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Enhancing Automated Question Paper Generation System with Weighting based on Bloom's Taxonomy

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Abstract: Bloom's Taxonomy is a framework used by educators to categorize the learning objectives that they assign to their students. This taxonomy's cognitive domain is intended to confirm a student's cognitive proficiency in a written test. Teachers mayoccasionally find it difficult to determine whether the exam questions they create adhere to Bloom's taxonomy requirements at various cognitive levels. Based on this taxonomy, this research suggests an automated examination question analysis to identify the relevant category. This rule-based method uses Natural Language Processing (NLP) approaches to find significant verbs and keywords that could help determine a question's category. The topic area of computer programming is the main emphasis of this work. Currently, the research uses a set of 100 questions, comprising 30 test questions and 70 training questions. According to preliminary findings, the guidelines could be able to help candidates accurately identify the Bloom's taxonomy category intest questions. By utilizing the hierarchical structure of Bloom's cognitive domain, automatic question paper production using Bloom's taxonomy can generate questions with different levels of complexityand cognitive ability. After analyzing the learning objectives or content using algorithms and natural language processing, the system creates pertinent questions that correspond with the levels of Bloom's taxonomy, which include knowledge, comprehension, application, analysis, synthesis, and assessment. This method aids teachers in developing thorough, well- balanced exams for pupils that encourage critical thinking and deeper comprehension.

Keywords: Bloom's Taxonomy, Natural Language Processing(NLP)

I. INTRODUCTION

A technology-based approach called Automatic Question Paper Generation employing Bloom's Taxonomy seeks to completely transform the way tests are given in educational institutions. The Bloom's Taxonomy framework is used by this systemto classify dividing learning objectives into six cognitive complexity categories in order to automatically create test questions. Prior to using the system, the learning objectives of a certain course or subject are examined. The approach creates a series of questions that correspond with the levels of Bloom's Taxonomybased on these objectives. The purpose of the questions is to evaluate the student's comprehension of the material at various cognitive levels, from basic recollection to in-depth analysis.

An clever algorithm built into the system makes sure the questions are varied, difficult, and pertinent to the subject matter. Additionally, it gives the pupils performance-based feedback, which aids in helping them recognize their strengths and shortcomings. This technology has a lotof advantages. Teachers no longer need to spend time and resources creating question sheets by hand thanksto this. Second, because the questions are automatically generated based on the learning objectives, it guarantees uniformity and fairness in tests. Thirdly, since students can practice responding to questions at various cognitive levels, it offers thema personalized learning experience. In the field of education, automatically generating question papersusing Bloom's Taxonomy is revolutionary. It guarantees uniformity and fairness in assessments, improves the learning experience for students, and saves teachers time and resources. This method will probably get more complex and be incorporated intoadditional educational systems as technology develops.

II. LITERATURESURVEY

Starting in 1948.A team of educators took on the responsibility of categorizing the aims and objectives of education. The three domains of the cognitive, emotional,and psychomotor domains were to be classified using a new system. The 1950s saw the completion of work onthe cognitive domain, which is now known as Bloom's taxonomy of the cognitive domain. The renowned Bloom's taxonomy is divided into six tiers. a) Level of knowledge: Also referred to as "rote learning" or "memorization," remembering data is another name for it.

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the base of the hierarchy, or the lowest level. This level involves pupils recalling previously learned material or memorizing facts[1]. Programming questions in thiscategory must meet certain requirements, such as remembering particular information from earliercourses, defining or explaining computer concepts, methodology, and process, identifying the importance of a topic, concept, or term, and explicitly listing information from questions.2]Examples: a) Enumerate every node in node J's left subtree. b) List the essential characteristics of a binary tree. c) In Java, define a method. b) Comprehension level: This level is defined as understanding the significance of the data. These levels' notions include the capacity for interpretation, translation, extrapolation, classification, and explanation[3]. Programming questions in this category could involve translating algorithms (writing a program's output, for example), elucidating the steps and sequence of a program, or giving examples to clarify ideas or algorithms. Examples: a) What does the code segment that follows produce as its output? b) Describe in words what occurs in the C++ code that follows. c) Application-level: Applying the idea to a particular situation defines application[4].

The queries Examples include: a) Declare a variable called employees to hold the 120 employees' records. c) Convert the provided while loop from a for loop. d) The evaluation level: This is the last stage, when one must judge, criticize, and either support or defend one's own position[5]. By determining whether the code satisfies the requirements for the testing technique, the programming question is understood. At this level, code quality is also commented according to standards or execution criteria. Example: a) Explain the idea of inheritance and provide an example of code to support your position. e) Synthesis-level: Students who reach this level should be able to reorganize parts of ideas or concepts to create a new whole, such as a product, plan, pattern, or proposal[6].

