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Efficient Subjective Answer Evaluation in E-Learning: Leveraging AI for Automated Scoring

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Abstract:- Online education is becoming increasingly prevalent, and the need for effective evaluation methods in this context is more critical than ever. This research addresses the challenge of assessing subjective answers in online examinations efficiently. Our software application utilizes artificial intelligence (AI) to automate the process of scoring subjective responses. It involves storing original answers provided by administrators, and when a user takes a test, their answers are compared to the stored originals. The system employs AI techniques to assess answers, accounting for variations in language and expression. The key objective is to enhance the accuracy and speed of the evaluation process, while reducing the administrative burden. This work not only offers a practical solution for e-learning environments but also opens the door to continuous improvement through the integration of evolving AI technologies.

Keywords:- *E-Learning, Automated Scoring, Language variation, Accuracy.*

I. INTRODUCTION

Traditional methods of examination and grading, tailored to physical classrooms, fall short when applied to the digital realm. Online education, characterized by its flexibility, accessibility, and scalability, demands a new approach to evaluation—one that not only maintains the integrity of the assessment process but also enhances its efficiency. As e-learning continues to gain traction, the assessment of student performance in an online environment has become a paramount concern. Online examination systems are becoming increasingly popular due to their convenience and efficiency. However, evaluating subjective answers can be a challenge, as it requires human evaluators to assess the quality of the answers based on a variety of criteria. This can be a time-consuming and error-prone process.

This research paper proposes a new online examination system that uses artificial intelligence (AI) to automate the evaluation of subjective answers. The system uses a machine learning classifier to train on a dataset of model answers and keywords. Once the classifier is trained, it can be used to evaluate the answers of students in real time and provide them with immediate feedback.

The proposed system here suggests the solution to conventional manual evaluation techniques that reveals several benefits. It is faster and more effective, more objective and less prone to human error. It also provide students with immediate feedback, which can help them to improve their learning.

II. EXISTING SYSTEM

Manual grading of answer sheets can be monotonous and time-consuming for examiners. Therefore, the system alleviates this burden by automating the grading process with precision. Consequently, the system eliminates the need for human intervention, resulting in substantial time and resource savings.

III. PROPOSED METHODLOGY

Our proposed system is engineered to assess responses given by the different users. Within our database, we maintain the standard answer accompanied by its description, meaning, and associated keywords. The system undertakes the task of evaluating each response by comparing the presence of keywords, essential concepts, and their synonyms against the standard answer. It also conducts a meticulous examination of grammar and spelling within the responses. Upon completion of this evaluation, the system assigns a grade based on the accuracy of the response. The overall evaluation process is comprised of three primary stages: Keyword Extraction, Keyword comparison and Scoring Mechanism.The grading mechanism relies on the count of matched keywords and synonyms to determine the final score for each answer.

IV. SUPPORT VECTOR MACHINES (SVM)

Support Vector Machines (SVM) are a class of supervised learning algorithms that have gained widespread popularity in the fields of machine learning and data science. SVMs are known for their effectiveness in both classification and regression tasks. This paper aims to provide a comprehensive understanding of SVM, its underlying principles, and its versatility in solving complex real-world problems.

In classification tasks, SVMs are used to predict the class label of a new data point. They do this by finding a hyperplane that separates the data into two classes with the maximum margin. The hyperplane is defined by the support

vectors, which are the data points that are closest to the hyperplane.

In regression tasks, SVMs are used to predict the continuous value of a new data point. They do this by finding a hyperplane that best fits the data. The value of the new data point is then predicted based on its location relative to the hyperplane.

A. Principles of SVM:

➢ *Mathematical Foundations :*

SVM operates on the principles of maximizing the margin between data points and defining a decision boundary that separates different classes or predicts continuous values. The mathematical foundation, including the notion of support vectors and the kernel trick, will be explored in this section.

➢ *Optimization:*

SVM involves solving a convex optimization problem, and this section delves into the mathematical optimization techniques used in SVM training, such as quadratic programming.

B. SVM in Classification

➢ *Linear SVM:*

Linear SVM is the simplest form of SVM, used for binary and multiclass classification. We will discuss how it constructs linear decision boundaries for classification tasks.

➢ *Non-Linear SVM:*

Non-linear SVM extends the capabilities of SVM to handle nonlinearly separable data. Kernel functions, such as the polynomial and radial basis function (RBF) kernels, will be explained.

➢ *Multi-Class Classification:*

SVM can be adapted for multi-class classification problems through methods like one-vs-one and one-vs-all. This section explores these strategies.

