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Automatic Question Paper Generation and Weightage Using Blooms's Taxonomy

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Abstract: Bloom's Taxonomy is a classification of learning objectives within education that educators set for students. The cognitive domain within this taxonomy is designed to verify a student's cognitive level during a written examination. Educators may sometimes face the challenge in analysing whether their examination questions comply within the requirements of the Bloom's taxonomy at different cognitive levels. This paper proposes an automated analysis of the exam questions to determine the appropriate category based on this taxonomy. This rule based approach applies Natural Language Processing (NLP) techniques to identify important keywords and verbs, which may assist in the identification of the category of a question. This work focuses on the computer programming subject domain. At present, a set of 100 questions (70 training set and 30 test set) is used in the research. Preliminary results indicate that the rules may successfully assist in the identification of the Bloom's taxonomy category correctly in the exam questions. Automatic question paper generation using Bloom's taxonomy is a technique that leverages the hierarchical structure of Bloom's cognitive domain to create questions of varying complexity and cognitive levels. The system uses algorithms and natural language processing to analyse the learning objectives or content and then generates appropriate questions that align with Bloom's taxonomy levels, such as knowledge, comprehension, application, analysis, synthesis, and evaluation. This approach helps educators to create well-balanced and comprehensive assessments for students, promoting deeper understanding and critical thinking.

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

I. INTRODUCTION

Automatic Question Paper Generation using Bloom's Taxonomy is a technology based solution that aims to revolutionize the way exams are conducted in educational institutions. This system utilizes the Bloom's Taxonomy framework, which categorizes learning objectives into six levels of cognitive complexity, to generate question papers automatically. The system works by first analyzing the learning objectives of a particular course or subject. Based on these objective, the system generates a set of questions that are aligned with the Bloom's Taxonomy levels. The question are designed to assess the student's understanding of the subject matter at different cognitive levels, ranging from simple recall to complex evaluation.

The system is equipped with an intelligent algorithm that ensures the questions are diverse, challenging, and relevant to the course. It also provides feedback to the students based on their performance, which helps them identify their strengths and weaknesses. The benefits of this technology are numerous. Firstly, it saves time and resources for educators, as they no longer have to manually create question papers. Secondly, it ensures consistency and fairness in exams, as the questions are generated automatically based on the learning objectives. Thirdly, it provides a personalized learning experience for students, as they can practice answering questions at different cognitive levels. Automatic Question Paper Generation using Bloom's Taxonomy is a game-changer in the education industry.

It enhances the learning experience for students, saves time and resources for educators, and ensures consistency and fairness in exams. As technology continues to advance, it is likely that this system will become more sophisticated and integrated into various educational platforms.

II. LITERATURE SURVEY

Beginning in 1948.A group of educators undertook the task of classifying education goals and objectives The intent was to develop a classification system for three domain: The cognitive, the affective, the psychomotor. Work on cognitive domain completed in 1950s and is commonly referred to as Blooms taxonomy of the cognitive domain. The famous Bloom's taxonomy consists of six levels a) Knowledge-level: Also known as recalling of data, refers it as 'rote learning' or 'memorization'. This level serves as the lower level or the beginning level of the hierarchy. It is a level where students remember or memorize facts or recall the knowledge they learn before[1].

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The questions for programming in this category have the criteria of recalling specific input from previous lessons, defining or describing computing terms, methodology and process, stating relevance description for a subject area, concept or term and listing explicitly information from questions .[2] Examples: a) List all the nodes in the left subtree of node J. b) Describe the key properties of a binary tree. c) Define method in JAVA. b) Comprehension level: Describes this level as grasping the meaning of information. The ability to interpret, translating, extrapolating, classifying, explaining are the concepts of these levels[3].

The questions for programming in this category could be translating algorithm (e.g.; write output of a program), explaining the processes and flows of program and providing examples to illustrate a concept or an algorithm. Examples: a) What is the output of the following code segment? b) Explain in words what happens in the following C++ code. c) Application- level: Application is defined by applying the concept to a certain scenario[4] .

The questions for programming in this category have the following criteria: understand the concept and use it to a new algorithm and modifying controls. Examples: a) Declare a variable, employees to represent the records of 120 employees. b) Modify the given for loop into while loop. d) Evaluation- level: This is a final level where judging, criticism, supporting or defending own stand involves[5].