This level's programming questions should direct students to develop complete programs or come up with original algorithms or alternate approaches to problems in order to writecodes based on earlier levels. As an illustration: If the statements from lines 22 to 34 were to be carried out ina function, then a) Write the definition of the function Output Time[7]. b) Create a software application that asks the user to enter the masses and spacing between the bodies. The force between the bodies is then output by the algorithm.[8] 2. The end-to-end automatic cloze question generating system in this proposed system uses a knowledge base that was taken from a Cricketportal to generate CQs in a semi-structured manner[9]. Furthermore, in contrast to earlier making a CQ. This clears out the query and prevents situations when a question has more than one answer.

We have clarified the issue in Example 1 by including background information about the world cup final. Applications for such a CQG system include quizzing platforms, trivia contests, and evaluating fans on social media by asking questions about the games theyplay.[10] Three. We investigate whether the questions generated by our system can be effectively utilized as pre-questions in this suggested system, thereby assisting those who develop assessment materials. Prequestions with accompanying images and text- based questions are the two forms of prequestions that are examined. We analyze the impact of pre-questions on test-takers' performance on a comprehension test about a scientific video documentary in order to assess if pre-questions are more effective when used in conjunction with audio-visual learning materialsthan when read alone.[11] We also investigate if the psychometric properties of questions generated automatically (by two systems) match those generated manually. One of the most crucial indicators of a question's quality is its psychometric qualities, such asits discrimination power.[12]

III. MOTIVATION

Because of the demand we are facing today and the growth in the field of computer science, this is a hard time. Exams are therefore essential for evaluating students' performance. For this reason, it's critical to have a clever development question model that assesses students' learning abilities and fosters their growth, all while monitoring their progress. Traditionally, question papers have been created manually. Using this technique, some officials write the question on the paper. But because of bias, repetition, and security issues, this approach may occasionally prove to be useless. We have developeda quick, efficient, randomized, and secure method for creating question papers.

IV. OBJECTIVE

Designing a smart question generation system for academic purposes necessitates a multifaceted approach,ensuring varied questions align with course objectives. Utilizing algorithms and NLP techniques, the system swiftly generates tailored question papers based on teacher inputs. By encompassing diverse question typesand cognitive levels, it fosters comprehensive assessment while promoting critical thinking. To prevent redundancy, the system dynamically selects questions from a categorized database, updating regularly for relevance. Its user-friendly interface empowers teachers to input specifications effortlessly and customize assessments.

