, and protein molecules that are essential to all life on earth. These macromolecules are built, usually in a linear manner, from a small amount of building blocks like amino acids or nucleotides. The genetic code, using perhaps an oversimplification, can thus be interpreted as sequences of these basic building blocks or letters. The function of each of the molecules is usually determined by their structure, and one of the key questions in modern molecular biology is to understand the relationship between the sequence, structure, and function of these molecules as well as the biological processes they are involved in.[1]

The machinery that is able to read, interpret, replicate, and otherwise utilize the information stored in DNA, RNA and protein molecules is essential to life. This universal language of life has evolved over billions of years, producing many different life-forms from

the simplest bacteria to human beings, being able to survive in extreme heat and pressure or under constant freezing conditions, or consuming completely different energy sources.[1]

Biological sequences, or biosequences, can be grouped in families based on their function, structure, cellular location, molecular processes, gene regulation, or other criteria. Patterns common to these groups are able to capture very different biological features.[1] Many of the protein families and their characteristic patterns have been collected in the protein family database PROSITE.[20] Finding characterizations of biosequence families is an important sequence analysis problem. If an attribute common to all known sequences of a family is discovered, then it is likely that this particular attribute is important for the biological role of the family. Algorithms for sequence pattern discovery have been widely used for characterizing protein families, examples of these algorithms are those studied by Jonassen[21], Hart et al.[22], and Rigoutsos and Floratos[4].

C.   Patterns

A pattern is a form, template, or model (or, more abstractly, a set of rules) which can be used to make or to generate things or parts of a thing, especially if the things that are generated have enough in common for the underlying pattern to be inferred or discerned, in which case the things are said to exhibit the pattern.[23] A sequence motif is a nucleotide or amino-acid sequence pattern that is widespread and has, or is conjectured to have, a biological significance.[24]

Rigoutsos and Floratos[4] used the Teiresias algorithm to analyze the core histone families H3 and H4 to see whether they could find evidence of the common evolutionary origin of these two familes in the forms of patterns preserved in both H3 and H4 proteins. The parameter settings used were L=3, W=35 and K=7. Based on the given parameters, the goal is to find all maximal <3,35> patterns that have support at least 7 (i.e. they appear in at least 7 distinct sequences in the input sequences). A <3,35> pattern is a pattern P containing at least 3 residues such that every subpattern of P containing 3 residues is at most 35 symbols in length.

In Figure 1, a small part of the ouput produced by Teiresias is presented; more specifically, all of the discovered patterns having four or more amino acids and occurring in at least 19 out of the 20 sequences. The patterns have been aligned with one representative member of the H3 and H4 families in order to show clearly the patterns' positions in the set.

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Interestingly enough, there are quite a few patterns appearing in all the proteins in the input set used. In order to verify the extent to which these patterns do indeed indicate evolutionary relationship (and are not found just by chance), Rigoutsos and Floratos searched SwissProt (Release 34) for sequences matching the most descriptive among these patterns, i.e. those with the largest number of non-don't care positions (as seen in Table 2).

```
>H33
_HUMAN
ARTKQTARKSTGGKAPRKQLATKAARKSAPSTGGVKKPHRYRPGTVALREIRRYQKSTELLIRKLPFQRLVREIAQDFKTDLRFQSAAIGALQEASEAYLVGLFEDTNLCAIHAKRVTIMPKDIQLARRIRGERA

Patterns shared by 20/20 sequences
                              G.......................T...I.........V..I........R        E......V...E............V...K.........G
        K.......R...............V.K                 P..R........................L....E    V.....T......K.V........L
          A.RK..............G                         K..L...........E......V    D.....H.........D........G
                 K.A......GGVK

Patterns shared by 19/20 sequences
                              G.......................T...I..L.....V..I.......R
        K.......R...............V.K...............T    I.....RL.R          R...............L....D.....H..R......D........G
        K.......R...............V.K...........A      I.K....RL                          V......T......K.V.......L.R..R
      T........K..........A.........G              L.......R...I......L              V......T......K.VT......L
            G..........................G..KP        L...........E.A..........A          D.....H...T....D........G
     R...T......K.................G                 K...........K..L.........E......V   D.....HA.........D........G
           K....LA.....K                              P..R...................L....E.......T  AI..........K.I
             K.......A...............R.......E         I....K...R...............Y            L.RR....R
               L...................K........L....R
               L...................K.......AL
              A..K.......V....R
                 G..K...R..........I
                 V.........TV........K

>H4_HUMAN
SGRGKGGKGLGKGGAKRHRKVLRDNIQGITKPAIRRLARRGGVKRISGLIYEETRGVLKVFLENVIRDAVTYTEHAKRKTVTAMDVVYALKRQGRTLYGFGG

Patterns shared by 20/20 sequences
      G.......................T...I.......V..I........R        E......V...E............V...K.........G
           K.......R...............V.K     V.....T......K.V........L
           P..R.....................L....E    D.....H.........D........G
           K.A......GGVK                      A.RK..............G
                  K..L...........E......V

Patterns shared by 19/20 sequences
      G.......................T...I..L.....V..I.......R      L...............K..........L....R
      G........................G..KP                         L...........E.A..........A
          I....K...R..............Y                          L...............K.......AL
          AI..........K.I                                    V......T......K.V.......L.R..R
        G..K...R.........I                                   V......T......K.VT......L
              L.RR....R                                      V......TV........K
          I......RL.R                                        R...T......K.................G
          I.K....RL                                          D.....H...T....D........G
          K....LA.....K                                      D.....HA.........D........G
             L.......R...I......L                            T.......K.........A.........G
                    R...................L.....D....H..R......D........G
           K.......R...............V.K...................T    A..K.......V....R
           K.......R...............V.K........A
           P..R.....................L....E.........T
                  K............K..L...........E......V
       K......A...............R.......E
```

Figure 1. Several of the discovered patterns that are common to both the H3 and H4 families.

The three patterns that were used for the search turned out to be very specific to the H3 and H4 protein families; SwissProt was able to pick almost all of the members of these two families. Also seen in Table 2 are the results of searching the given patterns in the non-redundant database of the core histone sequences maintained at the National Center for Biotechnology Information (NCBI). The high sensitivity of the patterns chosen is also clearly demonstrated by that experiment; the patterns are found to belong in just about all the histone proteins in the non-redundant database.

Patterns	SwissProt		NCBI	
	H3 (33)	H4 (20)	H3(81)	H4 (59)
G...................T..I.......V.I......R	27	19	79	58
K.A.......GGVK	24	20	77	59
E......V..E...........V...K........G	27	19	76	58

Table 2. For each pattern, the number of H3 and H4 members found to contain the pattern are shown.

D.   **Teiresias Algorithm**

Rigoutsos and Floratos[4] described the Teiresias algorithm by providing first the definition of Σ and a pattern. Let Σ be the alphabet of residues at hand (e.g. the set of all amino acids). A pattern is defined to be any string of the form Σ(Σ{'.'})Σ, that is, any string that begins and ends with a residue, and contains an arbitrary combination of residues and '.' characters. The '.' (referred to as a 'don't care character') is used to denote a position that can be occupied by an arbitrary residue.

A pattern P is really a regular expression and as such it defines a language G(P). The elements of the language are all the strings that can be obtained from P by substituting each don't care by an arbitrary residue from Σ.

For any pattern P, any substring of P that is itself a pattern is called a subpattern of P. For example, 'H..E' is a subpattern of the pattern 'A.CH..E'. A pattern P is called an <L,W> pattern (with L<=W) if P contains at least L residues and such that every subpattern of P containing L residues is at most W symbols in length.[25]

A string of residues over Σ is said to match a given pattern P if it contains at least one substring (i.e. a block of consecutive residues) that belongs in G(P). For example, each sequence in the following set matches the pattern 'A.CH..E' (the boldfaces strings indicate the particular matching substrings in each sequence):

S = {LFA**ADCHFFE**DTR, LKL**ALCHESE**SDR, AF**AGCHADE**LFT}

Given a pattern P and a set of sequences S = {S_1, S_2, …, S_n}, we define the offset list of P with respect to S to be the following set:

$$L_S(P) = \{(i, j) \mid \text{sequence } S_i \text{ matches P at offset } j\}$$

For the particular S given above, for example, the offset list of the pattern 'A.CH..E' is:

$$L_S(\text{'A.CH..E'}) = \{(1, 4), (2, 4), (3, 3)\}$$

A pattern P' is said to be more specific than a pattern P if P' can be obtained from P by changing one or more don't care characters to residues, or by appending an arbitrary string of residues and don't cares to the left or/and right of P. The following patterns are all more specific than the pattern 'A.CH..E':

'AFCH..E', 'A.CHL.E.K', 'SA.CH..E', 'SA.CH..EF..KL'

Notice that if a pattern P' is more specific than a pattern P, then for every set S of input sequences:

$$|L_S(P')| <= |L_S(P)|$$

Given a set of sequences S, a pattern P is called maximal with respect to S if there exists no pattern P' which is more specific than P and such that $|L_S(P)| = |L_S(P')|$. In other words, if P is a maximal pattern, then it cannot be made more specific without simultaneously reducing the size of its offset list.

Problem Definition: Given a set S = {S_1, S_2, …, S_n} of input sequences and parameters L (minimum number of residues in the pattern), W (maximum extent spanned by any L consecutive residues in the reported patterns), K (desired minimum support for a pattern), find all maximal <L, W> patterns that have support at least K (i.e. they appear in at least K distinct sequences in S). An <L,W> pattern is a pattern P containing at least L residues such that every subpattern of P containing L residues is at most W symbols in length.

Teiresias operates in two phases: scanning and convolution phases.[5] Teiresias begins by scanning the sequences in the input set S and locating all elementary patterns with support at least K. An elementary pattern is just an <L, W> pattern containing exactly L residues. Figure 2 gives an example of the scanning process for a particular set S of input sequences and particular values for the parameters L, W and K.

$$L = 3, \; W = 4, \; K = 3$$

$$S = \{s_1 = \text{"SDFBASTS"}, \; s_2 = \text{"LFCASTS"}, \; s_3 = \text{"FDASTSNP"}\}$$
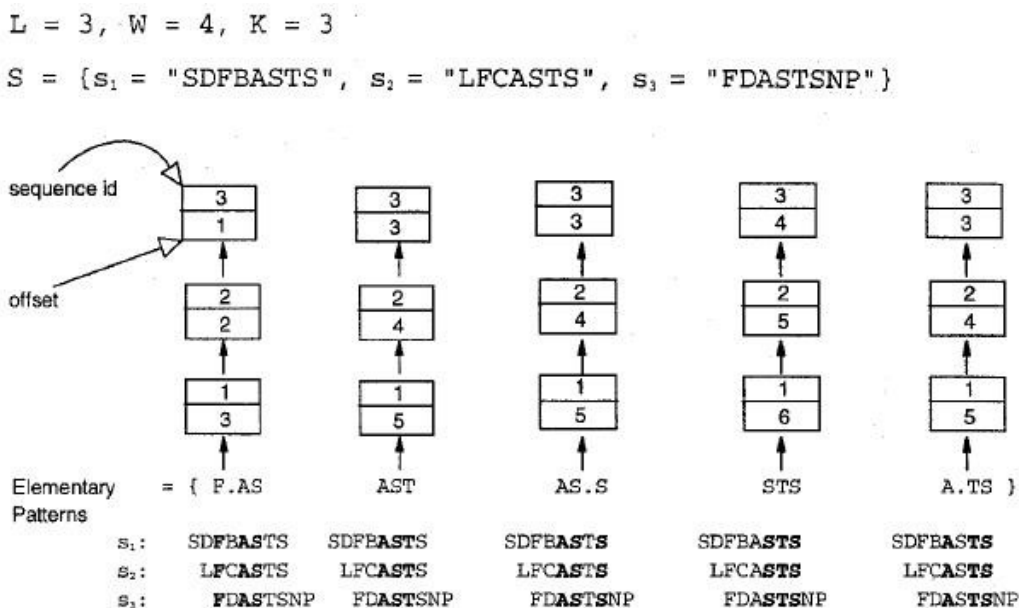
Figure 2. The scanning process builds the set of all <L,W> elementary patterns with support at least K.

The result of the scanning process described above is a set containing all the elementary patterns (and their associated offset lists) which satisfy the minimum support requirement. This set will then be the input to the convolution phase. To understand how convolution works, it helps to realize that the scanning phase of the algorithm breaks up all the patterns that exist in the input into smaller pieces. The task, then, of the convolution phase is to put these pieces back together (in a time/space efficient way) in order to recover the original patterns.

The key observation behind the convolution phase is that an original pattern P can be reconstructed by piecing together pairs A, B of intermediate patterns such that a suffix of A is the same as a prefix of B. For example, consider again the set of sequences S given in Figure 2. This set contains the patterns 'F.ASTS'. It is possible to reconstruct this pattern in the following way (see also Figure 3).

1.   Combine together the elementary patterns 'F.AS' and 'AST' to obtain the pattern 'F.AST'.

2.   Combine the newly generated pattern 'F.AST' with the elementary pattern 'STS' to get 'F.ASTS' .
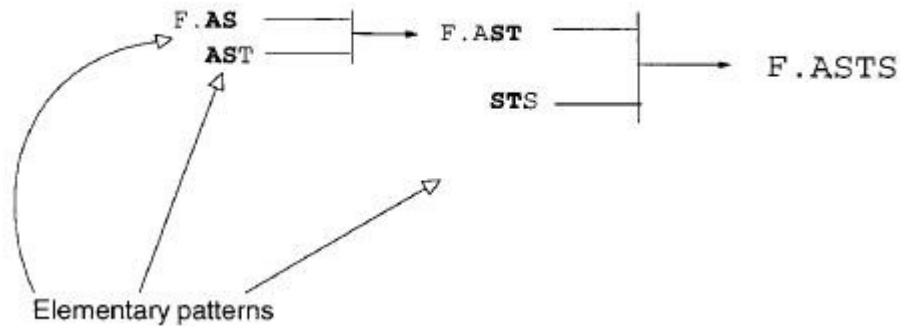
Figure 3. Reconstructing the maximal pattern 'F.ASTS' from the elementary patterns gathered in the scanning phase.

Given any pattern P with at least L residues, let prefix(P) be the (uniquely defined) subpattern of P that has exactly (L-1) residues and is a prefix of P. For instance, if L=3, then

prefix('F.ASTS') = 'F.A' and prefix('AST') = 'AS'

Similarly, let suffix(P) denote the suffix subpattern of P with exactly (L-1) residues. Again, for L=3:

suffix('F.A..S') = 'A..S' and suffix('ASTS') = 'TS'

A new binary operation, referred to herein as convolution (denoted by $\oplus$), between any pair of patterns. Let P, Q be arbitrary patterns with at least L residues each; the convolution of P with Q is a new pattern R defined as follows:

$$R = P \oplus Q = \begin{cases} PQ' & \text{if } suffix(P) = prefix(Q) \\ \varnothing & \text{otherwise} \end{cases}$$

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where Q' is a string such that Q=prefix(Q)Q'[i.e. Q' is what remains of Q after the prefix(Q) is thrown away] and Φ denotes the empty string. The patterns P, Q are called convolvable if P $\oplus$ Q != Φ. Here are some examples for the case L=3:

'DF.A.T' $\oplus$ 'A.TSE' = 'DF.A.TSE and 'AS.TF' $\oplus$ 'T.FDE' = Φ

If two patterns P, Q are convolvable and R = P $\oplus$ Q, then the offset list $L_S(R)$ of the resulting pattern R is the subset of $L_S(P)$ defined as:

$$L_S(R) = \{(i, j) \in L_S(P) \mid \exists (i, k) \in L_S(Q) \text{ such that } k - j = |P| - |suffix(P)|\}$$

where |P| denotes the number of characters (counting both residues and don't cares) in the pattern P.

Let P, Q be two arbitrary patterns. To decide if P is prefix-wise less than Q (written as P$<_{pf}$Q), use the following procedure. First, the two patterns are aligned so that their left-most residues are in the same column. Second, the columns of the alignment are examined starting at the left and proceeding to the right. Stop when there's a column in which one of the aligned characters is a residue and the other is a don't care character. If the residue comes from the pattern P, then P is prefix-wise less than Q (see Figure 4 for a concrete example).

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```
P = ASD...F
Q = SE.ERF.DG
```

Prefix Wise Less

Step 1: Align the patterns along their left-most columns

Step 2: Locate the first column containing both a don't care and a residue character (this column is marked with an **x** below).

Step 3: The pattern with the residue character in the **x**-marked column is the "smallest".

```
P:  ASD...F

Q:  SE.ERF.DG
```

```
P:  ASD...F
    | |x
Q:  SE.ERF.DG
```

$$P <_{pf} Q$$

Suffix Wise Less

Step 1: Align the patterns along their right-most columns

Step 2: Locate the first column containing both a don't care and a residue character (this column is marked with an **x** below).

Step 3: The pattern with the residue character in the **x**-marked column is the "smallest".

```
P:      ASD...F

Q:  SE.ERF.DG
```

```
P:      ASD...F
         x|
Q:  SE.ERF.DG
```

$$Q <_{sf} P$$

Figure 4. Deciding which of two patterns is prefix-wise (or suffix-wise) less than the other.

In exactly the same way, we can determine whether a pattern P is suffix-wise less than Q (written as $P<_{sf}Q$), only now the alignment is done so that the right-most residues of the two patterns are aligned together, and the examination of the columns starts from the right and proceeds to the left.

The algorithm always works with the pattern P which is found at the top of stack; we call this pattern the current top. First, it will extend this pattern to the 'left' (prefix-wise) by looking at patterns Q in the list of elementary patterns which are convolvable with P, i.e. Q $\oplus$ P != Φ. If more than one such Q exists, then each of them will be convolved with P, one at a time. Specifically, if Q_1, Q_2 are two such patterns and $Q_1<_{sf}Q_2$, then the convolution of P with Q_1 is tried before that of Q_2. Let R be the pattern resulting from such a convolution. If R is matched by fewer than K distinct input sequences (this can easily be checked by examining the offset list of R), then R is discarded, the current top remains unchanged, and the next convolution is tried out. Otherwise, R is placed at the top of stack, thus becoming the new current top, and the procedure starts over again, this time with the new current top.

After the pattern P at the top of the stack can no longer be extended to the prefix direction, the same process is applied trying now to extend P to the 'right' (suffix-wise). This time we are looking for patterns Q such that P $\oplus$ Q != Φ (again, if more than one such patterns exist, the partial ordering is $<_{pf}$ used in order to resolve the order in which the convolutions will be performed).

When extension in both directions has been completed, the current top is popped from the stack and is checked for maximality. If the pattern is found to be maximal, it is reported. The process starts all over with the new top of stack. The processing of the current stage terminates when no more patterns remain in the stack.

E. FASTA

A sequence in FASTA format begins with a single-line description, followed by lines of sequence data. The description line is distinguished from the sequence data by a greater-than (">") symbol in the first column. The word following the ">" symbol is the identifier of the sequence, and the rest of the line is the description (both are optional). There should be no space between the ">" and the first letter of the identifier. It is recommended that all lines of text be shorter than 80 characters. The sequence ends if another line starting with a ">" appears; this indicates the start of another sequence. An example FASTA format is:[26]

```
>gi|5524211|gb|AAD44166.1| cytochrome b [Elephas maximus maximus]
LCLYTHIGRNIYYGSYLYSETWNTGIMLLLITMATAFMGYVLPWGQMSFWGATVITNLFSAIPYIGTNLV
EWIWGGFSVDKATLNRFFAFHFILPFTMVALAGVHLTFLHETGSNNPLGLTSDSDKIPFHPYYTIKDFLG
LLILILLLLLALLSPDMLGDPDNHMPADPLNTPLHIKPEWYFLFAYAILRSVPNKLGGVLALFLSIVIL
GLMPFLHTSKHRSMMLRPLSQALFWTLTMDLLTLTWIGSQPVEYPYTIIGQMASILYFSIILAFLPIAGX
IENY
```

F. Relational Database

A relational database is one that maintains a set of separate, related files (tables), but combines data elements from the files for queries and reports when required. The concept was developed in 1970 by Edgar Codd, whose objective was to accommodate a user's ad hoc request for selected data.[27]

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The standard user and application program interface to a relational database is the *structured query language* (SQL). SQL statements are used both for interactive queries for information from a relational database and for gathering data for reports.[28]

Other than being relatively easy to create and access, a relational database has the important advantage of being easy to extend. After the original database creation, a new data category can be added without requiring that all existing applications be customized. [28]

IV. Design and Implementation

A.   Algorithm

Teiresias operates in two phases: scanning and convolution phases.[5] Teiresias begins by scanning the sequences in the input set S and locating all elementary patterns with support at least K. An elementary pattern is just an <L, W> pattern containing exactly L residues.[4]

The result of the scanning process is a set containing all the elementary patterns (and their associated offset lists) which satisfy the minimum support requirement. This set is the input to the convolution phase. To comprehend how convolution works, it helps to realize that the scanning phase of the algorithm breaks up all the patterns that exist in the input into smaller pieces. The task, then, of the convolution phase is to put these pieces back together (in a time/space efficient way) in order to recover the original patterns.[4]

Convolution is the main operation used by the Teiresias algorithm for the reconstruction of the original patterns. The order in which the convolutions are performed is dictated by two partial orderings on the universe of the patterns. The use of these orderings guarantees that (a) all patterns are generated and (b) a maximal pattern P is generated before any non-maximal pattern subsumed by P. In this way, a non-maximal pattern can be detected with a minimal effort, just by comparing it against all patterns reported up to that point (comparisons can be made very efficiently using the appropriate hashing scheme to keep track of the maximal patterns).[3]

A.   Entity-Relationship Diagram

Figure 5 shows the entity relationship diagram for CPD Tool with Tutorial Module. The entities are the following: Expert, Lecture, Quiz Item and Supplementary Study Material. Figures 6-9 shows the attributes of each of the entities.

20
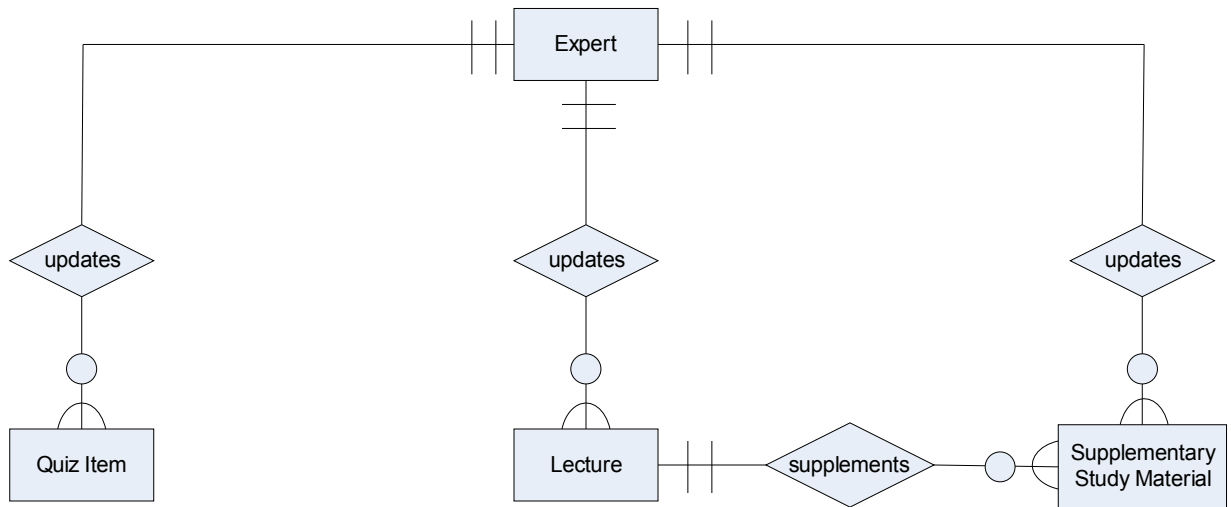
Figure 5. Entity-Relationship Diagram, *Combinatorial Pattern Discovery Tool with Tutorial Module*
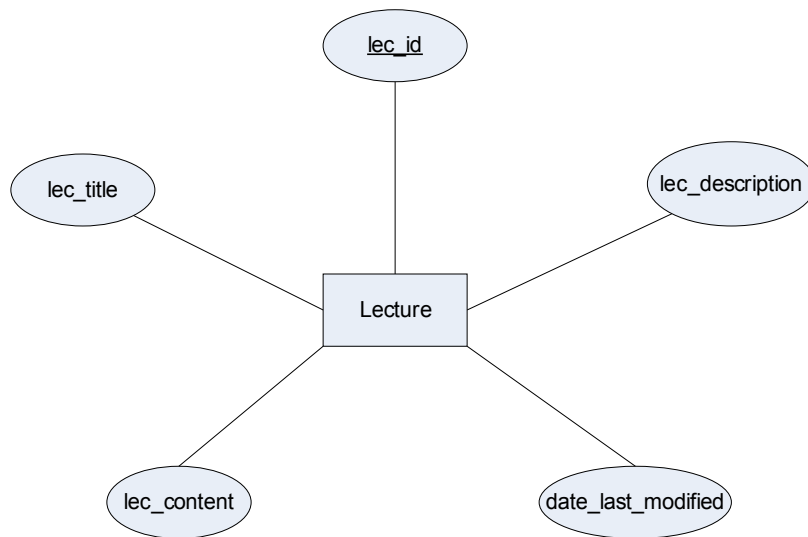
Figure 6. Lecture Entity with Attributes, *Combinatorial Pattern Discovery Tool with Tutorial Module*
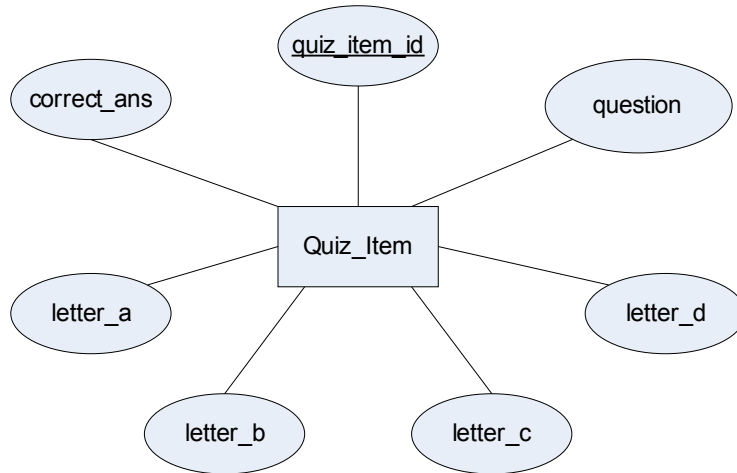
Figure 7. Quiz Item Entity and Attributes, *Combinatorial Pattern Discovery Tool with Tutorial Module*
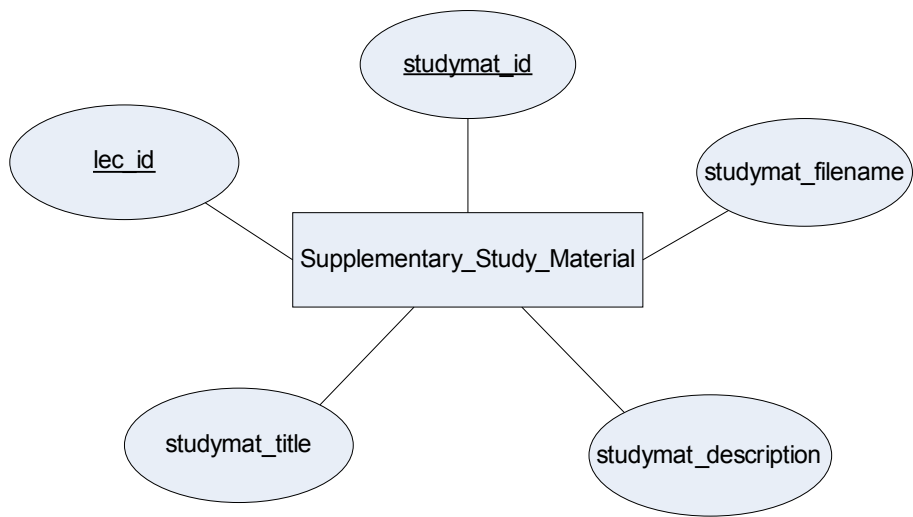
Figure 8. Supplementary Study Material Entity and Attributes, *Combinatorial Pattern Discovery Tool with Tutorial Module*
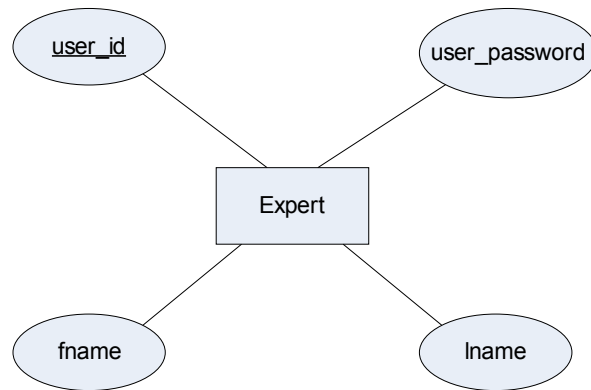
Figure 9. Expert Entity and Attributes, *Combinatorial Pattern Discovery Tool with Tutorial Module*

B. **Data Dictionary**

Lecture

Field Name	Data Type	Description
lec_id	Integer	Uniquely identifies lectures
lec_title	Varchar(200)	Title of the lecture
lec_description	Blob	Brief description of the lecture
lec_content	Blob	Contents of the lecture
date_last_modified	Varchar(10)	Date when lecture was last modified

Quiz_Item

Field Name	Data Type	Description
quiz_item_id	Integer	Uniquely identifies questions
question	Blob	The question text
correct_ans	Char(1)	The correct answer to the question
letter_a	Blob	The text corresponding to choice A of the question
letter_b	Blob	The text corresponding to choice B of the question
letter_c	Blob	The text corresponding to choice C of the question
letter_d	Blob	The text corresponding to choice D of the question

Supplementary Study Material

Field Name	Data Type	Description
studymat_id	Integer	Uniquely identifies a supplementary study material
lec_id	Integer	Foreign key that links to the lecture
studymat_title	Varchar(200)	Title of the study material
studymat_description	Blob	Brief description of the study material
studymat_filename	Varchar(200)	Filename of the study material

Expert

Field Name	Data Type	Description
user_id	Varchar(20)	Username used by the expert to login
user_password	Varchar(20)	Password used by the expert to login
fname	Varchar(50)	First name of the expert
lname	Varchar(50)	Last name of the expert

C.   **Context Diagram**

The Context Diagram in Figure 10 represents the overall interactions between the users and the CPD tool. There are two main entities in the system namely: expert and ordinary online user.
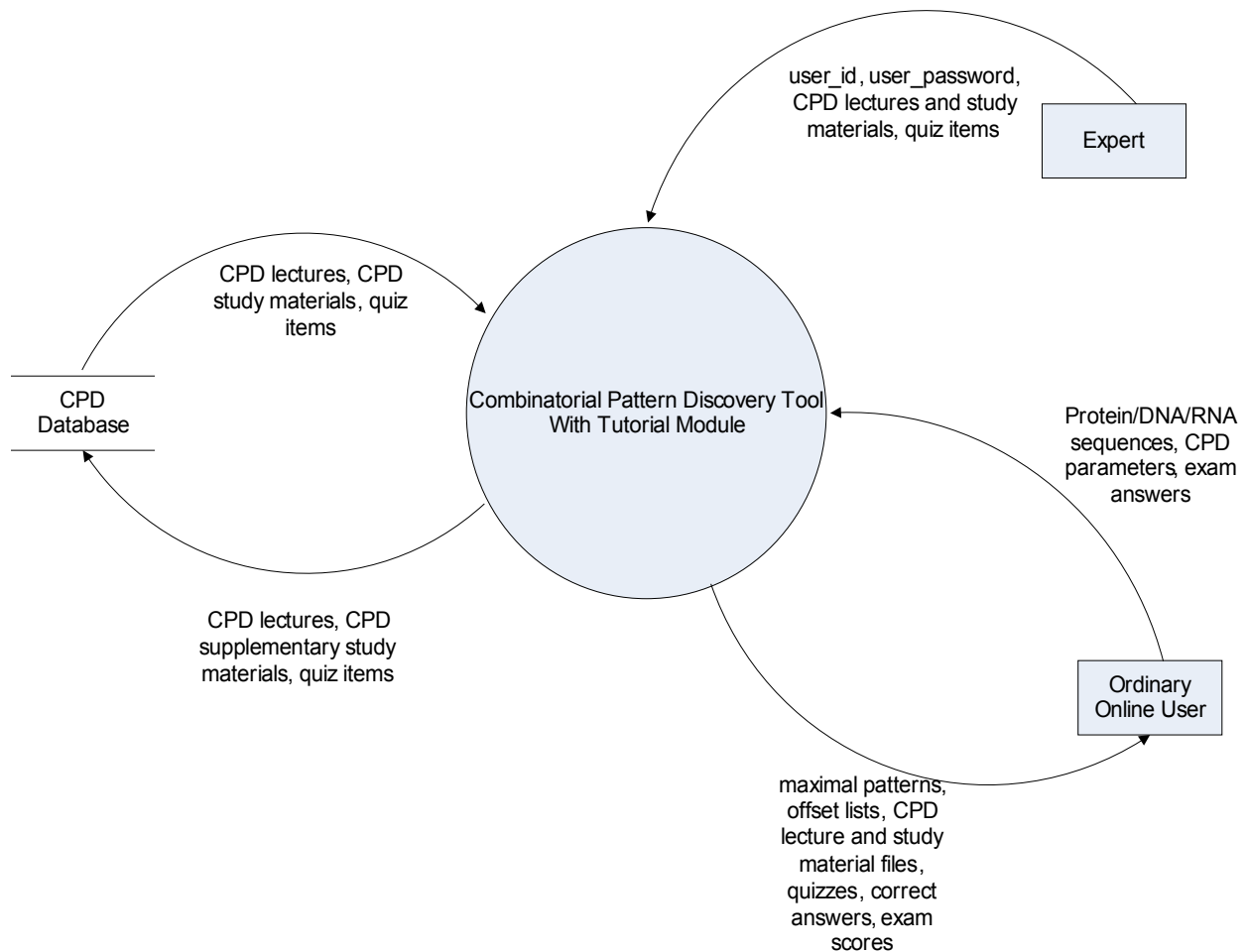
Figure 10. Context Diagram, *Combinatorial Pattern Discovery Tool with Tutorial Module*

D. **Data Flow Diagrams**

The Top Level Data Flow Diagram is illustrated in Figure 11. There are 3 processes: (1.0)Search for maximal patterns, (2.0)Take a tutorial and (3.0)Manage system files.
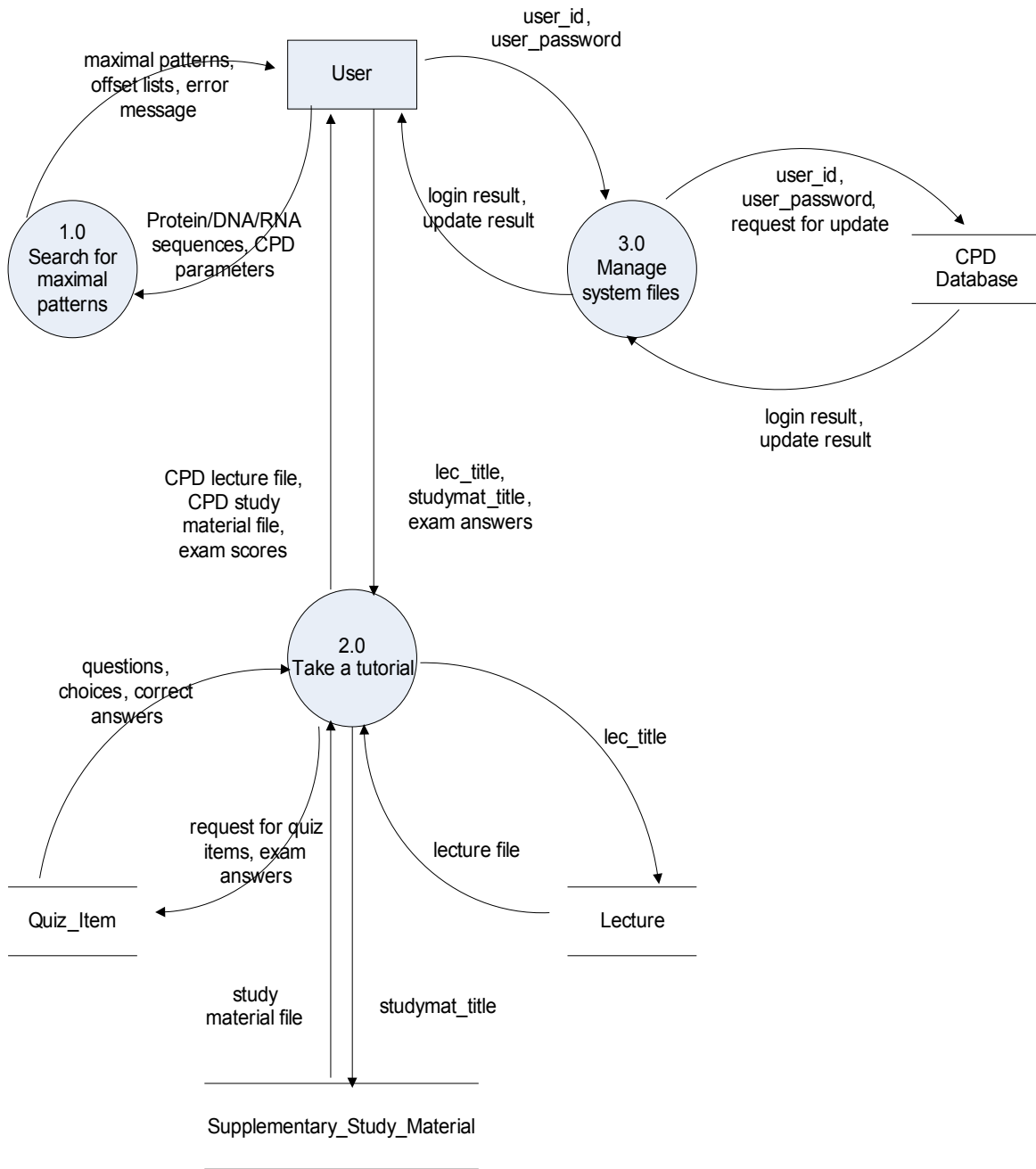
Figure 11. Top Level Data Flow Diagram, *Combinatorial Pattern Discovery Tool with Tutorial Module*

Process 1 can be subexploded into 4 subprocesses namely (1.1)Get user input, (1.2) Generate maximal patterns, (1.3)Save maximal patterns and their corresponding offset lists and (1.4)Browse sequences and results. These are shown in Figures 12-14.
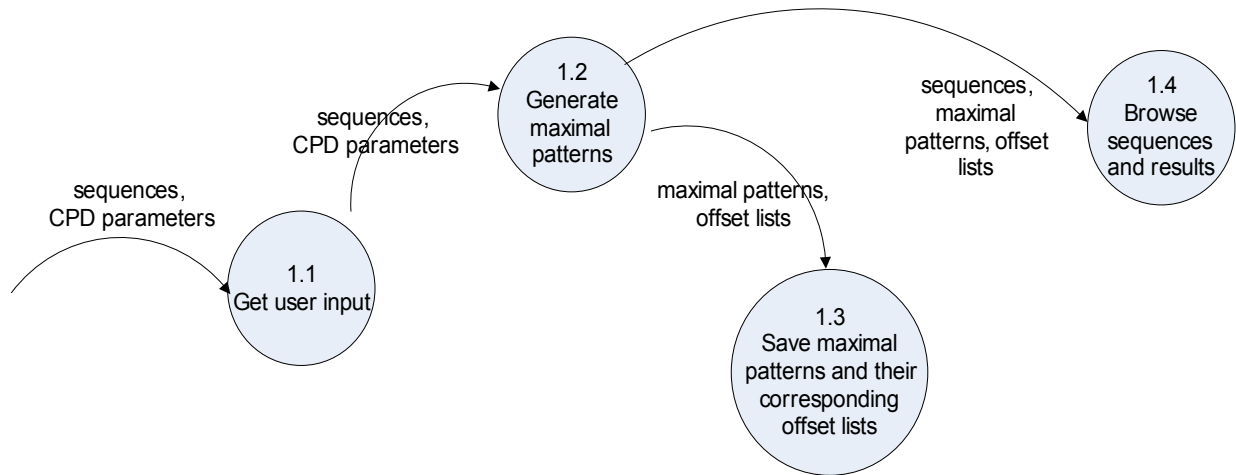
Figure 12. Subexplosion of Process 1, *Combinatorial Pattern Discovery Tool with Tutorial Module*
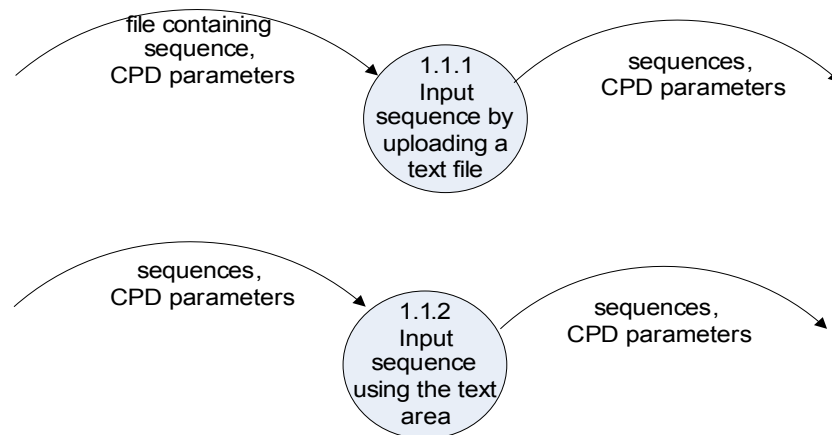
Figure 13. Subexplosion of process 1.1, *Combinatorial Pattern Discovery Tool with Tutorial Module*
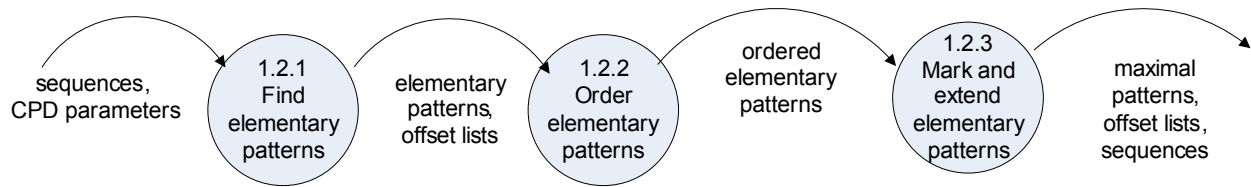
Figure 14. Subexplosion of process 1.2, *Combinatorial Pattern Discovery Tool with Tutorial Module*

Subexplosion of process 2 is illustrated in Figure 15. There are 5 subprocesses under the Take a tutorial process namely: View selected lecture, View selected study material, Take online examination, Check exam and View exam score and correct answers.
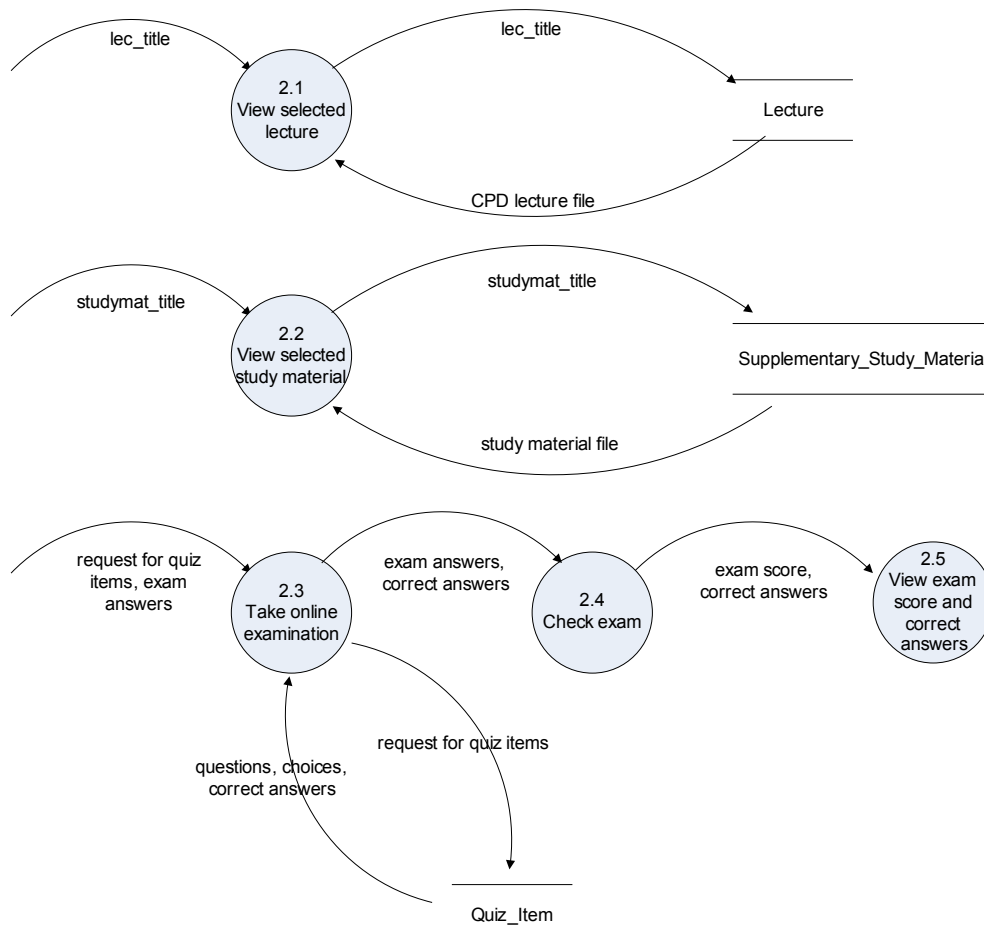
Figure 15. Subexplosion of Process 2, *Combinatorial Pattern Discovery Tool with Tutorial Module*

Subexplosion of process 3, Manage system files, is seen in Figure 16. The processes are: Login, Update lectures, Update quiz items and Update supplementary study materials. Further subexplosion of these processes are illustrated in Figures 17-19.
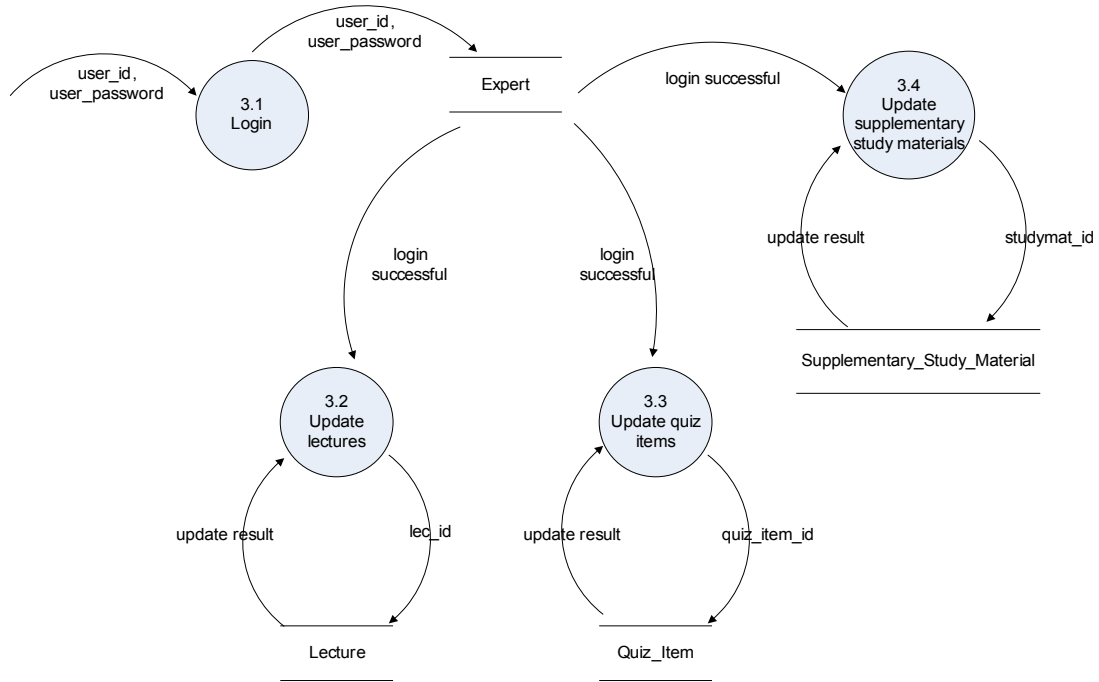
Figure 16. Subexplosion of Process 3, *Combinatorial Pattern Discovery Tool with Tutorial Module*
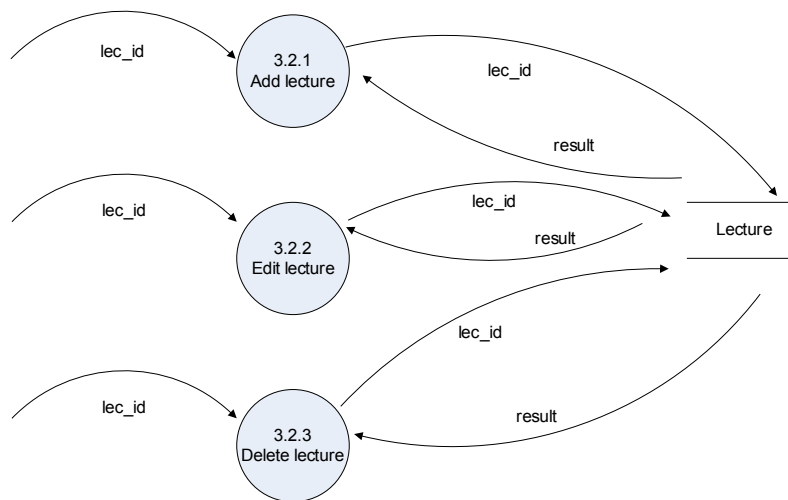
Figure 17. Subexplosion of Process 3.2, *Combinatorial Pattern Discovery Tool with Tutorial Module*
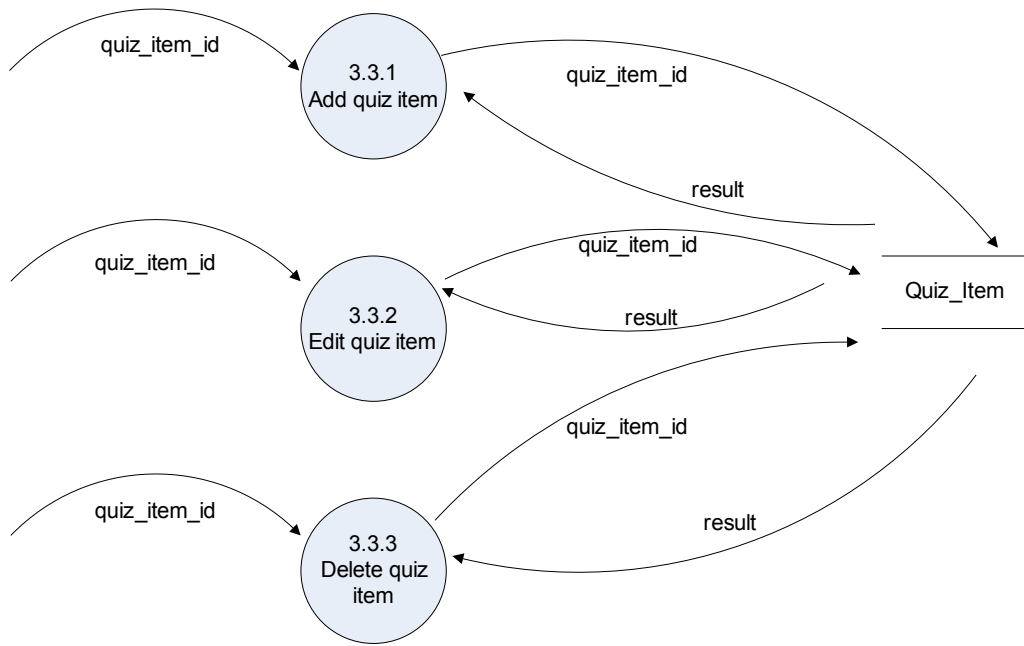
Figure 18. Subexplosion of Process 3.3, *Combinatorial Pattern Discovery Tool with Tutorial Module*
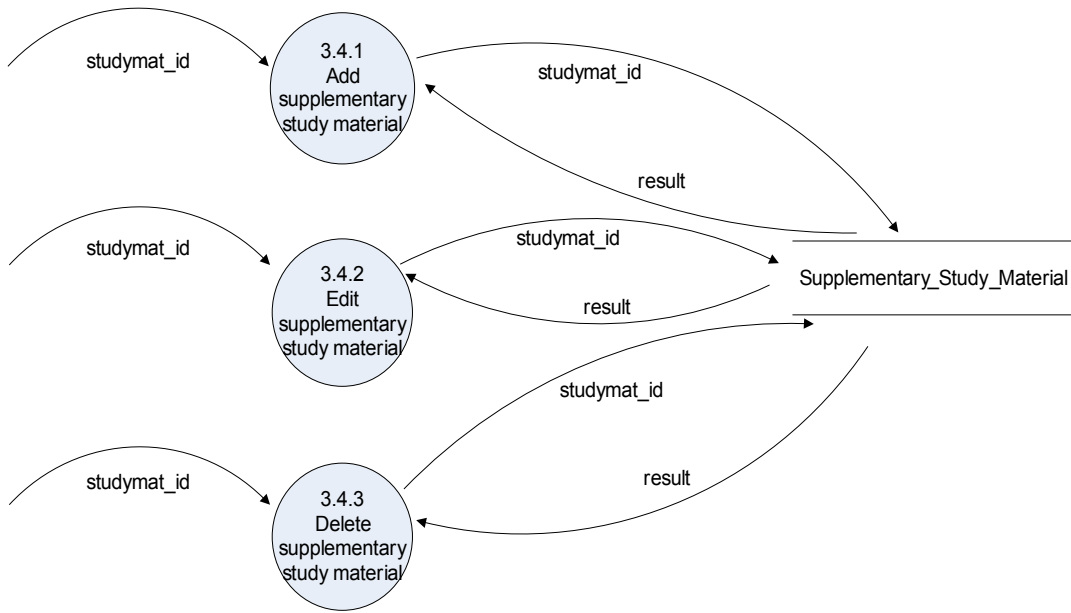
Figure 19. Subexplosion of Process 3.4, *Combinatorial Pattern Discovery Tool with Tutorial Module*

F. Technical Architecture

JavaServer Pages (JSP) technology allows web developers and designers to easily develop and maintain dynamic web pages that leverage existing business systems. As part of the Java technology family, JSP enables fast development of web-based applications that are platform-independent. JSP separates user interfaces from content generation, allowing designers to change the overall page layout without altering the underlying dynamic content.[29]

Apache Tomcat is a web container developed at the Apache Software Foundation. Tomcat implements the servlet and the JSP specifications from Sun Microsystems, providing an environment for Java code to run in cooperation with a web server. The Tomcat servlet engine is frequently used in combination with an Apache web server or other web servers. Tomcat runs on any operating system that has a Java Virtual Machine (JVM) since its developers wrote it in Java.[30]

The MySQL database has become the world's most popular open source database because of its consistent fast performance, high reliability and ease of use. MySQL runs on more than 20 platforms including Linux, Windows, OS/X, HP-UX, AIX, Netware, providing its users the kind of flexibility that puts them in control.[31]

The Combinatorial Pattern Discovery Tool with Tutorial Module was designed for use in a client-server scenario, and was developed using Apache 1.3.31 as HTTP server integrated with an Apache Tomcat 4.1.31 server, MySQL 4.0.21 as DBMS, and JavaServer Pages (JSP) to allow enhanced performance. It also uses client-side JavaScript for some form processing. The JavaScript embedded in the forms has been found to execute on Microsoft Internet Explorer 6.

V. Results

The home page of Combinatorial Pattern Discovery Tool is shown in Figure 20. The menu is visible on the left side of the page. The user can click on the hyperlink, Generate Maximal Patterns, if he wants to look for maximal patterns given the input sequences and parameters. He may also opt to take an online tutorial by clicking the Tutorial hyperlink. The Molecular Biology Expert can choose to login so that he will be able to perform tasks restricted for the Expert user only.

Figure 20. Home Page, *Combinatorial Pattern Discovery Tool with Tutorial Module*

To generate maximal patterns, the user clicks on Generate Maximal Patterns found on the menu at the left side of the main page. The user is given the option of choosing

whether he will input a protein, DNA or RNA sequences. After which, the user will be directed to a page with a form wherein the user can input sequences either by the use of a textarea or by reading a sequence from a file. In this form also the user inputs the L, W and K parameters. (See Figures 21 and 22)
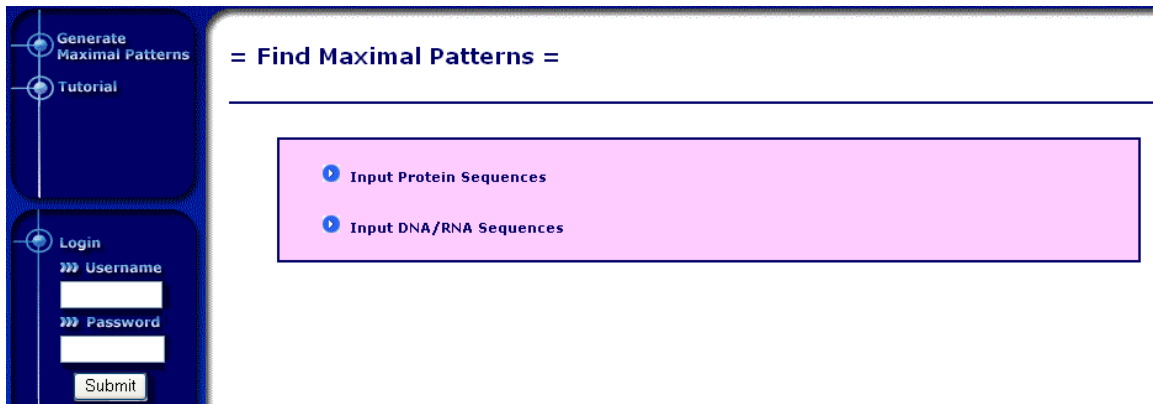
Figure 21. Choices for the type of sequence input, *Combinatorial Pattern Discovery Tool with Tutorial Module*

Figure 22. Input form for finding maximal patterns, *Combinatorial Pattern Discovery Tool with Tutorial Module*

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If there is an error found in the given parameters or in the input sequences, an error message will be displayed as shown in Figure 23. When the form is submitted with correct data, maximal patterns, if there's any, will be given as an output. A sample output is seen in Figure 24.
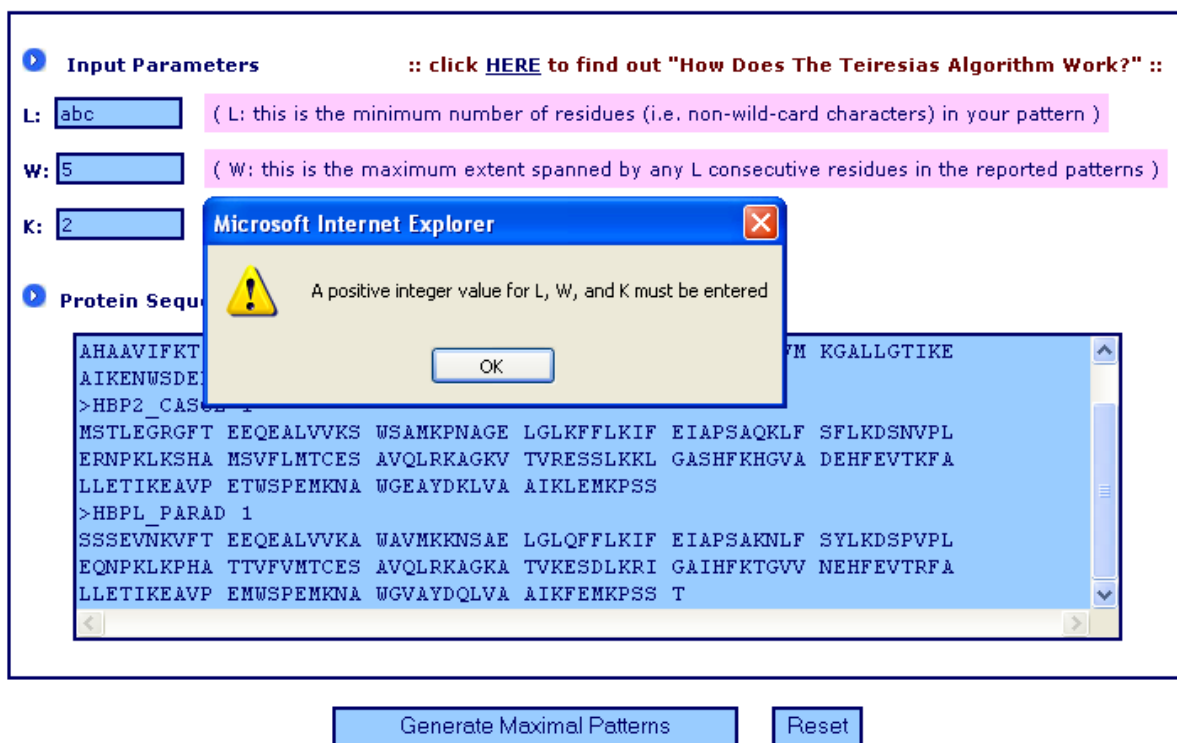
Figure 23. Error checking when an erroneous parameter is supplied, *Combinatorial Pattern Discovery Tool with Tutorial Module*

= Generated Maximal Patterns =

Click on the pattern then click 'Hightlight Pattern' to see the pattern highlighted in the input sequences