The programming question is interpreted by checking codes if the code fits the requirement for testing strategy. This level also includes commenting quality of codes based on standards or execution criteria. Example: a) Justify the concept of inheritance and give the sample of code to illustrate your answer. e) Synthesis-level: If a student achieves this level, the student should be able to integrate and combine ideas or concepts by re- arranging components into a new whole (a product, plan, pattern or proposal)[6].

The programming questions for this level should instruct student to write codes based on previous level by writing a complete program or create new alternative methods or algorithm to solve a problem. Examples: a) Write the definition of the function Output Time if the statements from the lines 22 to 34 were to be performed in a function[7]. b) Write a program that prompts the user to input the masses of the bodies and the distance between the bodies. The program then outputs the force between the bodies.[8] 2. In this proposed system present an end-to- end automatic cloze question generating system which adopts a semi-structured approach to generate CQs by making use of a knowledge base extracted from a Cricket portal[9].

Also, unlike previous approaches we add context to the question sentence in the process of creating a CQ. This is done to disambiguate the question and avoid cases where there are multiple answers for a question. In Example 1, we have disambiguated the question by adding context in the world-cup final. Such a CQG system can be used in a variety of applications such as quizzing systems, trivia games, assigning fan ratings on social networks by posing game related questions.[10] 3. In this proposed system, we examine whether the questions produced by our system can be successfully used as pre-questions and thus support creators of assessment materials. Two different types of prequestions are investigated: text-based and with supporting image. This experiment also serves to test whether pre-questions have a beneficial effect in combination with audio-visual learning material as opposed to reading material; we analyse the effect pre- questions have on test-takers performance on a comprehension test about a scientific video documentary.[11].We also examine whether or not questions generated automatically (by two systems) have the same psychometric parameters as those generated manually. The psychometric parameters of questions, such as their discrimination power, are among the most important measures of the quality of the questions.[12]

III. MOTIVATION

This is a challenging era due to the growth in the field of computer science and demand we are facing today. Hence examinations play a vital role in testing student's performance. And that is why it is important to have a smart development question model for growth of students as well as to test their learning skills thereby keeping a check on student performance. Now the traditional method of generating question paper has been manual. In this method certain officials chalk out the question paper. But this method can be ineffective at times owing to bias, repetition and security concerns. We have proposed an Question Paper Generation which is fast, streamlined, randomized and secure.

IV. OBJECTIVE

To make question papers with varied questions and which meet learning objectives of the course. To design approach for smart question generation system for academic purpose. To generate the question paper from teacher entered specification within few seconds. To cover all aspects of the course objectives and avoid duplication of questions in the subsequent exams.