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V. SYSTEMARCHITECTURE

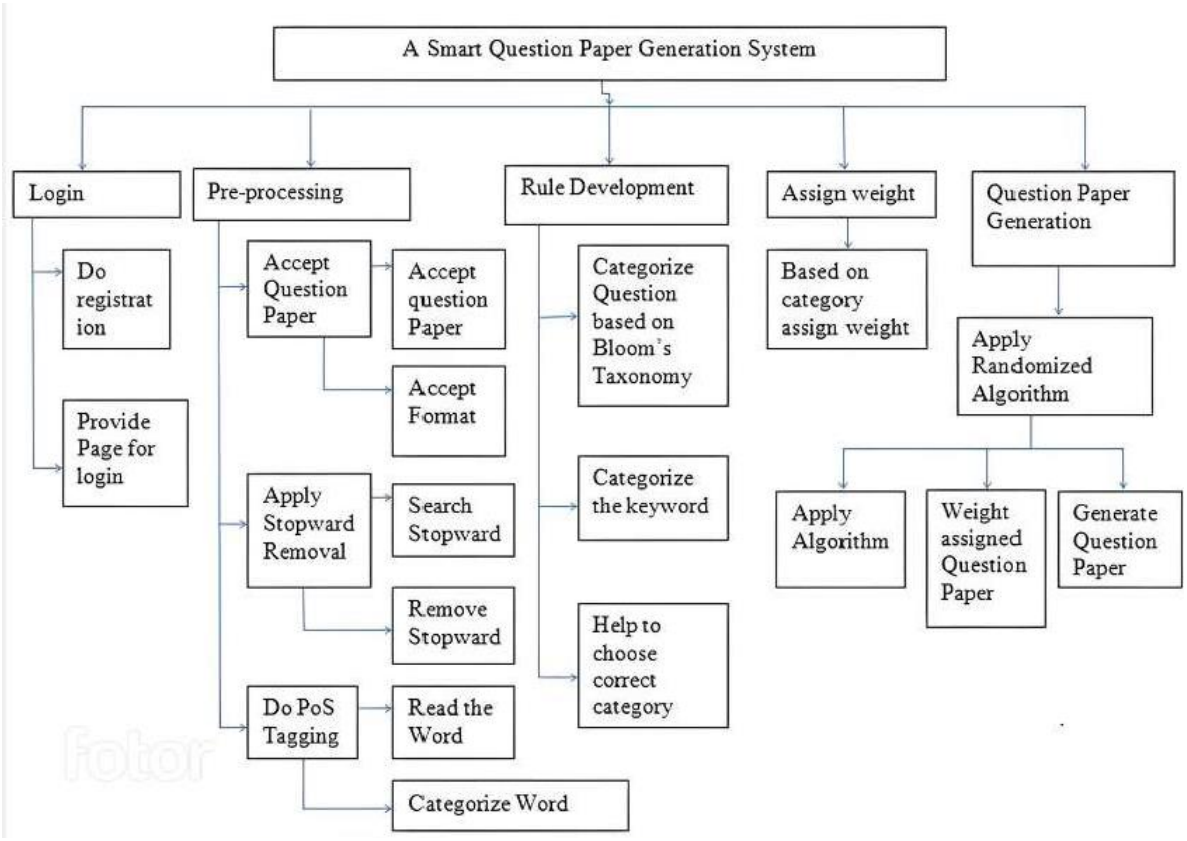

Figure1: System Architecture

The approved user will register, and upon successful registration, they will receive their login credentials. The user can input a text file by either manually inputting it or by supplying the file's path after logging in. The questions will be produced based on the input received. The user has the ability to examine and modify questions. By choosing preferred questions that the software generates, a question paper can be created.

VI. METHODOLOGY ANDSCOPE

Bloom's Taxonomy is a framework used by educators to categorize the learning objectives that they assign to their students. This taxonomy's cognitive domain is intended to confirm a student's cognitive proficiency in a written test. Teachers may occasionally find it difficult to determine whether the exam questions they create adhere to Bloom's taxonomy requirements at various cognitive levels. Based on this taxonomy, this research suggests an automated examination question analysis to identify the relevant category. This rule-based method uses Natural Language Processing (NLP) approaches to find significant verbs and keywords that could help determine a question's category. The topic area of computer programming is the main emphasis of this work. Currently, the research uses a set of 100 questions, comprising 30 test questions and 70 training questions. According to preliminary findings, the guidelines could be able to help candidates accurately identify the Bloom's taxonomy category in test questions. 1. Data mining: Using techniques from the fields of machine learning, statistics, and database systems, data mining is the computational process of finding patterns in massive data sets. 2.Bloom Taxonomy: This taxonomy organizes the many goals and competencies that teachers assign to their pupils (learning objectives). Benjamin Bloom, a University of Chicago educational psychologist, first suggested the taxonomy in 1956. 3. Organic Language Processing: Natural Language Processing, or NLP for short, is the academic discipline that focuses on the exchanges between human language and computers. 4.Randomized Algorithm: An algorithm that incorporates some degree of randomization into its logic is called a randomized algorithm. Formally, the running time or the output, or both, are random variables since the algorithm's performance is determined by the random bits.The system's scope comprises the following: it will be built in a way that guarantees the analysis of the questions we provide as input and in accordance with the completed classification. It will intelligently produce a test. The system will save time and generate the result quickly. The machine will create the question papers, reducing the need for human labor. The system will yield an objective outcome.

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VII. IMPLEMENTAION

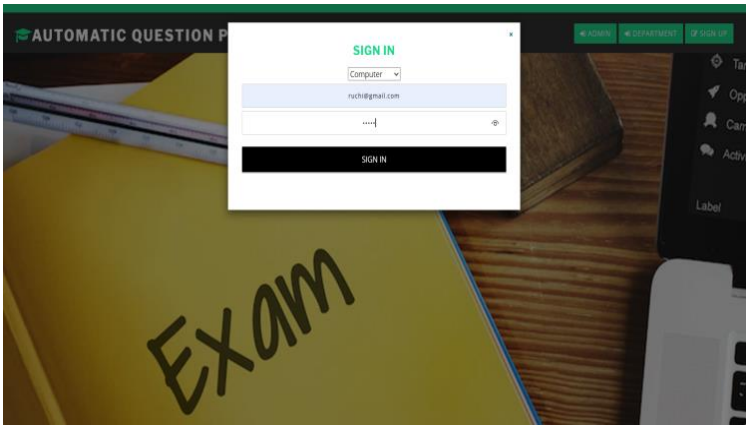
Randomization Algorithm Steps:
1. Pre-processing : Text pre-processing is a method in natural language processing to make the computer understand the structure or content of the text. Text preprocessing involves processes such as stopwords removal, stemming, lemmatization and POS tagging.