```
00001:   AIK
00002:   ALL.TIKEA
00003:   ALL
00004:   EMK
00005:   FAL
00006:   FLK
00007:   E.IKE
00008:   IKE
00009:   AL.E
00010:   I.EA.PE
00011:   EV.K
00012:   LK.S
00013:   MK.A
00014:   PE.K
00015:   TI.E
00016:   F.L.I
00017:   I.EA
00018:   L.A.I
00019:   S.LK
00020:   EHFEVT.FALLETIKEAVPE.WSPEMKNAWG.AYD.LVAAIK.EMKPSS
```
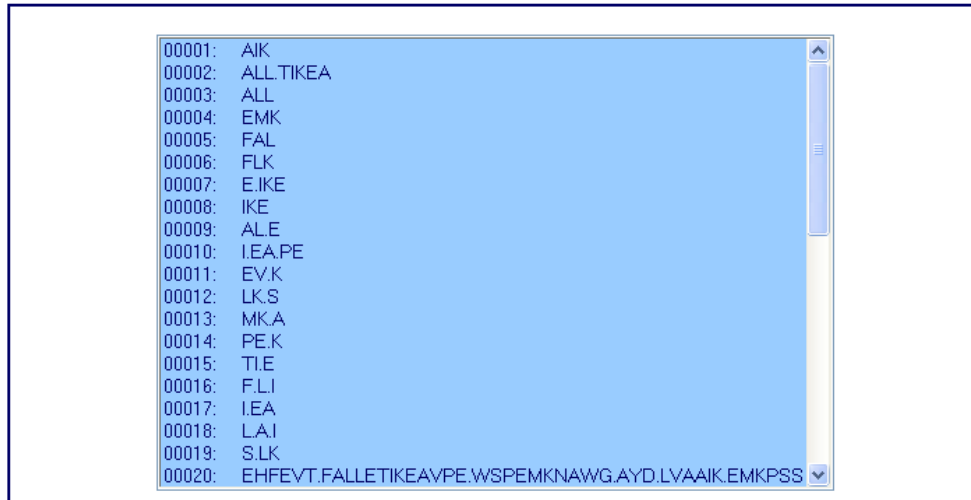
Figure 24. Maximal patterns generated based on the given input sequences, *Combinatorial Pattern Discovery Tool with Tutorial Module*

The user is given the option to display the input sequences wherein a selected maximal pattern is highlighted (see Figure 25). The user can also view the summary of results and save these results to their hard disks by clicking the specified hyperlinks seen in Figure 26.

```
There were 2 sequences containing the pattern
EHFEVT.FALLETIKEAVPE.WSPEMKNAWG.AYD.LVAAIK.EMKPSS with offset list { (2, 112), (3,
112) }

>HBP1_CASGL 1
ALTEKQEALL KQSWEVLKQN IPAHSLRLFA LIIEAAPESK YVFSFLKDSN EIPENNPKLK
AHAAVIFKTI CESATELRQK GHAVWDNNTL KRLGSIHLKN KITDPHFEVM KGALLGTIKE
AIKENWSDEM GQAWTEAYNQ LVATIKAEMK E

>HBP2_CASGL 1
MSTLEGRGFT EEQEALVVKS WSAMKPNAGE LGLKFFLKIF EIAPSAQKLF SFLKDSNVPL
ERNPKLKSHA MSVFLMTCES AVQLRKAGKV TVRESSLKKL GASHFKHGVA DEHFEVTKFA
LLETIKEAVP ETWSPEMKNA WGEAYDKLVA AIKLEMKPSS

>HBPL_PARAD 1
SSSEVNKVFT EEQEALVVKA WAVMKKNSAE LGLQFFLKIF EIAPSAKNLF SYLKDSPVPL
EQNPKLKPHA TTVFVMTCES AVQLRKAGKA TVKESDLKRI GAIHFKTGVV NEHFEVTRFA
LLETIKEAVP EMWSPEMKNA WGVAYDQLVA AIKFEMKPSS T
```

GO BACK

Figure 25. Display input sequences wherein a selected maximal pattern is highlighted, *Combinatorial Pattern Discovery Tool with Tutorial Module*

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```
00011:   F.VVKEALL.T.K
00012:   AYD.L
00013:   V.DSA.QL
00014:   DSA
00015:   EAL
00016:   FSFL
00017:   L.KAP.AK
00018:   AL.K
00019:   E.A.A.K
00020:   A.LK
```

Highlight Pattern

:: click **HERE** to view the summary of results ::

:: right-click **HERE** then click 'Save Target As...' to download the summary of results ::

There are a total of **428 MAXIMAL PATTERNS** found from the given sequences
You are currently viewing **Page 1**

:: **Click on the numbered link to go to that page** ::
1 2 3 4 5

Figure 26. Users are given the option of viewing and saving the summary of results, *Combinatorial Pattern Discovery Tool with Tutorial Module*

The lectures in the tutorial module can be accessed by clicking Tutorial>Lectures (Figure 27). The lecture IDs are hyperlinks. By clicking on them, the lecture will be available for viewing. (See Figure 28)

= Lectures =

Note: Click on the lecture ID to view that specified lecture.

Lecture Title	Lecture Description
Terminology of Teiresias Algorithm	definition of terms used in Teiresias algorithm
Teiresias Algorithm	by Rigoutsos and Floratos
Scanning Phase and Convolution Phase	by Rigoutsos and Floratos
Amino Acids and Nucleotides	definition of amino acids and nucleotides
A Discussion of the Definition of Patterns	by Murray Wolinsky
Fasta Format	description of fasta format

There are a total of **6** lecture/s in the database
You are currently viewing **Page 1**

::Click on the numbered link to go to that page::
1

Figure 27. List of available lectures, *Combinatorial Pattern Discovery Tool with Tutorial Module*

Amino Acids and Nucleotides

Amino acids are the basic structural building units of proteins. They form short polymer chains called peptides or polypeptides which in turn form structures called proteins. Twenty amino acids are encoded by the standard genetic code and are called proteinogenic or standard amino acids.

Nucleotides are the building blocks that are necessary for making new DNA and RNA. DNA is a very large molecule, and the rungs of the DNA ladder are made of a combination of two different nucleotides.

Two of the bases in nucleic acids, adenine (A) and guanine (G), are purines. In DNA, these bases form hydrogen bonds with their complementary pyrimidines thymine (T) and cytosine (C). In RNA, the complement of adenine is uracil (U) instead of thymine.

One of the most fascinating languages being studied by mankind is the genetic code of living organisms, the DNA, RNA, and protein molecules that are essential to all life on earth. These macromolecules are built (usually in a linear manner) from a small amount of building blocks like nucleotides or amino acids. The genetic code, using perhaps an oversimplification, can thus be interpreted as sequences of these basic building blocks or letters. The function of each of the molecules is usually determined by their structure, and one of the key questions in modern molecular biology is to understand the relationship between the sequence, structure, and function of these molecules as well as the biological processes they are involved in.

The machinery that is able to read, interpret, replicate, and otherwise utilize the information stored in DNA, RNA and protein molecules is essential to life. This universal language of life has evolved over billions of years, producing many different life-forms from the simplest bacteria to human beings, being able to survive in extreme heat and pressure or under constant freezing conditions, or consuming completely different energy sources.

Biological sequences, or biosequences, can be grouped in families based on their function, structure, cellular location, molecular processes, gene regulation, or other criteria. Patterns common to these

Figure 28. A static lecture on the definition of amino acids and nucleotides, *Combinatorial Pattern Discovery Tool with Tutorial Module*

By clicking on Tutorial>Study Materials, the user will be directed to a page where he can download supplementary study materials by right-clicking on the study material ID then clicking "Save Target As…" as shown in Figure 29. A user can take a 10-item quiz to test their knowledge of the topics discussed in the lectures and study materials regarding pattern discovery. This is illustrated on Figure 30.

= Download Study Materials =

Note: To download files, right-click on the study material ID and then click 'Save Target As…'

Study Material Title	Study Material Description	Associated With Lecture
Combinatorial Pattern Discovery in Biological Sequences: the TEIRESIAS Algorithm	by Rigoutsos and Floratos	Teiresias Algorithm
Scanning Phase	image of scanning phase described by Rigoutsos and Floratos	Scanning Phase and Convolution Phase
Reconstruction of maximal pattern from elementary patterns	image file	Scanning Phase and Convolution Phase
Definition of convolution	image file	Scanning Phase and Convolution Phase
On The Time Complexity of the Teiresias Algorithm	pdf file	Scanning Phase and Convolution Phase
Pattern Discovery from Biosequences	pdf file	Scanning Phase and Convolution Phase

Figure 29. List of study materials available for downloading, *Combinatorial Pattern Discovery Tool with Tutorial Module*

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D. none of the aboe

9. A _____ is defined to be any string that begins and ends with a residue, and contains an arbitrary combination of residues and '.' characters.

A. pattern

B. alphabet

C. literal

D. none of the above

10. This parameter pertains to the maximum extent spanned by any L consecutive literals in the reported patterns.

A. W parameter

B. K parameter

C. C parameter

D. Q parameter

Compute Score   Reset

Figure 30. 10-item quiz, *Combinatorial Pattern Discovery Tool with Tutorial Module*

A login form is provided for the Molecular Biology Expert to update the lectures, study materials and the quiz items in the tutorial module. By clicking on Update Tutorial Module>Lectures the Expert is given the chance to update the lectures. (See Figures 31-33)

:: Add A Lecture ::

Note: All fields are required.

| Lecture Title | Scanning Phase and Convolution Phase |
| Lecture Description | by Rigoutsos and Floratos |
| Lecture Content | The result of the scanning process described above is a set containing all the elementary patterns (and their associated offset lists) which satisfy the minimum support requirement. This set is the input to the convolution phase. To understand how convolution works, it helps to realize that the scanning phase of the algorithm breaks up all the patterns that exist in the input into smaller pieces. The task, then, of the convolution phase is to put these pieces back together (in a time/space efficient way) in order to recover the original patterns.

The key observation behind the convolution phase is that an original pattern P can be reconstructed by piecing together pairs A, B of intermediate patterns such that a suffix of A is the same as a prefix of B. For example, consider again the set of sequences S given in Figure 2. This set contains the patterns 'F.ASTS'. It is possible to reconstruct this pattern in the following way (see also Figure 3).

1. Combine together the elementary patterns 'F.AS' and 'AST' into the pattern 'F.AST'. |

Figure 31. Add a lecture, *Combinatorial Pattern Discovery Tool with Tutorial Module*

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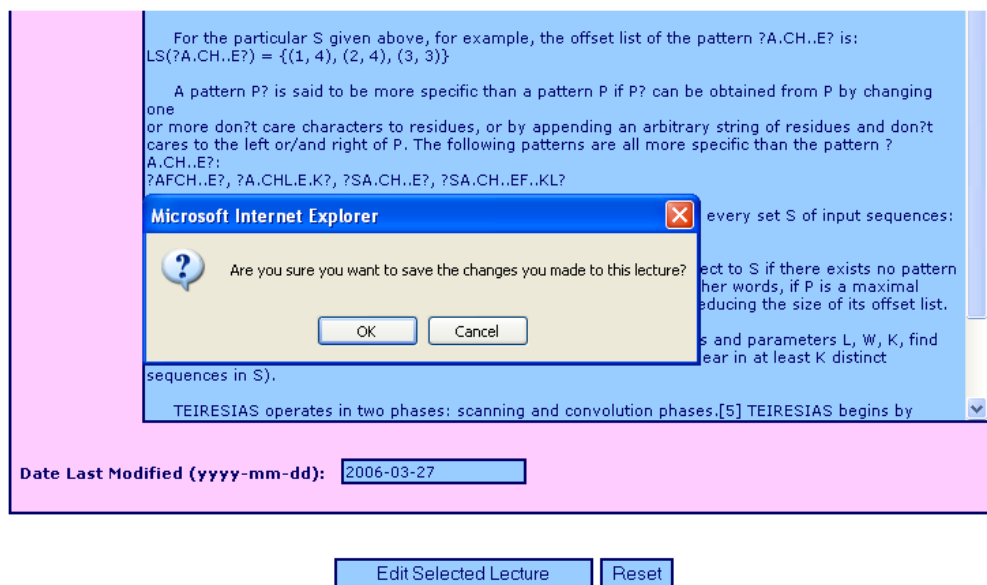
Figure 32. Edit a lecture, *Combinatorial Pattern Discovery Tool with Tutorial Module*
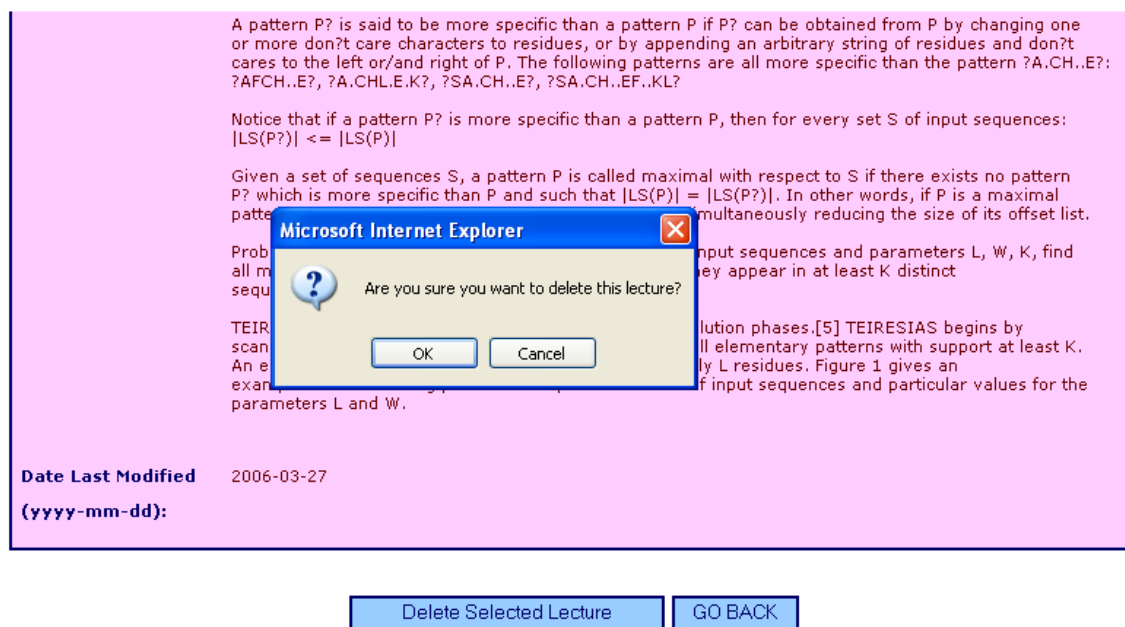
Figure 33. Delete a lecture, *Combinatorial Pattern Discovery Tool with Tutorial Module*

The Molecular Biology Expert is also free to update the study materials and also the quiz items of the tutorial module. (See Figures 34-39)

:: Add A Study Material ::

Note: All fields are required.

Lecture ID: 2

Study Material Title: very in Biological Sequences: the TEIRESIAS Algorithm

Study Material Description: by Rigoutsos and Floratos

Study Material Filename: C:\Tomcat\Tomcat4.1\webapps\cpd\supplementary_stu

[Add Study Material] [Reset]

Figure 34. Add a study material, *Combinatorial Pattern Discovery Tool with Tutorial Module*

:: Edit A Study Material ::

Study Material ID: 1

Lecture ID: 2

Study Material Title: Combin

Microsoft Internet Explorer

Are you sure you want to save the changes you made to this study material?

[OK] [Cancel]

Study Material Description: by Rigou

Study Material Filename: C:\Tomcat\Tomcat4.1 \webapps\cpd\supplementary_study_materials\55.pdf

[Edit Selected Study Material] [Reset]

Figure 35. Edit a study material, *Combinatorial Pattern Discovery Tool with Tutorial Module*

:: Delete A Study Material ::

Study Material ID: 1

Lecture ID: 2

Study Material Title: Combinatoria~~l~~ ... EIRESIAS
Algorithm

Study Material Description: by Rigoutsos

Study Material Filename: C:\Tomcat\Tomcat4.1\webapps\cpd\supplementary_study_materials\55.pdf

---

Microsoft Internet Explorer

? Are you sure you want to delete this study material?

[OK]   [Cancel]

[Delete Selected Study Material]   [GO BACK]

Figure 36. Delete a study material, *Combinatorial Pattern Discovery Tool with Tutorial Module*

:: Add A Quiz Item ::

Note: All fields are required.

Question: maximum extent spanned by any L consecutive literals in the reported patterns.

Choice A: W parameter

Choice B: K parameter

Choice C: C parameter

Choice D: Q parameter

Correct Answer: A

[Add Quiz Item]   [Reset]

Figure 37. Add a quiz item, *Combinatorial Pattern Discovery Tool with Tutorial Module*

:: Edit A Quiz Item ::

Question Item ID: 11

Question: maximum extent spanned by any L consecutive literals in the reported patterns.

Choice A: W parameter

Choice B: K parameter

Choice C: C parameter

Choice D: Q parameter

Correct Answer: A

Microsoft Internet Explorer

Are you sure you want to save the changes you made to this quiz item?

OK   Cancel

Edit Selected Quiz Item   Reset
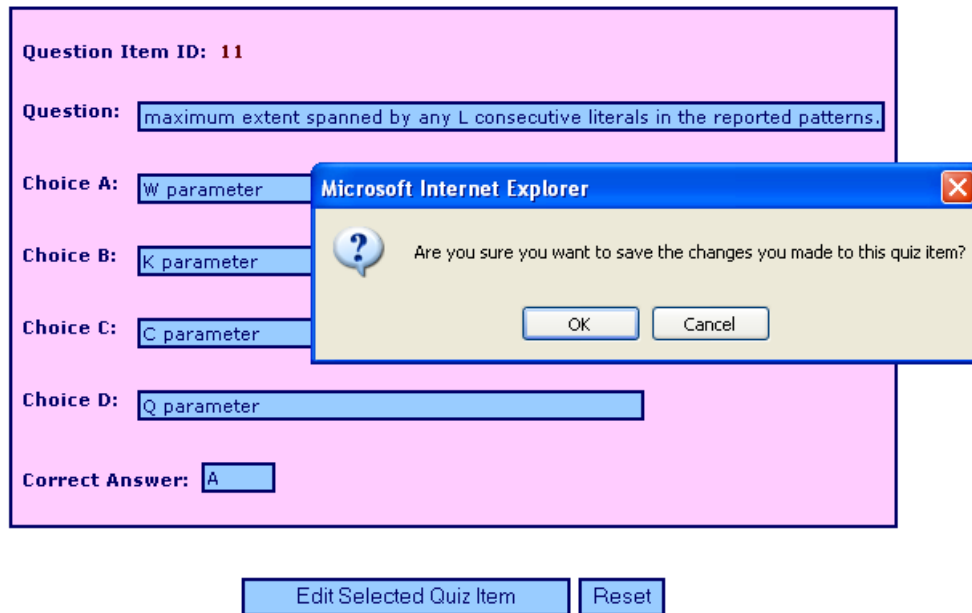
Figure 38. Edit a quiz item, *Combinatorial Pattern Discovery Tool with Tutorial Module*

:: Delete A Quiz Item ::

Question Item ID: 11

Question: This parameter pertains to the maximum extent spanned by any L consecutive literals in the reported patterns.

Choice A: W parameter

Choice B: K parameter

Choice C: C parameter

Choice D: Q parameter

Correct Answer: A

Microsoft Internet Explorer

Are you sure you want to delete this quiz item?

OK   Cancel

Delete Selected Quiz Item   GO BACK
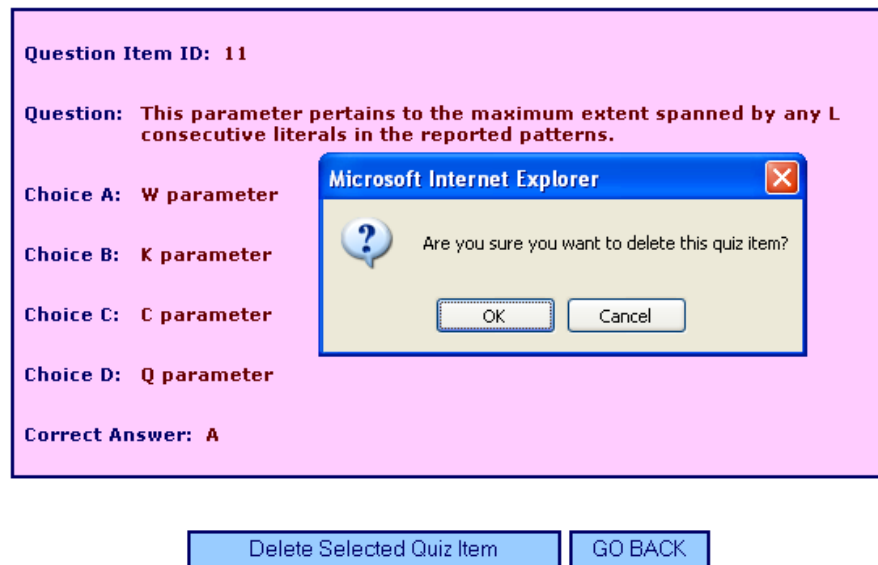
Figure 39. Delete a quiz item, *Combinatorial Pattern Discovery Tool with Tutorial Module*

VI. Discussion

The Combinatorial Pattern Discovery Tool is a web-based application which aims to find maximal patterns from a given set of protein/DNA/RNA sequences. The parameters specified by the user determine the maximal patterns that will be generated as output. Maximal patterns are found by using the Teiresias algorithm which involves two phases namely: the scanning phase and convolution phase. The offset lists corresponding to the maximal patterns, which determine the locations of a specific maximal pattern in the input sequences, are also displayed as part of the output.

An advantage of using the Teiresias algorithm in finding maximal patterns is that it does not enumerate the entire solution space, thus, saving a considerable amount of time. Also, the reported patterns generated after the execution of the program possess the maximality property. That is, if a pattern P is maximal, then it cannot be made more specific without simultaneously reducing the size of its offset list.

A drawback of the Teiresias algorithm, however, is that it requires significant amount of memory to perform its tasks. Parallelization might be of help in this regard, by dividing the set of sequences into subsets and then merging the results. However, it is not obvious how much can be gained in this regard. According to Rigoutsos and Floratos[3], the worst-case time complexity of the Teiresias algorithm is

$$O(W^L m \log m + W(Cm + t_H) \sum_{P \ maximal} rc(P))$$

Focusing on the first term of the bound we can observe that as the values of L and W becomes larger, the time complexity required for the algorithm to run to completion becomes worse.

Most of the existing pattern enumeration algorithms begin with a seed pattern and extend it by a single position at a time, examining at every step of the process whether the new pattern has the required support and pruning the search if it does not. This process guarantees completeness of the results; however, non-maximal patterns are generated and can be very time consuming, especially if the input contains long patterns. On the other hand, the convolution operation involved in the Teiresias algorithm permits the extension of

42

a pattern by more than one position at a time, allowing for considerable speed up. Furthermore, the ordering of the intermediate patterns when performing convolutions gives another performance boost, by avoiding the generation of redundant patterns.

Another property that differentiates Teiresias from existing works, is the kind of structural restriction the user is allowed to impose on the sought patterns. Usually, the speed of the pattern discovery process can be controlled by bounding the length of the reported patterns. However, this has the drawback that long patterns either escape attention or are broken into multiple redundant and overlapping pieces. On the other hand, by the use of Teiresias algorithm, only the parameter W which indicates basically the maximum number of don't care characters between two successive residues in a pattern needs to be set. It thus becomes possible to discover patterns of arbitrary length as long as preserved positions are not more than W residues away.[32]

The discovery of sequence similarity in the primary structure of related proteins or genes is one of the problems arising in the analysis of biological sequences. Finding the maximal patterns with minimal support found in biological sequences is important for molecular biologists because these usually corresponds to residues conserved during evolution due to an important structural or functional role.[4] If a feature common to all known sequences of a family is found, then it is likely that this particular feature is important for the biological role of the family.[1]

VII. Conclusion

The Combinatorial Pattern Discovery Tool is composed of a compute module (under the "Generate Maximal Patterns menu") and a tutorial module (under the "Tutorial menu").

It allows anonymous users to find maximal patterns given the input sequences and the required parameters. The users can browse through each of the maximal patterns and their corresponding offset list. The user can view the summary of results and they can also opt to save the summary of results in their hard disks.

In order to assist students in understanding the concepts behind Combinatorial Pattern Discovery, lectures and supplementary study materials are provided. These include static HTML files which explain concepts regarding pattern discovery and some definitions related to the Teiresias algorithm. A Flash animation file is also included to demonstrate how the Teiresias algorithm works given a sample input. An automatically-generated self-test whose questions are taken from the database is also provided so that students can test their knowledge of the concepts. An authenticated "expert" user has the privilege to add, edit or delete lectures, supplementary study materials and quiz items.

VIII. Recommendation

The class of patterns that Teiresias finds should be extended, if possible. The current implementation of the Teiresias algorithm does not handle flexible gaps. The method should be extended so that the detection of flexible gaps becomes an integral part of the algorithm. [4] Furthermore, the current algorithm will miss patterns that differ by biochemically similar residues.[26] It is also recommended that the algorithm allows groups of residues (rather than a sole residue) to occupy a single position within a pattern (as is the case, for example, with the patterns used in PROSITE).[4]

Another interesting improvement is to enhance the Flash animation so that the movie will allow more interactions with its users.