C. SVM in Regression

➢ *Support Vector Regression (SVR):*

SVM can also be applied to regression problems. SVR aims to find a hyperplane that best fits the data while allowing for a margin of error. We will discuss the principles and applications of SVR.

V. ARCHITECTURE DIAGRAM

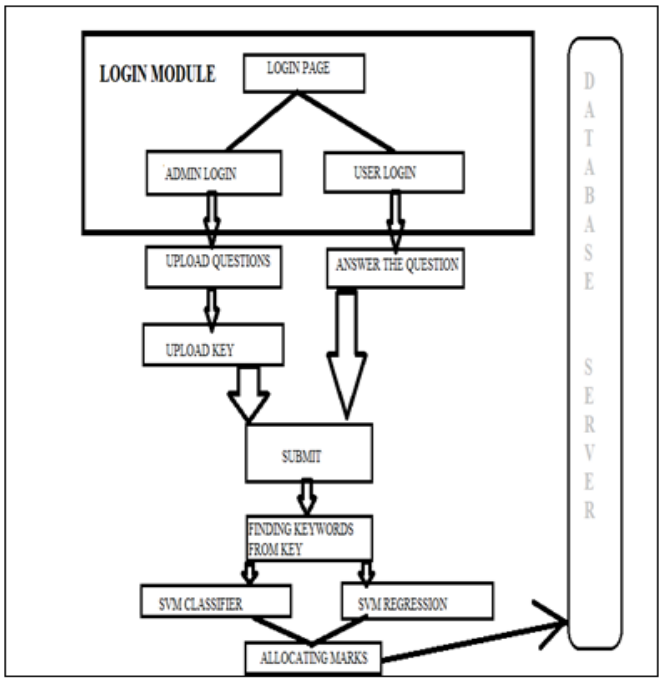

Fig 1 Architectural Diagram of Answer Verifier

➢ *Modules:*

- *Authentication and user Access Management:*

The Authentication module handles user and admin authentication. Users, upon successful login, gain access to answer-writing functionality. User authentication requires entering a login ID and test ID. Once authenticated, users can view questions and submit answers. Admin authentication necessitates the entry of a username and password. Authenticated administrators can create questions, store answers in the database, manage student profiles, subjects, and tests. Admins are guided by subject matter experts to identify keywords within answers, which are stored in capital letters and used as standard reference points for evaluation.

- *Subject Selection and Answer Submission:*

In the Subject Selection module, users choose the subject for which they want to answer a displayed question. User authentication is validated through the entry of login ID and test ID. Once authenticated, users are directed to a page displaying the question and a text box for answer composition. After completing their answers, users can submit them for evaluation.

- *Answer Composition Window:*

The Answer Composition Window serves as the platform for students to craft their responses. The system scans and preprocesses the input to extract the text of the answer. Model answer sets, provided by moderators/evaluators, are e mployed for training. These model answers and the associated keywords, specified by evaluators, are input into the system. Subsequently, the student's response is processed and examined for the presence of keywords and grammar accuracy. Grammar checks are performed using CSV files.

- *Answer Evaluation with SVM:*

In this crucial module, the system utilizes Support Vector Machine (SVM) algorithms for answer evaluation. SVM offers a robust approach to assess student answers by considering keyword matching, synonym matching, grammar, and other relevant factors. It compares the student's response to model answers and applies SVM for precise evaluation. SVM's classification capabilities classify answers as correct or incorrect based on predefined criteria, and SVR (Support Vector Regression) can provide a continuous score indicating the quality of answers.

- *Comprehensive Evaluation Report:*

The Evaluation Full Report module promptly provides an assessment of the marks earned by students based on their written responses. To execute this, the system necessitates the storage of the original answers, a privilege granted to administrators. Administrators can input questions and their corresponding subjective answers into the system, which are stored as notepad files for evaluation reference**.**

VI. CONCLUSION

In this paper, we have presented a comprehensive system for the efficient evaluation of subjective answers in online education, leveraging the power of artificial intelligence, and specifically, Support Vector Machine (SVM) algorithms. Our system addresses the significant challenges associated with traditional manual grading, such as time-consuming processes, subjectivity, and scalability issues.

Through the implementation of SVM, we have achieved a systematic and data-driven approach to answer evaluation, which considers keyword matching, synonym matching, grammar checks, and other relevant criteria. This integration has enabled the system to classify answers as correct or incorrect with precision, and for continuous score-based evaluations through Support Vector Regression (SVR).

The results and feedback generated by our system provide students with insightful, immediate, and accurate evaluations of their responses, allowing them to track their progress and refine their understanding of the subject.Our proposed model provide an effective solution for efficient subjective answer evaluation in e-learning, offering a more objective, consistent, and scalable approach that can significantly benefit both students and educators.

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