2. Rules Development: a rule-based approach is adopted in determining the category of an examination question based on the Bloom's taxonomy. The rules are developed from a training set which consists of 70 examination questions The rules will distinguish the suitable keyword for each question depending on its category.

Algorithm 1/Pseudo Code
Question paper generation Randomization Algorithm For N questions avail
able in database
Step 1: Create a List L of N elements
Step 2: Generate a random number n such that 1¡=n
Step 3: If n L
Go to Step 2
else Store n in the List L
Step 4: Select a question from database corresponding to n, whose flag==true
Step 5: For the question , set flag=false

VIII. RESULT

Home Page



Login Page

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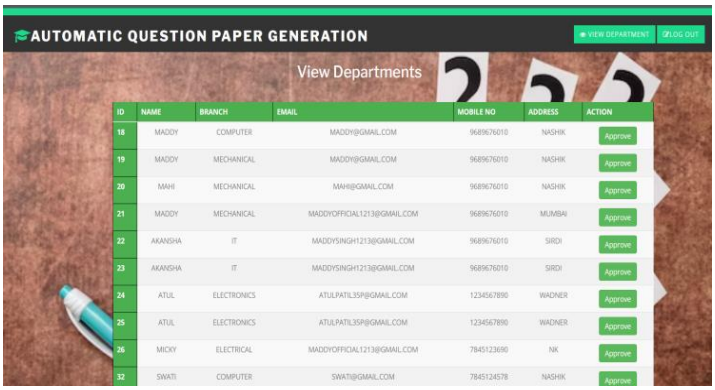
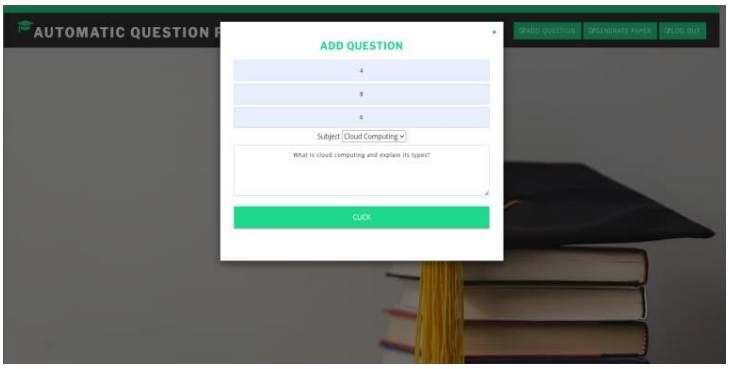
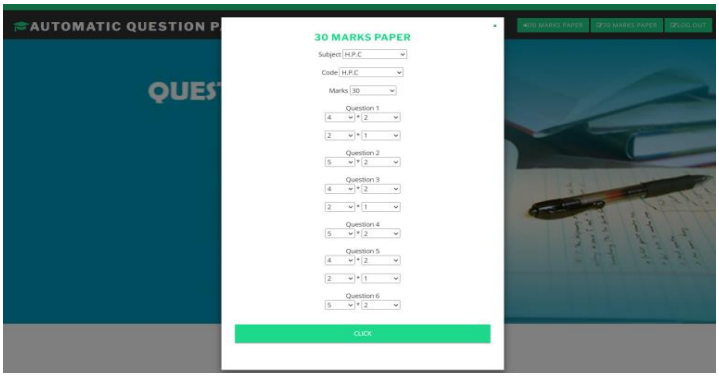
Questions paper dashboard



Admin Module



Dashboard of Add Questions



Question Paper Dashboard

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B.E.(Computers)
SDMT
Subject Code:410449

[Time: 2 Hour] [Max. Marks:30]

Q1)

a) design BI Dashboard. [4]

b) compare static and dynamic modeling with an example. [4]

c) explain hierarchical control architectural pattern in real time software architecture.? [2]

OR

Q2)

a) justify business application for retail shop management. [5]

b) write or define JUnit. [5]

Q3)

a) write the significance of BI Dashboard. [4]

b) give brief description of behavioural pattern. [4]

c) what is security testing [2]

OR

Q4)

a) Define architectural sterotype with example. [5]

b) write or define Selenium. [5]

Q5)

a) compare white box and black box testing [4]

b) phases in decision making processs. [4]

c) state Validation Testing in brief. [2]

Question paper

IX. CONCLUSION

Bloom's Taxonomy is a framework used by educators to categorize the learning objectives that they assign to their students. to automate the process of classifying test questions based on cognitive levels and Bloom's Taxonomy. The creation of regulations could increase the outcome's correctness.

A real-time implementation of the smart model for question paper generation will be implemented in this system. By giving the control access to the resources, the suggested work describes a smart system that advances from the conventional way of question paper creation to a smart process.

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