Blooms Taxonomy Based Question Paper Generation Using Machine Learning Algorithms

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Abstract: Exams are a key part of education, helping to test what students know and can do. However, making question papers the traditional way can be a tiring and time-consuming task for teachers. It's not always easy to balance the difficulty of the questions and make sure they cover all the important topics in the curriculum. This can sometimes lead to mistakes or uneven question papers.

With technology improving quickly, there is now a need for better ways to create exam papers that save time and still maintain high quality. One of the big challenges in this process is ensuring that questions cover different thinking levels, as explained in Bloom's Taxonomy. This framework organizes learning into categories like remembering, understanding, applying, and analyzing.

This project introduces an automated system to make creating question papers faster and easier. Using machine learning, the system can generate questions that match Bloom's Taxonomy and create well-balanced papers. These papers are customized to meet the needs of the subject and the educational goals of the institution.

To make the process even smoother, the system can produce the question papers as PDFs. This makes it simple for teachers to review, share, and store them. Automation reduces the chances of errors and gives teachers more time to focus on teaching and helping students.

In short, this project uses smart technology to simplify exam paper creation. It ensures that question papers are fair, high-quality, and aligned with educational goals, making life easier for teachers and improving the learning experience for students.

Key Words: Question paper generation, educational technology, machine learning, assessment processes, PDF format, educational institutions, government exams

INTRODUCTION

Examinations are an important part of education, helping to assess students' knowledge and skills. However, creating question papers manually can be a challenging and time-consuming job for teachers. It often leads to errors and inconsistencies, making it difficult to ensure high-quality assessments.

This project offers a solution to simplify and automate the process of creating question papers. Using machine learning and Bloom's Taxonomy, the system ensures that the questions are well-structured and meet educational standards. It also includes a feature to generate question papers in PDF format, making it easier for examiners to access and use them.

Background of the Industry:
Question papers are essential tools for testing students' understanding and abilities. However, manually preparing these papers is a tedious and error-prone task. It can result in repeated questions and affect the fairness of the exams.

This project addresses these problems by introducing an automated system that generates question papers accurately and efficiently. It ensures that the questions align with educational goals. Additionally, the option to email the papers to examiners makes the process more modern and convenient.

LITERATURE SURVEY

The literature survey reviews previous research on automated question paper generation, focusing on both proposed and existing systems.

Proposed system:

[1] Bangera Shanika Ashok Shanthi (Year) discusses automated question generation using a genetic algorithm, emphasizing the shared goal of automation despite differing approaches.

[2] Yulia Timakova (Year) demonstrates the value of incorporating Bloom's Taxonomy in question paper generation, while

[3] Zalte S.V. (Year) provides insights into automated paper generation and avoiding question repetition.

For existing systems:-

[4] Zalte S.V. (Year) serves as a benchmark for traditional methods, highlighting the need for innovation.

[5] Yulia Timakova's (Year) system showcases challenges in manual processes and potential for improvement through automation.

[6] Akhil Killawala (Year) introduces the idea of using computational intelligence for generating quiz questions, emphasizing the significance of automated content creation in educational technology.

Problem Definition

The challenge lies in the time-consuming and effort-intensive task of manually creating question papers for exams. This process often leads to inefficiencies, errors, and a lack of variety in question types. Furthermore, manual methods can result in the repetition of questions across different exams, which undermines the fairness and credibility of assessments. Therefore, there is a need for an automated solution capable of generating diverse and unique question papers efficiently, while ensuring they are high-quality and relevant to the subject matter.

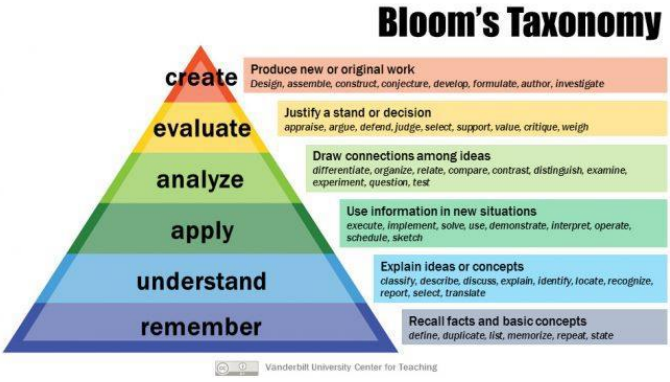

Fig [1] blooms Taxonomy levels

Proposed Working

The proposed system is designed to predict marks and Bloom's Taxonomy levels by leveraging datasets and employing linear regression and random forest algorithms. It also allows for the creation of datasets for various subjects and the generation of question papers at different difficulty levels. Below is a step-by-step overview of the process:

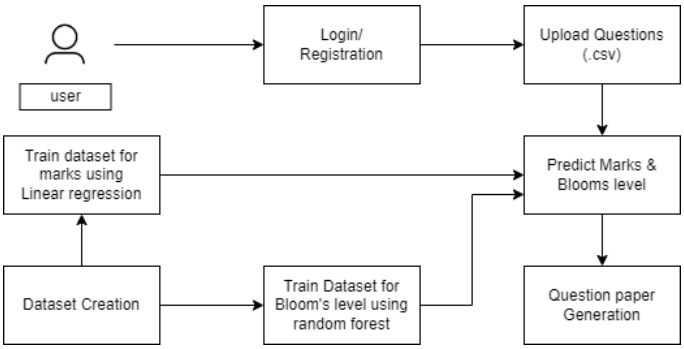

Fig [2] System Architecture

1. Login/Registration

Users can either sign into the system with existing credentials or create a new account to access its features.