IX. Bibliography

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X. Appendix (Source code)

addlecture.jsp
```
<html>
<head><title>Add Quiz</title>
<script language="JavaScript">
function checkParameters(form)
{
```

```
            if(!form.lec_title.value.length || !
form.lec_desc.value.length || !
form.lec_content.value.length || !
form.date_last_modified.value.length)
            {
                    alert('Please be reminded that all the
fields are required.');
                    return false;
            }

            return true;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLEncoder" %>
<%@ include file="connect.jsp" %>
<%
            int daysPerMonth[] = { 0, 31, 28, 31, 30, 31,
30, 31, 31, 30, 31, 30, 31 };
            String sub = request.getParameter("sub");

            if(sub.equals("Add Lecture"))
            {
                    String lec_title =
request.getParameter("lec_title");
                    String lec_desc =
request.getParameter("lec_desc");
                    String lec_content =
request.getParameter("lec_content");
                    String date_last_modified =
request.getParameter("date_last_modified");

                    String dateYearString =
Character.toString(date_last_modified.charAt(0)) +
Character.toString(date_last_modified.charAt(1)) +
Character.toString(date_last_modified.charAt(2)) +
Character.toString(date_last_modified.charAt(3));
                    String dateMonthString =
Character.toString(date_last_modified.charAt(5)) +
Character.toString(date_last_modified.charAt(6));
                    String dateDayString =
Character.toString(date_last_modified.charAt(8)) +
Character.toString(date_last_modified.charAt(9));

                    int dateYear =
Integer.parseInt(dateYearString);
                    int dateMonth =
Integer.parseInt(dateMonthString);
                    int dateDay =
Integer.parseInt(dateDayString);

                    if(((dateMonth>=1 &&
dateMonth<=12) && (dateDay>=1 &&
dateDay<=daysPerMonth[dateMonth])) || (dateMonth==2
&& dateDay==29 && (dateYear % 400==0 || (dateYear
%4==0 && dateYear%100!=0))))
                    {
                            String updateString =
"INSERT INTO LECTURE VALUES('NULL', '"
+URLEncoder.encode(lec_title)+ "', '"
+URLEncoder.encode(lec_desc)+ "', '"
+URLEncoder.encode(lec_content)+ "', '"
+date_last_modified+ "')";

            statement.executeUpdate(updateString);
                            out.println("<h4>::
Result ::</h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backblue'><br>The lecture was successfully added
to the database.<BR><BR></td></tr><tr><td
align='center' class='backblue'><a href='adminlecture.jsp'
target='_parent'>[ back to update lecture page ]
</a><br><br></td></tr></center></table>");
                            connection.close();
                    }
                    else
                    {
                            out.println("<h4><font
color=#660000>:: Warning
```

```
::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>The date you entered was invalid.
Please follow the format (yyyy-mm-dd) given in the
previous page regarding the date when the lecture was last
modified.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
                    }
            }
            else
            {
%>
                    <h3>:: Add A Lecture ::</h3>
                    <font color=#660000><i>Note: All
fields are required.</i></font>
                    <form method=POST
action="addlecture.jsp" name="form1" onSubmit="return
checkParameters(form1);">
                    <CENTER>
                    <table class="backpink" style="font-
family: Verdana; font-size: 11px; font-weight: bold;
border-collapse: collapse" cellpadding="3" cellspacing="1">

                    <tr>
                            <td colspan=2
class="label"><br>Lecture Title</td>
                            <td
colspan=2><br><input type="text" name="lec_title"
style="font-family: Verdana; font-size: 11px" size=50
maxlength=200><BR><BR></td>
                    </tr>
                    <tr>
                            <td colspan=2
class="label">Lecture Description</td>
                            <td colspan=2><textarea
name="lec_desc" cols="50" rows="5" style="font-family:
Verdana; font-size: 11px"
wrap="hard"></textarea><BR><BR></td>
                    </tr>
                    <tr>
                            <td colspan=2
class="label">Lecture Content</td>
                            <td colspan=2><textarea
name="lec_content" cols="100" rows="50" style="font-
family: Verdana; font-size: 11px"
wrap="hard"></textarea><BR><BR></td>
                    </tr>
                    <tr>
                            <td colspan=4
class="label">Date Last Modified (yyyy-mm-
dd)   <input type="text"
name="date_last_modified" style="font-family: Verdana;
font-size: 11px" size=20 maxlength=10><BR><BR></td>
                    </tr>
                    </table>
                    <BR><BR>
                    <input type="submit" name="sub"
value="Add Lecture">
                    <input type="reset" name="reset"
value="Reset"></CENTER>
                    </form>
<%
            }
%>
</font>
</body>
</html>
```

addquizitem.jsp
```
<html>
<head><title>Add Quiz</title>
<script language="JavaScript">
function checkParameters(form)
{
            if(!form.ques.value.length || !
form.let_a.value.length || !form.let_b.value.length || !
form.let_c.value.length || !form.let_d.value.length || !
form.answer.value.length)
            {
```

```
                alert('Please be reminded that all the
fields are required.');
                        return false;
                }

                if(!((form.answer.value=="A") ||
(form.answer.value=="B") || (form.answer.value=="C") ||
(form.answer.value=="D") || (form.answer.value=="a") ||
(form.answer.value=="b") || (form.answer.value=="c") ||
(form.answer.value=="d")))
                {
                        alert('The letter of the correct answer
must be either A, B, C or D.');
                        return false;
                }

                return true;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLEncoder" %>
<%@ include file="connect.jsp" %>
<%
        String sub = request.getParameter("sub");

        if(sub.equals("Add Quiz Item"))
        {
                String ques =
request.getParameter("ques");
                String let_a =
request.getParameter("let_a");
                String let_b =
request.getParameter("let_b");
                String let_c =
request.getParameter("let_c");
                String let_d =
request.getParameter("let_d");
                String answer =
request.getParameter("answer");

                String answerUpper =
answer.toUpperCase();

                String updateString = "INSERT INTO
QUIZ_ITEM VALUES('NULL', '" +URLEncoder.encode(ques)+
"', '" +answerUpper+ "', '" +URLEncoder.encode(let_a)+ "',
'" +URLEncoder.encode(let_b)+ "', '"
+URLEncoder.encode(let_c)+ "', '"
+URLEncoder.encode(let_d)+ "')";

                statement.executeUpdate(updateString);
                        out.println("<h4>:: Result
::</h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backblue'><br>The quiz item was successfully
added to the database.<BR><BR></td></tr><tr><td
align='center' class='backblue'><a
href='adminquizitem.jsp' target='_parent'>[ back to update
quiz item page ]
</a><br><br></td></tr></center></table>");
                        connection.close();
                }
                else
                {
%>
                        <h3>:: Add A Quiz Item ::</h3>
                        <font color=#660000><i>Note: All
fields are required.</i></font>
                        <form method=POST
action="addquizitem.jsp" name="form1" onSubmit="return
checkParameters(form1);">
                        <CENTER>
                        <table class="seventy backpink"
style="font-family: Verdana; font-size: 11px; font-weight:
bold; border-collapse: collapse" cellpadding="3"
cellspacing="1">
                        <tr>
                                <td colspan=1
class="label"><br>Question:</td>
```

```
                                        <td
colspan=3><br><input type="text" name="ques"
style="font-family: Verdana; font-size: 11px"
size="75"><BR><BR></td>
                        </tr>
                        <tr>
                                        <td colspan=1
class="label">Choice A:</td>
                                        <td colspan=3><input
type="text" name="let_a" style="font-family: Verdana;
font-size: 11px" size="50"><BR><BR></td>
                        </tr>
                        <tr>
                                        <td colspan=1
class="label">Choice B:</td>
                                        <td colspan=3><input
type="text" name="let_b" style="font-family: Verdana;
font-size: 11px" size="50"><BR><BR></td>
                        </tr>
                        <tr>
                                        <td colspan=1
class="label">Choice C:</td>
                                        <td colspan=3><input
type="text" name="let_c" style="font-family: Verdana;
font-size: 11px" size="50"><BR><BR></td>
                        </tr>
                        <tr>
                                        <td colspan=1
class="label">Choice D:</td>
                                        <td colspan=3><input
type="text" name="let_d" style="font-family: Verdana;
font-size: 11px" size="50"><BR><BR></td>
                        </tr>
                        <tr>
                                        <td colspan=4
class="label">Correct Answer:  <input
type="text" name="answer" style="font-family: Verdana;
font-size: 11px" maxlength="1"
size="5"><BR><BR></td>
                        </tr>
                        </table>
                        <BR><BR>
                        <input type="submit" name="sub"
value="Add Quiz Item">
                        <input type="reset" name="reset"
value="Reset"></CENTER>
                        </form>
<%
        }
%>
</font>
</body>
</html>
```

addstudymaterial2.jsp
```
<html>
<head><title>Add Study Material</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLEncoder" %>
<%@ include file="connect.jsp" %>
<%
        String sub = request.getParameter("sub");

        if(sub.equals("Add Study Material"))
        {
                String lec_idString =
request.getParameter("lec_id");
                String studymat_title =
request.getParameter("studymat_title");
                String studymat_desc =
request.getParameter("studymat_desc");
                String studymat_filename =
request.getParameter("studymat_filename");

                int lec_id =
Integer.parseInt(lec_idString);

                String qString = "SELECT LEC_ID
FROM LECTURE WHERE LEC_ID=" + lec_id;
```

```
                    ResultSet rs =
statement.executeQuery(qString);

                    int count=0;
                    while(rs.next())
                    {
                            count++;
                    }

                    if(count==0)
                    {
                            out.println("<h4><font
color=#660000>:: Warning
::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>The lecture ID you've chosen does
not exist in the database.<BR><BR></td></tr><tr><td
align='center' class='backpink'><form method=POST
action='addstudymaterial.jsp'><input type='submit'
value='Go Back To Add Study Material
Page'></form></td></tr></center></table>");
                    }
                    else
                    {
                            String qryString = "SELECT
STUDYMAT_FILENAME FROM
SUPPLEMENTARY_STUDY_MATERIAL WHERE
STUDYMAT_FILENAME='" +
URLEncoder.encode(studymat_filename) +"'";
                            rs =
statement.executeQuery(qryString);

                    int cnt=0;
                    while(rs.next())
                    {
                            cnt++;
                    }

                    if(cnt!=0)
                    {

        out.println("<h4><font color=#660000>::
Warning ::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>The file "+studymat_filename+"
already exists in the specified directory. Please try to
change the filename before
uploading.<BR><BR></td></tr><tr><td align='center'
class='backpink'><form method=POST
action='addstudymaterial.jsp'><input type='submit'
value='Go Back To Add Study Material
Page'></form></td></tr></center></table>");
                    }
                    else
                    {
                                    String
updateString = "INSERT INTO
SUPPLEMENTARY_STUDY_MATERIAL VALUES('NULL', '"
+lec_id+ "', '" +URLEncoder.encode(studymat_title)+ "', '"
+URLEncoder.encode(studymat_desc)+ "', '"
+URLEncoder.encode(studymat_filename)+ "')";

        statement.executeUpdate(updateString);

        out.println("<h4>:: Result
::</h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backblue'><br>The study material was successfully
added to the database.<BR><BR></td></tr><tr><td
align='center' class='backblue'><a
href='adminstudymaterial.jsp' target='_parent'>[ back to
update study material page ]
</a><br><br></td></tr></center></table>");

        connection.close();
                    }
                    }
                    }
%>
</font>
</body>
</html>
```

addstudymaterial.jsp
```
<html>
<head>
<title>Add Study Material</title>
<script language="JavaScript">
function checkInput(form)
{
            if(!form.theFile.value.length)
            {
                    alert('Please be reminded that you
must locate the study material you want to upload.');
                    return false;
            }

            return true;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*" %>
<%@ include file="connect.jsp" %>
<h3>:: Add A Study Material ::</h3>
<font color=#660000><i>Note: Click on the Browse button
to find the study material you wish to upload.</i></font>
<form name="uploadform" onSubmit="return
checkInput(uploadform);" action="upload.jsp"
method="POST" enctype="multipart/form-data">
<!-- enctype="multipart/form-data" -->
<input type="file" name="theFile"><br><br>
<input value="Upload File" type="submit">
</form>
</font>
</body>
</html>
```

adminhome1.jsp
```
<HTML>
<HEAD>
<TITLE>adminhome</TITLE>
<SCRIPT TYPE="text/javascript">
<!--
function regularImageFile(imageName) {
  return("images/" + imageName + ".gif");
}

function negativeImageFile(imageName) {
  return("images/" + imageName + "highlighted.gif");
}

function cacheImages(index) {
  regularImageObjects[index] = new Image(150, 25);
  regularImageObjects[index].src =
    regularImageFile(imageNames[index]);
  negativeImageObjects[index] = new Image(150, 25);
  negativeImageObjects[index].src =
    negativeImageFile(imageNames[index]);
}
imageNames = new Array("adminhome1_05",
"adminhome1_07", "adminhome1_09", "adminhome3_18",
"adminhome3_22", "adminhome3_25");
regularImageObjects = new Array(imageNames.length);
negativeImageObjects = new Array(imageNames.length);

for(var i=0; i<imageNames.length; i++) {
  cacheImages(i);
}

function highlight(imageName) {
  document.images[imageName].src =
    negativeImageFile(imageName);
}

function unHighlight(imageName) {
  document.images[imageName].src =
regularImageFile(imageName);
}
// -->
</SCRIPT>
```

```
<META HTTP-EQUIV="Content-Type" CONTENT="text/html;
charset=iso-8859-1">
</HEAD>
<BODY BGCOLOR=#FFFFFF LEFTMARGIN=0 TOPMARGIN=0
MARGINWIDTH=0 MARGINHEIGHT=0>
<TABLE WIDTH=1024 BORDER=0 CELLPADDING=0
CELLSPACING=0>
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                <TD COLSPAN=15>
                        <IMG
SRC="images/adminhome1_01.gif" WIDTH=1024
HEIGHT=12 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=7>
                        <IMG
SRC="images/adminhome1_02.gif" WIDTH=443
HEIGHT=224 ALT=""></TD>
                <TD COLSPAN=8>
                        <IMG
SRC="images/adminhome1_03.gif" WIDTH=581
HEIGHT=224 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=224
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=8 ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_04.gif" WIDTH=787
HEIGHT=38 ALT=""></TD>
                <TD ROWSPAN=2>
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href="adminhome1.jsp"
onMouseOver="highlight('adminhome1_05')"
onMouseOut="unHighlight('adminhome1_05')"><IMG
id="adminhome1_05" SRC="images/adminhome1_05.gif"
WIDTH=42 HEIGHT=22 ALT="Home"
border=0></a></TD>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_06.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                <TD ROWSPAN=2>
                        <a href="links.jsp"
target="mainframe"
onMouseOver="highlight('adminhome1_07')"
onMouseOut="unHighlight('adminhome1_07')"><IMG
id="adminhome1_07" SRC="images/adminhome1_07.gif"
WIDTH=38 HEIGHT=22 ALT="Links"
border=0></a></TD>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_08.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                <TD>
                        <a href="logout.jsp"
onMouseOver="highlight('adminhome1_09')"
onMouseOut="unHighlight('adminhome1_09')"><IMG
id="adminhome1_09" SRC="images/adminhome1_09.gif"
WIDTH=49 HEIGHT=21 ALT="Logout"
border=0></a></TD>
                <TD COLSPAN=2 ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_10.gif" WIDTH=84 HEIGHT=38
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=21
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=2>
                        <IMG
SRC="images/adminhome1_11.gif" WIDTH=49 HEIGHT=17
ALT=""></TD>
                <TD>
```

```
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
        </TR>
        <TR>
                <TD>
                        <IMG
SRC="images/adminhome1_12.gif" WIDTH=42 HEIGHT=16
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                <TD>
                        <IMG
SRC="images/adminhome1_13.gif" WIDTH=38 HEIGHT=16
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=6>
                        <IMG
SRC="images/adminhome1_14.gif" WIDTH=178 HEIGHT=4
ALT=""></TD>
                <TD COLSPAN=8 ROWSPAN=7>
                        <IFRAME SRC="main.jsp"
name="mainframe" WIDTH=811 HEIGHT=440
frameborder=0></IFRAME></TD>
                <TD ROWSPAN=8>
                        <IMG
SRC="images/adminhome3_16.gif" WIDTH=35
HEIGHT=494 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=4
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=7>
                        <IMG
SRC="images/adminhome3_17.gif" WIDTH=45
HEIGHT=490 ALT=""></TD>
                <TD COLSPAN=4>
                        <a
href="adminpatterns.jsp"
onMouseOver="highlight('adminhome3_18')"
onMouseOut="unHighlight('adminhome3_18')"><IMG
id="adminhome3_18" SRC="images/adminhome3_18.gif"
WIDTH=110 HEIGHT=28 ALT="Generate Maximal Patterns"
border=0></a></TD>
                <TD ROWSPAN=7>
                        <IMG
SRC="images/adminhome3_19.gif" WIDTH=23
HEIGHT=490 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=28
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=4>
                        <IMG
SRC="images/adminhome3_20.gif" WIDTH=110
HEIGHT=11 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=11
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=5>
                        <IMG
SRC="images/adminhome3_21.gif" WIDTH=1 HEIGHT=451
ALT=""></TD>
                <TD COLSPAN=3>
                        <a
href="adminupdate.jsp"
onMouseOver="highlight('adminhome3_22')"
onMouseOut="unHighlight('adminhome3_22')"><IMG
id="adminhome3_22" SRC="images/adminhome3_22.gif"
WIDTH=109 HEIGHT=32 ALT="Update Tutorial Module"
border=0></a></TD>
                <TD>
```

```
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=32
ALT=""></TD>
            </TR>
            <TR>
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                            <IMG
SRC="images/adminhome3_23.gif" WIDTH=109
HEIGHT=226 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=226
ALT=""></TD>
            </TR>
            <TR>
                    <TD ROWSPAN=3>
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SRC="images/adminhome3_24.gif" WIDTH=45
HEIGHT=193 ALT=""></TD>
                    <TD>
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onMouseOver="highlight('adminhome3_25')"
onMouseOut="unHighlight('adminhome3_25')"><IMG
id="adminhome3_25" SRC="images/adminhome3_25.gif"
WIDTH=61 HEIGHT=17 ALT="Logout"
border=0></a></TD>
                    <TD ROWSPAN=3>
                            <IMG
SRC="images/adminhome3_26.gif" WIDTH=3 HEIGHT=193
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
            </TR>
            <TR>
                    <TD ROWSPAN=2>
                            <IMG
SRC="images/adminhome3_27.gif" WIDTH=61
HEIGHT=176 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=122
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=8>
                            <IMG
SRC="images/adminhome3_28.gif" WIDTH=811
HEIGHT=54 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=54
ALT=""></TD>
            </TR>
            <TR>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=45 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=45 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=61 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=3 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=23 HEIGHT=1
ALT=""></TD>
                    <TD>
```

```
                            <IMG
SRC="images/spacer.gif" WIDTH=265 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=344 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=42 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=38 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=35 HEIGHT=1
ALT=""></TD>
                    <TD></TD>
            </TR>
</TABLE>
<!-- End ImageReady Slices -->
</BODY>
</HTML>
```

adminhome.jsp
```
<HTML>
<HEAD><TITLE>Administrator Home Page</TITLE>
<SCRIPT TYPE="text/javascript">
<!--
function regularImageFile(imageName) {
  return("images/" + imageName + ".gif");
}

function negativeImageFile(imageName) {
  return("images/" + imageName + "highlighted.gif");
}

function cacheImages(index) {
  regularImageObjects[index] = new Image(150, 25);
  regularImageObjects[index].src =
    regularImageFile(imageNames[index]);
  negativeImageObjects[index] = new Image(150, 25);
  negativeImageObjects[index].src =
    negativeImageFile(imageNames[index]);
}
imageNames = new Array("adminhome1_05",
"adminhome1_07", "adminhome1_09", "adminhome1_18",
"adminhome1_21", "adminhome1_28");
regularImageObjects = new Array(imageNames.length);
negativeImageObjects = new Array(imageNames.length);

for(var i=0; i<imageNames.length; i++) {
  cacheImages(i);
}

function highlight(imageName) {
  document.images[imageName].src =
    negativeImageFile(imageName);
}

function unHighlight(imageName) {
  document.images[imageName].src =
regularImageFile(imageName);
}
```

```
// -->
</SCRIPT>
</HEAD>
<BODY BGCOLOR=#FFFFFF LEFTMARGIN=0 TOPMARGIN=0
MARGINWIDTH=0 MARGINHEIGHT=0>
<FONT COLOR="white">
<%@ page import="java.sql.*" %>
<%@ include file="connect.jsp" %>
<%
        String user = request.getParameter("user");
        String password =
request.getParameter("password");
        String logged_in_user =
(String)session.getAttribute("logged_in_user");

        if(logged_in_user==null)
        {
                String queryString = "SELECT * FROM
EXPERT WHERE USER_ID='" + user + "' AND
USER_PASSWORD=PASSWORD('" + password + "')";
                ResultSet rs =
statement.executeQuery(queryString);

                int countRows=0;
                while(rs.next())
                {
                        countRows++;
                }

                if(countRows!=0)
                {

        session.setAttribute("logged_in_user", user);
%>
                <TABLE WIDTH=1024 BORDER=0
CELLPADDING=0 CELLSPACING=0>
                <TR>
                        <TD COLSPAN=16>
                                <IMG
SRC="images/adminhome1_01.gif" WIDTH=1024
HEIGHT=12 ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=8>
                                <IMG
SRC="images/adminhome1_02.gif" WIDTH=443
HEIGHT=224 ALT=""></TD>
                        <TD COLSPAN=8>
                                <IMG
SRC="images/adminhome1_03.gif" WIDTH=581
HEIGHT=224 ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=224
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=9
ROWSPAN=3>
                                <IMG
SRC="images/adminhome1_04.gif" WIDTH=787
HEIGHT=38 ALT=""></TD>
                        <TD ROWSPAN=2>
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href="adminhome1.jsp"
onMouseOver="highlight('adminhome1_05')"
onMouseOut="unHighlight('adminhome1_05')"><IMG
id="adminhome1_05" SRC="images/adminhome1_05.gif"
WIDTH=42 HEIGHT=22 border=0
ALT="Home"></a></TD>
                        <TD ROWSPAN=3>
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SRC="images/adminhome1_06.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                        <TD ROWSPAN=2>
                                <a
href="links.jsp" target="mainframe"
onMouseOver="highlight('adminhome1_07')"

onMouseOut="unHighlight('adminhome1_07')"><IMG
id="adminhome1_07" SRC="images/adminhome1_07.gif"
WIDTH=38 HEIGHT=22 border=0
ALT="Links"></a></TD>
                        <TD ROWSPAN=3>
                                <IMG
SRC="images/adminhome1_08.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                        <TD>
                                <a
href="logout.jsp"
onMouseOver="highlight('adminhome1_09')"
onMouseOut="unHighlight('adminhome1_09')"><IMG
id="adminhome1_09" SRC="images/adminhome1_09.gif"
WIDTH=49 HEIGHT=21 border=0
ALT="Logout"></a></TD>
                        <TD COLSPAN=2
ROWSPAN=3>
                                <IMG
SRC="images/adminhome1_10.gif" WIDTH=84 HEIGHT=38
ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=21
ALT=""></TD>
                </TR>
                <TR>
                        <TD ROWSPAN=2>
                                <IMG
SRC="images/adminhome1_11.gif" WIDTH=49 HEIGHT=17
ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
                </TR>
                <TR>
                        <TD>
                                <IMG
SRC="images/adminhome1_12.gif" WIDTH=42 HEIGHT=16
ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/adminhome1_13.gif" WIDTH=38 HEIGHT=16
ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=7>
                                <IMG
SRC="images/adminhome1_14.gif" WIDTH=178 HEIGHT=8
ALT=""></TD>
                        <TD COLSPAN=8
ROWSPAN=9>
                                <IFRAME
SRC="main.jsp" WIDTH=811 HEIGHT=440
name="mainframe" frameborder=0></IFRAME></TD>
                        <TD ROWSPAN=10>
                                <IMG
SRC="images/adminhome1_16.gif" WIDTH=35
HEIGHT=494 ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=8
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=2
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SRC="images/adminhome1_17.gif" WIDTH=45
HEIGHT=158 ALT=""></TD>
                        <TD COLSPAN=4>
                                <a
href="adminpatterns.jsp"
onMouseOver="highlight('adminhome1_18')"
onMouseOut="unHighlight('adminhome1_18')"><IMG
id="adminhome1_18" SRC="images/adminhome1_18.gif"
```

WIDTH=110 HEIGHT=26 border=0 ALT="Generate Maximal
Patterns"></TD>
                                                                          <TD ROWSPAN=9>
        <IMG
SRC="images/adminhome1_19.gif" WIDTH=23
HEIGHT=486 ALT=""></TD>
        <TD>
        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=26
ALT=""></TD>
        </TR>
        <TR>
        <TD COLSPAN=4>
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SRC="images/adminhome1_20.gif" WIDTH=110 HEIGHT=9
ALT=""></TD>
        <TD>
        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=9
ALT=""></TD>
        </TR>
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href="adminupdate.jsp"
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onMouseOut="unHighlight('adminhome1_21')"><IMG
id="adminhome1_21" SRC="images/adminhome1_21.gif"
WIDTH=110 HEIGHT=33 border=0 ALT="Update Tutorial
Module"></TD>
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        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=33
ALT=""></TD>
        </TR>
        <TR>
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SRC="images/adminhome1_22.gif" WIDTH=110
HEIGHT=90 ALT=""></TD>
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        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=90
ALT=""></TD>
        </TR>
        <TR>
        <TD ROWSPAN=5>
        <IMG
SRC="images/adminhome1_23.gif" WIDTH=31
HEIGHT=328 ALT=""></TD>
        <TD COLSPAN=4>
        <IMG
SRC="images/adminhome1_24.gif" WIDTH=123
HEIGHT=27 ALT=""></TD>
        <TD ROWSPAN=5>
        <IMG
SRC="images/adminhome1_25.gif" WIDTH=1 HEIGHT=328
ALT=""></TD>
        <TD>
        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=27
ALT=""></TD>
        </TR>
        <TR>
        <TD COLSPAN=4>
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SRC="images/adminhome1_26.gif" WIDTH=123 HEIGHT=3
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        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=3
ALT=""></TD>
        </TR>
        <TR>
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ROWSPAN=3>
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SRC="images/adminhome1_27.gif" WIDTH=61
HEIGHT=298 ALT=""></TD>
        <TD>
        <a
href="logout.jsp"

onMouseOver="highlight('adminhome1_28')"
onMouseOut="unHighlight('adminhome1_28')"><IMG
id="adminhome1_28" SRC="images/adminhome1_28.gif"
WIDTH=56 HEIGHT=19 border=0
ALT="Logout"></TD>
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SRC="images/adminhome1_29.gif" WIDTH=6 HEIGHT=298
ALT=""></TD>
        <TD>
        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=19
ALT=""></TD>
        </TR>
        <TR>
        <TD ROWSPAN=2>
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SRC="images/adminhome1_30.gif" WIDTH=56
HEIGHT=279 ALT=""></TD>
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SRC="images/spacer.gif" WIDTH=1 HEIGHT=225
ALT=""></TD>
        </TR>
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SRC="images/adminhome1_31.gif" WIDTH=811
HEIGHT=54 ALT=""></TD>
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SRC="images/spacer.gif" WIDTH=1 HEIGHT=54
ALT=""></TD>
        </TR>
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SRC="images/spacer.gif" WIDTH=31 HEIGHT=1
ALT=""></TD>
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ALT=""></TD>
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        <IMG
SRC="images/spacer.gif" WIDTH=6 HEIGHT=1
ALT=""></TD>
        <TD>
        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
        <TD>
        <IMG
SRC="images/spacer.gif" WIDTH=23 HEIGHT=1
ALT=""></TD>
        <TD>
        <IMG
SRC="images/spacer.gif" WIDTH=265 HEIGHT=1
ALT=""></TD>
        <TD>
        <IMG
SRC="images/spacer.gif" WIDTH=344 HEIGHT=1
ALT=""></TD>
        <TD>
        <IMG
SRC="images/spacer.gif" WIDTH=42 HEIGHT=1
ALT=""></TD>
        <TD>
        <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
        <TD>

```
                              <IMG
SRC="images/spacer.gif" WIDTH=38 HEIGHT=1
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=35 HEIGHT=1
ALT=""></TD>
                              <TD></TD>
                       </TR>
                       </TABLE>
<%
                       }
                       else
                       {
%>
<TABLE WIDTH=1024 BORDER=0 CELLPADDING=0
CELLSPACING=0>
              <TR>
                       <TD COLSPAN=13>
                                     <IMG
SRC="images/home_01.gif" WIDTH=1024 HEIGHT=16
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
              </TR>
              <TR>
                       <TD COLSPAN=6 ROWSPAN=4>
                                     <IMG
SRC="images/home_02.gif" WIDTH=432 HEIGHT=258
ALT=""></TD>
                       <TD COLSPAN=6>
                                     <IMG
SRC="images/home_03.gif" WIDTH=580 HEIGHT=161
ALT=""></TD>
                       <TD ROWSPAN=12>
                                     <IMG
SRC="images/home_04.gif" WIDTH=12 HEIGHT=752
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=161
ALT=""></TD>
              </TR>
              <TR>
                       <TD COLSPAN=6>
                                     <IMG
SRC="images/home_05.gif" WIDTH=580 HEIGHT=60
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=60
ALT=""></TD>
              </TR>
              <TR>
                       <TD ROWSPAN=2>
                                     <IMG
SRC="images/home_06.gif" WIDTH=356 HEIGHT=37
ALT=""></TD>
                              <TD>
                                     <a href="home.jsp"
onMouseOver="highlight('home_07')"
onMouseOut="unHighlight('home_07')"><IMG
id="home_07" SRC="images/home_07.gif" WIDTH=41
HEIGHT=20 ALT="Home" border="0"></a></TD>
                       <TD ROWSPAN=2>
                                     <IMG
SRC="images/home_08.gif" WIDTH=15 HEIGHT=37
ALT=""></TD>

              <TD>
                              <a href="links.jsp"
onMouseOver="highlight('home_09')"
onMouseOut="unHighlight('home_09')"
target="mainframe"><IMG id="home_09"
SRC="images/home_09.gif" WIDTH=33 HEIGHT=20
ALT="Links" border="0"></a></TD>
                       <TD COLSPAN=2 ROWSPAN=2>
                                     <IMG
SRC="images/home_10.gif" WIDTH=135 HEIGHT=37
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=20
ALT=""></TD>
              </TR>
              <TR>
                              <TD>
                                     <IMG
SRC="images/home_11.gif" WIDTH=41 HEIGHT=17
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/home_12.gif" WIDTH=33 HEIGHT=17
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
              </TR>
              <TR>
                       <TD COLSPAN=5>
                                     <IMG
SRC="images/home_13.gif" WIDTH=175 HEIGHT=4
ALT=""></TD>
                       <TD COLSPAN=6 ROWSPAN=7>
                                     <IFRAME SRC="main.jsp"
WIDTH=816 HEIGHT=443 NAME="mainframe"
frameborder="0"></IFRAME></TD>
                       <TD ROWSPAN=8>
                                     <IMG
SRC="images/home_15.gif" WIDTH=21 HEIGHT=494
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=4
ALT=""></TD>
              </TR>
              <TR>
                       <TD COLSPAN=2 ROWSPAN=4>
                                     <IMG
SRC="images/home_16.gif" WIDTH=45 HEIGHT=160
ALT=""></TD>
                       <TD COLSPAN=2>
                                     <a href="maxpatterns.jsp"
onMouseOver="highlight('home_17')"
onMouseOut="unHighlight('home_17')"><IMG
id="home_17" SRC="images/home_17.gif" WIDTH=110
HEIGHT=26 ALT="Generate Maximal Patterns"
border="0"></a></TD>
                       <TD ROWSPAN=7>
                                     <IMG
SRC="images/home_18.gif" WIDTH=20 HEIGHT=490
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=26
ALT=""></TD>
              </TR>
              <TR>
                       <TD COLSPAN=2>
                                     <IMG
SRC="images/home_19.gif" WIDTH=110 HEIGHT=10
ALT=""></TD>
                              <TD>
                                     <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=10
ALT=""></TD>
              </TR>
              <TR>
                       <TD COLSPAN=2>
```

```
                            <a href="tutorial.jsp"
onMouseOver="highlight('home_20')"
onMouseOut="unHighlight('home_20')"><IMG
id="home_20" SRC="images/home_20.gif" WIDTH=110
HEIGHT=24 ALT="Tutorial" border="0"></a></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=24
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2>
                            <IMG
SRC="images/home_21.gif" WIDTH=110 HEIGHT=100
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=100
ALT=""></TD>
            </TR>
            <TR>
                    <TD ROWSPAN=3>
                            <IMG
SRC="images/home_22.gif" WIDTH=15 HEIGHT=330
ALT=""></TD>
                    <TD COLSPAN=2>
                            <IFRAME SRC="login.jsp"
WIDTH=137 HEIGHT=169 name="loginframe"
frameborder="0" scrolling="no"></IFRAME></TD>
                    <TD ROWSPAN=3>
                            <IMG
SRC="images/home_24.gif" WIDTH=3 HEIGHT=330
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=169
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2 ROWSPAN=2>
                            <IMG
SRC="images/home_25.gif" WIDTH=137 HEIGHT=161
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=110
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=6>
                            <IMG
SRC="images/home_26.gif" WIDTH=816 HEIGHT=51
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=51
ALT=""></TD>
            </TR>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=15 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=30 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=107 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=3 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=20 HEIGHT=1
ALT=""></TD>
                    <TD>
```

```
                            <IMG
SRC="images/spacer.gif" WIDTH=257 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=356 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=41 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=15 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=33 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=114 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=21 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                    <TD></TD>
            </TR>
</TABLE>
<%
            }
    }
    else if(logged_in_user!=null)
    {
%>
            <TABLE WIDTH=1024 BORDER=0
CELLPADDING=0 CELLSPACING=0>
            <TR>
                    <TD COLSPAN=16>
                            <IMG
SRC="images/adminhome1_01.gif" WIDTH=1024
HEIGHT=12 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=8>
                            <IMG
SRC="images/adminhome1_02.gif" WIDTH=443
HEIGHT=224 ALT=""></TD>
                    <TD COLSPAN=8>
                            <IMG
SRC="images/adminhome1_03.gif" WIDTH=581
HEIGHT=224 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=224
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=9
ROWSPAN=3>
                            <IMG
SRC="images/adminhome1_04.gif" WIDTH=787
HEIGHT=38 ALT=""></TD>
                    <TD ROWSPAN=2>
                            <a
href="adminhome1.jsp"
onMouseOver="highlight('adminhome1_05')"
onMouseOut="unHighlight('adminhome1_05')"><IMG
id="adminhome1_05" SRC="images/adminhome1_05.gif"
WIDTH=42 HEIGHT=22 border=0
ALT="Home"></a></TD>
                    <TD ROWSPAN=3>
```

```
                                        <IMG                                            <TD COLSPAN=4>
SRC="images/adminhome1_06.gif" WIDTH=12 HEIGHT=38                                            <a
ALT=""></TD>                            href="adminpatterns.jsp"
                        <TD ROWSPAN=2>                  onMouseOver="highlight('adminhome1_18')"
                                        <a              onMouseOut="unHighlight('adminhome1_18')"><IMG
href="links.jsp" target="mainframe"                     id="adminhome1_18" SRC="images/adminhome1_18.gif"
onMouseOver="highlight('adminhome1_07')"                WIDTH=110 HEIGHT=26 border=0 ALT="Generate Maximal
onMouseOut="unHighlight('adminhome1_07')"><IMG          Patterns"></a></TD>
id="adminhome1_07" SRC="images/adminhome1_07.gif"                           <TD ROWSPAN=9>
WIDTH=38 HEIGHT=22 border=0                                                      <IMG
ALT="Links"></a></TD>                                   SRC="images/adminhome1_19.gif" WIDTH=23
                        <TD ROWSPAN=3>                  HEIGHT=486 ALT=""></TD>
                                        <IMG                                    <TD>
SRC="images/adminhome1_08.gif" WIDTH=12 HEIGHT=38                                       <IMG
ALT=""></TD>                            SRC="images/spacer.gif" WIDTH=1 HEIGHT=26
                        <TD>                            ALT=""></TD>
                                        <a                              </TR>
href="logout.jsp"                                               <TR>
onMouseOver="highlight('adminhome1_09')"                                <TD COLSPAN=4>
onMouseOut="unHighlight('adminhome1_09')"><IMG                                          <IMG
id="adminhome1_09" SRC="images/adminhome1_09.gif"       SRC="images/adminhome1_20.gif" WIDTH=110 HEIGHT=9
WIDTH=49 HEIGHT=21 border=0                             ALT=""></TD>
ALT="Logout"></a></TD>                                                  <TD>
                        <TD COLSPAN=2                                           <IMG
ROWSPAN=3>                              SRC="images/spacer.gif" WIDTH=1 HEIGHT=9
                                        <IMG            ALT=""></TD>
SRC="images/adminhome1_10.gif" WIDTH=84 HEIGHT=38                               </TR>
ALT=""></TD>                                                    <TR>
                        <TD>                                            <TD COLSPAN=4>
                                        <IMG                                            <a
SRC="images/spacer.gif" WIDTH=1 HEIGHT=21              href="adminupdate.jsp"
ALT=""></TD>                            onMouseOver="highlight('adminhome1_21')"
                </TR>                                   onMouseOut="unHighlight('adminhome1_21')"><IMG
                <TR>                                    id="adminhome1_21" SRC="images/adminhome1_21.gif"
                        <TD ROWSPAN=2>                  WIDTH=110 HEIGHT=33 border=0 ALT="Update Tutorial
                                        <IMG            Module"></a></TD>
SRC="images/adminhome1_11.gif" WIDTH=49 HEIGHT=17                               <TD>
ALT=""></TD>                                                             <IMG
                        <TD>                            SRC="images/spacer.gif" WIDTH=1 HEIGHT=33
                                        <IMG            ALT=""></TD>
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1                                </TR>
ALT=""></TD>                                                    <TR>
                </TR>                                           <TD COLSPAN=4>
                <TR>                                                    <IMG
                        <TD>                            SRC="images/adminhome1_22.gif" WIDTH=110
                                        <IMG            HEIGHT=90 ALT=""></TD>
SRC="images/adminhome1_12.gif" WIDTH=42 HEIGHT=16                               <TD>
ALT=""></TD>                                                             <IMG
                        <TD>                            SRC="images/spacer.gif" WIDTH=1 HEIGHT=90
                                        <IMG            ALT=""></TD>
SRC="images/adminhome1_13.gif" WIDTH=38 HEIGHT=16                               </TR>
ALT=""></TD>                                                    <TR>
                        <TD>                                            <TD ROWSPAN=5>
                                        <IMG                                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16              SRC="images/adminhome1_23.gif" WIDTH=31
ALT=""></TD>                            HEIGHT=328 ALT=""></TD>
                </TR>                                           <TD COLSPAN=4>
                <TR>                                                    <IMG
                        <TD COLSPAN=7>                  SRC="images/adminhome2_26.gif" WIDTH=123
                                        <IMG            HEIGHT=27 ALT=""></TD>
SRC="images/adminhome1_14.gif" WIDTH=178 HEIGHT=8                               <TD ROWSPAN=5>
ALT=""></TD>                                                             <IMG
                        <TD COLSPAN=8                   SRC="images/adminhome1_25.gif" WIDTH=1 HEIGHT=328
ROWSPAN=9>                              ALT=""></TD>
                                        <IFRAME                                 <TD>
SRC="main.jsp" WIDTH=811 HEIGHT=440                                             <IMG
name="mainframe" frameborder=0></IFRAME></TD>          SRC="images/spacer.gif" WIDTH=1 HEIGHT=27
                        <TD ROWSPAN=10>                 ALT=""></TD>
                                        <IMG                            </TR>
SRC="images/adminhome1_16.gif" WIDTH=35                                 <TR>
HEIGHT=494 ALT=""></TD>                                         <TD COLSPAN=4>
                        <TD>                                                    <IMG
                                        <IMG            SRC="images/adminhome1_26.gif" WIDTH=123 HEIGHT=3
SRC="images/spacer.gif" WIDTH=1 HEIGHT=8               ALT=""></TD>
ALT=""></TD>                                                             <TD>
                </TR>                                                           <IMG
                <TR>                                    SRC="images/spacer.gif" WIDTH=1 HEIGHT=3
                        <TD COLSPAN=2                   ALT=""></TD>
ROWSPAN=4>                                                      </TR>
                                        <IMG                            <TR>
SRC="images/adminhome1_17.gif" WIDTH=45                                         <TD COLSPAN=2
HEIGHT=158 ALT=""></TD>                                 ROWSPAN=3>
```

```
                                        <IMG
SRC="images/adminhome1_27.gif" WIDTH=61
HEIGHT=298 ALT=""></TD>
                        <TD>
                                        <a
href="logout.jsp"
onMouseOver="highlight('adminhome1_28')"
onMouseOut="unHighlight('adminhome1_28')"><IMG
id="adminhome1_28" SRC="images/adminhome1_28.gif"
WIDTH=56 HEIGHT=19 border=0
ALT="Logout"></a></TD>
                        <TD ROWSPAN=3>
                                        <IMG
SRC="images/adminhome1_29.gif" WIDTH=6 HEIGHT=298
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=19
ALT=""></TD>
                </TR>
                <TR>
                        <TD ROWSPAN=2>
                                        <IMG
SRC="images/adminhome1_30.gif" WIDTH=56
HEIGHT=279 ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=225
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=8>
                                        <IMG
SRC="images/adminhome1_31.gif" WIDTH=811
HEIGHT=54 ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=54
ALT=""></TD>
                </TR>
                <TR>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=31 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=14 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=47 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=56 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=6 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=23 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=265 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=344 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=42 HEIGHT=1
ALT=""></TD>
                        <TD>
```

```
                                        <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=38 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                        <TD>
                                        <IMG
SRC="images/spacer.gif" WIDTH=35 HEIGHT=1
ALT=""></TD>
                        <TD></TD>
                </TR>
                </TABLE>
<%
        }
%>
</FONT>
</BODY>
</HTML>
```

adminlecture.jsp
```
<HTML>
<HEAD>
<TITLE>adminlecture</TITLE>
<SCRIPT TYPE="text/javascript">
<!--
function regularImageFile(imageName) {
  return("images/" + imageName + ".gif");
}

function negativeImageFile(imageName) {
  return("images/" + imageName + "highlighted.gif");
}

function cacheImages(index) {
  regularImageObjects[index] = new Image(150, 25);
  regularImageObjects[index].src =
    regularImageFile(imageNames[index]);
  negativeImageObjects[index] = new Image(150, 25);
  negativeImageObjects[index].src =
    negativeImageFile(imageNames[index]);
}
imageNames = new Array("adminhome1_05",
"adminhome1_07", "adminhome1_09", "adminlecture_18",
"adminlecture_21", "adminlecture_24", "adminlecture_27",
"adminlecture_29", "adminlecture_31", "adminlecture_33",
"adminlecture_35", "adminhome3_25");
regularImageObjects = new Array(imageNames.length);
negativeImageObjects = new Array(imageNames.length);

for(var i=0; i<imageNames.length; i++) {
  cacheImages(i);
}

function highlight(imageName) {
  document.images[imageName].src =
    negativeImageFile(imageName);
}

function unHighlight(imageName) {
  document.images[imageName].src =
regularImageFile(imageName);
}
// -->
</SCRIPT>
<META HTTP-EQUIV="Content-Type" CONTENT="text/html;
charset=iso-8859-1">
</HEAD>
```

```html
<BODY BGCOLOR=#FFFFFF LEFTMARGIN=0 TOPMARGIN=0
MARGINWIDTH=0 MARGINHEIGHT=0>
<!-- ImageReady Slices (adminlecture.psd) -->
<TABLE WIDTH=1024 BORDER=0 CELLPADDING=0
CELLSPACING=0>
            <TR>
                    <TD COLSPAN=16>
                            <IMG
SRC="images/adminhome1_01.gif" WIDTH=1024
HEIGHT=12 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=8>
                            <IMG
SRC="images/adminhome1_02.gif" WIDTH=443
HEIGHT=224 ALT=""></TD>
                    <TD COLSPAN=8>
                            <IMG
SRC="images/adminhome1_03.gif" WIDTH=581
HEIGHT=224 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=224
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=9 ROWSPAN=3>
                            <IMG
SRC="images/adminhome1_04.gif" WIDTH=787
HEIGHT=38 ALT=""></TD>
                    <TD ROWSPAN=2>
                            <a
href="adminhome1.jsp"
onMouseOver="highlight('adminhome1_05')"
onMouseOut="unHighlight('adminhome1_05')"><IMG
id="adminhome1_05" SRC="images/adminhome1_05.gif"
WIDTH=42 HEIGHT=22 ALT="Home"
border=0></a></TD>
                    <TD ROWSPAN=3>
                            <IMG
SRC="images/adminhome1_06.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                    <TD ROWSPAN=2>
                            <a href="links.jsp"
target="mainframe"
onMouseOver="highlight('adminhome1_07')"
onMouseOut="unHighlight('adminhome1_07')"><IMG
id="adminhome1_07" SRC="images/adminhome1_07.gif"
WIDTH=38 HEIGHT=22 ALT="Links"
border=0></a></TD>
                    <TD ROWSPAN=3>
                            <IMG
SRC="images/adminhome1_08.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                    <TD>
                            <a href="logout.jsp"
onMouseOver="highlight('adminhome1_09')"
onMouseOut="unHighlight('adminhome1_09')"><IMG
id="adminhome1_09" SRC="images/adminhome1_09.gif"
WIDTH=49 HEIGHT=21 ALT="Logout"
border=0></a></TD>
                    <TD COLSPAN=2 ROWSPAN=3>
                            <IMG
SRC="images/adminhome1_10.gif" WIDTH=84 HEIGHT=38
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=21
ALT=""></TD>
            </TR>
            <TR>
                    <TD ROWSPAN=2>
                            <IMG
SRC="images/adminhome1_11.gif" WIDTH=49 HEIGHT=17
ALT=""></TD>
                    <TD>

                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
            </TR>
            <TR>
                    <TD>
                            <IMG
SRC="images/adminhome1_12.gif" WIDTH=42 HEIGHT=16
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/adminhome1_13.gif" WIDTH=38 HEIGHT=16
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=7>
                            <IMG
SRC="images/adminhome1_14.gif" WIDTH=178 HEIGHT=7
ALT=""></TD>
                    <TD COLSPAN=8 ROWSPAN=19>
                            <IFRAME
SRC="updatelecture.jsp?pageNumber=1"
name="mainframe" WIDTH=811 HEIGHT=440
frameborder=0></IFRAME></TD>
                    <TD ROWSPAN=20>
                            <IMG
SRC="images/adminlecture_16.gif" WIDTH=35
HEIGHT=494 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=7
ALT=""></TD>
            </TR>
            <TR>
                    <TD ROWSPAN=19>
                            <IMG
SRC="images/adminlecture_17.gif" WIDTH=45
HEIGHT=487 ALT=""></TD>
                    <TD COLSPAN=5>
                            <a
href="adminpatterns.jsp"
onMouseOver="highlight('adminlecture_18')"
onMouseOut="unHighlight('adminlecture_18')"><IMG
id="adminlecture_18" SRC="images/adminlecture_18.gif"
WIDTH=110 HEIGHT=23 ALT="Generate Maximal Patterns"
border=0></a></TD>
                    <TD ROWSPAN=19>
                            <IMG
SRC="images/adminlecture_19.gif" WIDTH=23
HEIGHT=487 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=23
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=5>
                            <IMG
SRC="images/adminlecture_20.gif" WIDTH=110
HEIGHT=13 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=13
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=5>
                            <a
href="adminupdate.jsp"
onMouseOver="highlight('adminlecture_21')"
onMouseOut="unHighlight('adminlecture_21')"><IMG
id="adminlecture_21" SRC="images/adminlecture_21.gif"
WIDTH=110 HEIGHT=35 ALT="Update Tutorial Module"
border=0></a></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=35
ALT=""></TD>
```

```html
				</TR>
				<TR>
						<TD COLSPAN=5>
								<IMG
SRC="images/adminlecture_22.gif" WIDTH=110
HEIGHT=10 ALT=""></TD>
						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=10
ALT=""></TD>
				</TR>
				<TR>
						<TD ROWSPAN=15>
								<IMG
SRC="images/adminlecture_23.gif" WIDTH=19
HEIGHT=406 ALT=""></TD>
						<TD COLSPAN=4>
								<a
href="adminlecture.jsp"
onMouseOver="highlight('adminlecture_24')"
onMouseOut="unHighlight('adminlecture_24')"><IMG
id="adminlecture_24" SRC="images/adminlecture_24.gif"
WIDTH=91 HEIGHT=16 ALT="Lectures"
border=0></a></TD>
						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
				</TR>
				<TR>
						<TD COLSPAN=4>
								<IMG
SRC="images/adminlecture_25.gif" WIDTH=91 HEIGHT=6
ALT=""></TD>
						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=6
ALT=""></TD>
				</TR>
				<TR>
						<TD ROWSPAN=6>
								<IMG
SRC="images/adminlecture_26.gif" WIDTH=8 HEIGHT=54
ALT=""></TD>
						<TD COLSPAN=3>
								<a href="addlecture.jsp?
sub="" target="mainframe"
onMouseOver="highlight('adminlecture_27')"
onMouseOut="unHighlight('adminlecture_27')"><IMG
id="adminlecture_27" SRC="images/adminlecture_27.gif"
WIDTH=83 HEIGHT=13 ALT="Add Lecture"
border=0></a></TD>

						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=13
ALT=""></TD>
				</TR>
				<TR>
						<TD COLSPAN=3>
								<IMG
SRC="images/adminlecture_28.gif" WIDTH=83 HEIGHT=3
ALT=""></TD>
						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=3
ALT=""></TD>
				</TR>
				<TR>
						<TD COLSPAN=3>
								<a href="editlecture.jsp?
sub="&update="" target="mainframe"
onMouseOver="highlight('adminlecture_29')"
onMouseOut="unHighlight('adminlecture_29')"><IMG
id="adminlecture_29" SRC="images/adminlecture_29.gif"
WIDTH=83 HEIGHT=13 ALT="Edit Lecture"
border=0></a></TD>
						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=13
ALT=""></TD>
				</TR>
```

```html
				<TR>
						<TD COLSPAN=3>
								<IMG
SRC="images/adminlecture_30.gif" WIDTH=83 HEIGHT=4
ALT=""></TD>
						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=4
ALT=""></TD>
				</TR>
				<TR>
						<TD COLSPAN=3>
								<a
href="deletelecture.jsp?sub="&delete=""
target="mainframe"
onMouseOver="highlight('adminlecture_31')"
onMouseOut="unHighlight('adminlecture_31')"><IMG
id="adminlecture_31" SRC="images/adminlecture_31.gif"
WIDTH=83 HEIGHT=12 ALT="Delete Lecture"
border=0></a></TD>
						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
				</TR>
				<TR>
						<TD COLSPAN=3>
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SRC="images/adminlecture_32.gif" WIDTH=83 HEIGHT=9
ALT=""></TD>
						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=9
ALT=""></TD>
				</TR>
				<TR>
						<TD COLSPAN=4>
								<a
href="adminstudymaterial.jsp"
onMouseOver="highlight('adminlecture_33')"
onMouseOut="unHighlight('adminlecture_33')"><IMG
id="adminlecture_33" SRC="images/adminlecture_33.gif"
WIDTH=91 HEIGHT=25 ALT="Supplementary Study
Materials" border=0></a></TD>

						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=25
ALT=""></TD>
				</TR>
				<TR>
						<TD COLSPAN=4>
								<IMG
SRC="images/adminlecture_34.gif" WIDTH=91 HEIGHT=6
ALT=""></TD>
						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=6
ALT=""></TD>
				</TR>
				<TR>
						<TD COLSPAN=4>
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href="adminquizitem.jsp"
onMouseOver="highlight('adminlecture_35')"
onMouseOut="unHighlight('adminlecture_35')"><IMG
id="adminlecture_35" SRC="images/adminlecture_35.gif"
WIDTH=91 HEIGHT=17 ALT="Quiz Items"
border=0></a></TD>
						<TD>
								<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
				</TR>
				<TR>
						<TD COLSPAN=4>
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SRC="images/adminlecture_36.gif" WIDTH=91 HEIGHT=89
ALT=""></TD>
						<TD>
```

```
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SRC="images/spacer.gif" WIDTH=1 HEIGHT=89
ALT=""></TD>
            </TR>
            <TR>
                <TD COLSPAN=2 ROWSPAN=3>
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SRC="images/adminlecture_37.gif" WIDTH=27
HEIGHT=193 ALT=""></TD>
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onMouseOver="highlight('adminhome3_25')"
onMouseOut="unHighlight('adminhome3_25')"><IMG
id="adminhome3_25" SRC="images/adminhome3_25.gif"
WIDTH=61 HEIGHT=17 ALT="Logout"
border=0></a></TD>
                <TD ROWSPAN=3>
                                <IMG
SRC="images/adminlecture_39.gif" WIDTH=3 HEIGHT=193
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
            </TR>
            <TR>
                <TD ROWSPAN=2>
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SRC="images/adminlecture_40.gif" WIDTH=61
HEIGHT=176 ALT=""></TD>
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                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=122
ALT=""></TD>
            </TR>
            <TR>
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SRC="images/adminlecture_41.gif" WIDTH=811
HEIGHT=54 ALT=""></TD>
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SRC="images/spacer.gif" WIDTH=1 HEIGHT=54
ALT=""></TD>
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SRC="images/spacer.gif" WIDTH=45 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=19 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=8 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=19 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=61 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=3 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=23 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=265 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=344 HEIGHT=1
ALT=""></TD>
```

```
                <TD>
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SRC="images/spacer.gif" WIDTH=42 HEIGHT=1
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                <TD>
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SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=38 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=35 HEIGHT=1
ALT=""></TD>
                <TD></TD>
            </TR>
</TABLE>
<!-- End ImageReady Slices -->
</BODY>
</HTML>
```