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V. SYSTEM ARCHITECTURE

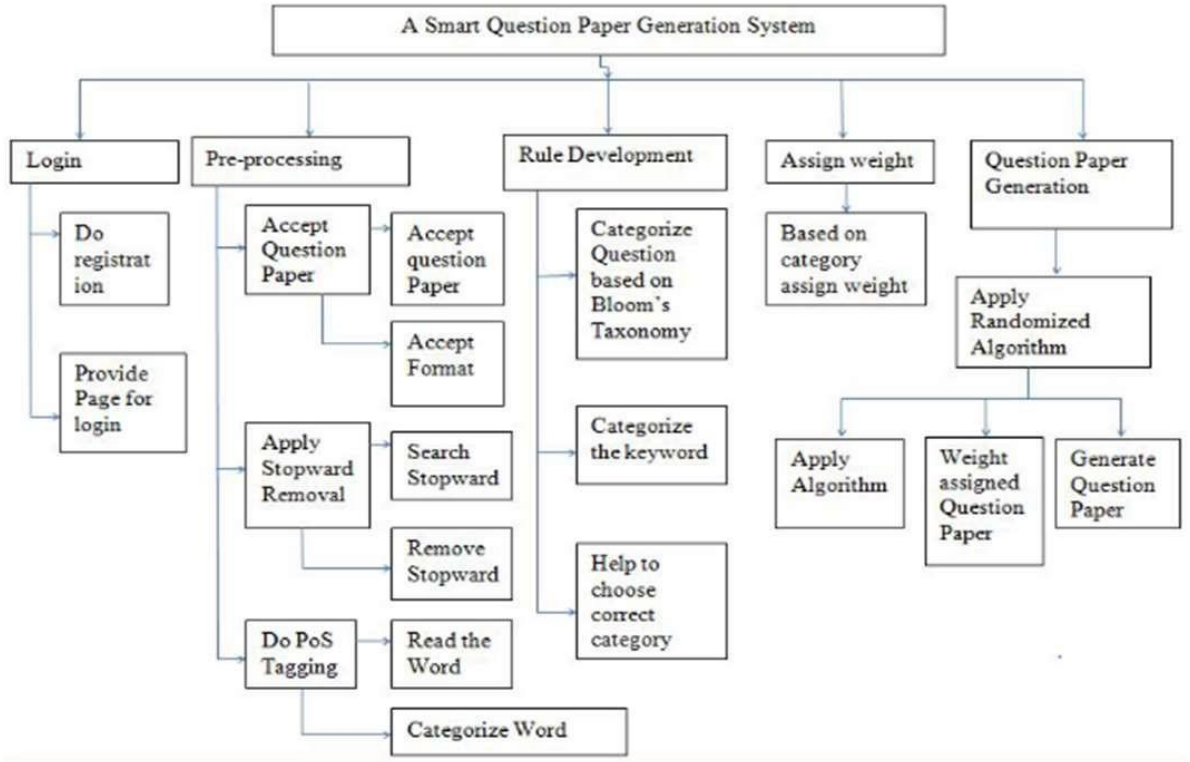

Figure 1: System Architecture

The authorized user will register, after the successful registration the user will be provided by the login-Id and password. After logging-In the user can input the text file either by manually entering it or by providing the path of the file. After the input is provided, the questions will be generated accordingly. Questions can be reviewed and manipulated by the user. A question paper can be generated by selecting desired questions generated by the software.

VI. METHODOLOGY AND SCOPE

Bloom's Taxonomy is a classification of learning objectives within education that educators set for students. The cognitive domain within this taxonomy is designed to verify a student's cognitive level during a written examination. Educators may sometimes face the challenge in analysing whether their examination questions comply within the requirements of the Bloom's taxonomy at different cognitive levels. This paper proposes an automated analysis of the exam questions to determine the appropriate category based on this taxonomy. This rule-based approach applies Natural Language Pro- cessing (NLP) techniques to identify important keywords and verbs, which may assist in the identification of the category of a question.

This work focuses on the computer programming subject domain. At present, a set of 100 questions (70 training set and 30 test set) is used in the research. Preliminary results indicate that the rules may successfully assist in the identification of the Bloom's taxonomy category correctly in the exam questions.

1. Data mining: Data Mining is the computing process of discovering patterns in large data sets involving methods at the intersection of machine learning, statistics and database systems.

2. Bloom Taxonomy:Blooms Taxonomy is a classification of the different objectives and skills that educators set for their students (learning objectives). The taxonomy was proposed in 1956 by Benjamin Bloom, an educational psychologist at the University of Chicago.

3. Natural Language Processing: The field of study that focuses on the interactions between human language and computers is called Natural Language Processing, or NLP for short.

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4. Randomized Algorithm: A randomized algorithm is an algorithm that employs a degree of randomness as part of its logic. Formally, the algorithm's performance will be a random variable determined by the random bits; thus either the running time, or the output (or both) are random variables.

Scope of this system includes: This system will be designed in such a way to ensure that analyze of questions which we will give as a input and according to the classification done. It will smartly generate question paper. The system will produce the result fast it will also save time. The question papers will be generated by system itself so that efforts of human will be reduced. System will provide unbiased result.

VII. CONCLUSION

Bloom's Taxonomy is a classification of learning objectives within education that educators set for students. To automate the process of categorizing examination question according to Bloom's Taxonomy based on its cognitive levels. The formation of rules may improve the accuracy of the result .In this system smart model for question paper generation will be implemented as real time application. The proposed work describe a smart system that progress from the traditional method of question paper generation to an smart process by providing the control access to the resources.

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