2. Upload Questions (.CSV)

Users can upload question papers in CSV format. The uploaded file should include the questions, their answers, and the corresponding Bloom's Taxonomy level for each question.

3. Dataset Creation

The system processes the uploaded questions and generates a dataset. This dataset is utilized to train machine learning models for further functionality.

4. Train Dataset for Marks Prediction using Linear Regression

The system divides the dataset into training and testing sets. The training set is used to develop a linear regression model that predicts the marks associated with each question, while the testing set evaluates the model's accuracy.

5. Train Dataset for Bloom's Level Prediction using Random Forest

Similarly, the dataset is split into training and testing sets. The training set is used to build a random forest model that predicts the Bloom's level for each question, and the testing set assesses the model's performance.

6. Question Paper Generation

After the models are trained, they are utilized to generate new question papers. The linear regression model determines the marks for each question, and the random forest model categorizes the Bloom's level, ensuring well-structured question papers.

7. Result

The automation of manual question paper generation has resulted in an efficient, reliable, and user-friendly system. This system can produce diverse and unique question papers with minimal human input, significantly saving time and effort for educators and administrators. It reduces the risk of errors and ensures fair and accurate assessments.

The system also offers customizable difficulty levels, uses Bloom's Taxonomy for organizing questions, and supports various formats for easy sharing and administration. Overall, it provides an optimized and enhanced approach to generating question papers, improving the educational assessment process.

Objectives

The primary objective of this project is to develop an automated system for generating question papers that integrates machine learning algorithms and Bloom's Taxonomy. The system aims to enhance the efficiency, accuracy, and quality of the examination process by addressing several key goals:

1. Automation of Question Paper Generation: The project seeks to automate the traditionally manual process of creating question papers. This reduces the time and effort required from educators while ensuring that the quality and relevance of the questions remain high.

2. Incorporation of Bloom's Taxonomy for Balanced Assessment: By integrating Bloom's Taxonomy, the system ensures that the generated questions cover a range of cognitive levels, from basic knowledge

recall to higher-order thinking skills such as analysis, synthesis, and evaluation. This helps create a comprehensive and pedagogically sound assessment that aligns with educational objectives.

3. Reduction of Human Error: The automated system aims to eliminate common human errors in question paper creation, such as repeated questions, misalignment with learning outcomes, or inconsistent difficulty levels. This contributes to more accurate and reliable assessments.

4. Customizable Question Papers: The system allows educators to customize question papers according to specific requirements such as subject matter, difficulty level, and the number of questions. This ensures the flexibility of the exams, making them adaptable to different curricula and institutional guidelines.

5. Scalability and Accessibility: The project aims to develop a scalable system that can generate question papers for a wide range of educational institutions, from schools to universities. The system's ability to generate question papers in PDF format further enhances accessibility and ease of use for educators.

CONCLUSION

In conclusion, the Blooms Taxonomy Based Question Paper Generation Using Machine Learning Algorithms system is a major improvement in educational technology, simplifying the traditional process of creating question papers. By using machine learning and aligning questions with Bloom's Taxonomy, the system makes it easier to customize exams and ensures fair assessments. The system's user-friendly design and automated process save time and make things more convenient for administrators. It can be used in various educational institutions and government exams, offering a chance to improve how assessments are done. In short, this system is an important innovation that can change and improve the way exams are created and managed in different educational settings.

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REFERENCES

[1] D. V. Paul, "Automatic question paper pattern generation using GA approach," INFOCOMP Journal of Computer Science, vol. 19, no. 1, 2020.

[2] M. S. Daware, "Automatic generation of question paper using NLP techniques & taxonomy rules," Vidyawarta, 2019.

[3] B. S. A. Shanthi, L. J. R. Harshitha, and K. Manasa, "Automated exam question generator using genetic algorithm," 2019.

[4] B. T. G. S. Kumara, A. Brahmana, and I. Paik, "Bloom's taxonomy and rules based question analysis approach for measuring the quality of examination papers," International Journal of Knowledge Engineering, vol. 5, no. 1, pp. 2–6, 2019.

[5] Y. Timakova and K. A. Bakon, "Bloom's taxonomy-based examination question paper generation system," 2018.

[6] S. V. Zalte, C. C. Jadhav, A. A. Mangire, A. D. Hole, and A. R. Tulshi, "Automatic question paper generator system," International Journal of Advanced Research in Computer and Communication Engineering ISO 3297:2007 Certified, vol. 7, no. 3, 2018.

[7] D. R. Ch and S. K. Saha, "Automatic multiple choice question generation from text: A survey," IEEE Transactions on Learning Technologies, 2018.

[8] S. Dhainje, "An automatic question paper generation: using bloom's taxonomy," 2018.

[9] A. Killawala, I. Khokhlov, and L. Reznik, "Computational intelligence framework for automatic quiz question generation," 978-1-5090-6020-7/18/_c 2018 IEEE.

[10] F. K. Gangar, H. G. Gori, and A. Dalvi, "Automatic question paper generator system," International Journal of Computer Applications, vol. 66, no. 10, pp. 42–47, 2017.

[11] Guan, Liancheng. "The design of the automatic generative system of examination papers," 2017 Sixth International Conference on Future Generation Communication Technologies (FGCT). IEEE, 2017.

[12] A. S. Khairnar, B. C. Jadhav, R. Birhade, P. Patil, "Automatic question paper generator," International Journal For Technological Research In Engineering, vol 4, no. 9, 2017.

[13] A. Leekha, T. Barot, and P. Salunke. "Automatic question paper generator system," International Journal of Research in Engineering and Technology.(IJSRET), vol. 6 no. 4, pp. 331–332, 2017.