adminpatterns.jsp
```
<HTML>
<HEAD>
<TITLE>adminpatterns</TITLE>
<SCRIPT TYPE="text/javascript">
<!--
function regularImageFile(imageName) {
  return("images/" + imageName + ".gif");
}

function negativeImageFile(imageName) {
  return("images/" + imageName + "highlighted.gif");
}

function cacheImages(index) {
  regularImageObjects[index] = new Image(150, 25);
  regularImageObjects[index].src =
    regularImageFile(imageNames[index]);
  negativeImageObjects[index] = new Image(150, 25);
  negativeImageObjects[index].src =
    negativeImageFile(imageNames[index]);
}
imageNames = new Array("adminhome1_05",
"adminhome1_07", "adminhome1_09", "adminhome3_18",
"adminhome3_22", "adminhome3_25");
regularImageObjects = new Array(imageNames.length);
negativeImageObjects = new Array(imageNames.length);

for(var i=0; i<imageNames.length; i++) {
  cacheImages(i);
}

function highlight(imageName) {
  document.images[imageName].src =
    negativeImageFile(imageName);
}

function unHighlight(imageName) {
  document.images[imageName].src =
regularImageFile(imageName);
}
// -->
</SCRIPT>
<META HTTP-EQUIV="Content-Type" CONTENT="text/html;
charset=iso-8859-1">
</HEAD>
```

```html
<BODY BGCOLOR=#FFFFFF LEFTMARGIN=0 TOPMARGIN=0
MARGINWIDTH=0 MARGINHEIGHT=0>
<TABLE WIDTH=1024 BORDER=0 CELLPADDING=0
CELLSPACING=0>
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                        <IMG
SRC="images/adminhome1_01.gif" WIDTH=1024
HEIGHT=12 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=7>
                        <IMG
SRC="images/adminhome1_02.gif" WIDTH=443
HEIGHT=224 ALT=""></TD>
                <TD COLSPAN=8>
                        <IMG
SRC="images/adminhome1_03.gif" WIDTH=581
HEIGHT=224 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=224
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=8 ROWSPAN=3>
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SRC="images/adminhome1_04.gif" WIDTH=787
HEIGHT=38 ALT=""></TD>
                <TD ROWSPAN=2>
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href="adminhome1.jsp"
onMouseOver="highlight('adminhome1_05')"
onMouseOut="unHighlight('adminhome1_05')"><IMG
id="adminhome1_05" SRC="images/adminhome1_05.gif"
WIDTH=42 HEIGHT=22 ALT="Home"
border=0></a></TD>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_06.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                <TD ROWSPAN=2>
                        <a href="links.jsp"
target="mainframe"
onMouseOver="highlight('adminhome1_07')"
onMouseOut="unHighlight('adminhome1_07')"><IMG
id="adminhome1_07" SRC="images/adminhome1_07.gif"
WIDTH=38 HEIGHT=22 ALT="Links"
border=0></a></TD>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_08.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                <TD>
                        <a href="logout.jsp"
onMouseOver="highlight('adminhome1_09')"
onMouseOut="unHighlight('adminhome1_09')"><IMG
id="adminhome1_09" SRC="images/adminhome1_09.gif"
WIDTH=49 HEIGHT=21 ALT="Logout"
border=0></a></TD>
                <TD COLSPAN=2 ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_10.gif" WIDTH=84 HEIGHT=38
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=21
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=2>
                        <IMG
SRC="images/adminhome1_11.gif" WIDTH=49 HEIGHT=17
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
        </TR>
        <TR>
                <TD>
                        <IMG
SRC="images/adminhome1_12.gif" WIDTH=42 HEIGHT=16
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/adminhome1_13.gif" WIDTH=38 HEIGHT=16
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=6>
                        <IMG
SRC="images/adminhome1_14.gif" WIDTH=178 HEIGHT=4
ALT=""></TD>
                <TD COLSPAN=8 ROWSPAN=7>
                        <IFRAME
SRC="patterns.jsp?seqType=''" name="mainframe"
WIDTH=811 HEIGHT=440
frameborder=0></IFRAME></TD>
                <TD ROWSPAN=8>
                        <IMG
SRC="images/adminhome3_16.gif" WIDTH=35
HEIGHT=494 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=4
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=7>
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SRC="images/adminhome3_17.gif" WIDTH=45
HEIGHT=490 ALT=""></TD>
                <TD COLSPAN=4>
                        <a
href="adminpatterns.jsp"
onMouseOver="highlight('adminhome3_18')"
onMouseOut="unHighlight('adminhome3_18')"><IMG
id="adminhome3_18" SRC="images/adminhome3_18.gif"
WIDTH=110 HEIGHT=28 ALT="Generate Maximal Patterns"
border=0></a></TD>
                <TD ROWSPAN=7>
                        <IMG
SRC="images/adminhome3_19.gif" WIDTH=23
HEIGHT=490 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=28
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=4>
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SRC="images/adminhome3_20.gif" WIDTH=110
HEIGHT=11 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=11
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=5>
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SRC="images/adminhome3_21.gif" WIDTH=1 HEIGHT=451
ALT=""></TD>
                <TD COLSPAN=3>
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href="adminupdate.jsp"
onMouseOver="highlight('adminhome3_22')"
onMouseOut="unHighlight('adminhome3_22')"><IMG
id="adminhome3_22" SRC="images/adminhome3_22.gif"
WIDTH=109 HEIGHT=32 ALT="Update Tutorial Module"
border=0></a></TD>
                <TD>
```

```
                                    <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=32
ALT=""></TD>
          </TR>
          <TR>
                    <TD COLSPAN=3>
                              <IMG
SRC="images/adminhome3_23.gif" WIDTH=109
HEIGHT=226 ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=226
ALT=""></TD>
          </TR>
          <TR>
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                              <IMG
SRC="images/adminhome3_24.gif" WIDTH=45
HEIGHT=193 ALT=""></TD>
                    <TD>
                              <a href="logout.jsp"
onMouseOver="highlight('adminhome3_25')"
onMouseOut="unHighlight('adminhome3_25')"><IMG
id="adminhome3_25" SRC="images/adminhome3_25.gif"
WIDTH=61 HEIGHT=17 ALT="Logout"
border=0></a></TD>
                    <TD ROWSPAN=3>
                              <IMG
SRC="images/adminhome3_26.gif" WIDTH=3 HEIGHT=193
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
          </TR>
          <TR>
                    <TD ROWSPAN=2>
                              <IMG
SRC="images/adminhome3_27.gif" WIDTH=61
HEIGHT=176 ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=122
ALT=""></TD>
          </TR>
          <TR>
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HEIGHT=54 ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=54
ALT=""></TD>
          </TR>
          <TR>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=45 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=45 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=61 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=3 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=23 HEIGHT=1
ALT=""></TD>
                    <TD>
```

```
                                    <IMG
SRC="images/spacer.gif" WIDTH=265 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=344 HEIGHT=1
ALT=""></TD>
                    <TD>
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SRC="images/spacer.gif" WIDTH=42 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=38 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                    <TD>
                              <IMG
SRC="images/spacer.gif" WIDTH=35 HEIGHT=1
ALT=""></TD>
                    <TD></TD>
          </TR>
</TABLE>
<!-- End ImageReady Slices -->
</BODY>
</HTML>
```

adminquizitem.jsp
```
<HTML>
<HEAD>
<TITLE>adminquiz</TITLE>
<SCRIPT TYPE="text/javascript">
<!--
function regularImageFile(imageName) {
  return("images/" + imageName + ".gif");
}

function negativeImageFile(imageName) {
  return("images/" + imageName + "highlighted.gif");
}

function cacheImages(index) {
  regularImageObjects[index] = new Image(150, 25);
  regularImageObjects[index].src =
    regularImageFile(imageNames[index]);
  negativeImageObjects[index] = new Image(150, 25);
  negativeImageObjects[index].src =
    negativeImageFile(imageNames[index]);
}
imageNames = new Array("adminhome1_05",
"adminhome1_07", "adminhome1_09", "adminupdate_18",
"adminupdate_21", "adminupdate_24", "adminupdate_26",
"adminupdate_28", "adminhome3_25");
regularImageObjects = new Array(imageNames.length);
negativeImageObjects = new Array(imageNames.length);

for(var i=0; i<imageNames.length; i++) {
  cacheImages(i);
}

function highlight(imageName) {
  document.images[imageName].src =
    negativeImageFile(imageName);
}

function unHighlight(imageName) {
```

```
    document.images[imageName].src =
regularImageFile(imageName);
}
// -->
</SCRIPT>
<META HTTP-EQUIV="Content-Type" CONTENT="text/html;
charset=iso-8859-1">
</HEAD>
<BODY BGCOLOR=#FFFFFF LEFTMARGIN=0 TOPMARGIN=0
MARGINWIDTH=0 MARGINHEIGHT=0>
<!-- ImageReady Slices (adminquiz.psd) -->
<TABLE WIDTH=1024 BORDER=0 CELLPADDING=0
CELLSPACING=0>
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SRC="images/adminhome1_01.gif" WIDTH=1024
HEIGHT=12 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=9>
                        <IMG
SRC="images/adminhome1_02.gif" WIDTH=443
HEIGHT=224 ALT=""></TD>
                <TD COLSPAN=8>
                        <IMG
SRC="images/adminhome1_03.gif" WIDTH=581
HEIGHT=224 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=224
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=10 ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_04.gif" WIDTH=787
HEIGHT=38 ALT=""></TD>
                <TD ROWSPAN=2>
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href="adminhome1.jsp"
onMouseOver="highlight('adminhome1_05')"
onMouseOut="unHighlight('adminhome1_05')"><IMG
id="adminhome1_05" SRC="images/adminhome1_05.gif"
WIDTH=42 HEIGHT=22 ALT="Home"
border=0></a></TD>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_06.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                <TD ROWSPAN=2>
                        <a href="links.jsp"
target="mainframe"
onMouseOver="highlight('adminhome1_07')"
onMouseOut="unHighlight('adminhome1_07')"><IMG
id="adminhome1_07" SRC="images/adminhome1_07.gif"
WIDTH=38 HEIGHT=22 ALT="Links"
border=0></a></TD>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_08.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                <TD>
                        <a href="logout.jsp"
onMouseOver="highlight('adminhome1_09')"
onMouseOut="unHighlight('adminhome1_09')"><IMG
id="adminhome1_09" SRC="images/adminhome1_09.gif"
WIDTH=49 HEIGHT=21 ALT="Logout"
border=0></a></TD>
                <TD COLSPAN=2 ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_10.gif" WIDTH=84 HEIGHT=38
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=21
ALT=""></TD>
        </TR>
```

```
        <TR>
                <TD ROWSPAN=2>
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SRC="images/adminhome1_11.gif" WIDTH=49 HEIGHT=17
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
        </TR>
        <TR>
                <TD>
                        <IMG
SRC="images/adminhome1_12.gif" WIDTH=42 HEIGHT=16
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/adminhome1_13.gif" WIDTH=38 HEIGHT=16
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=8>
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SRC="images/adminhome1_14.gif" WIDTH=178 HEIGHT=6
ALT=""></TD>
                <TD COLSPAN=8 ROWSPAN=19>
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SRC="updatequizitem.jsp?pageNumber=1"
name="mainframe" WIDTH=811 HEIGHT=440
frameborder=0></IFRAME></TD>
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SRC="images/adminquiz_16.gif" WIDTH=35 HEIGHT=494
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=6
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=19>
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SRC="images/adminquiz_17.gif" WIDTH=45 HEIGHT=488
ALT=""></TD>
                <TD COLSPAN=5>
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href="adminpatterns.jsp"
onMouseOver="highlight('adminquiz_18')"
onMouseOut="unHighlight('adminquiz_18')"><IMG
id="adminquiz_18" SRC="images/adminquiz_18.gif"
WIDTH=110 HEIGHT=25 ALT="Generate Maximal Patterns"
border=0></a></TD>
                <TD COLSPAN=2 ROWSPAN=14>
                        <IMG
SRC="images/adminquiz_19.gif" WIDTH=23 HEIGHT=194
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=25
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=5>
                        <IMG
SRC="images/adminquiz_20.gif" WIDTH=110 HEIGHT=12
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
        </TR>
        <TR>
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href="adminupdate.jsp"
onMouseOver="highlight('adminquiz_21')"
onMouseOut="unHighlight('adminquiz_21')"><IMG
id="adminquiz_21" SRC="images/adminquiz_21.gif"
```

```
WIDTH=110 HEIGHT=35 ALT="Update Tutorial Module"
border=0></a></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=35
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=5>
                        <IMG
SRC="images/adminquiz_22.gif" WIDTH=110 HEIGHT=10
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=10
ALT=""></TD>
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href="adminlecture.jsp"
onMouseOver="highlight('adminquiz_24')"
onMouseOut="unHighlight('adminquiz_24')"><IMG
id="adminquiz_24" SRC="images/adminquiz_24.gif"
WIDTH=91 HEIGHT=16 ALT="Lectures"
border=0></a></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=4>
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SRC="images/adminquiz_25.gif" WIDTH=91 HEIGHT=10
ALT=""></TD>
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                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=10
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=4>
                        <a
href="adminstudymaterial.jsp"
onMouseOver="highlight('adminquiz_26')"
onMouseOut="unHighlight('adminquiz_26')"><IMG
id="adminquiz_26" SRC="images/adminquiz_26.gif"
WIDTH=91 HEIGHT=25 ALT="Supplementary Study
Materials" border=0></a></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=25
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=4>
                        <IMG
SRC="images/adminquiz_27.gif" WIDTH=91 HEIGHT=8
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=8
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=4>
                        <a
href="adminquizitem.jsp"
onMouseOver="highlight('adminquiz_28')"
onMouseOut="unHighlight('adminquiz_28')"><IMG
id="adminquiz_28" SRC="images/adminquiz_28.gif"
WIDTH=91 HEIGHT=17 ALT="Quiz Items"
border=0></a></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=4>
                        <IMG
SRC="images/adminquiz_29.gif" WIDTH=91 HEIGHT=2
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=2
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=9>
                        <IMG
SRC="images/adminquiz_30.gif" WIDTH=8 HEIGHT=328
ALT=""></TD>
                <TD COLSPAN=3>
                        <a href="addquizitem.jsp?
sub='"' target="mainframe"
onMouseOver="highlight('adminquiz_31')"
onMouseOut="unHighlight('adminquiz_31')"><IMG
id="adminquiz_31" SRC="images/adminquiz_31.gif"
WIDTH=83 HEIGHT=13 ALT="Add Quiz Item"
border=0></a></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=13
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=3>
                        <IMG
SRC="images/adminquiz_32.gif" WIDTH=83 HEIGHT=4
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=4
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=3>
                        <a href="editquizitem.jsp?
sub='"&update='"' target="mainframe"
onMouseOver="highlight('adminquiz_33')"
onMouseOut="unHighlight('adminquiz_33')"><IMG
id="adminquiz_33" SRC="images/adminquiz_33.gif"
WIDTH=83 HEIGHT=13 ALT="Edit Quiz Item"
border=0></a></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=13
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=3>
                        <IMG
SRC="images/adminquiz_34.gif" WIDTH=83 HEIGHT=4
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=4
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=4>
                        <a
href="deletequizitem.jsp?sub='"&delete='"'
target="mainframe"
onMouseOver="highlight('adminquiz_35')"
onMouseOut="unHighlight('adminquiz_35')"><IMG
id="adminquiz_35" SRC="images/adminquiz_35.gif"
WIDTH=87 HEIGHT=12 ALT="Delete Quiz Item"
border=0></a></TD>
                <TD ROWSPAN=5>
                        <IMG
SRC="images/adminquiz_36.gif" WIDTH=19 HEIGHT=294
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
        </TR>
```

```
            <TR>
                    <TD COLSPAN=4>
                            <IMG
SRC="images/adminquiz_37.gif" WIDTH=87 HEIGHT=89
ALT=""></TD>
                            <TD>
                                    <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=89
ALT=""></TD>
                    </TR>
            <TR>
                    <TD ROWSPAN=3>
                            <IMG
SRC="images/adminquiz_38.gif" WIDTH=19 HEIGHT=193
ALT=""></TD>
                    <TD>
                            <a href="logout.jsp"
onMouseOver="highlight('adminhome3_25')"
onMouseOut="unHighlight('adminhome3_25')"><IMG
id="adminhome3_25" SRC="images/adminhome3_25.gif"
WIDTH=61 HEIGHT=17 ALT="Logout"
border=0></a></TD>
                    <TD COLSPAN=2 ROWSPAN=3>
                            <IMG
SRC="images/adminquiz_40.gif" WIDTH=7 HEIGHT=193
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
            </TR>
            <TR>
                    <TD ROWSPAN=2>
                            <IMG
SRC="images/adminquiz_41.gif" WIDTH=61 HEIGHT=176
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=122
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=8>
                            <IMG
SRC="images/adminquiz_42.gif" WIDTH=811 HEIGHT=54
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=54
ALT=""></TD>
            </TR>
            <TR>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=45 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=19 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=8 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=19 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=61 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=3 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=4 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=19 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=265 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=344 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=42 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=38 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=35 HEIGHT=1
ALT=""></TD>
                    <TD></TD>
            </TR>
</TABLE>
<!-- End ImageReady Slices -->
</BODY>
</HTML>
```

adminstudymaterial.jsp
```
<HTML>
<HEAD>
<TITLE>adminstudymaterial</TITLE>
        <SCRIPT TYPE="text/javascript">
        <!--
        function regularImageFile(imageName) {
          return("images/" + imageName + ".gif");
        }

        function negativeImageFile(imageName) {
  return("images/" + imageName + "highlighted.gif");
}

function cacheImages(index) {
  regularImageObjects[index] = new Image(150, 25);
  regularImageObjects[index].src =
    regularImageFile(imageNames[index]);
  negativeImageObjects[index] = new Image(150, 25);
  negativeImageObjects[index].src =
    negativeImageFile(imageNames[index]);
}
imageNames = new Array("adminhome1_05",
"adminhome1_07", "adminhome1_09", "adminupdate_18",
"adminupdate_21", "adminupdate_24", "adminupdate_26",
"adminupdate_28", "adminhome3_25");
regularImageObjects = new Array(imageNames.length);
negativeImageObjects = new Array(imageNames.length);

for(var i=0; i<imageNames.length; i++) {
  cacheImages(i);
}

function highlight(imageName) {
  document.images[imageName].src =
    negativeImageFile(imageName);
```

```
}
function unHighlight(imageName) {
  document.images[imageName].src =
regularImageFile(imageName);
}
// -->
</SCRIPT>
<META HTTP-EQUIV="Content-Type" CONTENT="text/html;
charset=iso-8859-1">
</HEAD>
<BODY BGCOLOR=#FFFFFF LEFTMARGIN=0 TOPMARGIN=0
MARGINWIDTH=0 MARGINHEIGHT=0>
<!-- ImageReady Slices (adminstudymaterial.psd) -->
<TABLE WIDTH=1024 BORDER=0 CELLPADDING=0
CELLSPACING=0>
        <TR>
                <TD COLSPAN=16>
                        <IMG
SRC="images/adminhome1_01.gif" WIDTH=1024
HEIGHT=12 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=8>
                        <IMG
SRC="images/adminhome1_02.gif" WIDTH=443
HEIGHT=224 ALT=""></TD>
                <TD COLSPAN=8>
                        <IMG
SRC="images/adminhome1_03.gif" WIDTH=581
HEIGHT=224 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=224
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=9 ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_04.gif" WIDTH=787
HEIGHT=38 ALT=""></TD>
                <TD ROWSPAN=2>
                        <a
href="adminhome1.jsp"
onMouseOver="highlight('adminhome1_05')"
onMouseOut="unHighlight('adminhome1_05')"><IMG
id="adminhome1_05" SRC="images/adminhome1_05.gif"
WIDTH=42 HEIGHT=22 ALT="Home"
border=0></a></TD>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_06.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                <TD ROWSPAN=2>
                        <a href="links.jsp"
target="mainframe"
onMouseOver="highlight('adminhome1_07')"
onMouseOut="unHighlight('adminhome1_07')"><IMG
id="adminhome1_07" SRC="images/adminhome1_07.gif"
WIDTH=38 HEIGHT=22 ALT="Links"
border=0></a></TD>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_08.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                <TD>
                        <a href="logout.jsp"
onMouseOver="highlight('adminhome1_09')"
onMouseOut="unHighlight('adminhome1_09')"><IMG
id="adminhome1_09" SRC="images/adminhome1_09.gif"
WIDTH=49 HEIGHT=21 ALT="Logout"
border=0></a></TD>
                <TD COLSPAN=2 ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_10.gif" WIDTH=84 HEIGHT=38
ALT=""></TD>
                <TD>
```

```
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=21
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=2>
                        <IMG
SRC="images/adminhome1_11.gif" WIDTH=49 HEIGHT=17
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
        </TR>
        <TR>
                <TD>
                        <IMG
SRC="images/adminhome1_12.gif" WIDTH=42 HEIGHT=16
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/adminhome1_13.gif" WIDTH=38 HEIGHT=16
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=7>
                        <IMG
SRC="images/adminhome1_14.gif" WIDTH=178 HEIGHT=5
ALT=""></TD>
                <TD COLSPAN=8 ROWSPAN=19>
                        <IFRAME
SRC="updatestudymaterial.jsp?pageNumber=1"
name="mainframe" WIDTH=811 HEIGHT=440
frameborder=0></IFRAME></TD>
                <TD ROWSPAN=20>
                        <IMG
SRC="images/adminstudymaterial_16.gif" WIDTH=35
HEIGHT=494 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=5
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=19>
                        <IMG
SRC="images/adminstudymaterial_17.gif" WIDTH=45
HEIGHT=489 ALT=""></TD>
                <TD COLSPAN=5>
                        <a
href="adminpatterns.jsp"
onMouseOver="highlight('adminstudymaterial_18')"
onMouseOut="unHighlight('adminstudymaterial_18')"><IM
G id="adminstudymaterial_18"
SRC="images/adminstudymaterial_18.gif" WIDTH=110
HEIGHT=27 ALT="Generate Maximal Patterns"
border=0></a></TD>
                <TD ROWSPAN=19>
                        <IMG
SRC="images/adminstudymaterial_19.gif" WIDTH=23
HEIGHT=489 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=27
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=5>
                        <IMG
SRC="images/adminstudymaterial_20.gif" WIDTH=110
HEIGHT=11 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=11
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=5>
```

```
                                <a
href="adminupdate.jsp"
onMouseOver="highlight('adminstudymaterial_21')"
onMouseOut="unHighlight('adminstudymaterial_21')"><IM
G id="adminstudymaterial_21"
SRC="images/adminstudymaterial_21.gif" WIDTH=110
HEIGHT=35 ALT="Update Tutorial Module"
border=0></a></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=35
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=5>
                                <IMG
SRC="images/adminstudymaterial_22.gif" WIDTH=110
HEIGHT=10 ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=10
ALT=""></TD>
                </TR>
                <TR>
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SRC="images/adminstudymaterial_23.gif" WIDTH=19
HEIGHT=406 ALT=""></TD>
                        <TD COLSPAN=4>
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href="adminlecture.jsp"
onMouseOver="highlight('adminstudymaterial_24')"
onMouseOut="unHighlight('adminstudymaterial_24')"><IM
G id="adminstudymaterial_24"
SRC="images/adminstudymaterial_24.gif" WIDTH=91
HEIGHT=16 ALT="Lectures" border=0></a></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=4>
                                <IMG
SRC="images/adminstudymaterial_25.gif" WIDTH=91
HEIGHT=10 ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=10
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=4>
                                <a
href="adminstudymaterial.jsp"
onMouseOver="highlight('adminstudymaterial_26')"
onMouseOut="unHighlight('adminstudymaterial_26')"><IM
G id="adminstudymaterial_26"
SRC="images/adminstudymaterial_26.gif" WIDTH=91
HEIGHT=25 ALT="Supplementary Study Materials"
border=0></a></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=25
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=4>
                                <IMG
SRC="images/adminstudymaterial_27.gif" WIDTH=91
HEIGHT=5 ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=5
ALT=""></TD>
                </TR>
                <TR>
                        <TD ROWSPAN=6>
                                <IMG
SRC="images/adminstudymaterial_28.gif" WIDTH=8
HEIGHT=88 ALT=""></TD>
                        <TD COLSPAN=3>
```

```
                                <a
href="addstudymaterial.jsp" target="mainframe"
onMouseOver="highlight('adminstudymaterial_29')"
onMouseOut="unHighlight('adminstudymaterial_29')"><IM
G id="adminstudymaterial_29"
SRC="images/adminstudymaterial_29.gif" WIDTH=83
HEIGHT=24 ALT="Add Study Material"
border=0></a></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=24
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=3>
                                <IMG
SRC="images/adminstudymaterial_30.gif" WIDTH=83
HEIGHT=3 ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=3
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=3>
                                <a
href="editstudymaterial.jsp?sub=''&update=''"
target="mainframe"
onMouseOver="highlight('adminstudymaterial_31')"
onMouseOut="unHighlight('adminstudymaterial_31')"><IM
G id="adminstudymaterial_31"
SRC="images/adminstudymaterial_31.gif" WIDTH=83
HEIGHT=24 ALT="Edit Study Material"
border=0></a></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=24
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=3>
                                <IMG
SRC="images/adminstudymaterial_32.gif" WIDTH=83
HEIGHT=3 ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=3
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=3>
                                <a
href="deletestudymaterial.jsp?sub=''&delete=''"
target="mainframe"
onMouseOver="highlight('adminstudymaterial_33')"
onMouseOut="unHighlight('adminstudymaterial_33')"><IM
G id="adminstudymaterial_33"
SRC="images/adminstudymaterial_33.gif" WIDTH=83
HEIGHT=25 ALT="Delete Study Material"
border=0></a></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=25
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=3>
                                <IMG
SRC="images/adminstudymaterial_34.gif" WIDTH=83
HEIGHT=9 ALT=""></TD>
                        <TD>
                                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=9
ALT=""></TD>
                </TR>
                <TR>
                        <TD COLSPAN=4>
                                <a
href="adminquizitem.jsp"
onMouseOver="highlight('adminstudymaterial_35')"
onMouseOut="unHighlight('adminstudymaterial_35')"><IM
G id="adminstudymaterial_35"
```

```
SRC="images/adminstudymaterial_35.gif" WIDTH=91
HEIGHT=17 ALT="Quiz Items" border=0></a></TD>

                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=4>
                            <IMG
SRC="images/adminstudymaterial_36.gif" WIDTH=91
HEIGHT=52 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=52
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2 ROWSPAN=3>
                            <IMG
SRC="images/adminstudymaterial_37.gif" WIDTH=27
HEIGHT=193 ALT=""></TD>
                    <TD>
                            <a href="logout.jsp"
onMouseOver="highlight('adminhome3_25')"
onMouseOut="unHighlight('adminhome3_25')"><IMG
id="adminhome3_25" SRC="images/adminhome3_25.gif"
WIDTH=61 HEIGHT=17 ALT="Logout"
border=0></a></TD>
                    <TD ROWSPAN=3>
                            <IMG
SRC="images/adminstudymaterial_39.gif" WIDTH=3
HEIGHT=193 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
            </TR>
            <TR>
                    <TD ROWSPAN=2>
                            <IMG
SRC="images/adminstudymaterial_40.gif" WIDTH=61
HEIGHT=176 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=122
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=8>
                            <IMG
SRC="images/adminstudymaterial_41.gif" WIDTH=811
HEIGHT=54 ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=54
ALT=""></TD>
            </TR>
            <TR>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=45 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=19 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=8 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=19 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=61 HEIGHT=1
ALT=""></TD>
                    <TD>
```

```
                            <IMG
SRC="images/spacer.gif" WIDTH=3 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=23 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=265 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=344 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=42 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=38 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=35 HEIGHT=1
ALT=""></TD>
                    <TD></TD>
            </TR>
</TABLE>
<!-- End ImageReady Slices -->
</BODY>
</HTML>
```

adminupdate.jsp
```
<HTML>
<HEAD>
<TITLE>adminupdate</TITLE>
<SCRIPT TYPE="text/javascript">
<!--
function regularImageFile(imageName) {
  return("images/" + imageName + ".gif");
}

function negativeImageFile(imageName) {
  return("images/" + imageName + "highlighted.gif");
}

function cacheImages(index) {
  regularImageObjects[index] = new Image(150, 25);
  regularImageObjects[index].src =
    regularImageFile(imageNames[index]);
  negativeImageObjects[index] = new Image(150, 25);
  negativeImageObjects[index].src =
    negativeImageFile(imageNames[index]);
}
imageNames = new Array("adminhome1_05",
"adminhome1_07", "adminhome1_09", "adminupdate_18",
"adminupdate_21", "adminupdate_24", "adminupdate_26",
"adminupdate_28", "adminhome3_25");
regularImageObjects = new Array(imageNames.length);
negativeImageObjects = new Array(imageNames.length);

for(var i=0; i<imageNames.length; i++) {
  cacheImages(i);
}
```

```
function highlight(imageName) {
  document.images[imageName].src =
    negativeImageFile(imageName);
}

function unHighlight(imageName) {
  document.images[imageName].src =
regularImageFile(imageName);
}
// -->
</SCRIPT>
<META HTTP-EQUIV="Content-Type" CONTENT="text/html;
charset=iso-8859-1">
</HEAD>
<BODY BGCOLOR=#FFFFFF LEFTMARGIN=0 TOPMARGIN=0
MARGINWIDTH=0 MARGINHEIGHT=0>
<!-- ImageReady Slices (adminupdate.psd) -->
<TABLE WIDTH=1024 BORDER=0 CELLPADDING=0
CELLSPACING=0>
        <TR>
                <TD COLSPAN=15>
                        <IMG
SRC="images/adminhome1_01.gif" WIDTH=1024
HEIGHT=12 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=7>
                        <IMG
SRC="images/adminhome1_02.gif" WIDTH=443
HEIGHT=224 ALT=""></TD>
                <TD COLSPAN=8>
                        <IMG
SRC="images/adminhome1_03.gif" WIDTH=581
HEIGHT=224 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=224
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=8 ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_04.gif" WIDTH=787
HEIGHT=38 ALT=""></TD>
                <TD ROWSPAN=2>
                        <a
href="adminhome1.jsp"
onMouseOver="highlight('adminhome1_05')"
onMouseOut="unHighlight('adminhome1_05')"><IMG
id="adminhome1_05" SRC="images/adminhome1_05.gif"
WIDTH=42 HEIGHT=22 ALT="Home"
border=0></a></TD>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_06.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                <TD ROWSPAN=2>
                        <a href="links.jsp"
target="mainframe"
onMouseOver="highlight('adminhome1_07')"
onMouseOut="unHighlight('adminhome1_07')"><IMG
id="adminhome1_07" SRC="images/adminhome1_07.gif"
WIDTH=38 HEIGHT=22 ALT="Links"
border=0></a></TD>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_08.gif" WIDTH=12 HEIGHT=38
ALT=""></TD>
                <TD>
                        <a href="logout.jsp"
onMouseOver="highlight('adminhome1_09')"
onMouseOut="unHighlight('adminhome1_09')"><IMG
id="adminhome1_09" SRC="images/adminhome1_09.gif"
WIDTH=49 HEIGHT=21 ALT="Logout"
border=0></a></TD>
                <TD COLSPAN=2 ROWSPAN=3>
                        <IMG
SRC="images/adminhome1_10.gif" WIDTH=84 HEIGHT=38
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=21
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=2>
                        <IMG
SRC="images/adminhome1_11.gif" WIDTH=49 HEIGHT=17
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
        </TR>
        <TR>
                <TD>
                        <IMG
SRC="images/adminhome1_12.gif" WIDTH=42 HEIGHT=16
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/adminhome1_13.gif" WIDTH=38 HEIGHT=16
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=6>
                        <IMG
SRC="images/adminhome1_14.gif" WIDTH=178 HEIGHT=7
ALT=""></TD>
                <TD COLSPAN=8 ROWSPAN=13>
                        <IFRAME
SRC="updatetutorial.jsp" name="mainframe" WIDTH=811
HEIGHT=440 frameborder=0></IFRAME></TD>
                <TD ROWSPAN=14>
                        <IMG
SRC="images/adminupdate_16.gif" WIDTH=35
HEIGHT=494 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=7
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=13>
                        <IMG
SRC="images/adminupdate_17.gif" WIDTH=45
HEIGHT=487 ALT=""></TD>
                <TD COLSPAN=4>
                        <a
href="adminpatterns.jsp"
onMouseOver="highlight('adminupdate_18')"
onMouseOut="unHighlight('adminupdate_18')"><IMG
id="adminupdate_18" SRC="images/adminupdate_18.gif"
WIDTH=110 HEIGHT=24 ALT="Generate Maximal Patterns"
border=0></a></TD>
                <TD ROWSPAN=13>
                        <IMG
SRC="images/adminupdate_19.gif" WIDTH=23
HEIGHT=487 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=24
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=4>
                        <IMG
SRC="images/adminupdate_20.gif" WIDTH=110
HEIGHT=12 ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=12
ALT=""></TD>
        </TR>
```

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```html
<TR>
	<TD COLSPAN=4>
		<a
href="adminupdate.jsp"
onMouseOver="highlight('adminupdate_21')"
onMouseOut="unHighlight('adminupdate_21')"><IMG
id="adminupdate_21" SRC="images/adminupdate_21.gif"
WIDTH=110 HEIGHT=35 ALT="Update Tutorial Module"
border=0></a></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=35
ALT=""></TD>
	</TR>
	<TR>
		<TD COLSPAN=4>
			<IMG
SRC="images/adminupdate_22.gif" WIDTH=110
HEIGHT=10 ALT=""></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=10
ALT=""></TD>
	</TR>
	<TR>
		<TD ROWSPAN=9>
			<IMG
SRC="images/adminupdate_23.gif" WIDTH=19
HEIGHT=406 ALT=""></TD>
		<TD COLSPAN=3>
			<a
href="adminlecture.jsp"
onMouseOver="highlight('adminupdate_24')"
onMouseOut="unHighlight('adminupdate_24')"><IMG
id="adminupdate_24" SRC="images/adminupdate_24.gif"
WIDTH=91 HEIGHT=16 ALT="Lectures"
border=0></a></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
	</TR>
	<TR>
		<TD COLSPAN=3>
			<IMG
SRC="images/adminupdate_25.gif" WIDTH=91 HEIGHT=10
ALT=""></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=10
ALT=""></TD>
	</TR>
	<TR>
		<TD COLSPAN=3>
			<a
href="adminstudymaterial.jsp"
onMouseOver="highlight('adminupdate_26')"
onMouseOut="unHighlight('adminupdate_26')"><IMG
id="adminupdate_26" SRC="images/adminupdate_26.gif"
WIDTH=91 HEIGHT=25 ALT="Supplementary Study
Materials" border=0></a></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=25
ALT=""></TD>
	</TR>
	<TR>
		<TD COLSPAN=3>
			<IMG
SRC="images/adminupdate_27.gif" WIDTH=91 HEIGHT=8
ALT=""></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=8
ALT=""></TD>
	</TR>
	<TR>
		<TD COLSPAN=3>
			<a
href="adminquizitem.jsp"
onMouseOver="highlight('adminupdate_28')"
onMouseOut="unHighlight('adminupdate_28')"><IMG
```

```html
id="adminupdate_28" SRC="images/adminupdate_28.gif"
WIDTH=91 HEIGHT=17 ALT="Quiz Items"
border=0></a></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
	</TR>
	<TR>
		<TD COLSPAN=3>
			<IMG
SRC="images/adminupdate_29.gif" WIDTH=91
HEIGHT=137 ALT=""></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=137
ALT=""></TD>
	</TR>
	<TR>
		<TD ROWSPAN=3>
			<IMG
SRC="images/adminupdate_30.gif" WIDTH=27
HEIGHT=193 ALT=""></TD>
		<TD>
			<a href="logout.jsp"
onMouseOver="highlight('adminhome3_25')"
onMouseOut="unHighlight('adminhome3_25')"><IMG
id="adminhome3_25" SRC="images/adminhome3_25.gif"
WIDTH=61 HEIGHT=17 ALT="Logout"
border=0></a></TD>
		<TD ROWSPAN=3>
			<IMG
SRC="images/adminupdate_32.gif" WIDTH=3 HEIGHT=193
ALT=""></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
	</TR>
	<TR>
		<TD ROWSPAN=2>
			<IMG
SRC="images/adminupdate_33.gif" WIDTH=61
HEIGHT=176 ALT=""></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=122
ALT=""></TD>
	</TR>
	<TR>
		<TD COLSPAN=8>
			<IMG
SRC="images/adminupdate_34.gif" WIDTH=811
HEIGHT=54 ALT=""></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=54
ALT=""></TD>
	</TR>
	<TR>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=45 HEIGHT=1
ALT=""></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=19 HEIGHT=1
ALT=""></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=27 HEIGHT=1
ALT=""></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=61 HEIGHT=1
ALT=""></TD>
		<TD>
			<IMG
SRC="images/spacer.gif" WIDTH=3 HEIGHT=1
ALT=""></TD>
		<TD>
```

```
                          <IMG
SRC="images/spacer.gif" WIDTH=23 HEIGHT=1
ALT=""></TD>
                  <TD>
                          <IMG
SRC="images/spacer.gif" WIDTH=265 HEIGHT=1
ALT=""></TD>
                  <TD>
                          <IMG
SRC="images/spacer.gif" WIDTH=344 HEIGHT=1
ALT=""></TD>
                  <TD>
                          <IMG
SRC="images/spacer.gif" WIDTH=42 HEIGHT=1
ALT=""></TD>
                  <TD>
                          <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                  <TD>
                          <IMG
SRC="images/spacer.gif" WIDTH=38 HEIGHT=1
ALT=""></TD>
                  <TD>
                          <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                  <TD>
                          <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                  <TD>
                          <IMG
SRC="images/spacer.gif" WIDTH=49 HEIGHT=1
ALT=""></TD>
                  <TD>
                          <IMG
SRC="images/spacer.gif" WIDTH=35 HEIGHT=1
ALT=""></TD>
                  <TD></TD>
          </TR>
</TABLE>
<!-- End ImageReady Slices -->
</BODY>
</HTML>
```

connect.jsp
```
<%@ page import="java.sql.*" %>
<%
// connection variables

        String dbHost = "localhost";
    String dbName = "cpd_db";
    int dbPort = 3306;
    String mysqlURL =
"jdbc:mysql://"+dbHost+":"+dbPort+"/"+dbName;
    String dbUsername = "adminuser";
    String dbPassword = "adminpassword";

// load jdbc driver
    Class.forName("com.mysql.jdbc.Driver").newInstance();
// establish connection
    Connection connection =
DriverManager.getConnection(mysqlURL, dbUsername,
dbPassword);
// create statement
    Statement statement = connection.createStatement();
%>
```

deletelecture.jsp
```
<html>
<head>
<title>Delete Lecture</title>
<script LANGUAGE="JavaScript">
function checkID(form)
{
        if(!form.lec_id.value.length)
        {
                alert('Please be reminded that the
lecture ID field is required.');
                return false;
```

```
        }
        if((!(form.lec_id.value > 0)))
    {
      alert("A positive integer value for lecture ID must be
entered.");
        return false;
    }
            return true;
}

function confirmDelete()
{
        var confirmDel = confirm("Are you sure you
want to delete this lecture?");
        if(confirmDel)
                return true;
        else
                return false;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
   String sub = request.getParameter("sub");
   String delete = request.getParameter("delete");

   if(sub.equals("Submit"))
        {
                String lec_idString =
request.getParameter("lec_id");

                int lec_id =
Integer.parseInt(lec_idString);

                String queryString = "SELECT
LEC_ID, LEC_TITLE, LEC_DESCRIPTION, LEC_CONTENT,
DATE_LAST_MODIFIED FROM LECTURE WHERE LEC_ID="
+lec_id;
                ResultSet rs =
statement.executeQuery(queryString);

                int countResult=0;
                while(rs.next())
                {
                        countResult++;
                }

                if(countResult!=0)
                {
                        rs.first();
                        int l_id =
rs.getInt("LEC_ID");
                        String lec_title =
URLDecoder.decode(rs.getString("LEC_TITLE"));
                        String lec_desc =
URLDecoder.decode(rs.getString("LEC_DESCRIPTION"));
                        lec_desc =
lec_desc.replaceAll("\r\n", "<BR>");
                        String lec_content =
URLDecoder.decode(rs.getString("LEC_CONTENT"));
                        lec_content =
lec_content.replaceAll("\r\n", "<BR>");
                        String date_last_modified =
rs.getString("DATE_LAST_MODIFIED");
%>
                        <h3>:: Delete A
Lecture ::</h3>
                        <form method=POST
action="deletelecture.jsp" onSubmit="return
confirmDelete();">
                        <center>
                        <table class="hundred
backpink" style="font-family: Verdana; font-size: 11px;
border-collapse: collapse" cellpadding="3" cellspacing="1">
                        <tr>
                                <td
colspan=4><br><b>Lecture
```

ID: <%= l_id %>

</td>

```
                                </tr>
                                <tr>
                                                <td colspan=2
class="label"><b>Lecture Title:</b></td>
                                                <td
colspan=2><font color="#660000"><%= lec_title
%></font><BR><BR></td>
                                </tr>
                                <tr>
                                                <td colspan=2
class="label"><b>Lecture Description:</b></td>
                                                <td
colspan=2><font color="#660000"><%= lec_desc
%></font><BR><BR></td>
                                </tr>
                                <tr>
                                                <td colspan=2
class="label"><b>Lecture Content:</b></td>
                                                <td
colspan=2><font color="#660000"><%= lec_content
%></font><BR><BR></td>
                                </tr>
                                <tr>
                                                <td colspan=2
class="label"><b>Date Last Modified</b></td>
                                                <td
colspan=2><font color="#660000"><%=
date_last_modified %></font></td>
                                </tr>
                                <tr>
                                                <td><b>(yyyy-
mm-dd):</b><br><br></td>
                                </tr>
                                </table>

                                <BR><BR><input
type="hidden" name="l_id" value="<%= l_id %>">
                                                <input type="hidden"
name="sub" value="">
                                                <input type="submit"
name="delete" value="Delete Selected Lecture">
                                                <input type=button
onClick=self.history.back(); value='GO BACK'></center>
                                                </form>
<%
                        }
                        else
                        {
                                                out.println("<h4><font
color=#660000>:: Warning
::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>The lecture with ID "+lec_id+" does
not exist in the database.<BR><BR></td></tr><tr><td
align='center' class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
                        }
                }
        else if(delete.equals("Delete Selected Lecture"))
                {
                                String l_id =
request.getParameter("l_id");

                                String updateString = "DELETE FROM
LECTURE WHERE LEC_ID=" +l_id;

                        statement.executeUpdate(updateString);
                                out.println("<h4>:: Result
::</h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backblue'><br>The lecture with ID<b> <u>"
+l_id+ "</u> </b>was successfully deleted from to the
database.<BR><BR></td></tr><tr><td align='center'
class='backblue'><a href='adminlecture.jsp'
target='_parent'>[ back to update lecture page ]
</a><br><br></td></tr></center></table>");
                                connection.close();
                }
```

```
        else
        {
%>
                        <h3>:: Delete A Lecture ::</h3>
                        <font color=#660000><i>Please
enter the ID of the lecture you want to delete.</i></font>
                        <form method=POST
action="deletelecture.jsp" name="form1"
onSubmit="return checkID(form1);">
                                <font style="font-size:
11px; font-weight: bold">Lecture
ID</font>  <input type="text" name="lec_id"
style="font-family: Verdana; font-size: 11px"
maxlength=9><BR><BR>
                                <BR>
                                <input type="hidden"
name="delete" value="">
                                <input type="submit"
name="sub" value="Submit">
                                <input type="reset"
name="reset" value="Reset">
                        </form>
<%
        }
%>
</font>
</body>
</html>
```

deletequizitem.jsp
```
<html>
<head>
<title>Delete Quiz</title>
<script LANGUAGE="JavaScript">
function checkID(form)
{
        if(!form.quiz_id.value.length)
        {
                alert('Please be reminded that the
quiz item ID field is required.');
                return false;
        }

        if((!(form.quiz_id.value > 0)))
    {
        alert("A positive integer value for quiz item ID must
be entered.");
        return false;
    }
        return true;
}

function checkParameters(form)
{
        var confirmDel = confirm("Are you sure you
want to delete this quiz item?");
        if(confirmDel)
                return true;
        else
                return false;

}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
    String sub = request.getParameter("sub");
    String delete = request.getParameter("delete");

    if(sub.equals("Submit"))
    {
                String quiz_idString =
request.getParameter("quiz_id");

                if(quiz_idString.length()==0)
                {
                                out.println("Please be
reminded that the quiz item ID field is
```

```
required.<BR><BR><input type=button
onClick=self.history.back(); value='GO BACK'>");
                        }
                        else
                        {
                                int quiz_id;
                                try
                                {
                                        quiz_id =
Integer.parseInt(quiz_idString);
                                }
                catch(NumberFormatException e)
                                {
                                        quiz_id=-1;
                                }

                                if(quiz_id==-1)

                                {
                                        out.println("The
quiz item ID must be a positive integer.<BR><BR><input
type=button onClick=self.history.back(); value='GO
BACK'>");
                                }
                                else
                                {
                                        String
queryString = "SELECT QUIZ_ITEM_ID, QUESTION,
CORRECT_ANS, LETTER_A, LETTER_B, LETTER_C,
LETTER_D FROM QUIZ_ITEM WHERE QUIZ_ITEM_ID="
+quiz_id;
                                        ResultSet rs =
statement.executeQuery(queryString);

                                        int
countResult=0;
                                        while(rs.next())
                                        {
                countResult++;

                                        }
                                        if(countResult!
=0)
                                        {
                rs.first();
                                                        int
q_id = rs.getInt("QUIZ_ITEM_ID");
                                                String ques =
URLDecoder.decode(rs.getString("QUESTION"));
                                                String answer =
rs.getString("CORRECT_ANS");
                                                String let_a =
URLDecoder.decode(rs.getString("LETTER_A"));
                                                String let_b =
URLDecoder.decode(rs.getString("LETTER_B"));
                                                String let_c =
URLDecoder.decode(rs.getString("LETTER_C"));
                                                String let_d =
URLDecoder.decode(rs.getString("LETTER_D"));
%>
                                                <h3>:: Delete
A Quiz Item ::</h3>
                                                <form
method=POST action="deletequizitem.jsp" name="form2"
onSubmit="return checkParameters(form2);">

                        <center>

                        <table class="seventy backpink" style="font-
family: Verdana; font-size: 11px; font-weight: bold;
border-collapse: collapse" cellpadding="3" cellspacing="1">
                                                        <tr>

                        <td colspan=4><BR>Question Item
ID:  <font color="#660000"><%= q_id
%></font><br><br></td>

                        </tr>
                                                        <tr>

                        <td colspan=1 class="label">Question:</td>

                        <td colspan=3><font color="#660000"><%=
ques %></font><br><br></td>

                        </tr>
                                                        <tr>

                        <td colspan=1 class="label">Choice A:</td>

                        <td colspan=3><font color="#660000"><%=
let_a %></font><br><br></td>

                        </tr>
                                                        <tr>

                        <td colspan=1 class="label">Choice B:</td>

                        <td colspan=3><font color="#660000"><%=
let_b %></font><br><br></td>

                        </tr>
                                                        <tr>

                        <td colspan=1 class="label">Choice C:</td>

                        <td colspan=3><font color="#660000"><%=
let_c %></font><br><br></td>

                        </tr>
                                                        <tr>

                        <td colspan=1 class="label">Choice D:</td>

                        <td colspan=3><font color="#660000"><%=
let_d %></font><br><br></td>

                        </tr>
                                                        <tr>

                        <td colspan=4>Correct
Answer:  <font color="#660000"><%=
answer %></font><BR><BR></td>

                        </tr>

                        </table>

                        <BR><BR><input type="hidden" name="q_id"
value="<%= q_id %>">

                        <input type="hidden" name="sub" value="">

                        <input type="submit" name="delete"
value="Delete Selected Quiz Item">

                        <input type=button onClick=self.history.back();
value='GO BACK'></center>
                                                        </form>
<%
                                        }
                                        else
                                        {

                        out.println("<h4><font color=#660000>::
Warning ::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>The quiz item with ID "+quiz_id+"
does not exist in the
database.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
                                        }
                                }
                        }
                }
        else if(delete.equals("Delete Selected Quiz Item"))
                {
                                String q_id =
request.getParameter("q_id");
```

String updateString = "DELETE FROM QUIZ_ITEM WHERE QUIZ_ITEM_ID=" +q_id;

                statement.executeUpdate(updateString);
                out.println("<h4>:: Result ::</h4><center><table cellspacing=0 cellpadding=0><tr><td align='center' class='backblue'>
The quiz item with ID <u>" +q_id+ "</u> was successfully deleted from to the database.

</td></tr><tr><td align='center' class='backblue'>[back to update quiz item page]

</td></tr></center></table>");
                connection.close();
        }
    else
    {
%>
                <h3>:: Delete A Quiz Item ::</h3>
                <i>Please enter the ID of the quiz item you want to delete.</i>
                <form method=POST action="deletequizitem.jsp" name="form1" onSubmit="return checkID(form1);">
                        Quiz Item ID <input type="text" name="quiz_id" style="font-family: Verdana; font-size: 11px" maxlength=9>

                        <input type="hidden" name="delete" value="">
                        <input type="submit" name="sub" value="Submit">
                        <input type="reset" name="reset" value="Reset">
                    </form>
<%
        }
%>

</body>
</html>

deletestudymaterial.jsp
```
<html>
<head>
<title>Delete Study Material</title>
<script LANGUAGE="JavaScript">
function checkID(form)
{
        if(!form.studymat_id.value.length)
        {
                alert('Please be reminded that the study material ID field is required.');
                return false;
        }

        if((!(form.studymat_id.value > 0)))
    {
        alert("A positive integer value for study material ID must be entered.");
        return false;
    }
        return true;
}

function confirmDelete()
{
        var confirmEdit = confirm("Are you sure you want to delete this study material?");
        if(confirmEdit)
                return true;
        else
                return false;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
```


<%@ page import="java.sql.*, java.net.URLDecoder, java.io.*" %>
<%@ include file="connect.jsp" %>
<%
  String sub = request.getParameter("sub");
  String delete = request.getParameter("delete");

  if(sub.equals("Submit"))
  {
                String studymat_idString = request.getParameter("studymat_id");

                int studymat_id = Integer.parseInt(studymat_idString);

                String queryString = "SELECT STUDYMAT_ID, LEC_ID, STUDYMAT_TITLE, STUDYMAT_DESCRIPTION, STUDYMAT_FILENAME FROM SUPPLEMENTARY_STUDY_MATERIAL WHERE STUDYMAT_ID=" +studymat_id;
                ResultSet rs = statement.executeQuery(queryString);

                int countResult=0;
                while(rs.next())
                {
                        countResult++;
                }

                if(countResult!=0)
                {
                        rs.first();
                        int smat_id = rs.getInt("STUDYMAT_ID");
                        String lec_id = rs.getString("LEC_ID");
                        String studymat_title = URLDecoder.decode(rs.getString("STUDYMAT_TITLE"));
                        String studymat_desc = URLDecoder.decode(rs.getString("STUDYMAT_DESCRIPTION"));
                        studymat_desc = studymat_desc.replaceAll("\r\n", "<BR>");
                        String studymat_filename = URLDecoder.decode(rs.getString("STUDYMAT_FILENAME"));
%>
                        <h3>:: Delete A Study Material ::</h3>
                        <form method=POST action="deletestudymaterial.jsp" onSubmit="return confirmDelete();">
                        <center>
                        <table class="backpink" border="0" style="font-family: Verdana; font-size: 11px; font-weight: bold; border-collapse: collapse" cellpadding="3" cellspacing="1">
                                <tr>
                                        <td colspan=4 class="label">
Study Material ID: <%= smat_id %>

</td>
                                </tr>
                                <tr>
                                        <td colspan=2 class="label">Lecture ID:</td>
                                        <td colspan=2><%= lec_id %>

</td>
                                </tr>
                                <tr>
                                        <td colspan=2 class="label">Study Material Title:</td>
                                        <td colspan=2><%= studymat_title %>

</td>
                                </tr>
                                <tr>
                                        <td colspan=2 class="label">Study Material Description:</td>

<td colspan=2><%= studymat_desc %>

</td>
                    </tr>
                    <tr>
                        <td colspan=2 class="label">Study Material Filename:</td>
                        <td colspan=2><%= studymat_filename %>

</td>
                    </tr>
                    </table>

<input type="hidden" name="smat_id" value="<%= smat_id %>">
                    <input type="hidden" name="smat_filename" value="<%= studymat_filename %>">
                    <input type="hidden" name="sub" value="">
                    <input type="submit" name="delete" value="Delete Selected Study Material">
                    <input type=button onClick=self.history.back(); value="GO BACK"></center>
                    </form>
<%
        }
        else
        {
                out.println("<h4>:: Warning ::</h4><center><table cellspacing=0 cellpadding=0><tr><td align='center' class='backpink'>
The study material with ID "+studymat_id+" does not exist in the database.

</td></tr><tr><td align='center' class='backpink'><input type=button onClick=self.history.back(); value='GO BACK'>

</td></tr></center></table>");
        }
    }
    else if(delete.equals("Delete Selected Study Material"))
        {
                String smat_id = request.getParameter("smat_id");
                String smat_filename = request.getParameter("smat_filename");
                File handler = new File(smat_filename);
                handler.delete();

                String updateString = "DELETE FROM SUPPLEMENTARY_STUDY_MATERIAL WHERE STUDYMAT_ID=" +smat_id;

        statement.executeUpdate(updateString);

                out.println("<h4>:: Result ::</h4><center><table cellspacing=0 cellpadding=0><tr><td align='center' class='backblue'>
The study material with ID <u>" +smat_id+ "</u> was successfully deleted from to the database.

</td></tr><tr><td align='center' class='backblue'>[back to update study material page]

</td></tr></center></table>");
                connection.close();
        }
    else
    {
%>
                <h3>:: Delete A Study Material ::</h3>
                <i>Please enter the ID of the study material you want to delete.</i>
                <form method=POST action="deletestudymaterial.jsp" name="form1" onSubmit="return checkID(form1);">

Study Material ID <input type="text" name="studymat_id" style="font-family: Verdana; font-size: 11px" maxlength=9>

                        <input type="hidden" name="delete" value="">
                        <input type="submit" name="sub" value="Submit">
                        <input type="reset" name="reset" value="Reset">
                    </form>
<%
        }
%>

</body>
</html>

editlecture.jsp
<html>
<head><title>Edit Quiz</title>
<script LANGUAGE="JavaScript">
function checkID(form)
{
        if(!form.lec_id.value.length)
        {
                alert('Please be reminded that the lecture ID field is required.');
                return false;
        }

        if((!(form.lec_id.value > 0)))
    {
        alert("A positive integer value for lecture ID must be entered.");
        return false;
    }
        return true;
}

function checkParameters(form)
{
        if(!form.lec_title.value.length || ! form.lec_desc.value.length || ! form.lec_content.value.length || ! form.date_last_modified.value.length)
        {
                alert('Please be reminded that all the fields are required.');
                return false;
        }

        var confirmEdit = confirm("Are you sure you want to save the changes you made to this lecture?");
        if(confirmEdit)
                return true;
        else
                return false;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLEncoder, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
        int daysPerMonth[] = { 0, 31, 28, 31, 30, 31, 30, 31, 31, 30, 31, 30, 31 };
    String sub = request.getParameter("sub");
    String update = request.getParameter("update");

    if(sub.equals("Submit"))
    {
                String lec_idString = request.getParameter("lec_id");

                int lec_id = Integer.parseInt(lec_idString);

```
                    String queryString = "SELECT
LEC_ID, LEC_TITLE, LEC_DESCRIPTION, LEC_CONTENT,
DATE_LAST_MODIFIED FROM LECTURE WHERE LEC_ID="
+lec_id;
                    ResultSet rs =
statement.executeQuery(queryString);

                    int countResult=0;
                    while(rs.next())
                    {
                            countResult++;
                    }

                    if(countResult!=0)
                    {
                            rs.first();
                            int l_id =
rs.getInt("LEC_ID");
                            String lec_title =
URLDecoder.decode(rs.getString("LEC_TITLE"));
                            String lec_desc =
URLDecoder.decode(rs.getString("LEC_DESCRIPTION"));
                            String lec_content =
URLDecoder.decode(rs.getString("LEC_CONTENT"));
                            String date_last_modified
= rs.getString("DATE_LAST_MODIFIED");

%>
                            <h3>:: Edit A Lecture
::</h3>
                            <form method=POST
action="editlecture.jsp" name="form2" onSubmit="return
checkParameters(form2);">
                            <center>
                            <table class="backpink"
style="font-family: Verdana; font-size: 11px; font-weight:
bold; border-collapse: collapse" cellpadding="3"
cellspacing="1">
                            <tr>
                                    <td colspan=4
class="label"><BR>Lecture
ID:    <font color="#660000"><
%= l_id %></font><br><br></td>

                            </tr>
                            <tr>
                                    <td colspan=2
class="label">Lecture Title:</td>
                                    <td
colspan=2><input type="text" name="lec_title" value="<
%= lec_title %>" style="font-family: Verdana; font-size:
11px" size=50 maxlength=200><BR><BR></td>
                            </tr>
                            <tr>
                                    <td colspan=2
class="label">Lecture Description:</td>
                                    <td
colspan=2><textarea name="lec_desc" cols="50"
rows="5" style="font-family: Verdana; font-size: 11px"
wrap="hard"><%= lec_desc
%></textarea><BR><BR></td>
                            </tr>
                            <tr>
                                    <td colspan=2
class="label">Lecture Content:</td>
                                    <td
colspan=2><textarea name="lec_content" cols="100"
rows="50" style="font-family: Verdana; font-size: 11px"
wrap="hard"><%= lec_content
%></textarea><BR><BR></td>
                            </tr>
                            <tr>
                                    <td colspan=4
class="label">Date Last Modified (yyyy-mm-
dd):   <input type="text"
name="date_last_modified" value="<%=
date_last_modified %>" style="font-family: Verdana; font-
size: 11px" size=20 maxlength=10><BR><BR></td>
                            </tr>
                            </table>
```

```
                            <BR><BR><input
type="hidden" name="l_id" value="<%= l_id %>">
                            <input type="hidden"
name="sub" value="">
                            <input type="submit"
name="update" value="Edit Selected Lecture">
                            <input type="reset"
name="reset" value="Reset"></center>
                            </form>
<%
                    }
                    else
                    {
                            out.println("<h4><font
color=#660000>:: Warning
::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>The lecture with ID "+lec_id+" does
not exist in the database.<BR><BR></td></tr><tr><td
align='center' class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
                    }
            }
            else if(update.equals("Edit Selected Lecture"))
            {
                    String l_id =
request.getParameter("l_id");
                    String lec_title =
URLEncoder.encode(request.getParameter("lec_title"));
                    String lec_desc =
URLEncoder.encode(request.getParameter("lec_desc"));
                    String lec_content =
URLEncoder.encode(request.getParameter("lec_content"));
                    String date_last_modified =
request.getParameter("date_last_modified");

                    String dateYearString =
Character.toString(date_last_modified.charAt(0)) +
Character.toString(date_last_modified.charAt(1)) +
Character.toString(date_last_modified.charAt(2)) +
Character.toString(date_last_modified.charAt(3));
                    String dateMonthString =
Character.toString(date_last_modified.charAt(5)) +
Character.toString(date_last_modified.charAt(6));
                    String dateDayString =
Character.toString(date_last_modified.charAt(8)) +
Character.toString(date_last_modified.charAt(9));

                    int dateYear =
Integer.parseInt(dateYearString);
                    int dateMonth =
Integer.parseInt(dateMonthString);
                    int dateDay =
Integer.parseInt(dateDayString);

                    if(((dateMonth>=1 &&
dateMonth<=12) && (dateDay>=1 &&
dateDay<=daysPerMonth[dateMonth])) || (dateMonth==2
&& dateDay==29 && (dateYear % 400==0 || (dateYear
%4==0 && dateYear%100!=0))))
                    {
                            String updateString =
"UPDATE LECTURE SET LEC_TITLE='" +lec_title+ "',
LEC_DESCRIPTION='" +lec_desc+ "', LEC_CONTENT='"
+lec_content+ "', DATE_LAST_MODIFIED='"
+date_last_modified+ "' WHERE LEC_ID=" +l_id;

                    statement.executeUpdate(updateString);
                            out.println("<h4>::
Result ::</h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backblue'><br>Changes to the lecture with ID<b>
<u>" +l_id+ "</u> </b>was successfully added to the
database.<BR><BR></td></tr><tr><td align='center'
class='backblue'><a href='adminlecture.jsp'
target='_parent'>[ back to update lecture page ]
</a><br><br></td></tr></center></table>");
                            connection.close();

                    }
                    else
```

```
                {
                                out.println("<h4><font
color=#660000>:: Warning
::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>The date you entered was invalid.
Please follow the format (yyyy-mm-dd) given in the
previous page regarding the date when the lecture was last
modified.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
                }
    else
    {
%>
                        <h3>:: Edit A Lecture ::</h3>
                        <font color=#660000><i>Note:
Please enter the ID of the lecture you wish to
edit.</i></font>
                        <form method=POST
action="editlecture.jsp" name="form1" onSubmit="return
checkID(form1);">
                        <font style="font-size:
11px; font-weight: bold">Lecture
ID</font>  <input type="text" name="lec_id"
style="font-family: Verdana; font-size: 11px"
maxlength=9><BR><BR>
                        <BR>
                        <input type="submit"
name="sub" value="Submit">
                        <input type="reset"
name="reset" value="Reset">
                        </form>
<%
                }
%>
</font>
</body>
</html>
```

editquizitem.jsp
```
<html>
<head><title>Edit Quiz</title>
<script LANGUAGE="JavaScript">
function checkID(form)
{
                if(!form.quiz_id.value.length)
                {
                        alert('Please be reminded that the
quiz item ID field is required.');
                        return false;
                }

                if((!(form.quiz_id.value > 0)))
    {
        alert("A positive integer value for quiz item ID must
be entered.");
        return false;
    }
                return true;
}

function checkParameters(form)
{
                if(!form.ques.value.length || !
form.let_a.value.length || !form.let_b.value.length || !
form.let_c.value.length || !form.let_d.value.length || !
form.answer.value.length)
                {
                        alert('Please be reminded that all the
fields are required.');
                        return false;
                }

                if(!((form.answer.value=="A") ||
(form.answer.value=="B") || (form.answer.value=="C") ||
(form.answer.value=="D") || (form.answer.value=="a") ||
(form.answer.value=="b") || (form.answer.value=="c") ||
(form.answer.value=="d")))
                {
```

```
                        alert('The letter of the correct answer
must be either A, B, C or D.');
                        return false;
                }

                var confirmEdit = confirm("Are you sure you
want to save the changes you made to this quiz item?");
        if(confirmEdit)
                        return true;
                else
                        return false;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLEncoder,
java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
   String sub = request.getParameter("sub");
   String update = request.getParameter("update");

   if(sub.equals("Submit"))
   {
                String quiz_idString =
request.getParameter("quiz_id");

                int quiz_id =
Integer.parseInt(quiz_idString);

                String queryString = "SELECT
QUIZ_ITEM_ID, QUESTION, CORRECT_ANS, LETTER_A,
LETTER_B, LETTER_C, LETTER_D FROM QUIZ_ITEM WHERE
QUIZ_ITEM_ID=" +quiz_id;
                ResultSet rs =
statement.executeQuery(queryString);

                int countResult=0;
                while(rs.next())
                {
                        countResult++;
                }

                if(countResult!=0)
                {
                        rs.first();
                        int q_id =
rs.getInt("QUIZ_ITEM_ID");
                        String ques =
URLDecoder.decode(rs.getString("QUESTION"));
                        String answer =
rs.getString("CORRECT_ANS");
                        String let_a =
URLDecoder.decode(rs.getString("LETTER_A"));
                        String let_b =
URLDecoder.decode(rs.getString("LETTER_B"));
                        String let_c =
URLDecoder.decode(rs.getString("LETTER_C"));
                        String let_d =
URLDecoder.decode(rs.getString("LETTER_D"));
%>
                        <h3>:: Edit A Quiz
Item ::</h3>
                        <form method=POST
action="editquizitem.jsp" name="form2" onSubmit="return
checkParameters(form2);">
                        <center>
                        <table class="seventy
backpink" style="font-family: Verdana; font-size: 11px;
font-weight: bold; border-collapse: collapse"
cellpadding="3" cellspacing="1">
                        <tr>
                                <td colspan=4
class="label"><br>Question Item ID:  <font
color="#660000"><%= q_id %></font><br><br></td>
                        </tr>
                        <tr>
                                <td colspan=1
class="label">Question:</td>
```

```
                                <td
colspan=3><input type="text" name="ques" value="<%=
ques %>" style="font-family: Verdana; font-size: 11px"
size="75"><br><br></td>
                        </tr>
                        <tr>
                                <td colspan=1
class="label">Choice A:</td>
                                <td
colspan=3><input type="text" name="let_a" value="<%=
let_a %>" style="font-family: Verdana; font-size: 11px"
size="50"><br><br></td>
                        </tr>
                        <tr>
                                <td colspan=1
class="label">Choice B:</td>
                                <td
colspan=3><input type="text" name="let_b" value="<%=
let_b %>" style="font-family: Verdana; font-size: 11px"
size="50"><br><br></td>
                        </tr>
                        <tr>
                                <td colspan=1
class="label">Choice C:</td>
                                <td
colspan=3><input type="text" name="let_c" value="<%=
let_c %>" style="font-family: Verdana; font-size: 11px"
size="50"><br><br></td>
                        </tr>
                        <tr>
                                <td colspan=1
class="label">Choice D:</td>
                                <td
colspan=3><input type="text" name="let_d" value="<%=
let_d %>" style="font-family: Verdana; font-size: 11px"
size="50"><br><br></td>
                        </tr>
                        <tr>
                                <td colspan=4
class="label">Correct Answer:  <input
type"text" name="answer" value="<%= answer %>"
style="font-family: Verdana; font-size: 11px"
maxlength="1" size="5"><BR><BR></td>
                        </tr>
                        </table>

                        <BR><BR><input
type="hidden" name="q_id" value="<%= q_id %>">
                                <input type="hidden"
name="sub" value="">
                                <input type="submit"
name="update" value="Edit Selected Quiz Item">
                                <input type="reset"
name="reset" value="Reset"></center>
                        </form>
<%
                }
                else
                {
                                out.println("<h4><font
color=#660000>:: Warning
::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>The quiz item with ID "+quiz_id+"
does not exist in the
database.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
                }
        }
        else if(update.equals("Edit Selected Quiz Item"))
                {
                        String q_id =
request.getParameter("q_id");
                        String ques =
request.getParameter("ques");
                        String let_a =
request.getParameter("let_a");
                        String let_b =
request.getParameter("let_b");
```

```
                String let_c =
request.getParameter("let_c");
                        String let_d =
request.getParameter("let_d");
                        String answer =
request.getParameter("answer");

                        String answerUpper =
answer.toUpperCase();

                        String updateString = "UPDATE
QUIZ_ITEM SET QUESTION='" +URLEncoder.encode(ques)
+ "', CORRECT_ANS='" +answerUpper+ "', LETTER_A='"
+URLEncoder.encode(let_a)+ "', LETTER_B='"
+URLEncoder.encode(let_b)+ "', LETTER_C='"
+URLEncoder.encode(let_c)+ "', LETTER_D='"
+URLEncoder.encode(let_d)+ "' WHERE QUIZ_ITEM_ID="
+q_id;

                        statement.executeUpdate(updateString);
                        out.println("<h4>:: Result
::</h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backblue'><br>Changes to the quiz item with
ID<b> <u>" +q_id+ "</u> </b>was successfully added to
the database.<BR><BR></td></tr><tr><td
align='center' class='backblue'><a
href='adminquizitem.jsp' target='_parent'>[ back to update
quiz item page ]
</a><br><br></td></tr></center></table>");
                        connection.close();
                }
        else
        {
%>
                <h3>:: Edit A Quiz Item ::</h3>
                <font color=#660000><i>Please
enter the ID of the quiz item you wish to edit.</i></font>
                <form method=POST
action="editquizitem.jsp" name="form1" onSubmit="return
checkID(form1);">
                                <font style="font-size:
11px; font-weight: bold">Quiz Item
ID</font>  <input type="text"
name="quiz_id" style="font-family: Verdana; font-size:
11px" maxlength=9><BR><BR>
                                <BR>
                                <input type="submit"
name="sub" value="Submit">
                                <input type="reset"
name="reset" value="Reset">

                        </form>
<%
                }
%>
</font>
</body>
</html>
```

editstudymaterial.jsp
```
<html>
<head><title>Edit Study Material</title>
<script LANGUAGE="JavaScript">
function checkID(form)
{
        if(!form.studymat_id.value.length)
        {
                alert('Please be reminded that the
study material ID field is required.');
                return false;
        }

        if((!(form.studymat_id.value > 0)))
  {
     alert("A positive integer value for study material ID
must be entered.");
     return false;
  }
        return true;
}
```

```
function checkParameters(form)
{
            if(!form.lec_id.value.length || !
form.studymat_title.value.length || !
form.studymat_desc.value.length)
            {
                        alert('Please be reminded that all the
fields are required.');
                        return false;
            }

            if((!(form.lec_id.value > 0)))
    {
        alert("A positive integer value for lecture ID must be
entered.");
        return false;
    }

            var confirmEdit = confirm("Are you sure you
want to save the changes you made to this study
material?");
            if(confirmEdit)
                        return true;
            else
                        return false;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLEncoder,
java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
   String sub = request.getParameter("sub");
   String update = request.getParameter("update");

   if(sub.equals("Submit"))
   {
                String studymat_idString =
request.getParameter("studymat_id");

                int studymat_id =
Integer.parseInt(studymat_idString);

                String queryString = "SELECT
STUDYMAT_ID, LEC_ID, STUDYMAT_TITLE,
STUDYMAT_DESCRIPTION, STUDYMAT_FILENAME FROM
SUPPLEMENTARY_STUDY_MATERIAL WHERE
STUDYMAT_ID=" +studymat_id;
                ResultSet rs =
statement.executeQuery(queryString);

                int countResult=0;
                while(rs.next())
                {
                            countResult++;
                }

                if(countResult!=0)
                {
                            rs.first();
                            int smat_id =
rs.getInt("STUDYMAT_ID");
                            String lec_id =
rs.getString("LEC_ID");
                            String studymat_title =
URLDecoder.decode(rs.getString("STUDYMAT_TITLE"));
                            String studymat_desc =
URLDecoder.decode(rs.getString("STUDYMAT_DESCRIPTIO
N"));
                            String studymat_filename =
URLDecoder.decode(rs.getString("STUDYMAT_FILENAME"));
%>
                            <h3>:: Edit A Study
Material ::</h3>
                            <form method=POST
action="editstudymaterial.jsp" name="form2"
onSubmit="return checkParameters(form2);">
                                        <center>

                            <table class="backpink"
border="0" style="font-family: Verdana; font-size: 11px;
font-weight: bold; border-collapse: collapse"
cellpadding="3" cellspacing="1">
                                        <tr>
                                                    <td colspan=4
class="label"><br>Study Material ID:  <font
color="#660000"><%= smat_id
%></font><br><br></td>
                                        </tr>
                                        <tr>
                                                    <td colspan=2
class="label">Lecture ID:</td>
                                                    <td
colspan=2><input type"text" name="lec_id" value="<%=
lec_id %>" style="font-family: Verdana; font-size: 11px"
maxlength="9"><BR><BR></td>
                                        </tr>
                                        <tr>
                                                    <td colspan=2
class="label">Study Material Title:</td>
                                                    <td
colspan=2><input type="text" name="studymat_title"
value="<%= studymat_title %>" style="font-family:
Verdana; font-size: 11px" size=50
maxlength=200><BR><BR></td>
                                        </tr>
                                        <tr>
                                                    <td colspan=1
class="label">Study Material Description:</td>
                                                    <td
colspan=3> <textarea cols="50" rows="5"
style="font-family: Verdana; font-size: 11px"
name="studymat_desc"><%= studymat_desc
%></textarea><BR><BR><BR></td>
                                        </tr>
                                        <tr>
                                                    <td colspan=1
class="label">Study Material Filename:</td>
                                                    <td
colspan=3> <font color="#660000"><%=
studymat_filename %></font><BR><BR></td>
                                        </tr>
                                        </table>

                            <BR><BR><input
type="hidden" name="smat_id" value="<%= smat_id
%>">
                            <input type="hidden"
name="sub" value="">
                            <input type="submit"
name="update" value="Edit Selected Study Material">
                            <input type="reset"
name="reset" value="Reset"></center>
                            </form>
<%
                }
                else
                {
                            out.println("<h4><font
color=#660000>:: Warning
::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>The study material with ID
"+studymat_id+" does not exist in the
database.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
                }
   }
   else if(update.equals("Edit Selected Study Material"))
            {
                        String smat_id =
request.getParameter("smat_id");
                        String lec_id =
request.getParameter("lec_id");
                        String studymat_title =
request.getParameter("studymat_title");
                        String studymat_desc =
request.getParameter("studymat_desc");
```

```
            String studymat_filename =
request.getParameter("studymat_filename");

            String qString = "SELECT LEC_ID
FROM LECTURE WHERE LEC_ID=" + lec_id;
            ResultSet rs =
statement.executeQuery(qString);

            int count=0;
            while(rs.next())
            {
                    count++;
            }

            if(count==0)
            {
                    out.println("<h4><font
color=#660000>:: Warning
::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>The lecture ID you've chosen does
not exist in the database.<BR><BR></td></tr><tr><td
align='center' class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
            }
            else
            {
                    String updateString =
"UPDATE SUPPLEMENTARY_STUDY_MATERIAL SET
LEC_ID='" +lec_id+ "', STUDYMAT_TITLE='"
+URLEncoder.encode(studymat_title)+ "',
STUDYMAT_DESCRIPTION='"
+URLEncoder.encode(studymat_desc)+ "' WHERE
STUDYMAT_ID=" +smat_id;

        statement.executeUpdate(updateString);
                    out.println("<h4>::
Result ::</h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backblue'><br>Changes to the study material with
ID<b> <u>" +smat_id+ "</u> </b>was successfully
added to the database.<BR><BR></td></tr><tr><td
align='center' class='backblue'><a
href='adminstudymaterial.jsp' target='_parent'>[ back to
update study material page ]
</a><br><br></td></tr></center></table>");
                    connection.close();
            }
        }
    else
    {
%>
                <h3>:: Edit A Study Material ::</h3>
                <font color=#660000><i>Please
enter the ID of the study material you wish to
edit.</i></font>
                <form method=POST
action="editstudymaterial.jsp" name="form1"
onSubmit="return checkID(form1);">
                    <font style="font-size:
11px; font-weight: bold">Study Material
ID</font>  <input type="text"
name="studymat_id" style="font-family: Verdana; font-
size: 11px" maxlength=9><BR><BR>
                    <BR>
                    <input type="submit"
name="sub" value="Submit">
                    <input type="reset"
name="reset" value="Reset">

                </form>
<%
        }
%>
</font>
</body>
</html>
```

generateMaxPat.jsp
```
<html>
<head><title>Generate Maximal Patterns</title>
<script language="JavaScript">
function checkIfHighlighted(form)
{
        if(!form.selectedpattern.value.length)
        {
                alert('Please select a pattern to be
highlighted.');
                return false;
        }

        return true;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.util.*, maxpatterns.*, java.io.*"
%>
<%
        String home =
"C:\\Tomcat\\Tomcat4.1\\webapps\\cpd\\";
        String tempFolder = "tempFiles\\";
        String maxpat =
request.getParameter("maxpat");
        Vector MaxPatListVec = new Vector();
        Vector MaxPatOffsetListVec = new Vector();
        Vector supportVec = new Vector();
        Vector MPListVec = new Vector();
        Vector MPOffsetListVec = new Vector();
        Vector suppVec = new Vector();
        int rowsPerPage=100, offset=0, maxPage;

if(maxpat.equals("Generate Maximal Patterns"))
{
        String seq= request.getParameter("sequences");
        int maxlength = seq.length();
        Vector seqOrigVec = new Vector();
        int lparam =
Integer.parseInt(request.getParameter("lparam"));
        int wparam =
Integer.parseInt(request.getParameter("wparam"));
        int kparam =
Integer.parseInt(request.getParameter("kparam"));
        Vector seqLabelVec = new Vector();
        Vector seqListVec = new Vector();
        Vector alphabetVec = new Vector();
        int count=0, firstChar=0;
        String seqString="", tempString;
        genMaxPat gmp = new genMaxPat();

        while(count<maxlength)
        {
                tempString = "";
                seqString =
Character.toString(seq.charAt(count));
                if(seqString.equals(">"))
                {
                        while(!
(seqString.equals("\n") || seqString.equals("\r")) )
                        {
                                tempString =
tempString.concat(seqString);
                                count++;
                                seqString =
Character.toString(seq.charAt(count));
                        }

                seqLabelVec.addElement(tempString);
                }
                else if((seqString.equals("\n")) ||
(seqString.equals("\r")))
                {
                        count++;
                }
                else
                {
                        while((!
(seqString.equals(">")) && count < maxlength))
                        {
                                if(!
(seqString.equals("\n") || seqString.equals("\r")))
```

```java
                                                {
                tempString = tempString.concat(seqString);

                boolean foundChar = gmp.getFound(seqString,
alphabetVec);

                if(firstChar==0)
                                                        {

                alphabetVec.addElement(seqString);

                firstChar++;
                                                        }
                                                        else
if(!foundChar)
                                                        {

                alphabetVec.addElement(seqString);

                                                        }
                                                }
                                                count++;
                }
                if(count<maxlength)

                seqString =
Character.toString(seq.charAt(count));
                                                }
                seqOrigVec.addElement(tempString);
                                String seqLine ="";
                                String[] result =
tempString.split("\\s");
                                for (int x=0; x<result.length; x++)
                                seqLine += result[x];

                seqListVec.addElement(seqLine);
                                }
                }
                String seqListArray[] = new
String[seqListVec.size()];
                seqListVec.toArray(seqListArray);

                String alphaTemp = "";
                int alphaMinIndex;
                for(int q=0; q<alphabetVec.size()-1; q++)
                {
                                alphaMinIndex = q;
                                for(int r=q+1; r<alphabetVec.size();
r++)
                                {
                                                String alphaMinStr =
(String) alphabetVec.elementAt(alphaMinIndex);
                                                String alphaCompStr =
(String) alphabetVec.elementAt(r);

                if(alphaMinStr.compareTo(alphaCompStr) > 0)
                                                {
                                                                alphaTemp =
alphaMinStr;

                alphabetVec.removeElementAt(alphaMinIndex);

                alphabetVec.add(alphaMinIndex, alphaCompStr);

                alphabetVec.removeElementAt(r);

                alphabetVec.add(r, alphaTemp);
                                                }
                                }
                }
                if(seqLabelVec.size()!=1 && seqListVec.size()!
=1)
                {

                if(seqLabelVec.size()==seqListVec.size())
                                {
                                                int tempKParam =
Integer.parseInt(request.getParameter("kparam"));

                if(tempKParam<=seqLabelVec.size())
                                {

                session.removeAttribute("SLabelV");

                session.removeAttribute("SListV");

                session.setAttribute("SLabelV", seqLabelVec);

                session.setAttribute("SListV", seqListVec);

                                int pageNum=1;

                                offset = (pageNum - 1) *
rowsPerPage;

                gmp.genMaximalPatterns(alphabetVec,
seqListArray, seqListVec.size(), lparam, wparam, kparam);

                                MaxPatListVec =
gmp.getGMPMaxPatternListVec();

                MaxPatOffsetListVec =
gmp.getGMPMaxPatternOffsetListVec();
                                supportVec =
gmp.getGMPsupportVec();

                if(MaxPatListVec.size()!=0)
                                {

                session.removeAttribute("MPLV");

                session.removeAttribute("MPOLV");

                session.removeAttribute("SV");

                session.setAttribute("MPLV", MaxPatListVec);

                session.setAttribute("MPOLV",
MaxPatOffsetListVec);

                session.setAttribute("SV", supportVec);

                                                int
randNum = 1 + (int) (Math.random() * (1000000-1));

                String randNumString =
String.valueOf(randNum);

                String filename = home + tempFolder +
randNumString.concat("_results.txt");

                session.setAttribute("filename", filename);
                                                try
                                                {

                PrintStream ps = new PrintStream(new
FileOutputStream(filename));

                ps.println(":: SUMMARY OF RESULTS ::");

                ps.println();

                ps.println("There are a total of "+
MaxPatListVec.size() + " maximal pattern/s found.");

                ps.println();


                for(int r=0; r<MaxPatListVec.size(); r++)

                {

                                ps.println("Maximal Pattern:   "+
MaxPatListVec.elementAt(r));

                                Vector offElt = (Vector)
MaxPatOffsetListVec.elementAt(r);

                                String offsetPrint = "";
```

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```
                        offsetPrint = offsetPrint.concat("Offset
List:      { ");

                        for(int s=0; s<offElt.size(); s+=2)

                        {

                                if(offElt.size()-2 == s)

                                        offsetPrint =
offsetPrint.concat("(" + String.valueOf(offElt.elementAt(s))
+ ", " + String.valueOf(offElt.elementAt(s+1)) +") ");

                                else

                                        offsetPrint =
offsetPrint.concat("(" + String.valueOf(offElt.elementAt(s))
+ ", " + String.valueOf(offElt.elementAt(s+1)) +"), ");

                        }

                        offsetPrint = offsetPrint.concat("}");

                        ps.println(offsetPrint);

                        ps.println("Support:
"+supportVec.elementAt(r));

                        ps.println();

                }

                ps.close();
                                                }catc
h(Exception e)
                                        {

                out.println("Error writing to a file...");
                                                }


                out.println("<form method=POST
action='highlightPattern.jsp' name='form1'
onSubmit='return checkIfHighlighted(form1);'>");

                out.println("<h3>= Generated Maximal Patterns
=</h3>Click on the pattern then click 'Hightlight Pattern' to
see the pattern highlighted in the input
sequences<BR><BR><center>");

                out.println("<table><tr><td><br><select
name='selectedpattern' align='center' size='20'>");

                for(int z=offset; z<MaxPatListVec.size(); z++)
                                                {

                if(z % rowsPerPage == 0 && z!=offset)

                                break;

                else if (z<9)

                                out.println("<option value='" + z +
"'> 0000"+(z+1)+":     
"+MaxPatListVec.elementAt(z));

                else if (z>=9 && z<99)

                                out.println("<option value='" + z +
"'> 000"+(z+1)+":     
"+MaxPatListVec.elementAt(z));

                else if (z>=99 && z<999)

                                out.println("<option value='" + z +
"'> 00"+(z+1)+":     
"+MaxPatListVec.elementAt(z));

                else if (z>=999 && z<9999)

                                out.println("<option value='" + z +
```

```
"'> 0"+(z+1)+":     
"+MaxPatListVec.elementAt(z));

                        else

                                out.println("<option value='" + z +
"'> "+(z+1)+":     
"+MaxPatListVec.elementAt(z));
                                                }

        out.println("</select><br><br></td></tr></table><br>"
);

                out.println("<input type='submit' name='submit'
value='Highlight Pattern'></form>");

                out.println("<p><b>:: click <a
href='"+filename+"'><u>HERE</u></a> to view the
summary of results ::</b>");

                out.println("<p><b>:: right-click <a
href='"+filename+"'><u>HERE</u></a> then click 'Save
Target As...' to download the summary of results ::</b>");
                                                int
numrows = MaxPatListVec.size();


                out.println("<BR><HR><BR>There are a total
of <b><font color=#660000>" + numrows + "</font>
MAXIMAL PATTERNS </b>found from the given
sequences");

                out.println("<BR>You are currently viewing
<b><font color=#660000>Page " + pageNum +
"</font></b>");

                if(numrows % rowsPerPage == 0)

                maxPage = numrows/rowsPerPage;
                                                else

                maxPage = (numrows/rowsPerPage)+1;


                out.println("<br><br><b>:: Click on the
numbered link to go to that page ::</b><br>");


                for(pageNum = 1; pageNum <= maxPage;
pageNum++)
                                                {

                if(pageNum % 10 == 1 && pageNum!=1)

                out.println("<BR>");

                out.println("<a href='generateMaxPat.jsp?
pageNumber=" +pageNum +"&maxpat=" + " " +
"&filename="+filename+"'>" + pageNum +"</a> ");
                                                }

                out.println("<BR></CENTER>");
                                                }
                                                else
                                                {

                out.println("<h4><font color=#660000>::
Results ::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>There were no patterns
found.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");


                                                }
                                        }
                                        else
                                        {
```

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```
				out.println("<h4><font color=#660000>::
Warning ::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>The value of the K parameter must
not exceed the number of input
sequences.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
			}
			else
			{
				out.println("<h4><font
color=#660000>:: Warning
::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>There's an error with the input
sequences. Please check if it follows FASTA
format.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
			}
		}
		else
		{
			out.println("<h4><font
color=#660000>:: Warning
::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>There should be at least 2 sequences
entered.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
		}
	}
	else
	{
		int pageNum =
Integer.parseInt(request.getParameter("pageNumber"));
		MPListVec = (Vector)
session.getAttribute("MPLV");
		MPOffsetListVec = (Vector)
session.getAttribute("MPOLV");
		suppVec = (Vector) session.getAttribute("SV");
		offset = (pageNum - 1) * rowsPerPage;
		String filename =
request.getParameter("filename");
		try
		{
			PrintStream ps = new
PrintStream(new FileOutputStream(filename));
				ps.println(":: SUMMARY OF
RESULTS ::");
			ps.println();
			ps.println("There are a total of "+
MPListVec.size() + " maximal pattern/s found.");
			ps.println();

			for(int r=0; r<MPListVec.size(); r++)
			{
				ps.println("Maximal
Pattern:   "+ MPListVec.elementAt(r));
				Vector offElt = (Vector)
MPOffsetListVec.elementAt(r);

				String offsetPrint = "";
				offsetPrint =
offsetPrint.concat("Offset List:    { ");
				for(int s=0; s<offElt.size();
s+=2)
				{
					if(offElt.size()-2
== s)

		offsetPrint = offsetPrint.concat("(" +
String.valueOf(offElt.elementAt(s)) + ", " +
String.valueOf(offElt.elementAt(s+1)) +") ");
					else

		offsetPrint = offsetPrint.concat("(" +
String.valueOf(offElt.elementAt(s)) + ", " +
String.valueOf(offElt.elementAt(s+1)) +"), ");

				}
				offsetPrint =
offsetPrint.concat("}");
				ps.println(offsetPrint);
				ps.println("Support:
"+suppVec.elementAt(r));

				ps.println();

			}
			ps.close();
		}catch(Exception e)
		{
			out.println("Error writing to a file...");
		}
		out.println("<form method=POST
action='highlightPattern.jsp' name='form2'
onSubmit='return checkIfHighlighted(form2);'>");
		out.println("<h3>= Generated Maximal Patterns
=</h3><center>");
		out.println("<table><tr><td><br><select
name='selectedpattern' align='center' size='20'>");
		for(int z=offset; z<MPListVec.size(); z++)
		{
			if(z % rowsPerPage == 0 && z!
=offset)
				break;
			else if (z<9)
				out.println("<option
value='" + z + "'> 0000"+
(z+1)+":     
"+MPListVec.elementAt(z));
			else if (z>=9 && z<99)
				out.println("<option
value='" + z + "'> 000"+
(z+1)+":     
"+MPListVec.elementAt(z));
			else if (z>=99 && z<999)
				out.println("<option
value='" + z + "'> 00"+
(z+1)+":     
"+MPListVec.elementAt(z));
			else if (z>=999 && z<9999)
				out.println("<option
value='" + z + "'> 0"+
(z+1)+":     
"+MPListVec.elementAt(z));
			else
				out.println("<option
value='" + z + "'> "+
(z+1)+":     
"+MPListVec.elementAt(z));
		}

out.println("</select><br><br></td></tr></table><br>"
);

		out.println("<input type='submit' name='submit'
value='Highlight Pattern'></form>");
		out.println("<p><b>:: click <a
href='"+filename+"'><u>HERE</u></a> to view the
summary of results ::</b>");
		out.println("<p><b>:: right-click <a
href='"+filename+"'><u>HERE</u></a> then click 'Save
Target As...' to download the summary of results ::</b>");
		int numrows = MPListVec.size();

		out.println("<BR><HR><BR>There are a total
of <b><font color=#660000>" + numrows + "</font>
MAXIMAL PATTERNS </b> found from the given
sequences");
		out.println("<BR>You are currently viewing
<b><font color=#660000>Page " + pageNum +
"</font></b>");

		if(numrows % rowsPerPage == 0)
			maxPage = numrows/rowsPerPage;
		else
```

```
                    maxPage = (numrows/rowsPerPage)
+1;

            out.println("<br><br><b>:: Click on the
numbered link to go to that page ::</b><br>");
            for(pageNum = 1; pageNum <= maxPage;
pageNum++)
                {
                    if(pageNum % 10 == 1 && pageNum!
=1)
                        out.println("<BR>");
                        out.println("<a
href='generateMaxPat.jsp?pageNumber=" +pageNum
+"&maxpat=" + " " + "&filename="+filename+"'>" +
pageNum +"</a> ");
                }
            out.println("<BR></CENTER>");
}
%>
</font>
</body>
</html>
```

highlightpattern.jsp

```
<html>
<head><title>Highlight Pattern</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Courier" color="#000066" size="3">
<%@ page import="java.util.*, maxpatterns.*" %>
<%
            String submit =
String.valueOf(request.getParameter("submit"));

        if(submit.equals("Highlight Pattern"))
            {
                String selectedString =
String.valueOf(request.getParameter("selectedpattern"));
                int selectedIndex;
                selectedIndex =
Integer.parseInt(selectedString);
                Vector tempLabel = new Vector();
                tempLabel = (Vector)
session.getAttribute("SLabelV");

                Vector tempList = new Vector();
                tempList = (Vector)
session.getAttribute("SListV");

                Vector tempMaxPatList = new
Vector();
                tempMaxPatList = (Vector)
session.getAttribute("MPLV");

                Vector tempMaxPatOffList = new
Vector();
                tempMaxPatOffList = (Vector)
session.getAttribute("MPOLV");

                Vector tempsupportVec = new
Vector();
                tempsupportVec = (Vector)
session.getAttribute("SV");
                out.println("There were "+
tempsupportVec.elementAt(selectedIndex)+" sequences
containing the pattern "+
tempMaxPatList.elementAt(selectedIndex)+ " with offset list
");
                Vector tempOffsetList =
(Vector)tempMaxPatOffList.elementAt(selectedIndex);
                out.print("{ ");
                for(int q=0; q<tempOffsetList.size();
q+=2)
                    {
                        out.print("("
+tempOffsetList.elementAt(q)+",
"+tempOffsetList.elementAt(q+1)+")");
                        if(!(tempOffsetList.size()-
2==q))
                            out.print(", ");
                    }
```

```
            out.print(" }");
            for(int i=0; i<tempLabel.size(); i++)
            {
        out.println("<br><br>"+tempLabel.elementAt(i)
+"<br>");

                Vector highlightChar = new
Vector();
                Vector highlightOffset =
new Vector();
                highlightOffset = (Vector)
tempMaxPatOffList.elementAt(selectedIndex);
                for(int k=0;
k<highlightOffset.size(); k+=2)
                {

if((i+1)==Integer.parseInt((String)highlightOffset.elementA
t(k)))
                        {
            String highlightPattern = (String)
tempMaxPatList.elementAt(selectedIndex);
                            int
offsetStart = Integer.parseInt((String)
highlightOffset.elementAt(k+1));
                            int
s=0;

            String offsetString;

            while(s<highlightPattern.length())
                            {

            offsetString = String.valueOf(offsetStart);

            highlightChar.addElement(offsetString);

            offsetStart++;

            s++;
                            }
                    }
                }
                String tempString =
(String) tempList.elementAt(i);
                tempString =
"s".concat(tempString);

                String concatString="";

                for(int j=1;
j<tempString.length(); j++)
                    {
            if(highlightChar.contains(String.valueOf(j)))
                        {
            concatString = concatString.concat("<font
class='highlight'>"+String.valueOf(tempString.charAt(j))
+"</font>");

                        }
                        else
            concatString =
concatString.concat(String.valueOf(tempString.charAt(j)));
                            if (j%60==0)
            concatString = concatString.concat("<BR>");
                            else if(j
%10==0)
            concatString = concatString.concat(" ");
                        }
                    out.println(concatString);
                }
```

85

```jsp
        out.println("<center><br><br><input
type=button onClick=self.history.back(); value='GO
BACK'></center>");
        }
%>
</font>
</body>
</html>
```

home.jsp
```html
<HTML>
<HEAD>
<TITLE>home</TITLE>
<SCRIPT TYPE="text/javascript">
<!--

function regularImageFile(imageName) {
  return("images/" + imageName + ".gif");
}

function negativeImageFile(imageName) {
  return("images/" + imageName + "highlighted.gif");
}

function cacheImages(index) {
  regularImageObjects[index] = new Image(150, 25);
  regularImageObjects[index].src =
    regularImageFile(imageNames[index]);
  negativeImageObjects[index] = new Image(150, 25);
  negativeImageObjects[index].src =
    negativeImageFile(imageNames[index]);
}
imageNames = new Array("home_07", "home_09",
"home_17", "home_20");
regularImageObjects = new Array(imageNames.length);
negativeImageObjects = new Array(imageNames.length);

for(var i=0; i<imageNames.length; i++) {
  cacheImages(i);
}

function highlight(imageName) {
  document.images[imageName].src =
    negativeImageFile(imageName);
}

function unHighlight(imageName) {
  document.images[imageName].src =
regularImageFile(imageName);
}
// -->
</SCRIPT>
<META HTTP-EQUIV="Content-Type" CONTENT="text/html;
charset=iso-8859-1">
</HEAD>
<BODY BGCOLOR=#FFFFFF LEFTMARGIN=0 TOPMARGIN=0
MARGINWIDTH=0 MARGINHEIGHT=0>
<TABLE WIDTH=1024 BORDER=0 CELLPADDING=0
CELLSPACING=0>
        <TR>
                <TD COLSPAN=13>
                        <IMG
SRC="images/home_01.gif" WIDTH=1024 HEIGHT=16
ALT=""></TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=6 ROWSPAN=4>
                        <IMG
SRC="images/home_02.gif" WIDTH=432 HEIGHT=258
ALT=""></TD>
                <TD COLSPAN=6>
                        <IMG
SRC="images/home_03.gif" WIDTH=580 HEIGHT=161
ALT=""></TD>
                <TD ROWSPAN=12>
```
```html
                        <IMG
SRC="images/home_04.gif" WIDTH=12 HEIGHT=752
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=161
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=6>
                        <IMG
SRC="images/home_05.gif" WIDTH=580 HEIGHT=60
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=60
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=2>
                        <IMG
SRC="images/home_06.gif" WIDTH=356 HEIGHT=37
ALT=""></TD>
                <TD>
                        <a href="home.jsp"
onMouseOver="highlight('home_07')"
onMouseOut="unHighlight('home_07')"><IMG
id="home_07" SRC="images/home_07.gif" WIDTH=41
HEIGHT=20 ALT="Home" border="0"></a></TD>
                <TD ROWSPAN=2>
                        <IMG
SRC="images/home_08.gif" WIDTH=15 HEIGHT=37
ALT=""></TD>
                <TD>
                        <a href="links.jsp"
onMouseOver="highlight('home_09')"
onMouseOut="unHighlight('home_09')"
target="mainframe"><IMG id="home_09"
SRC="images/home_09.gif" WIDTH=33 HEIGHT=20
ALT="Links" border="0"></a></TD>
                <TD COLSPAN=2 ROWSPAN=2>
                        <IMG
SRC="images/home_10.gif" WIDTH=135 HEIGHT=37
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=20
ALT=""></TD>
        </TR>
        <TR>
                <TD>
                        <IMG
SRC="images/home_11.gif" WIDTH=41 HEIGHT=17
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/home_12.gif" WIDTH=33 HEIGHT=17
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=5>
                        <IMG
SRC="images/home_13.gif" WIDTH=175 HEIGHT=4
ALT=""></TD>
                <TD COLSPAN=6 ROWSPAN=7>
                        <IFRAME SRC="main.jsp"
WIDTH=816 HEIGHT=443 NAME="mainframe"
frameborder="0"></IFRAME></TD>
                <TD ROWSPAN=8>
                        <IMG
SRC="images/home_15.gif" WIDTH=21 HEIGHT=494
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=4
ALT=""></TD>
        </TR>
        <TR>
```

```
                    <TD COLSPAN=2 ROWSPAN=4>
                            <IMG
SRC="images/home_16.gif" WIDTH=45 HEIGHT=160
ALT=""></TD>
                    <TD COLSPAN=2>
                            <a href="maxpatterns.jsp"
onMouseOver="highlight('home_17')"
onMouseOut="unHighlight('home_17')"><IMG
id="home_17" SRC="images/home_17.gif" WIDTH=110
HEIGHT=26 ALT="Generate Maximal Patterns"
border="0"></a></TD>
                    <TD ROWSPAN=7>
                            <IMG
SRC="images/home_18.gif" WIDTH=20 HEIGHT=490
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=26
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2>
                            <IMG
SRC="images/home_19.gif" WIDTH=110 HEIGHT=10
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=10
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2>
                            <a href="tutorial.jsp"
onMouseOver="highlight('home_20')"
onMouseOut="unHighlight('home_20')"><IMG
id="home_20" SRC="images/home_20.gif" WIDTH=110
HEIGHT=24 ALT="Tutorial" border="0"></a></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=24
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2>
                            <IMG
SRC="images/home_21.gif" WIDTH=110 HEIGHT=100
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=100
ALT=""></TD>
            </TR>
            <TR>
                    <TD ROWSPAN=3>
                            <IMG
SRC="images/home_22.gif" WIDTH=15 HEIGHT=330
ALT=""></TD>
                    <TD COLSPAN=2>
                            <IFRAME SRC="login.jsp"
WIDTH=137 HEIGHT=169 name="loginframe"
frameborder="0" scrolling="no"></IFRAME></TD>
                    <TD ROWSPAN=3>
                            <IMG
SRC="images/home_24.gif" WIDTH=3 HEIGHT=330
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=169
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2 ROWSPAN=2>
                            <IMG
SRC="images/home_25.gif" WIDTH=137 HEIGHT=161
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=110
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=6>
```

```
                            <IMG
SRC="images/home_26.gif" WIDTH=816 HEIGHT=51
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=51
ALT=""></TD>
            </TR>
            <TR>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=15 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=30 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=107 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=3 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=20 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=257 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=356 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=41 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=15 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=33 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=114 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=21 HEIGHT=1
ALT=""></TD>
                    <TD>
                            <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                    <TD></TD>
            </TR>
</TABLE>
<!-- End ImageReady Slices -->
</BODY>
</HTML>
```

lectures.jsp
```
<html>
<head>
<title>Lectures</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
   int rowsPerPage = 10;
   int pageNum, maxPage, offset=0;
   String pageNumString;
```

```
pageNumString = request.getParameter("pageNumber");
pageNum = Integer.parseInt(pageNumString);

offset = (pageNum - 1) * rowsPerPage;
String queryString = "SELECT LEC_ID, LEC_TITLE,
LEC_DESCRIPTION FROM LECTURE ORDER BY LEC_ID
LIMIT " + offset + ", " +rowsPerPage;
ResultSet rs = statement.executeQuery(queryString);

int countResult=0;
while(rs.next())
{
        countResult++;
        if(countResult==1)
                        out.println("<h3>=
Lectures =</h3><font color=#660000>Note: Click on the
lecture ID to view that specified
lecture.</font><BR><BR><CENTER><TABLE><TD
class='coltitle'><b>Lecture Title</b></TD><TD
class='coltitle'><b>Lecture
Description</b></TD></TR>");
        int lec_id = rs.getInt("LEC_ID");
        String lec_title =
URLDecoder.decode(rs.getString("LEC_TITLE"));
        String lec_description =
URLDecoder.decode(rs.getString("LEC_DESCRIPTION"));
        lec_description =
lec_description.replaceAll("\r\n", "<BR>");

        out.println("<TR>");
%>
                <td align="center"
class="backblue"><font style="font-family: Verdana; font-
size: 11px"><a href="viewlecturecontent.jsp?l_title=<%=
lec_title %>"><%= lec_title %></a></font></td>
<%
        out.println("<td align='center'
class='backblue'><font style='font-family: Verdana; font-
size: 11px'>" + lec_description + "</font></td>");

}
if(countResult==0)
{
        out.println("<h4><font color=#660000>::
Warning ::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>There are no lectures in the
database.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
}
else
{
        out.println("</TR></TABLE></CENTER>");
        rs.close();

        String countRows = "SELECT
COUNT(*) AS numRows FROM LECTURE";
        rs =
statement.executeQuery(countRows);
        rs.next();
        int numrows = rs.getInt("numRows");


        out.println("<BR><HR><BR><CENTER>There
are a total of <b><font color=#660000>" + numrows +
"</font></b> lecture/s in the database");
        out.println("<BR>You are currently
viewing <b><font color=#660000>Page " + pageNum +
"</font></b></CENTER>");

        if(numrows % rowsPerPage == 0)
                        maxPage =
numrows/rowsPerPage;
                else
                        maxPage =
(numrows/rowsPerPage)+1;

        out.println("<br><CENTER>::Click on
the numbered link to go to that page:: <br>");
```

```
        for(pageNum = 1; pageNum <=
maxPage; pageNum++)
                {
                        if(pageNum % 10 == 1 &&
pageNum!=1)
                                out.println("<BR>");
                out.println("<a href='lectures.jsp?
pageNumber=" +pageNum +"'>" + pageNum +"</a> ");
                        }
                        out.println("<BR>");
                }
%>
</font>
</body>
</html>
```

links.jsp
```
<html>
<head><title>Links</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font color=##000066>links page</font>
</body>
</html>
```

login.jsp
```
<HTML>
<HEAD>
<TITLE>Login</TITLE>
<META HTTP-EQUIV="Content-Type" CONTENT="text/html;
charset=iso-8859-1">
</HEAD>
<BODY BGCOLOR=#FFFFFF LEFTMARGIN=0 TOPMARGIN=0
MARGINWIDTH=0 MARGINHEIGHT=0>
<form method=POST action="adminhome.jsp"
target="_parent">
<TABLE WIDTH=1024 BORDER=0 CELLPADDING=0
CELLSPACING=0>
        <TR>
                <TD COLSPAN=7>
                        <IMG
SRC="images/login_01.gif" WIDTH=1024 HEIGHT=22
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=7>
                        <IMG
SRC="images/login_02.gif" WIDTH=1024 HEIGHT=21
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=8>
                        <IMG
SRC="images/login_03.gif" WIDTH=33 HEIGHT=734
ALT=""></TD>
                <TD COLSPAN=5
bgcolor="#000033">
                        <input type="text"
name="user" size=10 maxlength=20></TD>
                <TD ROWSPAN=8>
                        <IMG
SRC="images/login_05.gif" WIDTH=908 HEIGHT=734
ALT=""></TD>
        </TR>
        <TR bgcolor="#000066">
                <TD COLSPAN=5>
                        <IMG
SRC="images/login_06.gif" WIDTH=83 HEIGHT=20
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=5
bgcolor="#000033">
                        <input type="password"
name="password" size=10 maxlength=20></TD>
        </TR>
        <TR bgcolor="#000033">
                <TD COLSPAN=5>
                        <IMG
SRC="images/login_08.gif" WIDTH=83 HEIGHT=6
ALT=""></TD>
```

```
                    </TR>
                    <TR>
                            <TD ROWSPAN=4>
                                    <IMG
SRC="images/login_09.gif" WIDTH=10 HEIGHT=660
ALT=""></TD>
                            <TD COLSPAN=3
bgcolor="#000033">
                                    <input type="submit"
value="Submit" name="sub"></TD>
                            <TD ROWSPAN=4>
                                    <IMG
SRC="images/login_11.gif" WIDTH=12 HEIGHT=660
ALT=""></TD>
                    </TR>
                    <TR>
                            <TD COLSPAN=3
bgcolor="#000033">
                                    <IMG
SRC="images/login_12.gif" WIDTH=62 HEIGHT=6
ALT=""></TD>
                    </TR>
                    <TR>
                            <TD ROWSPAN=2>
                                    <IMG
SRC="images/login_13.gif" WIDTH=4 HEIGHT=630
ALT=""></TD>
                            <TD bgcolor="#000033">
                                    <input type="reset"
value="Reset" name="reset"></TD>
                            <TD ROWSPAN=2>
                                    <IMG
SRC="images/login_15.gif" WIDTH=3 HEIGHT=630
ALT=""></TD>
                    </TR>
                    <TR>
                            <TD>
                                    <IMG
SRC="images/login_16.gif" WIDTH=56 HEIGHT=607
ALT=""></TD>
                    </TR>
            </TABLE>
            </form>
            </BODY>
            </HTML>
```

logout.jsp
```
<html>
<head><title>Logout</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font color=#000066>
<%@ page import="java.sql.*" %>
<%@ include file="connect.jsp" %>
<%
        String logged_in_user =
(String)session.getAttribute("logged_in_user");

if((String)session.getAttribute("logged_in_user")!=null)
        {

        session.removeAttribute("logged_in_user");
                        out.println("You have been logged
out.<BR>");
%>
                        <br><a
href="home.jsp">[Home]</a>
<%
        }
        else
        {
                        out.println("You haven't even logged
in yet.<BR>");
%>
                        <br><a
href="home.jsp">[Home]</a>
<%
        }
%>
</font>
</body>
```

```
</html>
```

main.jsp
```
<html>
<head>
<title>Main Page</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<h3>= Combinatorial Pattern Discovery =</h3>
<center><BR>
<table cellspacing=0 cellpadding=0>
<tr>
        <td class='backblue' colspan=2><br><br>
        <font
size="2">     Sequence
pattern discovery is a research area aiming at developing
        tools and methods for finding a priori unknown
patterns in a given set of sequences, patterns that are
frequent,
        unexpected, or interesting according to some
formal criteria.</font><br><br><br></td>
</tr>
<tr>
        <td class='backblue' colspan=4><font
size="2">     This website's
Pattern Discovery Tool
        uses the Teiresias Algorithm which operates in
two phases: the scanning phase and the convolution
phase.</font><br><br></td>
</tr>
<tr>
        <td class='backblue' colspan=4><BR><font
size="2">     The
TEIRESIAS algorithm is a recent addition to
        the class of pattern finding algorithms for
biological sequences. These algorithms are important for a
variety of
        important problems in the pure and applied
biosciences. TEIRESIAS is unique in its ability to find
patterns of
        arbitrary length provided preserved positions are
not too far apart.</font><br><br></td>
</tr>
<tr>
        <td class='backblue' colspan=4><BR><font
size="2">     This website
contains a tutorial module
        which aims at providing its users knowledge
about Pattern Discovery and also testing how far they have
learned by taking online
quizzes.</font><br><br><br></td>
</tr>
</table>
</center>


</body>
</html>
```

maxpatterns.jsp
```
<HTML>
<HEAD>
<TITLE>Find Maximal Patterns</TITLE>
<SCRIPT TYPE="text/javascript">
<!--

// Given "Foo", returns "images/Foo.gif".

function regularImageFile(imageName) {
  return("images/" + imageName + ".gif");
}

// Given "Bar", returns "images/Bar-Negative.gif".

function negativeImageFile(imageName) {
  return("images/" + imageName + "highlighted.gif");
}

// Cache image at specified index. E.g., given index 0,
// take imageNames[0] to get "Home". Then preload
// images/Home.gif and images/Home-Negative.gif.
```

```
function cacheImages(index) {
  regularImageObjects[index] = new Image(150, 25);
  regularImageObjects[index].src =
    regularImageFile(imageNames[index]);
  negativeImageObjects[index] = new Image(150, 25);
  negativeImageObjects[index].src =
    negativeImageFile(imageNames[index]);
}
imageNames = new Array("home_07", "home_09",
"home_17",
              "home_20");
regularImageObjects = new Array(imageNames.length);
negativeImageObjects = new Array(imageNames.length);

// Put images in cache for fast highlighting.
for(var i=0; i<imageNames.length; i++) {
  cacheImages(i);
}

// This is attached to onMouseOver -- change image
// under the mouse to negative (reverse video) version.

function highlight(imageName) {
  document.images[imageName].src =
    negativeImageFile(imageName);
}

// This is attached to onMouseOut -- return image to
// normal.

function unHighlight(imageName) {
  document.images[imageName].src =
  regularImageFile(imageName);
}

// -->
</SCRIPT>
<META HTTP-EQUIV="Content-Type" CONTENT="text/html;
charset=iso-8859-1">
</HEAD>
<BODY BGCOLOR=#FFFFFF LEFTMARGIN=0 TOPMARGIN=0
MARGINWIDTH=0 MARGINHEIGHT=0>
<TABLE WIDTH=1024 BORDER=0 CELLPADDING=0
CELLSPACING=0>
        <TR>
                <TD COLSPAN=13>
                        <IMG
SRC="images/home_01.gif" WIDTH=1024 HEIGHT=16
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=6 ROWSPAN=4>
                        <IMG
SRC="images/home_02.gif" WIDTH=432 HEIGHT=258
ALT=""></TD>
                <TD COLSPAN=6>
                        <IMG
SRC="images/home_03.gif" WIDTH=580 HEIGHT=161
ALT=""></TD>
                <TD ROWSPAN=12>
                        <IMG
SRC="images/home_04.gif" WIDTH=12 HEIGHT=752
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=161
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=6>
                        <IMG
SRC="images/home_05.gif" WIDTH=580 HEIGHT=60
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=60
ALT=""></TD>
        </TR>
```

```
        <TR>
                <TD ROWSPAN=2>
                        <IMG
SRC="images/home_06.gif" WIDTH=356 HEIGHT=37
ALT=""></TD>
                <TD>
                        <a href="home.jsp"
onMouseOver="highlight('home_07')"
onMouseOut="unHighlight('home_07')"><IMG
id="home_07" SRC="images/home_07.gif" WIDTH=41
HEIGHT=20 ALT="Home" border="0"></a></TD>
                <TD ROWSPAN=2>
                        <IMG
SRC="images/home_08.gif" WIDTH=15 HEIGHT=37
ALT=""></TD>
                <TD>
                        <a href="links.jsp"
onMouseOver="highlight('home_09')"
onMouseOut="unHighlight('home_09')"
target="mainframe"><IMG id="home_09"
SRC="images/home_09.gif" WIDTH=33 HEIGHT=20
ALT="Links" border="0"></a></TD>
                <TD COLSPAN=2 ROWSPAN=2>
                        <IMG
SRC="images/home_10.gif" WIDTH=135 HEIGHT=37
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=20
ALT=""></TD>
        </TR>
        <TR>
                <TD>
                        <IMG
SRC="images/home_11.gif" WIDTH=41 HEIGHT=17
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/home_12.gif" WIDTH=33 HEIGHT=17
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=5>
                        <IMG
SRC="images/home_13.gif" WIDTH=175 HEIGHT=4
ALT=""></TD>
                <TD COLSPAN=6 ROWSPAN=7>
                        <IFRAME
SRC="patterns.jsp?seqType=''" WIDTH=816 HEIGHT=443
NAME="mainframe" frameborder="0"></IFRAME></TD>
                <TD ROWSPAN=8>
                        <IMG
SRC="images/home_15.gif" WIDTH=21 HEIGHT=494
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=4
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=2 ROWSPAN=4>
                        <IMG
SRC="images/home_16.gif" WIDTH=45 HEIGHT=160
ALT=""></TD>
                <TD COLSPAN=2>
                        <a href="maxpatterns.jsp"
onMouseOver="highlight('home_17')"
onMouseOut="unHighlight('home_17')"><IMG
id="home_17" SRC="images/home_17.gif" WIDTH=110
HEIGHT=26 ALT="Generate Maximal Patterns"
border="0"></a></TD>
                <TD ROWSPAN=7>
                        <IMG
SRC="images/home_18.gif" WIDTH=20 HEIGHT=490
ALT=""></TD>
                <TD>
```

```
                <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=26
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=2>
                        <IMG
SRC="images/home_19.gif" WIDTH=110 HEIGHT=10
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=10
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=2>
                        <a href="tutorial.jsp"
onMouseOver="highlight('home_20')"
onMouseOut="unHighlight('home_20')"><IMG
id="home_20" SRC="images/home_20.gif" WIDTH=110
HEIGHT=24 ALT="Tutorial" border="0"></a></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=24
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=2>
                        <IMG
SRC="images/home_21.gif" WIDTH=110 HEIGHT=100
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=100
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/home_22.gif" WIDTH=15 HEIGHT=330
ALT=""></TD>
                <TD COLSPAN=2>
                        <IFRAME SRC="login.jsp"
WIDTH=137 HEIGHT=169 name="loginframe"
frameborder="0" scrolling="no"></IFRAME></TD>
                <TD ROWSPAN=3>
                        <IMG
SRC="images/home_24.gif" WIDTH=3 HEIGHT=330
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=169
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=2 ROWSPAN=2>
                        <IMG
SRC="images/home_25.gif" WIDTH=137 HEIGHT=161
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=110
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=6>
                        <IMG
SRC="images/home_26.gif" WIDTH=816 HEIGHT=51
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=51
ALT=""></TD>
        </TR>
        <TR>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=15 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=30 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=107 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=3 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=20 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=257 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=356 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=41 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=15 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=33 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=114 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=21 HEIGHT=1
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
                <TD></TD>
        </TR>
</TABLE>
<!-- End ImageReady Slices -->
</BODY>
</HTML>
```

patterns.jsp
```
<html>
<head>
<title>Patterns</title>
<script src="javascript/isEmptySequence.js"></script>
<script src="javascript/LWKparams.js"></script>
<script src="javascript/checkValidChars.js"></script>
<script src="javascript/fastaFormat.js"></script>
<script
src="javascript/checkConsecutiveFastaLabel.js"></script>
<script language="JavaScript">
function checkInput(form)
{
        if (!isEmptySequence(form)) return false;
        if (!checkLWKParameters(form)) return false;
        if (!checkValidChars(form)) return false;
        if (!checkLabel(form)) return false;
        if (!checkFastaFormat(form)) return false;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<%@ page import="java.util.*" %>
<font color="#000066" face="Verdana" size="2">
<h3>= Find Maximal Patterns =</h3>
<hr>
```

```
<form method=POST action="generateMaxPat.jsp"
name="maxpatform" onSubmit="return
checkInput(maxpatform);">
<%
        String seqType =
request.getParameter("seqType");
        if(seqType.equals("protseq"))
        {
                String sequences =
request.getParameter("sequences");
                String inputType =
request.getParameter("inputType");
%>
                <center>
                <table style="font-family: Verdana;
font-size: 11px; font-weight: bold" cellpadding="3"
cellspacing="2">
                        <tr>
                                <td colspan=4><font
color="#000066"><br><img src="images/button1.jpg"
border="0">   Input
Parameters</font>     &nbs
p;        &
nbsp;      
                                <font
color="#660000"><b>:: click <a
href="supplementary_study_materials/teiresias_animation.
swf" target="new"><u>HERE</u></a> to find out "How
Does The Teiresias Algorithm Work?" ::</b></font></td>
                        </tr>
                        <tr>
                                <td
colspan=2>L:</font>  <input type="text"
name="lparam" value="" style="font-family: Verdana;
font-size: 11px" size=10></td>
                                <td colspan=2><font
class="pfont">( L: this is the minimum number of residues
(i.e. non-wild-card characters) in your pattern )
</font></td>
                        </tr>
                        <tr>
                                <td
colspan=2>W:</font> <input type="text"
name="wparam" value="" style="font-family: Verdana;
font-size: 11px" size=10></td>
                                <td colspan=2><font
class="pfont">( W: this is the maximum extent spanned by
any L consecutive residues in the reported patterns )
</font></td>
                        </tr>
                        <tr>
                                <td
colspan=2>K:</font>  <input type="text"
name="kparam" value="" style="font-family: Verdana;
font-size: 11px" size=10><br><br></td>
                                <td colspan=2><font
class="pfont">( K: this is the desired minimum support for
a pattern )</font><br><br></td>
                        </tr>
<%
                if(sequences.equals(""))
                {
%>
                </table>
                <br><br>

                <table style="font-family:
Verdana; font-size: 11px; font-weight: bold"
cellpadding="3" cellspacing="2">
                        <tr>
                                <td
colspan=2><br><font color=#660000><b>:: Click <a
href="patterns.jsp?
seqType=protseq&inputType=textarea&sequences="><u>
HERE</u></a> to input sequences using a textarea
::</b></font><br></td>
                                <td align="right"
colspan=2><br><p><b>:: Click <a href="patterns.jsp?
seqType=protseq&inputType=file&sequences="><u>HERE
</u></a> to input sequences by reading a file
::</b><br></td>
                        </tr>
```

```
<%
                        if(inputType.equals(""))
                        {
%>
                                <tr>
                                        <td
align="center" colspan=4><IFRAME SRC="readFile.jsp?
seqType=protseq&inputType=textarea" FRAMEBORDER=0
HEIGHT=200 WIDTH=700></IFRAME><br></td>
                                </tr>
<%
                        }
                        else
                        {
%>
                                <tr>
                                        <td
align="center" colspan=4><IFRAME SRC="readFile.jsp?
seqType=protseq&inputType=<%=inputType%>"
FRAMEBORDER=0 HEIGHT=200
WIDTH=700></IFRAME><br></td>
                                </tr>
<%
                        }
%>
                </table>
                </center>
<%
                }
                else
                {
                        Vector si = new Vector();
                        si =
(Vector)session.getAttribute("seqInput");
                                si.addElement(sequences);

        session.setAttribute("seqInput", si);
                        si =
(Vector)session.getAttribute("seqInput");
%>
                        <tr>
                                <td colspan=4
align="left"><img src="images/button1.jpg"
border="0">  Protein Sequences</td>
                        </tr>
                        <tr>
                                <td
align="center" colspan=4><textarea wrap="off" rows="10"
cols="75" name="sequences"><%for(int s=0; s<si.size();
s++){out.println(si.elementAt(s));}
%></textarea><BR><BR></td>
                        </tr>
                </table>
                <br>
                <input type="submit"
name="maxpat" value="Generate Maximal
Patterns">   
                <input type="reset"
name="reset" value="Reset">
                <input type="hidden"
name="seqType" value="protseq"><br><br>

                <table style="font-family:
Verdana; font-size: 11px; font-weight: bold"
cellpadding="3" cellspacing="2">
                        <tr>
                                <td
colspan=2><br><font color=#660000><b>:: Click <a
href="patterns.jsp?
seqType=protseq&inputType=textarea&sequences="><u>
HERE</u></a> to input sequences using a textarea
::</b></font><br></td>
                                <td
align="right" colspan=2><br><p><b>:: Click <a
href="patterns.jsp?
seqType=protseq&inputType=file&sequences="><u>HERE
</u></a> to input sequences from file ::</b><br></td>
                        </tr>
                        <tr>
                                <td
align="center" colspan=4><IFRAME SRC="readFile.jsp?
seqType=protseq&inputType=<%=inputType%>"
```

```
FRAMEBORDER=0 HEIGHT=200
WIDTH=700></IFRAME><br></td>
                                        </tr>
                                </table>
                        </center>
<%
                        }
                }
                else if (seqType.equals("dnarnaseq"))
                {
%>
                        <center>
                        <table class="backpink" style="font-
family: Verdana; font-size: 11px; font-weight: bold">
                                <tr>
                                        <td colspan=4
align="left"><br>    &nbsp
; <img src="images/button1.jpg"
border="0">  Input DNA/RNA Sequences</td>
                                </tr>
                                <tr>
                                        <td colspan=4
align="left"><br>     &nbsp
;      <img
src="images/button1.jpg" border="0">  <a
href="patterns.jsp?
seqType=dnaseq&sequences=&inputType=">Input DNA
Sequences</a></td>
                                </tr>
                                <tr>
                                        <td colspan=4
align="left"><br>     &nbsp
;      <img
src="images/button1.jpg" border="0">  <a
href="patterns.jsp?
seqType=rnaseq&sequences=&inputType=">Input RNA
Sequences</a><br><br></td>

                                </tr>
                        </table>
                        <br><br><input type=button
onClick=self.history.back(); value='GO BACK'>
                        </center>
<%
                }
                else if (seqType.equals("dnaseq"))
                {
                        String sequences =
request.getParameter("sequences");
                        String inputType =
request.getParameter("inputType");
%>
                        <center>
                        <table style="font-family: Verdana;
font-size: 11px; font-weight: bold" cellpadding="3"
cellspacing="2">
                                <tr>
                                        <td colspan=4><font
color="#000066"><br><img src="images/button1.jpg"
border="0">   Input
Parameters</font>     &nbs
p;        &
nbsp;      
                                                <font
color="#660000"><b>:: click <a
href="supplementary_study_materials/teiresias_animation.
swf" target="new"><u>HERE</u></a> to find out "How
Does The Teiresias Algorithm Work?" ::</b></font></td>
                                </tr>
                                <tr>
                                        <td
colspan=2>L:</font>  <input type="text"
name="lparam" value="" style="font-family: Verdana;
font-size: 11px" size=10></td>
                                        <td colspan=2><font
class="pfont">( L: this is the minimum number of residues
(i.e. non-wild-card characters) in your pattern )
</font></td>
                                </tr>
                                <tr>
                                        <td
colspan=2>W:</font> <input type="text"
```

```
name="wparam" value="" style="font-family: Verdana;
font-size: 11px" size=10></td>
                                        <td colspan=2><font
class="pfont">( W: this is the maximum extent spanned by
any L consecutive residues in the reported patterns )
</font></td>
                                </tr>
                                <tr>
                                        <td
colspan=2>K:</font>  <input type="text"
name="kparam" value="" style="font-family: Verdana;
font-size: 11px" size=10><BR><BR></td>
                                        <td colspan=2><font
class="pfont">( K: this is the desired minimum support for
a pattern )</font><BR><BR></td>
                                </tr>
<%
                        if(sequences.equals(""))
                        {
%>
                                </table>
                                <br><br>

                                <table style="font-family:
Verdana; font-size: 11px; font-weight: bold"
cellpadding="3" cellspacing="2">
                                        <tr>
                                                <td
colspan=2><br><font color=#660000><b>:: Click <a
href="patterns.jsp?
seqType=dnaseq&inputType=textarea&sequences="><u>H
ERE</u></a> to input sequences using a textarea
::</b></font><br></td>
                                                <td align="right"
colspan=2><br><p><b>:: Click <a href="patterns.jsp?
seqType=dnaseq&inputType=file&sequences="><u>HERE<
/u></a> to input sequences by reading a file
::</b><br></td>
                                        </tr>
<%
                        if(inputType.equals(""))
                        {
%>
                                                <tr>
                                                        <td
align="center" colspan=4><IFRAME SRC="readFile.jsp?
seqType=dnaseq&inputType=textarea" FRAMEBORDER=0
HEIGHT=200 WIDTH=700></IFRAME><br></td>
                                                </tr>
<%
                        }
                        else
                        {
%>
                                                <tr>
                                                        <td
align="center" colspan=4><IFRAME SRC="readFile.jsp?
seqType=dnaseq&inputType=<%=inputType%>"
FRAMEBORDER=0 HEIGHT=200
WIDTH=700></IFRAME><br></td>
                                                </tr>
<%
                        }
%>
                                </table>
                        </center>
<%
                        }
                        else
                        {
                                Vector si = new Vector();
                                si =
(Vector)session.getAttribute("seqInput");
                                si.addElement(sequences);

                        session.setAttribute("seqInput", si);
                                si =
(Vector)session.getAttribute("seqInput");
%>
                                        <tr>
```

```
                                    <td colspan=4
align="left"><img src="images/button1.jpg"
border="0">  DNA Sequences</td>
                                    </tr>
                                    <tr>
                                        <td
align="center" colspan=4><textarea wrap="off" rows="10"
cols="75" name="sequences"><%for(int s=0; s<si.size();
s++){out.println(si.elementAt(s));}
%></textarea><BR><BR></td>
                                    </tr>
                                    </table>
                                    <br>
                                    <input type="submit"
name="maxpat" value="Generate Maximal
Patterns">   
                                    <input type="reset"
name="reset" value="Reset">
                                    <input type="hidden"
name="seqType" value="dnaseq"><BR><BR>

                                    <table style="font-family:
Verdana; font-size: 11px; font-weight: bold"
cellpadding="3" cellspacing="2">
                                    <tr>
                                        <td
colspan=2><br><font color=#660000><b>:: Click <a
href="patterns.jsp?
seqType=dnaseq&inputType=textarea&sequences="><u>H
ERE</u></a> to input sequences using a textarea
::</b></font><br></td>
                                        <td
align="right" colspan=2><br><p><b>:: Click <a
href="patterns.jsp?
seqType=dnaseq&inputType=file&sequences="><u>HERE<
/u></a> to input sequences from file ::</b><br></td>
                                    </tr>
                                    <tr>
                                        <td
align="center" colspan=4><IFRAME SRC="readFile.jsp?
seqType=dnaseq&inputType=<%=inputType%>"
FRAMEBORDER=0 HEIGHT=200
WIDTH=700></IFRAME><br></td>
                                    </tr>
                                    </table>
                                    </center>
<%
                    }
                }
            else if (seqType.equals("rnaseq"))
                {
                    String sequences =
request.getParameter("sequences");
                    String inputType =
request.getParameter("inputType");
%>
                    <center>
                    <table style="font-family: Verdana;
font-size: 11px; font-weight: bold" cellpadding="3"
cellspacing="2">
                    <tr>
                        <td colspan=4><font
color="#000066"><br><img src="images/button1.jpg"
border="0">   Input
Parameters</font>     &nbs
p;        &
nbsp;      
                        <font
color="#660000"><b>:: click <a
href="supplementary_study_materials/teiresias_animation.
swf" target="new"><u>HERE</u></a> to find out "How
Does The Teiresias Algorithm Work?" ::</b></font></td>
                    </tr>
                    <tr>
                        <td
colspan=2>L:</font>  <input type="text"
name="lparam" value="" style="font-family: Verdana;
font-size: 11px" size=10></td>
                        <td colspan=2><font
class="pfont">( L: this is the minimum number of residues
(i.e. non-wild-card characters) in your pattern )
</font></td>

                    </tr>
                    <tr>
                        <td
colspan=2>W:</font> <input type="text"
name="wparam" value="" style="font-family: Verdana;
font-size: 11px" size=10></td>
                        <td colspan=2><font
class="pfont">( W: this is the maximum extent spanned by
any L consecutive residues in the reported patterns )
</font></td>
                    </tr>
                    <tr>
                        <td
colspan=2>K:</font>  <input type="text"
name="kparam" value="" style="font-family: Verdana;
font-size: 11px" size=10><BR><BR></td>
                        <td colspan=2><font
class="pfont">( K: this is the desired minimum support for
a pattern )</font><BR><BR></td>
                    </tr>
<%
                    if(sequences.equals(""))
                    {
%>
                    </table>
                    <br><br>

                    <table style="font-family:
Verdana; font-size: 11px; font-weight: bold"
cellpadding="3" cellspacing="2">
                    <tr>
                        <td
colspan=2><br><font color=#660000><b>:: Click <a
href="patterns.jsp?
seqType=rnaseq&inputType=textarea&sequences="><u>H
ERE</u></a> to input sequences using a textarea
::</b></font><br></td>
                        <td align="right"
colspan=2><br><p><b>:: Click <a href="patterns.jsp?
seqType=rnaseq&inputType=file&sequences="><u>HERE<
/u></a> to input sequences by reading a file
::</b><br></td>
                    </tr>
<%
                    if(inputType.equals(""))
                    {
%>
                            <tr>
                                <td
align="center" colspan=4><IFRAME SRC="readFile.jsp?
seqType=rnaseq&inputType=textarea" FRAMEBORDER=0
HEIGHT=200 WIDTH=700></IFRAME><br></td>
                            </tr>
<%
                    }
                    else
                    {
%>
                            <tr>
                                <td
align="center" colspan=4><IFRAME SRC="readFile.jsp?
seqType=rnaseq&inputType=<%=inputType%>"
FRAMEBORDER=0 HEIGHT=200
WIDTH=700></IFRAME><br></td>
                            </tr>
<%
                    }
%>
                    </table>
                    </center>
<%
                }
                else
                {
                    Vector si = new Vector();
                    si =
(Vector)session.getAttribute("seqInput");
                    si.addElement(sequences);

            session.setAttribute("seqInput", si);
                    si =
(Vector)session.getAttribute("seqInput");
```

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```
%>
                                        <tr>
                                                <td colspan=4
align="left"><img src="images/button1.jpg"
border="0">  RNA Sequences</td>
                                        </tr>
                                        <tr>
                                                <td
align="center" colspan=4><textarea wrap="off" rows="10"
cols="75" name="sequences"><%for(int s=0; s<si.size();
s++){out.println(si.elementAt(s));}
%></textarea><BR><BR></td>
                                        </tr>
                                        </table>
                                        <br>
                                        <input type="submit"
name="maxpat" value="Generate Maximal
Patterns">   
                                        <input type="reset"
name="reset" value="Reset">
                                        <input type="hidden"
name="seqType" value="rnaseq"><BR><BR>

                                        <table style="font-family:
Verdana; font-size: 11px; font-weight: bold"
cellpadding="3" cellspacing="2">
                                        <tr>
                                                <td
colspan=2><br><font color=#660000><b>:: Click <a
href="patterns.jsp?
seqType=rnaseq&inputType=textarea&sequences="><u>H
ERE</u></a> to input sequences using a textarea
::</b></font><br></td>
                                                <td
align="right" colspan=2><br><p><b>:: Click <a
href="patterns.jsp?
seqType=rnaseq&inputType=file&sequences="><u>HERE<
/u></a> to input sequences from file ::</b><br></td>
                                        </tr>
                                        <tr>
                                                <td
align="center" colspan=4><IFRAME SRC="readFile.jsp?
seqType=rnaseq&inputType=<%=inputType%>"
FRAMEBORDER=0 HEIGHT=200
WIDTH=700></IFRAME><br></td>
                                        </tr>
                                        </table>
                                        </center>
<%
                                }
                        }
                        else
                        {
                                session.removeAttribute("seqInput");
                                Vector seqInput = new Vector();
                                session.setAttribute("seqInput",
seqInput);
%>
                                <center>
                                <table class="backpink" style="font-
family: Verdana; font-size: 11px; font-weight: bold"
cellpadding="3" cellspacing="2">
                                        <tr>
                                                <td colspan=4
align="left"><br>     &nbsp
; <img src="images/button1.jpg"
border="0">  <a href="patterns.jsp?
seqType=protseq&sequences=&inputType=">Input Protein
Sequences</a></td>
                                        </tr>
                                        <tr>
                                                <td colspan=4
align="left"><br>     &nbsp
; <img src="images/button1.jpg"
border="0">  <a href="patterns.jsp?
seqType=dnarnaseq">Input DNA/RNA
Sequences</a><br><br></td>
                                        </tr>
                                        </table>
                                        </center>
<%
                        }
```

```
%>
</form>
</font>
</body>
</html>
```

quizzes.jsp
```
<html>
<head><title>Quizzes</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
        String takeQuiz =
request.getParameter("takeQuiz");
        String computeScore =
request.getParameter("computeScore");
        int quizItemArray[] = new int[11];
        String question[] = new String[11];
        String correctAnswer[] = new String[11];
        String userAnswer[] = new String[11];
        int randQuizItem=0;

        if(takeQuiz.equals("Take Online Quiz"))
        {
                String countRows = "SELECT
COUNT(*) AS numRows FROM QUIZ_ITEM";
                ResultSet rs =
statement.executeQuery(countRows);
                rs.next();
                int quizNumRows =
rs.getInt("numRows");
                int i;
%>
                <form method=POST
action="quizzes.jsp">
                <h3>Online Quiz</h3>
                <center>
                <table class="backpink" style="font-
family: Verdana; font-size: 11px; font-weight: bold;
border-collapse: collapse" cellpadding="3" cellspacing="1">
<%
                for(i=1; i<=10; i++)
                {
                        int k=1;
                        randQuizItem = 1 + (int)
(Math.random() * (quizNumRows-1));
                        quizItemArray[i] =
randQuizItem;
                        while(k<i)
                        {
                if(randQuizItem==quizItemArray[k])
                                {
                randQuizItem = 1 + (int) (Math.random() *
(quizNumRows-1));

                quizItemArray[i] = randQuizItem;
                                        k=1;
                                }
                                else
                                        k++;
                        }

                        String queryString =
"SELECT QUESTION, CORRECT_ANS, LETTER_A, LETTER_B,
LETTER_C, LETTER_D FROM QUIZ_ITEM WHERE
QUIZ_ITEM_ID=" +randQuizItem;
                        rs =
statement.executeQuery(queryString);
                        rs.next();

                        String ques =
URLDecoder.decode(rs.getString("QUESTION"));
                        String answer =
rs.getString("CORRECT_ANS");
```

```jsp
                                String let_a =
URLDecoder.decode(rs.getString("LETTER_A"));
                                String let_b =
URLDecoder.decode(rs.getString("LETTER_B"));
                                String let_c =
URLDecoder.decode(rs.getString("LETTER_C"));
                                String let_d =
URLDecoder.decode(rs.getString("LETTER_D"));
%>
                                        <tr>
                                                <td
colspan=4><BR><font color="#660000"><b><%
out.println(i+". "+ques); %></b></font>
                                        <input
type="hidden" name=<% out.println("question["+i+"]");
%> value="<%= ques %>"><br></td>
                                        </tr>
                                        <tr>
                                                <td
valign="top"><input type="radio" name=<%
out.println("userAnswer[" + i + "]"); %>
value="A">   
                                                <font
color=#000066><% out.println("A. "+let_a);
%><br></font></td>
                                        </tr>
                                        <tr>
                                                <td
valign="top"><input type="radio" name=<%
out.println("userAnswer[" + i + "]"); %>
value="B">   
                                                <font
color=#000066><% out.println("B. "+let_b);
%><br></font></td>
                                        </tr>
                                        <tr>
                                                <td
valign="top"><input type="radio" name=<%
out.println("userAnswer[" + i + "]"); %>
value="C">   
                                                <font
color=#000066><% out.println("C. "+let_c);
%><br></font></td>
                                        </tr>
                                        <tr>
                                                <td
valign="top"><input type="radio" name=<%
out.println("userAnswer[" + i + "]"); %>
value="D">   
                                                <font
color=#000066><% out.println("D. "+let_d);
%><br></font></td>
                                        </tr>
                                        <input type="hidden"
name=<% out.println("correctAnswer["+i+"]"); %>
value="<%= answer %>">
<%
                                        rs.close();

                                }
%>
                                </table>

                                <BR><BR>
                                <input type="hidden"
name="takeQuiz" value="">
                                <input type="submit"
name="computeScore" value="Compute Score">
                                <input type="reset" name="reset"
value="Reset"></center>
                        </form>
<%
                }
                else if(computeScore.equals("Compute Score"))
                {
                        int totalScore=0;
                        double percentScore=0.0;
%>
                        <h3>:: Quiz Results ::</h3>
                        <form method=POST
action="quizzes.jsp">
                                <center>
```

```jsp
                        <table  class="backpink" style="font-
family: Verdana; font-size: 11px; font-weight: bold;
border-collapse: collapse" cellpadding="3" cellspacing="1">
<%
                        for(int j=1; j<=10; j++)
                        {
                                question[j] =
request.getParameter("question["+j+"]");
                                userAnswer[j] =
request.getParameter("userAnswer["+j+"]");
                                correctAnswer[j] =
request.getParameter("correctAnswer["+j+"]");

                if(correctAnswer[j].equals(userAnswer[j]))
                                        totalScore++;
%>
                        <tr>
                                <td><br>Question <%= j
%>: <% out.println(question[j]); %></td>
                        </tr>
                        <tr>
                                <td><font
color="#003300">Your answer: <%
if(userAnswer[j]==null) out.println(""); else
out.println(userAnswer[j]); %></font></td>
                        </tr>
                        <tr>
                                <td><font
color="#660000">Correct answer: <%
out.println(correctAnswer[j]); %></font><br><br></td>
                        </tr>
<%
                        }
                        percentScore =
(((double)totalScore)/10) * 100;
                        out.println("<p><b>Out of 10
questions you got " +totalScore + " correct answer/s. Thus,
you garnered " + percentScore + " % in this online
quiz.</b><br><br>");
%>
                        </table>
                        <br><br><input type="submit"
name="takeQuiz" value="Take Online Quiz">
                        <input type=button
onClick=self.history.back(); value='GO BACK'></center>
                        </form>
<%
                }
                else
                {
%>
                        <h3>= Online Quiz =</h3>
                        <center><BR>
                        <table cellspacing=0 cellpadding=0>
                        <tr>
                                <td
class='backblue'><br><br>    &n
bsp; <font size="2">This online quiz is provided
                                so that users of this
system will have a way of testing how far they have learned
regarding topics
                                related to Pattern
Discovery.</font><br><br></td>
                        </tr>
                        <tr>
                                <td
class='backblue'><BR><font
size="2">     The quiz items
contained in this online
                                quiz is randomly selected
from a pool of quiz items. This is a multiple choice type of
quiz.</font><br><br></td>
                        </tr>
                        <tr>
                                <td
class='backblue'><BR><font
size="2">     If you are
ready to start, simply hit the
                                "Take Online Quiz" button. Good
luck!!!</font><br><br><br></td>
                        </tr>
                        </table>
```

```
            <form method=POST
action="quizzes.jsp">
                <BR><input type="submit"
name="takeQuiz" value="Take Online Quiz"></center>
                </form>
<%
        }
%>

</font>
</body>
</html>
```

readFile.jsp
```
<html>
<head>
<title>Input Sequences</title>
<script src="javascript/checkValidChars.js"></script>
<script language="JavaScript">
function checkInput(form)
{
        if(!form.theFile.value.length)
        {
                alert('Please be reminded that you
must locate the file you want to read.');
                return false;
        }

        return true;
}

function checkTextArea(form)
{
        if (!checkValidChars(form)) return false;
        if(!form.sequences.value.length)
        {
                alert('Please be reminded that you
must input sequences.');
                return false;
        }

        return true;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<%@ page import="java.util.*" %>
<%@ include file="connect.jsp" %>

<%
String seqType = request.getParameter("seqType");
String inputType = request.getParameter("inputType");
if(inputType.equals("textarea"))
{
%>
        <form name="textareaform" onSubmit="return
checkTextArea(textareaform);" method=POST
action="patterns.jsp?seqType=<%=seqType
%>&inputType=textarea" target="mainframe">
<%
        if(seqType.equals("protseq"))
        {
%>
                <img src="images/button1.jpg"
border="0">  <b>Input Protein Sequences
Using A Textarea</b>
<%
        }
        else if(seqType.equals("dnaseq"))
        {
%>
                <img src="images/button1.jpg"
border="0">  <b>Input DNA Sequences Using
A Textarea</b>
<%
        }
        else if(seqType.equals("rnaseq"))
        {
%>
```

```
                <img src="images/button1.jpg"
border="0">  <b>Input RNA Sequences Using
A Textarea</b>
<%
        }
%>
        <CENTER>
        <textarea wrap="off" rows="5" cols="75"
name="sequences"></textarea><br><br>
            <input type="submit" name="submit"
value="Add Sequence">
            <input type="hidden" name="seqType"
value="<%= seqType %>">
        </form>
<%
}
else if(inputType.equals("file"))
{
%>
        <br><br><CENTER>
        <form name="uploadform" onSubmit="return
checkInput(uploadform);" action="tempUpload.jsp?
seqType=<%= seqType %>" method="POST"
enctype="multipart/form-data">
        <!-- enctype="multipart/form-data" -->
        <input size="70" type="file"
name="theFile"><br><br>
        <input value="Read File" type="submit">
        </form>
<%
}
%>
</CENTER>
</body>
</html>
```

studymaterials.jsp
```
<html>
<head>
<title>Supplementary Study Materials</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
   int rowsPerPage = 10;
   int pageNum, maxPage, offset=0;
   String pageNumString;

   pageNumString = request.getParameter("pageNumber");
   pageNum = Integer.parseInt(pageNumString);

   offset = (pageNum - 1) * rowsPerPage;
   String queryString = "SELECT STUDYMAT_ID, LEC_ID,
STUDYMAT_TITLE, STUDYMAT_DESCRIPTION,
STUDYMAT_FILENAME FROM
SUPPLEMENTARY_STUDY_MATERIAL ORDER BY LEC_ID
LIMIT " + offset + ", " +rowsPerPage;
   ResultSet rs = statement.executeQuery(queryString);

   int countResult=0;
   while(rs.next())
   {
        countResult++;
        if(countResult==1)
                        out.println("<h3>=
Download Study Materials =</h3><font
color=#660000>Note: To download files, right-click on the
study material ID and then click 'Save Target
As...'</font><BR><BR><BR><CENTER><TABLE><TR
align='center'><TD class='coltitle'><b>Study Material
Title</b></TD><TD class='coltitle'><b>Study Material
Description</b></TD><TD class='coltitle'><b>Associated
With Lecture</b></TD></TR>");

                int studymat_id =
rs.getInt("STUDYMAT_ID");
                        int lec_id = rs.getInt("LEC_ID");
                String studymat_title =
URLDecoder.decode(rs.getString("STUDYMAT_TITLE"));
```

```
            String studymat_desc =
URLDecoder.decode(rs.getString("STUDYMAT_DESCRIPTIO
N"));
                String studymat_filename =
URLDecoder.decode(rs.getString("STUDYMAT_FILENAME"));
                Statement statement2 =
connection.createStatement();
                String qString = "SELECT LEC_TITLE FROM
LECTURE WHERE LEC_ID="+lec_id;
            ResultSet rs2 =
statement2.executeQuery(qString);
            rs2.next();
            String lec_title =
URLDecoder.decode(rs2.getString("LEC_TITLE"));
                out.println("<TR>");
%>
                <td align="center"
class="backblue"><font style="font-family: Verdana; font-
size: 11px"><a href="<%= studymat_filename %>"><%=
studymat_title %></a></font></td>
<%
                out.println("<td align='center'
class='backblue'><font style='font-family: Verdana; font-
size: 11px'>" + studymat_desc + "</font></td>");
                out.println("<td align='center'
class='backblue'><font tyle='font-family: Verdana; font-
size: 11px'>" + lec_title + "</font></td>");
                        rs2.close();
        }
    if(countResult==0)
    {
                out.println("<h4><font color=#660000>::
Warning ::</font></h4><center><table
class='backpink'><tr><td align='center'><br>There are
no study materials in the
database.<BR><BR></td></tr><tr><td
align='center'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
    }
    else
    {
            out.println("</TR></TABLE></CENTER>");
            rs.close();

                String countRows = "SELECT
COUNT(*) AS numRows FROM
SUPPLEMENTARY_STUDY_MATERIAL";
                rs =
statement.executeQuery(countRows);
                rs.next();
                int numrows = rs.getInt("numRows");


            out.println("<BR><HR><BR><CENTER>There
are a total of <b><font color=#660000>" + numrows +
"</font></b> quiz item/s in the database");
                out.println("<BR>You are currently
viewing <b><font color=#660000>Page " + pageNum +
"</font></b></CENTER>");

                if(numrows % rowsPerPage == 0)
                        maxPage =
numrows/rowsPerPage;
                else
                        maxPage =
(numrows/rowsPerPage)+1;



out.println("<br><CENTER><br><CENTER>::Click on the
numbered link to go to that page:: <br>");
                for(pageNum = 1; pageNum <=
maxPage; pageNum++)
                {
                        if(pageNum % 10 == 1 &&
pageNum!=1)
                                out.println("<BR>");
                        out.println("<a
href='studymaterials.jsp?pageNumber=" +pageNum +"'>"
+ pageNum +"</a> ");
                }
```

```
                out.println("<BR>");
            }
%>
</font>
</body>
</html>
```

tempUpload.jsp
```
<html>
<head><title>Upload Temp File</title>
<script src="javascript/checkValidChars.js"></script>
<script language="JavaScript">
function checkFile(form)
{
            if (!checkValidChars(form)) return false;
            if(!form.sequences.value.length)
            {
                    alert('Please be reminded that you
must read a file containing sequences.');
                    return false;
            }

            return true;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066">
<%@ page import="java.io.*, java.sql.*, java.util.*" %>
<%
String contentType = request.getContentType();
System.out.println("Content type is :: " +contentType);
if ((contentType != null) &&
(contentType.indexOf("multipart/form-data") >= 0))
{
        DataInputStream in = new
DataInputStream(request.getInputStream());
        int formDataLength =
request.getContentLength();

        byte dataBytes[] = new byte[formDataLength];
        int byteRead = 0;
        int totalBytesRead = 0;
        while (totalBytesRead < formDataLength)
        {
                byteRead = in.read(dataBytes,
totalBytesRead, formDataLength);
                totalBytesRead += byteRead;
        }

        String file = new String(dataBytes);
        String saveFile =
file.substring(file.indexOf("filename=\"") + 10);
        saveFile = saveFile.substring(0,
saveFile.indexOf("\n"));
        saveFile =
saveFile.substring(saveFile.lastIndexOf("\\") +
1,saveFile.indexOf("\""));

        int lastIndex = contentType.lastIndexOf("=");
        String boundary =
contentType.substring(lastIndex + 1,contentType.length());
        int pos;
        pos = file.indexOf("filename=\"");

        pos = file.indexOf("\n", pos) + 1;

        pos = file.indexOf("\n", pos) + 1;

        pos = file.indexOf("\n", pos) + 1;

        int boundaryLocation = file.indexOf(boundary,
pos) - 4;
        int startPos = ((file.substring(0,
pos)).getBytes()).length;
        int endPos = ((file.substring(0,
boundaryLocation)).getBytes()).length;
        saveFile =
"C:\\Tomcat\\Tomcat4.1\\webapps\\cpd\\tempFiles\\" +
saveFile;
```

```
            FileOutputStream fileOut = new
FileOutputStream(saveFile);

            fileOut.write(dataBytes, startPos, (endPos -
startPos));
            fileOut.flush();
            fileOut.close();

String seqType = request.getParameter("seqType");

                Vector fileSeq = new Vector();
                String line = "";
                File handler = new File(saveFile);
                BufferedReader br = new
BufferedReader(new FileReader(saveFile));
                while((line = br.readLine()) != null)
                {
                        fileSeq.addElement(line);
                }
                br.close();
                handler.delete();
                session.setAttribute("fileSeq",
fileSeq);
%>
        <form method=POST name="fileform"
onSubmit="return checkFile(fileform);"
action="patterns.jsp?seqType=<%=seqType
%>&inputType=file" target="mainframe">
<%
        if(seqType.equals("protseq"))
        {
%>
                <img src="images/button1.jpg"
border="0">  <b>Input Protein Sequences by
Reading A File</b>
<%
        }
        else if(seqType.equals("dnaseq"))
        {
%>
                <img src="images/button1.jpg"
border="0">  <b>Input DNA Sequences by
Reading A File</b>
<%
        }
        else if(seqType.equals("rnaseq"))
        {
%>
                <img src="images/button1.jpg"
border="0">  <b>Input RNA Sequences by
Reading A File</b>
<%
        }
%>
        <CENTER>
        <textarea wrap="off" rows="5" cols="75"
name="sequences"><%for(int i=0; i<fileSeq.size(); i++)
{out.println(fileSeq.elementAt(i));}
%></textarea><br><br>
        <input type="hidden" name="seqType"
value="<%= seqType %>">
        <input type="submit" name="submit"
value="Add Sequence">
        </form>
        </center>
<%
}
%>
</html>
```

tutorial.jsp
```
<HTML>
<HEAD>
<TITLE>tutorial</TITLE>
<SCRIPT TYPE="text/javascript">
<!--

function regularImageFile(imageName) {
  return("images/" + imageName + ".gif");
}

function negativeImageFile(imageName) {
  return("images/" + imageName + "highlighted.gif");
}

function cacheImages(index) {
  regularImageObjects[index] = new Image(150, 25);
  regularImageObjects[index].src =
    regularImageFile(imageNames[index]);
  negativeImageObjects[index] = new Image(150, 25);
  negativeImageObjects[index].src =
    negativeImageFile(imageNames[index]);
}
imageNames = new Array("home_07", "home_09",
"tutorial_17", "tutorial_20");
regularImageObjects = new Array(imageNames.length);
negativeImageObjects = new Array(imageNames.length);

for(var i=0; i<imageNames.length; i++) {
  cacheImages(i);
}

function highlight(imageName) {
  document.images[imageName].src =
    negativeImageFile(imageName);
}

function unHighlight(imageName) {
  document.images[imageName].src =
regularImageFile(imageName);
}
// -->
</SCRIPT>
<META HTTP-EQUIV="Content-Type" CONTENT="text/html;
charset=iso-8859-1">
</HEAD>
<BODY BGCOLOR=#FFFFFF LEFTMARGIN=0 TOPMARGIN=0
MARGINWIDTH=0 MARGINHEIGHT=0>
<TABLE WIDTH=1024 BORDER=0 CELLPADDING=0
CELLSPACING=0>
        <TR>
                <TD COLSPAN=15>
                        <IMG
SRC="images/home_01.gif" WIDTH=1024 HEIGHT=16
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=16
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=8 ROWSPAN=4>
                        <IMG
SRC="images/home_02.gif" WIDTH=432 HEIGHT=258
ALT=""></TD>
                <TD COLSPAN=6>
                        <IMG
SRC="images/home_03.gif" WIDTH=580 HEIGHT=161
ALT=""></TD>
                <TD ROWSPAN=18>
                        <IMG
SRC="images/home_04.gif" WIDTH=12 HEIGHT=752
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=161
ALT=""></TD>
        </TR>
        <TR>
                <TD COLSPAN=6>
                        <IMG
SRC="images/home_05.gif" WIDTH=580 HEIGHT=60
ALT=""></TD>
                <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=60
ALT=""></TD>
        </TR>
        <TR>
                <TD ROWSPAN=2>
                        <IMG
SRC="images/home_06.gif" WIDTH=356 HEIGHT=37
ALT=""></TD>
                <TD>
```

```
                    <a href="home.jsp"
onMouseOver="highlight('home_07')"
onMouseOut="unHighlight('home_07')"><IMG
id="home_07" SRC="images/home_07.gif" WIDTH=41
HEIGHT=20 ALT="Home" border="0"></a></TD>
                    <TD ROWSPAN=2>
                        <IMG
SRC="images/home_08.gif" WIDTH=15 HEIGHT=37
ALT=""></TD>
                    <TD>
                        <a href="links.jsp"
onMouseOver="highlight('home_09')"
onMouseOut="unHighlight('home_09')"
target="mainframe"><IMG id="home_09"
SRC="images/home_09.gif" WIDTH=33 HEIGHT=20
ALT="Links" border="0"></a></TD>
                    <TD COLSPAN=2 ROWSPAN=2>
                        <IMG
SRC="images/home_10.gif" WIDTH=135 HEIGHT=37
ALT=""></TD>
                    <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=20
ALT=""></TD>
            </TR>
            <TR>
                    <TD>
                        <IMG
SRC="images/home_11.gif" WIDTH=41 HEIGHT=17
ALT=""></TD>
                    <TD>
                        <IMG
SRC="images/home_12.gif" WIDTH=33 HEIGHT=17
ALT=""></TD>
                    <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=17
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=7>
                        <IMG
SRC="images/tutorial_13.gif" WIDTH=175 HEIGHT=5
ALT=""></TD>
                    <TD COLSPAN=6 ROWSPAN=13>
                        <IFRAME
SRC="tutorialpage.jsp" WIDTH=816 HEIGHT=443
NAME="mainframe" frameborder="0"></IFRAME></TD>
                    <TD ROWSPAN=14>
                        <IMG
SRC="images/tutorial_15.gif" WIDTH=21 HEIGHT=494
ALT=""></TD>
                    <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=5
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2 ROWSPAN=10>
                        <IMG
SRC="images/tutorial_16.gif" WIDTH=44 HEIGHT=159
ALT=""></TD>
                    <TD COLSPAN=4>
                        <a href="maxpatterns.jsp"
onMouseOver="highlight('tutorial_17')"
onMouseOut="unHighlight('tutorial_17')"><IMG
id="tutorial_17" SRC="images/tutorial_17.gif" WIDTH=112
HEIGHT=26 ALT="Generate Maximal Patterns"
border="0"></a></TD>
                    <TD ROWSPAN=13>
                        <IMG
SRC="images/tutorial_18.gif" WIDTH=19 HEIGHT=489
ALT=""></TD>
                    <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=26
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=4>
```
```
                        <IMG
SRC="images/tutorial_19.gif" WIDTH=112 HEIGHT=13
ALT=""></TD>
                    <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=13
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=4>
                        <a href="tutorial.jsp"
onMouseOver="highlight('tutorial_20')"
onMouseOut="unHighlight('tutorial_20')"><IMG
id="tutorial_20" SRC="images/tutorial_20.gif" WIDTH=112
HEIGHT=14 ALT="Tutorial" border="0"></a></TD>
                    <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=14
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=4>
                        <IMG
SRC="images/tutorial_21.gif" WIDTH=112 HEIGHT=6
ALT=""></TD>
                    <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=6
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2 ROWSPAN=4>
                        <IMG
SRC="images/tutorial_22.gif" WIDTH=14 HEIGHT=44
ALT=""></TD>
                    <TD COLSPAN=2>
                        <a href="lectures.jsp?
pageNumber=1" target="mainframe"
onMouseOver="highlight('tutorial_23')"
onMouseOut="unHighlight('tutorial_23')"><IMG
id="tutorial_23" SRC="images/tutorial_23.gif" WIDTH=98
HEIGHT=13 ALT="Lectures" border="0"></a></TD>
                    <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=13
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2>
                        <IMG
SRC="images/tutorial_24.gif" WIDTH=98 HEIGHT=8
ALT=""></TD>
                    <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=8
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2>
                        <a
href="studymaterials.jsp?pageNumber=1"
target="mainframe" onMouseOver="highlight('tutorial_25')"
onMouseOut="unHighlight('tutorial_25')"><IMG
id="tutorial_25" SRC="images/tutorial_25.gif" WIDTH=98
HEIGHT=15 ALT="Study Materials"
border="0"></a></TD>

                    <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=15
ALT=""></TD>
            </TR>
            <TR>
                    <TD COLSPAN=2>
                        <IMG
SRC="images/tutorial_26.gif" WIDTH=98 HEIGHT=8
ALT=""></TD>
                    <TD>
                        <IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=8
ALT=""></TD>
            </TR>
```

```
					<TR>
						<TD ROWSPAN=2>
							<IMG
SRC="images/tutorial_27.gif" WIDTH=13 HEIGHT=56
ALT=""></TD>
						<TD COLSPAN=3>
							<a href="quizzes.jsp?
takeQuiz=''&computeScore="" target="mainframe"
onMouseOver="highlight('tutorial_28')"
onMouseOut="unHighlight('tutorial_28')"><IMG
id="tutorial_28" SRC="images/tutorial_28.gif" WIDTH=99
HEIGHT=15 ALT="Quizzes" border="0"></a></TD>

						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=15
ALT=""></TD>
					</TR>
					<TR>
						<TD COLSPAN=3>
							<IMG
SRC="images/tutorial_29.gif" WIDTH=99 HEIGHT=41
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=41
ALT=""></TD>
					</TR>
					<TR>
						<TD ROWSPAN=3>
							<IMG
SRC="images/tutorial_30.gif" WIDTH=15 HEIGHT=330
ALT=""></TD>
						<TD COLSPAN=4>
							<IFRAME SRC="login.jsp"
WIDTH=137 HEIGHT=169 name="loginframe"
frameborder="0" scrolling="no"></IFRAME></TD>
						<TD ROWSPAN=3>
							<IMG
SRC="images/tutorial_32.gif" WIDTH=4 HEIGHT=330
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=169
ALT=""></TD>
					</TR>
					<TR>
						<TD COLSPAN=4 ROWSPAN=2>
							<IMG
SRC="images/tutorial_33.gif" WIDTH=137 HEIGHT=161
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=110
ALT=""></TD>
					</TR>
					<TR>
						<TD COLSPAN=6>
							<IMG
SRC="images/tutorial_34.gif" WIDTH=816 HEIGHT=51
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=51
ALT=""></TD>
					</TR>
					<TR>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=15 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=29 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=13 HEIGHT=1
ALT=""></TD>
						<TD>
```

```
							<IMG
SRC="images/spacer.gif" WIDTH=1 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=94 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=4 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=19 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=257 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=356 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=41 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=15 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=33 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=114 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=21 HEIGHT=1
ALT=""></TD>
						<TD>
							<IMG
SRC="images/spacer.gif" WIDTH=12 HEIGHT=1
ALT=""></TD>
						<TD></TD>
					</TR>
</TABLE>
<!-- End ImageReady Slices -->
</BODY>
</HTML>
```

tutorialpage.jsp
```
<html>
<head>
<title>Tutorial Page</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<h3>= Tutorial Module =</h3>
<center><BR>
<table cellspacing=0 cellpadding=0>
<tr>
	<td class='backblue'><br><br>
	     <font
size="2">The tutorial module consisting of lectures,
supplementary study
	materials and quizzes is intended to provide
information on Combinatorial Pattern Discovery and other
topics
	related to it. The purpose of this module is also
to allow its users to be familiar with the algorithm used
	to generate the maximal patterns given the input
sequences.</font><br><br></td>
</tr>
<tr>
	<td class='backblue'><BR><font
size="2">     The online
quiz part of this module
```

evaluates the user's understanding of the topics related to Pattern Discovery which were presented in the lectures and study materials parts of the tutorial module.

</td>
</tr>
</table>
</center>

</body>
</html>

updatelecture.jsp
```
<html>
<head>
<title>Update Lecture</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
   int rowsPerPage = 10;
   int pageNum, maxPage, offset=0;
   String pageNumString;

   pageNumString = request.getParameter("pageNumber");
   pageNum = Integer.parseInt(pageNumString);

   offset = (pageNum - 1) * rowsPerPage;
   String queryString = "SELECT LEC_ID, LEC_TITLE,
LEC_DESCRIPTION FROM LECTURE ORDER BY LEC_ID
LIMIT " + offset + ", " +rowsPerPage;
   ResultSet rs = statement.executeQuery(queryString);

   int countResult=0;
   while(rs.next())
   {
              countResult++;
              if(countResult==1)
                          out.println("<h3>=
Lectures =</h3><font color=#660000>Note: Click on the
lecture ID to view information about that specific
lecture.</font><BR><BR><CENTER><TABLE><TR
align='center'><TD class='coltitle'><b>Lecture
ID</b></TD><TD class='coltitle'><b>Lecture
Title</b></TD><TD class='coltitle'><b>Lecture
Description</b></TD></TR>");
              int lec_id = rs.getInt("LEC_ID");
              String lec_title =
URLDecoder.decode(rs.getString("LEC_TITLE"));
              String lec_description =
URLDecoder.decode(rs.getString("LEC_DESCRIPTION"));

              out.println("<TR>");
%>
                          <td align="center"
class="backblue"><font style="font-family: Verdana; font-
size: 11px"><a href="viewlecture.jsp?l_id=<%= lec_id
%>"><%= lec_id %></a></font></td>
<%
                          out.println("<td align='center'
class='backblue'>" + lec_title + "</td>");
                          out.println("<td align='center'
class='backblue'>" + lec_description + "</td>");

   }
   if(countResult==0)
   {
              out.println("<h4><font color=#660000>::
Warning ::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>There are no lectures in the
database.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
   }
   else
   {
              out.println("</TR></TABLE></CENTER>");
              rs.close();
```

```
              String countRows = "SELECT
COUNT(*) AS numRows FROM LECTURE";
              rs =
statement.executeQuery(countRows);
              rs.next();
              int numrows = rs.getInt("numRows");


   out.println("<BR><HR><BR><CENTER>There
are a total of <b><font color=#660000>" + numrows +
"</font></b> lecture/s in the database");
              out.println("<BR>You are currently
viewing <b><font color=#660000>Page " + pageNum +
"</font></b></CENTER>");

              if(numrows % rowsPerPage == 0)
                          maxPage =
numrows/rowsPerPage;
              else
                          maxPage =
(numrows/rowsPerPage)+1;

              out.println("<br><CENTER><b>::
Click on the numbered link to go to that page
::</b><br>");
              for(pageNum = 1; pageNum <=
maxPage; pageNum++)
              {
                          if(pageNum % 10 == 1 &&
pageNum!=1)
                                      out.println("<BR>");
                          out.println("<a href='lectures.jsp?
pageNumber=" +pageNum +"'>" + pageNum +"</a> ");
              }
              out.println("<BR>");
   }
%>
</font>
</body>
</html>
```

updatequizitem.jsp
```
<html>
<head>
<title>Update Quiz</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
   int rowsPerPage = 10;
   int pageNum, maxPage, offset=0;
   String pageNumString;

   pageNumString = request.getParameter("pageNumber");
   pageNum = Integer.parseInt(pageNumString);

   offset = (pageNum - 1) * rowsPerPage;
   String queryString = "SELECT QUIZ_ITEM_ID,
QUESTION, CORRECT_ANS FROM QUIZ_ITEM ORDER BY
QUIZ_ITEM_ID LIMIT " + offset + ", " +rowsPerPage;
   ResultSet rs = statement.executeQuery(queryString);

              int countResult=0;

   while(rs.next())
   {
              countResult++;
              if(countResult==1)
                          out.println("<h3>= Quiz
Items =</h3><font color=#660000>Note: Click on the
quiz item ID to view information about that specific quiz
item.</font><BR><BR><CENTER><TABLE
class='seventy'><TR><TD class='coltitle'><b>Quiz Item
ID</b></TD><TD
class='coltitle'><b>Question</b></TD></TR>");
                          int id = rs.getInt("QUIZ_ITEM_ID");
                          String question =
URLDecoder.decode(rs.getString("QUESTION"));
```

```
        out.println("<TR>");
%>
                <td align="center"
class="backblue"><font style="font-family: Verdana; font-
size: 11px"><a href="viewquizitem.jsp?q_id=<%= id
%>"><%= id %></a></font></td>
<%
                out.println("<td class='backblue'>" +
question + "</td>");
    }
    if(countResult==0)
    {
        out.println("<h4><font color=#660000>::
Warning ::</font></h4><center><table cellspacing=0
cellpadding=0><tr><td align='center'
class='backpink'><br>There are no quiz items in the
database.<BR><BR></td></tr><tr><td align='center'
class='backpink'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
    }
    else
    {
        out.println("</TR></TABLE></CENTER>");
        rs.close();

            String countRows = "SELECT
COUNT(*) AS numRows FROM QUIZ_ITEM";
            rs =
statement.executeQuery(countRows);
            rs.next();
            int numrows = rs.getInt("numRows");


        out.println("<BR><HR><BR><CENTER>There
are a total of <b><font color='#660000'>" + numrows +
"</font></b> quiz item/s in the database");
            out.println("<BR>You are now in
<font color='#660000'><b>Page " + pageNum +
"</b></font></CENTER>");

            if(numrows % rowsPerPage == 0)
                maxPage =
numrows/rowsPerPage;
            else
                maxPage =
(numrows/rowsPerPage)+1;

            out.println("<br><CENTER><b>::
Click on the numbered link to go to that page
::</b><br>");
            for(pageNum = 1; pageNum <=
maxPage; pageNum++)
            {
                if(pageNum % 10 == 1 &&
pageNum!=1)
                    out.println("<BR>");
                out.println("<a
href='updatequizitem.jsp?pageNumber=" +pageNum +"'>"
+ pageNum +"</a> ");
            }
                out.println("<BR>");
        }
%>
</font>
</body>
</html>


updatestudymaterial.jsp
<html>
<head>
<title>Update Study Material</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.sql.*, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
    int rowsPerPage = 10;
    int pageNum, maxPage, offset=0;
```

```
    String pageNumString;

    pageNumString = request.getParameter("pageNumber");
    pageNum = Integer.parseInt(pageNumString);

    offset = (pageNum - 1) * rowsPerPage;
    String queryString = "SELECT STUDYMAT_ID,
STUDYMAT_TITLE, STUDYMAT_DESCRIPTION FROM
SUPPLEMENTARY_STUDY_MATERIAL ORDER BY
STUDYMAT_ID LIMIT " + offset + ", " +rowsPerPage;
    ResultSet rs = statement.executeQuery(queryString);

        int countResult=0;

    while(rs.next())
    {
            countResult++;
            if(countResult==1)
                    out.println("<h3>= Study
Materials =</h3><font color=#660000>Note: Click on the
study material ID to view information about that specific
study material.</font><BR><BR><CENTER><TABLE><TR
align='center'><TD class='coltitle'><b>Study Material
ID</b></TD><TD class='coltitle'><b>Study Material
Title</b></TD><TD class='coltitle'><b>Study Material
Description</b></TD></TR>");
            int id = rs.getInt("STUDYMAT_ID");
            String studymat_title =
URLDecoder.decode(rs.getString("STUDYMAT_TITLE"));
            String studymat_desc =
URLDecoder.decode(rs.getString("STUDYMAT_DESCRIPTIO
N"));
            studymat_desc =
studymat_desc.replaceAll("\r\n", "<BR>");

            out.println("<TR>");
%>
                <td align="center"
class="backblue"><font style="font-family: Verdana; font-
size: 11px"><a href="viewstudymaterial.jsp?smat_id=<
%= id %>"><%= id %></a></font></td>
<%
            out.println("<td align='center'
class='backblue'>" + studymat_title + "</td>");
            out.println("<td align='center'
class='backblue'>" + studymat_desc + "</td>");

    }
    if(countResult==0)
    {
        out.println("<h4><font color=#660000>::
Warning ::</font></h4><center><table
class='backpink'><tr><td align='center'><br>There are
no study materials in the
database.<BR><BR></td></tr><tr><td
align='center'><input type=button
onClick=self.history.back(); value='GO
BACK'><br><br></td></tr></center></table>");
    }
    else
    {
        out.println("</TR></TABLE></CENTER>");
        rs.close();

            String countRows = "SELECT
COUNT(*) AS numRows FROM
SUPPLEMENTARY_STUDY_MATERIAL";
            rs =
statement.executeQuery(countRows);
            rs.next();
            int numrows = rs.getInt("numRows");


        out.println("<BR><HR><BR><CENTER>There
are a total of <b><font color='#660000'>" + numrows +
"</font></b> study material/s in the database");
            out.println("<BR>You are now in
<font color='#660000'><b>Page " + pageNum +
"</b></font></CENTER>");

            if(numrows % rowsPerPage == 0)
```

```
                                 maxPage =
numrows/rowsPerPage;
                        else
                                 maxPage =
(numrows/rowsPerPage)+1;

                        out.println("<br><CENTER><b>::
Click on the numbered link to go to that page
::</b><br>");
                        for(pageNum = 1; pageNum <=
maxPage; pageNum++)
                        {
                                 if(pageNum % 10 == 1 &&
pageNum!=1)
                                 out.println("<BR>");
                        out.println("<a
href='updatestudymaterial.jsp?pageNumber=" +pageNum
+"'>" + pageNum +"</a> ");
                        }
                        out.println("<BR>");
        }
%>
</font>
</body>
</html>
```

updatetutorial.jsp
```
<html>
<head>
<title>Update Tutorial Main Page</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<h3>= Tutorial Module =</h3>
<center><BR>
<table cellspacing=0 cellpadding=0>
<tr>
        <td class='backblue'><br><br>
             <font
size="2">Simply click on the links in the menu bar to
update the tutorial module consisting of lectures, study
materials and quiz items.</font><br><br><br></td>
</tr>
</table>
</center>
</font>
</body>
</html>
```

upload.jsp
```
<html>
<head><title>Add Supplementary Study Material</title>
<script language="JavaScript">
function checkParameters(form)
{
        if(!form.lec_id.value.length || !
form.studymat_title.value.length || !
form.studymat_desc.value.length)
        {
                alert('Please be reminded that all the
fields are required.');
                return false;
        }

        if (!(form.lec_id.value > 0))
    {
        alert("A positive integer value for lecture ID must be
entered.");
        return false;
    }

        return true;
}
</script>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="2">
<%@ page import="java.io.*, java.sql.*,
java.net.URLEncoder" %>
<%
```

```
String contentType = request.getContentType();
System.out.println("Content type is :: " +contentType);
if ((contentType != null) &&
(contentType.indexOf("multipart/form-data") >= 0))
{
        DataInputStream in = new
DataInputStream(request.getInputStream());
        int formDataLength =
request.getContentLength();

        byte dataBytes[] = new byte[formDataLength];
        int byteRead = 0;
        int totalBytesRead = 0;
        while (totalBytesRead < formDataLength)
        {
                byteRead = in.read(dataBytes,
totalBytesRead, formDataLength);
                totalBytesRead += byteRead;
        }

        String file = new String(dataBytes);
        String saveFile =
file.substring(file.indexOf("filename=\"") + 10);
        saveFile = saveFile.substring(0,
saveFile.indexOf("\n"));
        saveFile =
saveFile.substring(saveFile.lastIndexOf("\\") +
1,saveFile.indexOf("\""));

        int lastIndex = contentType.lastIndexOf("=");
        String boundary =
contentType.substring(lastIndex + 1,contentType.length());
        int pos;
        pos = file.indexOf("filename=\"");

        pos = file.indexOf("\n", pos) + 1;

        pos = file.indexOf("\n", pos) + 1;

        pos = file.indexOf("\n", pos) + 1;

        int boundaryLocation = file.indexOf(boundary,
pos) - 4;
        int startPos = ((file.substring(0,
pos)).getBytes()).length;
        int endPos = ((file.substring(0,
boundaryLocation)).getBytes()).length;
        saveFile =
"C:\\Tomcat\\Tomcat4.1\\webapps\\cpd\\supplementary_st
udy_materials\\" + saveFile;
        FileOutputStream fileOut = new
FileOutputStream(saveFile);

        fileOut.write(dataBytes, startPos, (endPos -
startPos));
        fileOut.flush();
        fileOut.close();
%>
<h3>:: Add A Study Material ::</h3>
<font color=#660000><i>Note: All fields are
required.</i></font>
<form method=POST action="addstudymaterial2.jsp"
name="thisform" onSubmit="return
checkParameters(thisform);">
<CENTER>
<table class="seventy backpink" border="0" style="font-
family: Verdana; font-size: 11px; font-weight: bold;
border-collapse: collapse" cellpadding="3" cellspacing="1">
<tr>
        <td colspan=4 class="label"><br>Lecture
ID:        
        &n
bsp;       &nbsp
;  
        <input type="text" name="lec_id" style="font-
family: Verdana; font-size: 11px"
maxlength=9><BR><BR></td></tr>
</tr>
<tr>
        <td colspan=4 class="label">Study Material
Title:       &nbs
p;      
```

```
            <input type="text" name="studymat_title"
style="font-family: Verdana; font-size: 11px" size=51
maxlength=200><BR><BR></td></tr>
</tr>
<tr>
            <td colspan=3 class="label">Study Material
Description:      &nbs
p;       &
nbsp;       &nbs
p;
            <td colspan=1><textarea
name="studymat_desc" cols="50" rows="5" style="font-
family: Verdana; font-size: 11px"
wrap="hard"></textarea><BR><BR></td>
</tr>
<tr>
            <td colspan=4 class="label">Study Material
Filename:     
            <input type="text" name="studymat_filename"
style="font-family: Verdana; font-size: 11px" size=51
readonly="true" value="<%= saveFile
%>"><BR><BR></td></tr>
</table>
<BR><BR>
<input type="submit" name="sub" value="Add Study
Material">
<input type="reset" name="reset"
value="Reset"></CENTER>
</form>
<%}
%>
</html>
```

viewlecture.jsp
```
<html>
<head><title>View Lecture</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="1">
<%@ page import="java.sql.*, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
    String l_id = request.getParameter("l_id");
    String queryString = "SELECT LEC_ID, LEC_TITLE,
LEC_DESCRIPTION, LEC_CONTENT, DATE_LAST_MODIFIED
FROM LECTURE WHERE LEC_ID=" +l_id;
    ResultSet rs = statement.executeQuery(queryString);
    rs.next();

    int lec_id = rs.getInt("LEC_ID");
            String lec_title =
URLDecoder.decode(rs.getString("LEC_TITLE"));
            String lec_desc =
URLDecoder.decode(rs.getString("LEC_DESCRIPTION"));
            lec_desc = lec_desc.replaceAll("\r\n", "<BR>");
            String lec_content =
URLDecoder.decode(rs.getString("LEC_CONTENT"));
            lec_content = lec_content.replaceAll("\r\n",
"<BR>");
            String date_last_modified =
rs.getString("DATE_LAST_MODIFIED");

%>
<h3>:: View Lecture ::</h3>
<center>
<table class="hundred backpink" style="font-family:
Verdana; font-size: 11px; border-collapse: collapse">
<tr>
            <td colspan=4><font
color="#000066"><br><b>Lecture
ID:</b></font>   <font
color="#660000"><b><%= l_id
%></b></font><br><br></td>

</tr>
<tr>
            <td colspan=1 class="label"><font
color="#000066"><b>Lecture Title:</b></font></td>
            <td colspan=3><font color="#660000"><%=
lec_title %></font><BR><BR></td>
```

```
</tr>
<tr>
            <td colspan=1 class="label"><font
color="#000066"><b>Lecture
Description:</b></font></td>
            <td colspan=3><font color="#660000"><%=
lec_desc %></font><BR><BR></td>
</tr>
<tr>
            <td colspan=1 class="label"><font
color="#000066"><b>Lecture
Content:</font></font></td>
            <td colspan=3><font color="#660000"><%=
lec_content %></font><BR><BR></td>
</tr>
<tr>
            <td colspan=1><font
color="#000066"><b>Date Last
Modified</b></font></td>
            <td colspan=3><font color="#660000"><%=
date_last_modified %></font></td>
</tr>
<tr>
            <td><b>(yyyy-mm-dd):</b><br><br></td>
</tr>
</table><BR><BR><input type="button"
onClick="self.history.back();" value="GO BACK">
</center>
</font>
</body>
</html>
```

viewlecturecontent.jsp
```
<html>
<head><title>View Lecture</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="1">
<center>
<%@ page import="java.sql.*, java.net.URLDecoder,
java.net.URLEncoder" %>
<%@ include file="connect.jsp" %>
<%
    String l_title = request.getParameter("l_title");
    String queryString = "SELECT LEC_TITLE, LEC_CONTENT
FROM LECTURE WHERE LEC_TITLE='"
+URLEncoder.encode(l_title)+"'";
    ResultSet rs = statement.executeQuery(queryString);
    rs.next();

            String lec_title =
URLDecoder.decode(rs.getString("LEC_TITLE"));
            String lec_content =
URLDecoder.decode(rs.getString("LEC_CONTENT"));
            lec_content = lec_content.replaceAll("\r\n",
"<BR>");

%>
<table class="backblue" style="font-family: Verdana; font-
size: 11px; font-weight: bold; border-collapse: collapse"
cellpadding="3" cellspacing="1">

<tr>
            <td colspan=4
align="center"><BR><b><u><font color="#660000"><
%= lec_title %></font></u></b><BR><BR></td>
</tr>

<tr>
            <td colspan=4><%= lec_content
%><BR><BR></td>
</tr>

</table><BR><BR><input type="button"
onClick="self.history.back();" value="GO BACK">
</center>
</font>
</body>
</html>
```

viewquizitem.jsp

```
<html>
<head><title>View Quiz Item</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
</head>
<body>
<font face="Verdana" color="#000066" size="1">
<%@ page import="java.sql.*, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
    String q_id = request.getParameter("q_id");
    String queryString = "SELECT QUIZ_ITEM_ID,
QUESTION, CORRECT_ANS, LETTER_A, LETTER_B,
LETTER_C, LETTER_D FROM QUIZ_ITEM WHERE
QUIZ_ITEM_ID=" +q_id;
    ResultSet rs = statement.executeQuery(queryString);
    rs.next();

    int quiz_id = rs.getInt("QUIZ_ITEM_ID");
    String ques =
URLDecoder.decode(rs.getString("QUESTION"));
    String answer = rs.getString("CORRECT_ANS");
    String let_a =
URLDecoder.decode(rs.getString("LETTER_A"));
    String let_b =
URLDecoder.decode(rs.getString("LETTER_B"));
    String let_c =
URLDecoder.decode(rs.getString("LETTER_C"));
    String let_d =
URLDecoder.decode(rs.getString("LETTER_D"));
%>
<h3>:: View Quiz Item ::</h3>
<center>
<table class="seventy backpink" style="font-family:
Verdana; font-size: 11px; font-weight: bold; border-
collapse: collapse" cellpadding="3" cellspacing="1">
<tr>
        <td colspan=4 class="label"><br>Question
Item ID:  <font color="#660000"><%=
quiz_id %></font><br><br></td>
</tr>
<tr>
        <td colspan=1 class="label">Question:</td>
        <td colspan=3><font color="#660000"><%=
ques %></font><br><br></td>
</tr>
<tr>
        <td colspan=1 class="label">Choice A:</td>
        <td colspan=3><font color="#660000"><%=
let_a %></font><br><br></td>
</tr>
<tr>
        <td colspan=1 class="label">Choice B:</td>
        <td colspan=3><font color="#660000"><%=
let_b %></font><br><br></td>
</tr>
<tr>
        <td colspan=1 class="label">Choice C:</td>
        <td colspan=3><font color="#660000"><%=
let_c %></font><br><br></td>
</tr>
<tr>
        <td colspan=1 class="label">Choice D:</td>
        <td colspan=3><font color="#660000"><%=
let_d %></font><br><br></td>
</tr>
<tr>
        <td colspan=4 class="label">Correct
Answer:  <font color="#660000"><%=
answer %></font><br><br></td>
</tr>
</table>
<BR><BR><input type="button"
onClick="self.history.back();" value="GO BACK">
</center>
</font>
</body>
</html>
```

viewstudymaterial.jsp
```
<html>
<head><title>View Study Material</title>
<link rel="STYLESHEET" type="text/css" href="style.css">
```

```
</head>
<body>
<font face="Verdana" color="#000066" size="1">
<%@ page import="java.sql.*, java.net.URLDecoder" %>
<%@ include file="connect.jsp" %>
<%
    String smat_id = request.getParameter("smat_id");
    String queryString = "SELECT STUDYMAT_ID, LEC_ID,
STUDYMAT_TITLE, STUDYMAT_DESCRIPTION,
STUDYMAT_FILENAME FROM
SUPPLEMENTARY_STUDY_MATERIAL WHERE
STUDYMAT_ID=" +smat_id;
    ResultSet rs = statement.executeQuery(queryString);
    rs.next();

    int studymat_id = rs.getInt("STUDYMAT_ID");
    int lec_id = rs.getInt("LEC_ID");
        String studymat_title =
URLDecoder.decode(rs.getString("STUDYMAT_TITLE"));
        String studymat_desc =
URLDecoder.decode(rs.getString("STUDYMAT_DESCRIPTIO
N"));
        studymat_desc =
studymat_desc.replaceAll("\r\n", "<BR>");
        String studymat_filename =
URLDecoder.decode(rs.getString("STUDYMAT_FILENAME"));


%>
<h3>:: View Study Material ::</h3>
<center>
<table class="backpink" border="0" style="font-family:
Verdana; font-size: 11px; font-weight: bold; border-
collapse: collapse" cellpadding="3" cellspacing="1">
<tr>
        <td colspan=4><br>Study Material
ID:   <font color="#660000"><
%= smat_id %></font><br><br></td>
</tr>
<tr>
        <td colspan=2 class="label">Lecture ID:</td>
        <td colspan=2><font color="#660000"><%=
lec_id %></font><BR><BR></td>
</tr>
<tr>
        <td colspan=2 valign="top" class="label">Study
Material Title:</td>
        <td colspan=2><font color="#660000"><%=
studymat_title %></font><BR><BR><BR></td>
</tr>
<tr>
        <td colspan=2 valign="top" class="label">Study
Material Description:</td>
        <td colspan=2><font color="#660000"><%=
studymat_desc %></font><BR><BR><BR></td>
</tr>
<tr>
        <td colspan=2 valign="top" class="label">Study
Material Filename:</td>
        <td colspan=2><font color="#660000"><%=
studymat_filename %></font><BR><BR></td>
</tr>
</table><BR><BR><input type="button"
onClick="self.history.back();" value="GO BACK">
</center>
</font>
</body>
</html>
```

style.css
```
h1,h2,h3,h4,h5,h6 { font-style: verdana; color: #000066;}
p { text-align: right; font: 11px verdana; color: #660000}
body { padding: 0px; font: 11px verdana, terminal, sans-
serif; color: #000066}
a { color: #000066; text-decoration: none}
a:hover { background: #000066; color: white;}

table { border: thin solid #000066; width: 90%;
cellspacing: 0px; cellpadding: 0px}
table.seventy { border: thin solid #000066; width: 70%;
cellspacing: 0px;}
```

```
table.sixty { border: thin solid #000066; width: 60%;
cellspacing: 0px;}
table.fifty { border: thin solid #000066; width: 50%;
cellspacing: 0px;}
table.hundred { border: thin solid #000066; width: 100%;
cellspacing: 0px;}
td { font: 11px verdana; font-weight: bold,
terminal;padding: 5px; vertical-align: middle; color:
#000066}
td.courier { font: 11px courier; padding: 5px; vertical-
align: middle; color: #000066}
td.label { font: 11px verdana; font-weight: bold,
terminal;padding: 5px; vertical-align: top; color: #000066}
.backblue { background: #99CCFF; font: 11px verdana,
terminal;padding: 5px; vertical-align: middle; color:
#000066}
.backpink { background: FFCCFF; font: 11px verdana,
terminal;padding: 5px; vertical-align: middle; color:
#000066}
.coltitle { background: #000066; color: white; text-align:
center;}
.pfont { background: FFCCFF; font: 11px verdana,
terminal;padding: 5px; vertical-align: middle; color:
#000066}
.highlight { background: red; color: white}

input, textarea, select { background: #99CCFF; color:
#000066; border: thin solid #000066}
input.submit:hover { border-right: thick solid black; border-
bottom: thick solid black; border-top: thick solid white;
border-left:thick solid white;}
hr {color: #000066}
```

javascript/checkConsecutiveFastaLabel.js
```
function checkConsecutiveFastaDescriptions(form)
{
        var lines;
        var linecount;

        var c_1;

        if ( form.sequences.value.indexOf('\n') >= 0 )
        {
        lines = form.sequences.value.split('\n');
        }
        else
        {
        lines = form.sequences.value.split('\r');
        }

        linecount = lines.length;

        for (c_1 = 0; c_1 < linecount-1; c_1++)
        {
                if ((lines[c_1].charAt(0) == ">") &&
(lines[c_1 + 1].charAt(0) == ">"))
        {
                return false;
        }
   }

        return true;
}

function countNumbFASTADataSets(form)
{
        var lines;
        var c_1;
        var fastacount = 0;
        var linecount;
        var length2 = form.sequences.value.length;

        if (form.sequences.value.indexOf('\n') >= 0 )
        {
        lines = form.sequences.value.split('\n');
        }
        else
        {
        lines = form.sequences.value.split('\r');
        }

        linecount = lines.length;
```

```
        for (c_1 = (linecount-1); c_1 > -1; c_1--)
        {
                if (lines[c_1].charAt(0) == '>')
                {
                        c_1++;
                        break;
                }
        }

        while (c_1 < linecount)
        {
                if (lines[c_1].length == 0)
                {
                        if ((lines[c_1-
1].charAt(lines[c_1-1].length-1) == '\r') || (lines[c_1-
1].charAt(lines[c_1-1].length-1) == '\n'))
                        {
                                alert("The line
after the last FASTA label is blank");

                                return -1;
                        }
                }
                else if ((lines[c_1].charAt(0) == '\n')
|| (lines[c_1].charAt(0) == '\r'))
                {
                }
                else
                {
                        break;
                }
                c_1++;
        }

        if (lines[linecount-1].charAt(0) == '>')
        {
                alert("The last line is a FASTA label
which lacks a data set");
                return -1;
        }

        if (form.sequences.value.charAt(0) == ">")
        {
                fastacount = 1;
        }
        else
        {
                return -1;
        }
        c_1 = -1;

        while (c_1 < eval(length2-2))
        {
                c_1 =
form.sequences.value.indexOf("\n>", c_1 + 1);

                if (c_1 > 0)
                {
                        fastacount++;
                }
                else
                {
                        c_1 = length2;
                }
        }

        return fastacount;
}
function checkFastaFormat(form)
{
        if (!checkConsecutiveFastaDescriptions(form))
   {
     alert('There is at least two consecutive FASTA "labels"
(lines starting with a ">") in the data set');
     return false;
   }

        if (countNumbFASTADataSets(form) == -1)
   {
     return false;
   }
```

```
return true;
}
```

javascript/checkValidChars.js

```
function findInvalidAminoAcidChar(form)
{
// return false if a char is NOT: a valid AA (O, U, B, J, X, Z
and * are illegal) \n, or \r

        var answer = true;

        var c_1 = 0;
        var c_2 = 0;

        var lines;
        var seqChar;

        if (form.sequences.value.indexOf( '\n' ) >= 0 )
        {
        lines = form.sequences.value.split( '\n' );
        }
        else
        {
        lines = form.sequences.value.split( '\r' );
        }

        for (c_1 = 0; c_1 < lines.length; c_1++)
        {
                for (c_2 = 0; c_2 < lines[c_1].length;
c_2++)
                {
                        if (lines[c_1].charAt(0) ==
'>')
                        {
                                c_2 =
lines[c_1].length;
                        }
                        else
                        {
                                seqChar =
lines[c_1].charAt(c_2);

                                if ((seqChar !=
"A") && (seqChar != "a") && (seqChar != "C") &&
(seqChar != "c") && (seqChar != "D") && (seqChar != "d")
&& (seqChar != "E") && (seqChar != "e") && (seqChar !=
"F") && (seqChar != "f") && (seqChar != "G") &&
(seqChar != "g") && (seqChar != "H") && (seqChar != "h")
&& (seqChar != "I") && (seqChar != "i") && (seqChar !=
"K") && (seqChar != "k") && (seqChar != "L") &&
(seqChar != "l") && (seqChar != "M") && (seqChar != "m")
&& (seqChar != "N") && (seqChar != "n") && (seqChar !=
"P") && (seqChar != "p") && (seqChar != "Q") &&
(seqChar != "q") && (seqChar != "R") && (seqChar != "r")
&& (seqChar != "S") && (seqChar != "s") && (seqChar !=
"T") && (seqChar != "t") && (seqChar != "V") &&
(seqChar != "v") && (seqChar != "W") && (seqChar != "w")
&& (seqChar != "Y") && (seqChar != "y") && (seqChar !=
"\n") && (seqChar != "\r") && (seqChar != " "))
                                {

        alert('The "Input Sequences" contains the illegal
non-amino acid character "' + seqChar + '" on line ' +
eval(c_1+1) + '\n(position ' + eval(c_2 + 1) + ').  Only the
amino acids ACDEFGHIKLMNPQRSTVWY are permitted.');

                                return false;
                                }
                        }
                }
        }
return true;
}

function findInvalidDNAChar(form)
{
// return false if a char is NOT: ACGTURYMKSWBDHVN, \n,
or \r

        var answer = true;
```

```
        var c_1 = 0;
        var c_2 = 0;

        var lines;
        var seqChar;

        if (form.sequences.value.indexOf( '\n' ) >= 0 )
        {
        lines = form.sequences.value.split( '\n' );
        }
        else
        {
        lines = form.sequences.value.split( '\r' );
        }

        for (c_1 = 1; c_1 < lines.length; c_1++)
        {
                for (c_2 = 0; c_2 < lines[c_1].length;
c_2++)
                {
                        if (lines[c_1].charAt(0) ==
'>')
                        {
                                c_2 =
lines[c_1].length;
                        }
                        else
                        {
                                seqChar =
lines[c_1].charAt(c_2);
                                if ((seqChar !=
"A") && (seqChar != "a") && (seqChar != "C") &&
(seqChar != "c") && (seqChar != "G") && (seqChar != "g")
&& (seqChar != "T") && (seqChar != "t") && (seqChar !=
"\n") && (seqChar != "\r") && (seqChar != " "))
                                {

        alert('The "Input Sequences" contains the illegal
character "' + seqChar + '" on line ' + eval(c_1+1) +
'\n(position ' + eval(c_2 + 1) + ').  Only the symbols ACGT
are permitted.');

                                return false;
                                }
                        }
                }
        }
return true;
}

function findInvalidRNAChar(form)
{
// return false if a char is NOT: ACGTURYMKSWBDHVN, \n,
or \r

        var answer = true;

        var c_1 = 0;
        var c_2 = 0;

        var lines;
        var seqChar;

        if (form.sequences.value.indexOf( '\n' ) >= 0 )
        {
        lines = form.sequences.value.split( '\n' );
        }
        else
        {
        lines = form.sequences.value.split( '\r' );
        }

        for (c_1 = 1; c_1 < lines.length; c_1++)
        {
                for (c_2 = 0; c_2 < lines[c_1].length;
c_2++)
                {
                        if (lines[c_1].charAt(0) ==
'>')
                        {
```

```
                    c_2 =
lines[c_1].length;
                    }
                  else
                  {
                      seqChar =
lines[c_1].charAt(c_2);
                      if ((seqChar !=
"A") && (seqChar != "a") && (seqChar != "C") &&
(seqChar != "c") && (seqChar != "G") && (seqChar != "g")
&& (seqChar != "U") && (seqChar != "u") && (seqChar !=
"\n") && (seqChar != "\r") && (seqChar != " "))
                      {
         alert('The "Input Sequences" contains the illegal
character "' + seqChar + '" on line ' + eval(c_1+1) +
'\n(position ' + eval(c_2 + 1) + ').  Only the symbols ACGU
are permitted.');

             return false;
                                        }
                    }
                }
            }

    return true;
    }

    function checkValidChars(form)
    {
            var answer = true;
            if      (form.seqType.value=="protseq")
            {
                    answer =
findInvalidAminoAcidChar(form);
            }
            else if (form.seqType.value=="dnaseq")
            {
                    answer = findInvalidDNAChar(form);
            }
            else if (form.seqType.value=="rnaseq")
            {
                    answer = findInvalidRNAChar(form);
            }

    return answer;
    }
```

javascript/fastaFormat.js
```
function checkLabel(form)
{
            if ( form.sequences.value.indexOf( '\n' ) >= 0 )
            {
                    lines =
form.sequences.value.split( '\n' );
            }
            else
            {
            lines = form.sequences.value.split( '\r' );
            }

            seq = 0;
            label = false;
            for ( i = 0; i < lines.length; i++ )
            {
            j = 0;
            while ( j < lines[i].length && lines[i].charAt( j )
== ' ' )
                    j++;
            if ( j < lines[i].length )
            {
                    if ( lines[i].charAt(j) == '\r' ||
lines[i].charAt(j) == '\n' )
                            continue;
                    if ( !label )
                    {
                    if ( lines[i].charAt( j ) != '>' )
                    {
                            alert( 'The "Input
Sequence" must be preceded by a FASTA format label
e.g.\n>label 123');
                            return false;
```

```
                    }
                  else
                  {
                          label = true;
                          continue;
                    }
                  }
              }
          }

          return true;
  }
```

javascript/isEmptySequence.js
```
function isEmptySequence(form)
{
            if(!form.sequences.value.length)
            {
                    alert('No "Input Sequence" data was
entered');
                    return false;
            }
            return true;
}
```

javascript/LWKparams.js
```
function checkLWKParameters(form)
{
            if ((!(form.lparam.value > 0))  || (!
(form.wparam.value > 0))  || (!(form.kparam.value > 0)))
      {
          alert("A positive integer value for L, W, and K must be
entered");
          return false;
      }

            if (form.kparam.value < 2)
      {
          alert('The "K" parameter (' + form.kparam.value + ')
must be an integer greater than 1');
          return false;
      }

            if (eval(form.wparam.value - form.lparam.value)
< 0)
      {
          alert('The "L" parameter (' + form.lparam.value  + ")
must be less than or equal to W (" + form.wparam.value  +
")");
          return false;
      }

            if (form.wparam.value >
(10*form.lparam.value))
      {
          if (!confirm('Do you want to use a "W"  (' +
form.wparam.value + ') which is much larger than "L" (' +
form.lparam.value + ')?'))
          {
              return false;
          }
      }
            return true;
}
```

WEB-INF/classes/maxpatterns/convolutionPhase.java
```
package maxpatterns;

import java.io.*;
import java.util.*;
public class convolutionPhase
{
            static convolutionPhase cPhase= new
convolutionPhase();
            scanningPhase sPhase= new scanningPhase();

            Vector EPStack = new Vector();
            Vector EPPrefixLessVec = new Vector();
            Vector EPPrefixLessOffsetList = new Vector();
            Vector EPPrefixLessVecClone = new Vector();
```

```
        Vector EPPrefixLessOffsetListClone = new
Vector();
        Vector MaxPatternListVec = new Vector();
        Vector MaxPatternOffsetListVec = new Vector();
        Vector supportVec = new Vector();
        Vector hashTableLabel = new Vector();
        Vector hashTable = new Vector();

        public Vector setCPMaxPatternListVec()
        {
                return MaxPatternListVec;
        }

        public Vector setCPMaxPatternOffsetListVec()
        {
                return MaxPatternOffsetListVec;
        }

        public Vector setCPsupportVec()
        {
                return supportVec;
        }

        public void getMaxPatterns(Vector EPListVec,
Vector EPOffsetList, int KPrmtr, int LPrmtr, String []
seqLArr, int seqLArrSize)
        {
                String EPListArray[] = new
String[EPListVec.size()];
                EPListVec.toArray(EPListArray);
                Vector leftVec = new Vector();
                Vector rightVec = new Vector();
                Vector leftTempVec = new Vector();
                Vector revLeftTempVec = new
Vector();
                Vector rightTempVec = new Vector();
                Vector topOfStackOffsetList = new
Vector();
                Vector resultConvOffsetList = new
Vector();

                Vector resultConvHashValue = new
Vector();
                boolean start;
                String prefixStr, suffixStr, QString,
resultConv;

                EPPrefixLessVec =
arrangePrefixWiseLess(EPListArray, EPListVec.size());


                for(int b=0;
b<EPPrefixLessVec.size(); b++)
                {

EPPrefixLessOffsetList.addElement(EPOffsetList.elementAt(E
PListVec.indexOf((String) EPPrefixLessVec.elementAt(b))));
                }
                for(int p =0;
p<EPPrefixLessVec.size(); p++)
                {

EPPrefixLessVecClone.addElement(EPPrefixLessVec.element
At(p));

EPPrefixLessOffsetListClone.addElement(EPPrefixLessOffsetL
ist.elementAt(p));
                }
                for(int c=0; c<EPPrefixLessVec.size();
c++)
                {
                        prefixStr =
cPhase.findPrefix((String)EPPrefixLessVec.elementAt(c),
LPrmtr);

leftVec.addElement(findConvolvable(EPPrefixLessVec,EPPref
ixLessVec.size(), prefixStr, true));
```

```
                        suffixStr =
findSuffix((String) EPPrefixLessVec.elementAt(c), LPrmtr);

rightVec.addElement(findConvolvable(EPPrefixLessVec,
EPPrefixLessVec.size(), suffixStr, false));
                }
                for(int d=0;
d<EPPrefixLessVec.size(); d++)
                {
                        String EPTemp = (String)
EPPrefixLessVec.elementAt(d);
                        Vector EPTempOffsetList =
new Vector();
                        EPTempOffsetList =
(Vector) EPPrefixLessOffsetList.elementAt(d);
                        Vector EPTempAddOneVec
= new Vector();
                        for(int k=0;
k<EPTempOffsetList.size(); k++)
                        {

EPTempAddOneVec.addElement(EPTempOffsetList.elementA
t(k));
                        }
                        EPTempAddOneVec =
addOneToElt(EPTempAddOneVec);
                        Vector EPTempHashValue
= new Vector();
                        EPTempHashValue =
computeHashValue(EPTempAddOneVec, seqLArr,
seqLArrSize);

                if(isNotSubsumed(EPTempHashValue))
                {
                EPStack.addElement(EPTemp);
                }
                        else
                                continue;
                        while(EPStack.size()!=0)
                        {
                                start = false;
                                int tosPointer =
EPStack.size()-1;
                                String
topOfStack = (String) EPStack.elementAt(tosPointer);

                topOfStackOffsetList = (Vector)
EPPrefixLessOffsetListClone.elementAt(EPPrefixLessVecClon
e.indexOf(topOfStack));
                                String prefixVar
= findPrefix(topOfStack, LPrmtr);
                                leftTempVec =
(Vector)
leftVec.elementAt(EPPrefixLessVecClone.indexOf(topOfStack
));

                        if(leftTempVec.size()!=0)
                                {

                String leftTempArr[] = new
String[leftTempVec.size()];

                leftTempArr = reverseOrder(leftTempVec,
leftTempVec.size());

                revLeftTempVec =
arrangePrefixWiseLess(leftTempArr, leftTempVec.size());

                leftTempArr = reverseOrder(revLeftTempVec,
revLeftTempVec.size());

                for(int f=0; f<leftTempVec.size(); f++)
                                        {

                QString = leftTempArr[f];
```

```
            resultConv = convolveAB(QString, topOfStack,
prefixVar.length());
            resultConvOffsetList =
findExtendedOffsetList(QString, topOfStack, prefixVar);

            if(resultConvOffsetList.size() ==
topOfStackOffsetList.size())

                {

                EPStack.removeElementAt((EPStack.size()-1));

                }

                Vector addOneVec = new Vector();

                for(int g=0; g<resultConvOffsetList.size(); g++)

                {

addOneVec.addElement(resultConvOffsetList.elementAt(g));

                }

                addOneVec = addOneToElt(addOneVec);

                resultConvHashValue =
computeHashValue(addOneVec, seqLArr, seqLArrSize);


                if(sPhase.support(resultConvOffsetList) >=
KPrmtr && isNotSubsumed(resultConvHashValue))

                {

                        EPStack.addElement(resultConv);


                EPPrefixLessVecClone.addElement(resultConv);


EPPrefixLessOffsetListClone.add(EPPrefixLessVecClone.index
Of(resultConv), resultConvOffsetList);

                        prefixStr = findPrefix(resultConv,
LPrmtr);


leftVec.addElement(findConvolvable(EPPrefixLessVec,
EPPrefixLessVec.size(), prefixStr,true));

                        suffixStr = findSuffix(resultConv,
LPrmtr);


rightVec.addElement(findConvolvable(EPPrefixLessVec,
EPPrefixLessVec.size(), suffixStr, false));

                        start = true;

                        break;

                }
                                                }
                                        if(start)
continue;

                                String suffixVar
= findSuffix(topOfStack, LPrmtr);
                                        rightTempVec =
(Vector)
rightVec.elementAt(EPPrefixLessVecClone.indexOf(topOfSta
ck));
```

```
        if(rightTempVec.size()!=0)
                                {
                for(int f=0; f<rightTempVec.size(); f++)
                                        {
                QString = (String) rightTempVec.elementAt(f);

                resultConv = convolveAB(topOfStack, QString,
suffixVar.length());
                resultConvOffsetList =
findExtendedOffsetList(topOfStack, QString, suffixVar);

                if(resultConvOffsetList.size() ==
topOfStackOffsetList.size())

                EPStack.removeElementAt((EPStack.size()-1));

                Vector addOneVec = new Vector();

                for(int g=0; g<resultConvOffsetList.size(); g++)

                {

addOneVec.addElement(resultConvOffsetList.elementAt(g));

                }

                addOneVec = addOneToElt(addOneVec);

                resultConvHashValue =
computeHashValue(addOneVec, seqLArr, seqLArrSize);

                if(sPhase.support(resultConvOffsetList) >=
KPrmtr && isNotSubsumed(resultConvHashValue))

                {

                        EPStack.addElement(resultConv);


                EPPrefixLessVecClone.addElement(resultConv);


EPPrefixLessOffsetListClone.add(EPPrefixLessVecClone.index
Of(resultConv), resultConvOffsetList);

                        prefixStr = findPrefix(resultConv,
LPrmtr);


leftVec.addElement(findConvolvable(EPPrefixLessVec,
EPPrefixLessVec.size(), prefixStr,true));

                        suffixStr = findSuffix(resultConv,
LPrmtr);


rightVec.addElement(findConvolvable(EPPrefixLessVec,
EPPrefixLessVec.size(), suffixStr, false));

                        start = true;

                        break;

                }
                                                }
                                        }
                                        if(start)
continue;
                                        String top =
(String) EPStack.remove(EPStack.size()-1);
                                        int maxIndex =
0;
```

```
                                                Vector
MaxOffsetList = new Vector();
        if(MaxPatternListVec.size()==0)
                                {
        MaxPatternListVec.addElement(top);

        maxIndex = MaxPatternListVec.indexOf(top);

        MaxOffsetList = (Vector)
EPPrefixLessOffsetListClone.elementAt(EPPrefixLessVecClon
e.indexOf(top));
                                        int
patternSupport = sPhase.support(MaxOffsetList);

supportVec.addElement(String.valueOf(patternSupport));
                                }
                                else
                                {

        MaxOffsetList = (Vector)
EPPrefixLessOffsetListClone.elementAt(EPPrefixLessVecClon
e.indexOf(top));
                                        int
patternSupport = sPhase.support(MaxOffsetList);

        maxIndex = insertMaxPat(patternSupport);

        MaxPatternListVec.insertElementAt(top,
maxIndex);

supportVec.insertElementAt(String.valueOf(patternSupport)
, maxIndex);

                                }
                                Vector
maxAddOneVec = new Vector();
                                        maxAddOneVec
= (Vector) MaxOffsetList;
                                        maxAddOneVec
= addOneToElt(maxAddOneVec);
                                Vector
maxHashValue = new Vector();
                                        maxHashValue
= computeHashValue(maxAddOneVec, seqLArr,
seqLArrSize);

        addToHashTable(maxHashValue);

MaxPatternOffsetListVec.insertElementAt(maxAddOneVec,
maxIndex);
                                }
                        }
                }
        public Vector arrangePrefixWiseLess(String []
EPListArr, int EPListArrSize)
                {
                        int maxLen = EPListArr[0].length();
                        int count = EPListArrSize-1;
                        String EPPreLess[] = new
String[EPListArrSize];
                        Vector EPPreLessVec = new Vector();

                        for(int q=1; q<EPListArrSize; q++)
                        {
                if(maxLen<EPListArr[q].length())
                                        maxLen =
EPListArr[q].length();
                        }
                        for(int r=0; r<EPListArrSize; r++)
                        {
                                int tempLen =
EPListArr[r].length();
                                while(tempLen!=maxLen)

                                {
                                        EPListArr[r] =
EPListArr[r].concat("0");
                                        tempLen++;
                                }
                        }
                        for(int s=0; s<maxLen; s++)
                        {
                                Vector nullVec = new
Vector();
                                for(int t=EPListArrSize-1;
t>-1; t--)
                                {
                                        if((!
(EPListArr[t].equals(""))))
                                        {
                if(EPListArr[t].charAt(s)=='.')
                                                {

                EPPreLess[count] = EPListArr[t];

                EPListArr[t] = "";

                count--;
                                                }
                                                else
if(EPListArr[t].charAt(s)=='0')
                                                {

                nullVec.addElement(String.valueOf(t));

                nullVec.addElement(EPListArr[t]);
                                                }
                                        }
                                }
                                for(int v=0;
v<nullVec.size(); v+=2)
                                {
                                        String temp =
String.valueOf(nullVec.elementAt(v));
                                        int ind =
Integer.parseInt(temp);
                                        EPPreLess[count] = (String)
nullVec.elementAt(v+1);
                                        EPListArr[ind] =
"";
                                        count--;
                                }
                                for(int w=EPListArrSize-1; w>-1; w--)
                                {
                                        if(!
(EPListArr[w].equals("")))
                                        {
                EPPreLess[count] = EPListArr[w];
                                                EPListArr[w] =
"";
                                        count--;
                                }
                        }
                        for(int x=0; x<EPListArrSize; x++)
                        {
                                for(int y=0;
y<EPPreLess[x].length(); y++)
                                {
                if(EPPreLess[x].charAt(y)=='0')
                                        {
                EPPreLess[x] = EPPreLess[x].substring(0, y);
                                        }
                                }
                        }
                        for(int z=0; z<EPListArrSize; z++)
                        {
                EPPreLessVec.addElement(EPPreLess[z]);
```

```java
                    }

                    return EPPreLessVec;
            }

            public String findPrefix(String preString, int LPar)
            {
                    String preStr="";
                    int p=0;
                    int cnt=1;
                    while(cnt<LPar)
                    {
                            if(preString.charAt(p)!='.')
                                    cnt++;
                            preStr =
preStr.concat(String.valueOf(preString.charAt(p)));
                            p++;
                    }
                    return preStr;
            }

            public String findSuffix(String sufString, int LPar)
            {
                    String sufStr = "";
                    int p= sufString.length()-1;
                    int cnt=1;
                    while(cnt<LPar)
                    {
                            if(sufString.charAt(p)!='.')
                                    cnt++;
                            sufStr =
(String.valueOf(sufString.charAt(p))).concat(sufStr);
                            p--;
                    }
                    return sufStr;
            }

            public Vector findConvolvable(Vector
EPPreSufLess, int EPPreSufLessSize, String preSufVar,
boolean sufJoinPre)
            {
                    String tempStr;
                    Vector EPVar = new Vector();

                    if(sufJoinPre == true)
                    {
                            for(int q=0;
q<EPPreSufLessSize; q++)
                            {
                                    tempStr =
(String) EPPreSufLess.elementAt(q);

            if(tempStr.endsWith(preSufVar))

            EPVar.addElement(tempStr);
                            }
                    }
                    else if(sufJoinPre==false)
                    {
                            for(int q=0;
q<EPPreSufLessSize; q++)
                            {
                                    tempStr =
(String) EPPreSufLess.elementAt(q);

            if(tempStr.startsWith(preSufVar))

            EPVar.addElement(tempStr);
                            }
                    }
                    return EPVar;
            }

            public String[] reverseOrder(Vector tempVec, int
tempVecSize)
            {
                    String tempArray[] = new
String[tempVecSize];
                    tempVec.toArray(tempArray);
                    Vector revVec = new Vector();
                    for(int s=0; s<tempVecSize; s++)
                    {
```

```java
                            String tmpStr = "";
                            for(int
t=(tempArray[s].length()-1); t>-1; t--)
                            {
                                    tmpStr =
tmpStr.concat(String.valueOf(tempArray[s].charAt(t)));
                            }
                            revVec.addElement(tmpStr);
                    }
                    String revArray[] = new
String[revVec.size()];
                    revVec.toArray(revArray);
                    return revArray;
            }

            public String convolveAB(String AStr, String
BStr, int length)
            {
                    String resultAB =
AStr.concat(BStr.substring(length, BStr.length()));
                    return resultAB;
            }
            public Vector findExtendedOffsetList(String QStr,
String TOSStr, String preVar)
            {
                    Vector QStrOffsetList = new Vector();
                    Vector TOSOffsetList = new Vector();
                    Vector resConvOffsetList = new
Vector();

                    QStrOffsetList = (Vector)
EPPrefixLessOffsetListClone.elementAt(EPPrefixLessVecClon
e.indexOf(QStr));
                    TOSOffsetList = (Vector)
EPPrefixLessOffsetListClone.elementAt(EPPrefixLessVecClon
e.indexOf(TOSStr));
                    for(int g=0; g<QStrOffsetList.size();
g+=2)
                    {
                            int qxval =
Integer.parseInt((String) QStrOffsetList.elementAt(g));
                            int qyval =
Integer.parseInt((String) QStrOffsetList.elementAt(g+1));
                            for(int m=0;
m<TOSOffsetList.size(); m+=2)
                            {

            if(qxval==Integer.parseInt((String)
TOSOffsetList.elementAt(m)))
                                    {
                                            int
txval = Integer.parseInt((String)
TOSOffsetList.elementAt(m));
                                            int
tyval = Integer.parseInt((String)
TOSOffsetList.elementAt(m+1));

            if(tyval == QStr.length() - preVar.length()
+qyval)
                                            {

            resConvOffsetList.addElement(String.valueOf(qxval));

            resConvOffsetList.addElement(String.valueOf(qyval));
                                            }
                                    }
                            }
                    }
                    return resConvOffsetList;
            }

            public Vector addOneToElt(Vector addVec)
            {
                    Vector retAddVec = new Vector();
                    for(int a=0; a<addVec.size(); a++)
                    {
                            String aStr = (String)
addVec.elementAt(a);
```

```
                    int aInt =
Integer.parseInt(aStr) + 1;

            retAddVec.addElement(String.valueOf(aInt));
                    }
                            return retAddVec;
            }

            public Vector computeHashValue(Vector
offsetListVec, String[] seqListArrClone, int seqListCloneSize)
                    {
                            Vector hashValueVec = new Vector();
                            Vector funcValueVec = new Vector();
                            int sumLen=0;

hashValueVec.addElement(String.valueOf((offsetListVec.siz
e()/2)));
                            for(int u=0; u<offsetListVec.size();
u+=2)
                            {
                                    int xvalue =
Integer.parseInt((String) offsetListVec.elementAt(u)) - 1;
                                    int yvalue =
Integer.parseInt((String) offsetListVec.elementAt(u+1));
                                    if(xvalue!=0)
                                    {
                                            sumLen=0;
                                            for(int v=1;
v<=xvalue; v++)
                                            {

        sumLen+=seqListArrClone[v-1].length();
                                            }
                                    }
                                    int funcValue = yvalue +
sumLen;

        funcValueVec.addElement(String.valueOf(funcValue));
                            }
                            int diffSum =0;
                            for(int w=0;
w<(offsetListVec.size()/2)-1; w++)
                            {
                                    int secondTemp =
Integer.parseInt((String) funcValueVec.elementAt(w+1));
                                    int firstTemp =
Integer.parseInt((String) funcValueVec.elementAt(w));
                                    diffSum += (secondTemp-
firstTemp);
                            }

hashValueVec.addElement(String.valueOf(diffSum));
                            return hashValueVec;
            }

            public boolean isNotSubsumed(Vector
resHashValue)
            {
                    String offsetSizeStr = (String)
resHashValue.elementAt(0);
                    String diffSumStr = (String)
resHashValue.elementAt(1);

                    if(hashTableLabel.size()==0)
                    {
                            return true;
                    }
                    else
                    {

        if(hashTableLabel.contains(offsetSizeStr))
                            {
                                            Vector
hashTableElt = new Vector();
                                            hashTableElt =
(Vector)
hashTable.elementAt(hashTableLabel.indexOf(offsetSizeStr)
);
```

```
            if(hashTableElt.contains(diffSumStr))
                                    {
                    return false;
                                    }
                                    else
                                    {
                    return true;
                                    }
                            }
                            else
                            {
                                    return true;
                            }
                    }
            }
            public void addToHashTable(Vector
resHashValue)
            {
                    String offsetSizeStr = (String)
resHashValue.elementAt(0);
                    String diffSumStr = (String)
resHashValue.elementAt(1);

                    if(hashTableLabel.size()==0)
                    {

        hashTableLabel.addElement(offsetSizeStr);
                                    int tmpIndex =
hashTableLabel.indexOf(offsetSizeStr);
                                    Vector hashTableElt = new
Vector();

        hashTableElt.addElement(diffSumStr);
                                    hashTable.add(tmpIndex,
hashTableElt);
                    }
                    else
                    {

        if(hashTableLabel.contains(offsetSizeStr))
                            {
                                    Vector
hashTableElt = new Vector();
                                    int index =
hashTableLabel.indexOf(offsetSizeStr);
                                    hashTableElt =
(Vector) hashTable.remove(index);

        hashTableElt.addElement(diffSumStr);

        hashTable.add(index, hashTableElt);
                            }
                            else
                            {

        hashTableLabel.addElement(offsetSizeStr);
                                            int tmpIndex =
hashTableLabel.indexOf(offsetSizeStr);
                                            Vector
hashTableElt = new Vector();

        hashTableElt.addElement(diffSumStr);

        hashTable.add(tmpIndex, hashTableElt);
                            }
                    }
            }
            public int insertMaxPat(int support)
            {
                    int s;
                    for(s=0; s<supportVec.size(); s++)
                    {

if(Integer.parseInt((String)supportVec.elementAt(s))<supp
ort)
                            {
                                    break;
```

```
                    }
            }
            return s;
        }
}
```

WEB-INF/classes/maxpatterns/genMaxPat.java
```java
package maxpatterns;

import java.io.*;
import java.util.*;

public class genMaxPat
{
        Vector GMPEPListVec = new Vector();
        Vector GMPEPOffsetList = new Vector();
        Vector GMPMaxPatternListVec = new Vector();
        Vector GMPMaxPatternOffsetListVec = new
Vector();
        Vector GMPsupportVec = new Vector();
        scanningPhase sPhase = new scanningPhase();
        convolutionPhase cPhase = new
convolutionPhase();
        public boolean getFound(String x, Vector y)
        {
                boolean found = false;
                if(y.contains(x))
                {
                        found = true;
                        return found;
                }
                else
                        return found;
        }

        public Vector getGMPEPListVec()
        {
                return this.GMPEPListVec;
        }

        public Vector getGMPEPOffsetList()
        {
                return this.GMPEPOffsetList;
        }

        public Vector getGMPMaxPatternListVec()
        {
                return this.GMPMaxPatternListVec;
        }

        public Vector getGMPMaxPatternOffsetListVec()
        {
                return
this.GMPMaxPatternOffsetListVec;
        }

        public Vector getGMPsupportVec()
        {
                return this.GMPsupportVec;
        }

        public void genMaximalPatterns(Vector AVec,
String[] SLArray, int SLSize, int LParameter, int
WParameter, int KParameter)
        {
                sPhase.findElemPat(AVec, SLArray,
SLSize, LParameter, WParameter, KParameter);
                GMPEPListVec =
sPhase.setSPEPListVec();
                GMPEPOffsetList =
sPhase.setSPEPOffsetList();

                if(GMPEPListVec.size()!=0)
                {

        cPhase.getMaxPatterns(GMPEPListVec,
GMPEPOffsetList, KParameter, LParameter, SLArray,
SLSize);
                        GMPMaxPatternListVec =
cPhase.setCPMaxPatternListVec();
```

```java
                        GMPMaxPatternOffsetListVec =
cPhase.setCPMaxPatternOffsetListVec();
                        GMPsupportVec =
cPhase.setCPsupportVec();
                }
        }
}
```

WEB-INF/classes/maxpatterns/scanningPhase.java
```java
package maxpatterns;

import java.io.*;
import java.util.*;

public class scanningPhase
{
        static scanningPhase sPhase = new
scanningPhase();
        Vector EPListVec = new Vector();
        Vector EPOffsetList = new Vector();
        Vector patternList = new Vector();
        Vector patternOffsetList = new Vector();
        public Vector setSPEPListVec()
        {
                return EPListVec;
        }

        public Vector setSPEPOffsetList()
        {
                return EPOffsetList;
        }

        public void findElemPat(Vector alphabetV,
String[] seqLArray, int seqLSize, int LPrmtr, int WPrmtr, int
KPrmtr)
        {
                Vector temporaryOffset = new
Vector();

                for(int i=0; i<alphabetV.size(); i++)
                {
                        temporaryOffset =
retrieveOffsetList((String)alphabetV.elementAt(i),
seqLArray, seqLSize);

patternList.addElement((String)alphabetV.elementAt(i));
                        patternOffsetList.add(i,
temporaryOffset);
                        for(int i=0; i<alphabetV.size(); i++)
                        {
                                temporaryOffset =
(Vector)
patternOffsetList.elementAt(patternList.indexOf((String)alp
habetV.elementAt(i)));

                if(support(temporaryOffset) >= KPrmtr)
                        {

                extend((String)alphabetV.elementAt(i),
alphabetV, seqLArray, seqLSize, LPrmtr, WPrmtr, KPrmtr);
                        }
                }
        }

        public void extend(String pattern, Vector
alphabetVec, String[] seqListArray, int seqListSize, int
LParam, int WParam, int KParam)
        {
                int patternLen = pattern.length();
                int numRegChars=0, k, m, x,
maxNumDots;
                String pPrime="", dot=".";
                Vector tempOffsetList = new Vector();
                Vector tempVec = new Vector();
                int counter=0;

                for(int j=0; j<patternLen; j++)
                {
                        if(pattern.charAt(j)!='.')
                                numRegChars+
+;
                }
```

```
                    if(numRegChars==LParam)
                    {
                                if(!
(EPListVec.contains(pattern))){

        EPListVec.addElement(pattern);


EPOffsetList.addElement(patternOffsetList.elementAt(patter
nList.indexOf(pattern)));
                        }
                        return;
                    }
                    else
                    {
                            maxNumDots = WParam -
patternLen - LParam + numRegChars;
                            for(k=0;
k<=maxNumDots; k++)
                            {
                                    if(k==0)
                                    {

        pPrime = pattern;

                                    }
                                    else
                                    {

        m=0;

        while(m < k)
                                            {

        pPrime = pattern.concat(dot);

        m++;
                                            }
                                    }


        if(patternList.contains(pattern))
                                    {
                                            int
index = patternList.indexOf(pattern);

        tempVec = (Vector)
patternOffsetList.elementAt(index);

        for(x=0; x<tempVec.size(); x+=2)
                                            {

        Vector alphaOffset = new Vector();

        String xvalueString =
String.valueOf(tempVec.elementAt(x));

        int xvalue = Integer.parseInt(xvalueString);

        String yvalueString =
String.valueOf(tempVec.elementAt(x+1));

        int pos = Integer.parseInt(yvalueString) +
patternLen + k;


        if(pos < seqListArray[xvalue].length())

        {
                                String alphaTemp =
pPrime.concat(String.valueOf(seqListArray[xvalue].charAt(p
os)));
                                alphaOffset =
retrieveOffsetList(alphaTemp, seqListArray, seqListSize);

                                if(!(patternList.contains(alphaTemp)))

        {
```

```
        patternList.addElement(alphaTemp);


        patternOffsetList.addElement(alphaOffset);


                }
        }
                                }
                        }

                        for(int n=0;
n<alphabetVec.size(); n++)
                        {
        String tempString =
pPrime.concat((String)alphabetVec.elementAt(n));

        if(patternList.contains(tempString))
                                {
        tempOffsetList = (Vector)
patternOffsetList.elementAt(patternList.indexOf(tempString
));

        if(support(tempOffsetList) >= KParam)

        {
                        extend(tempString, alphabetVec,
seqListArray, seqListSize, LParam, WParam, KParam);

        }
                                }
                        }
                    }
                }

        public Vector retrieveOffsetList(String ptrn,
String[] seqListArr, int seqListArrSize)
            {
                    Vector tempOffset = new Vector();
                    int limitSLoop, tempSeqNum,
tempStart, t;
                    int ptrnLen = ptrn.length();

                    for(int r=0; r<seqListArrSize; r++)
                    {
                            limitSLoop =
seqListArr[r].length()-ptrnLen+1;
                            if(limitSLoop>0)
                            {
                                    for(int s=0;
s<limitSLoop; s++)
                                    {
                                            int
temp = s;

        for(t=0; t<ptrnLen; t++)
                                            {

        if(ptrn.charAt(t) == seqListArr[r].charAt(temp)
|| ptrn.charAt(t)=='.')

                        temp++;

        else

                        break;
                                            }

        if(t==ptrnLen)
                                            {

        tempSeqNum = r;

        tempStart = temp - ptrnLen;
```

```java
tempOffset.addElement(String.valueOf(tempSeqNum));

tempOffset.addElement(String.valueOf(tempStart));

            s=temp-1;
                                                    }
                                }
                        }
                }
                return tempOffset;
        }

        public int support(Vector tempVec)
        {
                int count = 0, i;
                Vector uniqueOffsetList = new
Vector();
                for(count=0; count<tempVec.size()-
1; count+=2)
                {
                        if(!
(uniqueOffsetList.contains(tempVec.elementAt(count))))

uniqueOffsetList.addElement(tempVec.elementAt(count));
                }
                return uniqueOffsetList.size();
        }

        public int insertElt(Vector alphaOff, String
offset1, String offset2)
        {
                int offsetInt1 =
Integer.parseInt(offset1);
                int offsetInt2 =
Integer.parseInt(offset2);
                for(int r=0; r<alphaOff.size(); r+=2)
                {
                        int alpha1 =
Integer.parseInt((String)alphaOff.elementAt(r));
                        int alpha2 =
Integer.parseInt((String)alphaOff.elementAt(r+1));

                        if(!((alpha1==offsetInt1
&& alpha2<offsetInt2) || alpha1<offsetInt1))
                        {
                                return r;
                        }
                }
                return 1000000;
        }
}
```

XI. Acknowledgement

Bago ang lahat, nais ko munang pasalamatan ang sinumang mag-aalay ng kaniyang panahon upang basahin at unawain ang mga nilalaman ng akdang ito.

Ipinahahatid ko rin ang aking pasasalamat sa lahat ng aming mga guro na buong pusong nagbahagi ng kanilang mga kaalaman tungkol sa iba't ibang larangan sa mga estudyanteng katulad ko. Nagpapasalamat ako lalo't higit sa aking tagapayo na si Dr. Vincent Peter Magboo sa kanyang paggabay at pagsuporta hinggil sa proyektong ito. Nagpapasalamat din ako sa kanyang mga suhestiyon upang lalong mapaunlad ang kompyuter sistem na aking ginawa. Malaking pasasalamat din ang hatid ko para kay Ate Eden na palagian nang gumagabay sa amin tuwing kami ay may "presentation" o "defense".

Isa sa naging malaking parte ng aking buhay kolehiyo ay ang aking masasayahing mga kaibigan. Nais kong kunin ang pagkakataong ito upang pasalamatan kayo sa lahat ng mga alaala na ibinahagi ninyo sa akin. Salamat sa mga kuwentuhan, pangaral, korning jokes, "G-Box moments", "picture-an moments", at marami pang iba. Maraming salamat lalung-lalo na kina Oni, Tinmae, Reg, Anna, Ate Zari, Pau, Pierce, Mark, TJ at Mike.

Taos-pusong pasasalamat ang handog ko sa aking mga kamag-anak at kapamilya lalo't higit sa aking mga magulang sa kanilang pagmamahal at pagsuporta sa akin. Kayo po ang isa sa mga dahilan kung bakit ako nagsusumikap sa buhay. Kayo po ang aking inspirasyon na nagbibigay ng lakas ng loob sa akin upang harapin ang bawat pagsubok na dumarating.

Higit sa lahat, nagpapasalamat ako sa Poong Maykapal na palaging gumagabay sa atin saanman tayo naroroon. Nagpapasalamat din ako sa Kanya sa pagbibigay ng liwanag at pag-asa lalo na noong mga panahong pinanghihinaan ako ng loob.