AUTO ASSESS: FAST AND ACCURATE GRADING PLATFORM

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Keywords:

Automated Grading System, Artificial Intelligence, Machine Learning, Natural Language Processing, Transformer Models, Adaptive Rubric Generation, Educational Technology, Semantic Evaluation, Code Assessment, Plagiarism Detection.

Introduction:

The rapid expansion of digital learning platforms and large-scale online assessments has created a significant demand for efficient, scalable, and reliable evaluation systems. Traditional manual grading approaches are time-consuming, inconsistent, and difficult to scale, particularly in environments with large student populations.

To address these limitations, this project proposes “Auto Assess: Fast and Accurate Grading Platform,” an AI-driven automated evaluation system capable of handling multiple question types. The system integrates advanced Natural Language Processing (NLP), machine learning algorithms, and rule-based evaluation techniques to assess multiple-choice questions, descriptive answers, and programming submissions.

Unlike conventional systems that rely on keyword matching, the proposed solution employs transformer-based semantic analysis to evaluate the contextual meaning of student responses. Additionally, the platform incorporates adaptive rubric generation and real-time feedback mechanisms, ensuring fairness, consistency, and improved learning outcomes. The modular and scalable architecture enables seamless integration with existing educational platforms.

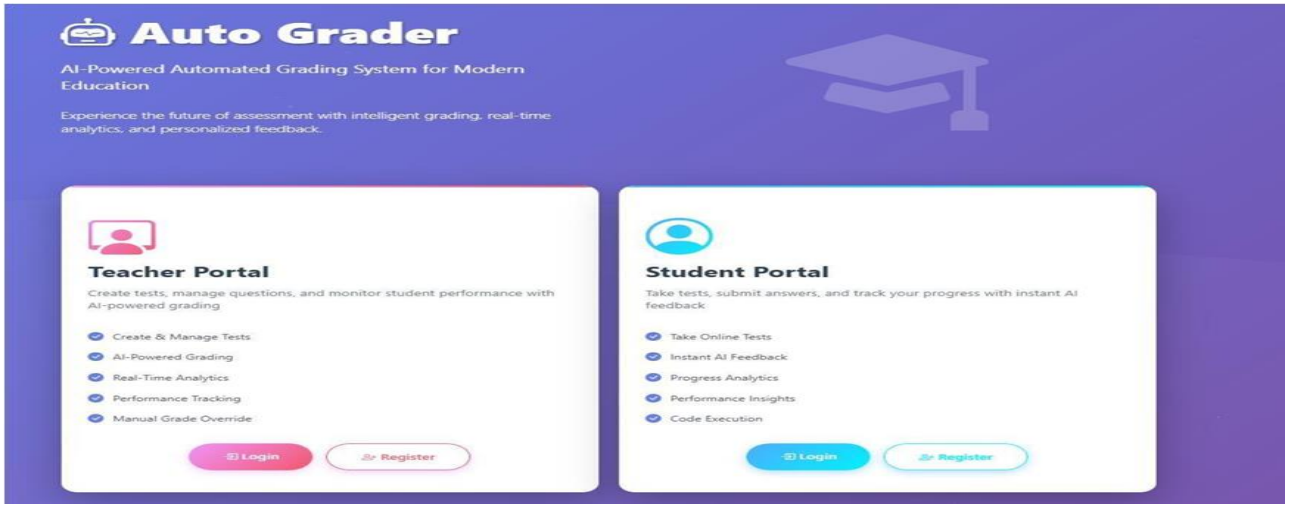

Figure 1: Login page

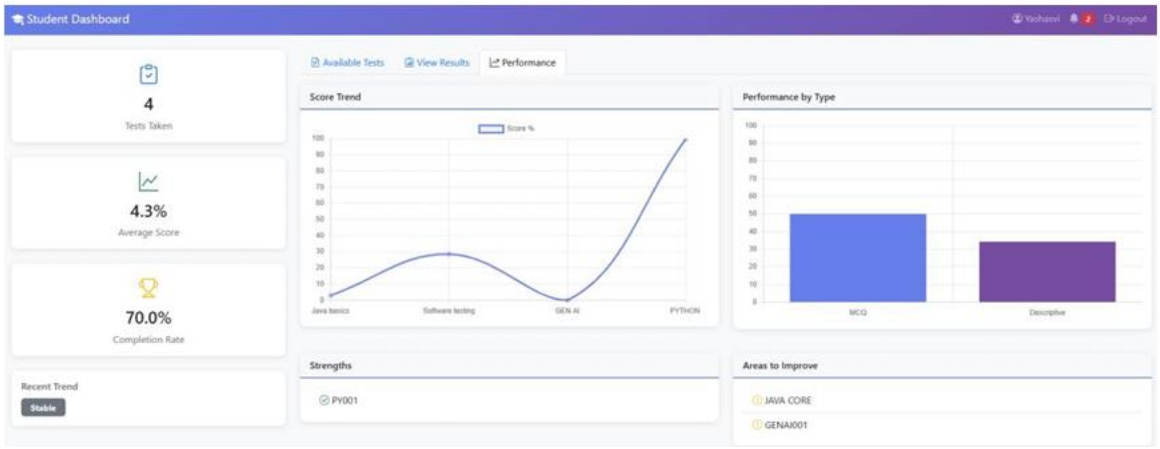

Figure 2: Student dashboard (a)

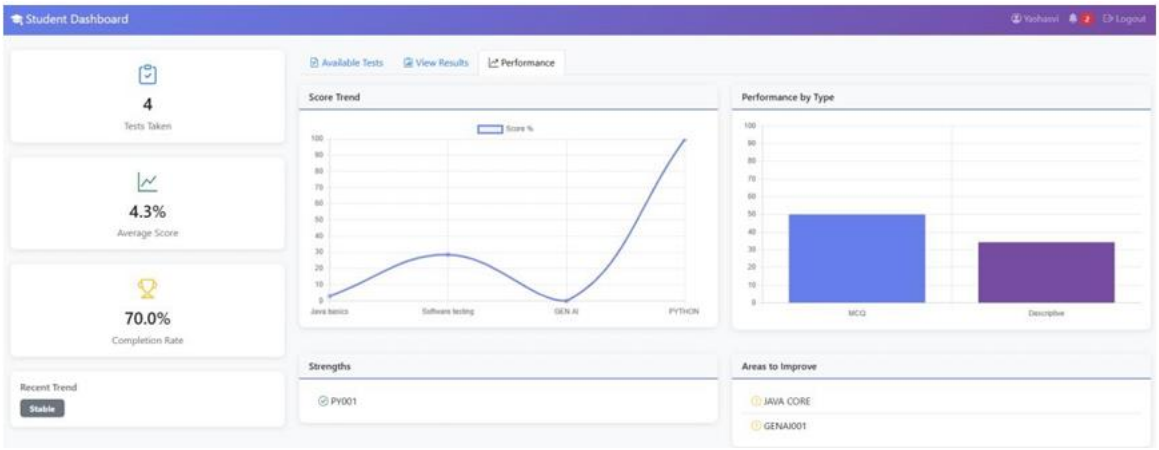

Figure 3: Student dashboard (b)

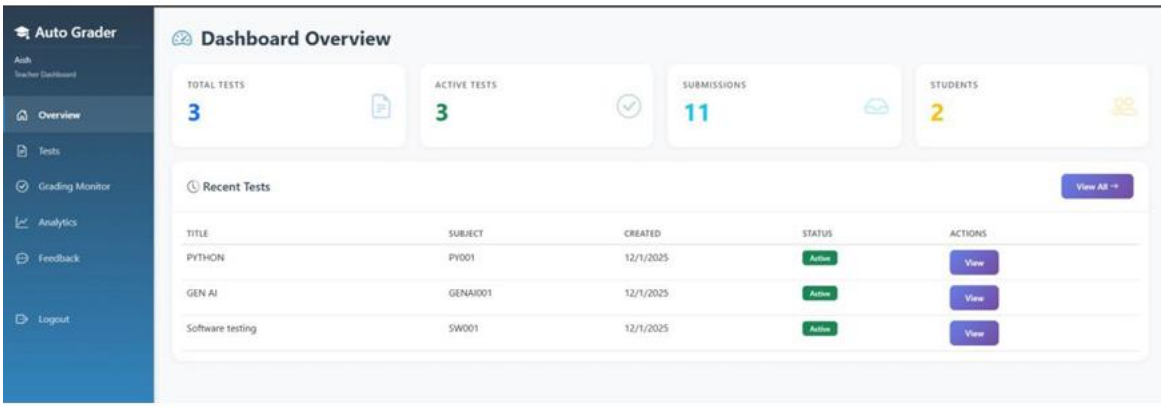

Figure 4: Instructor dashboard (a)

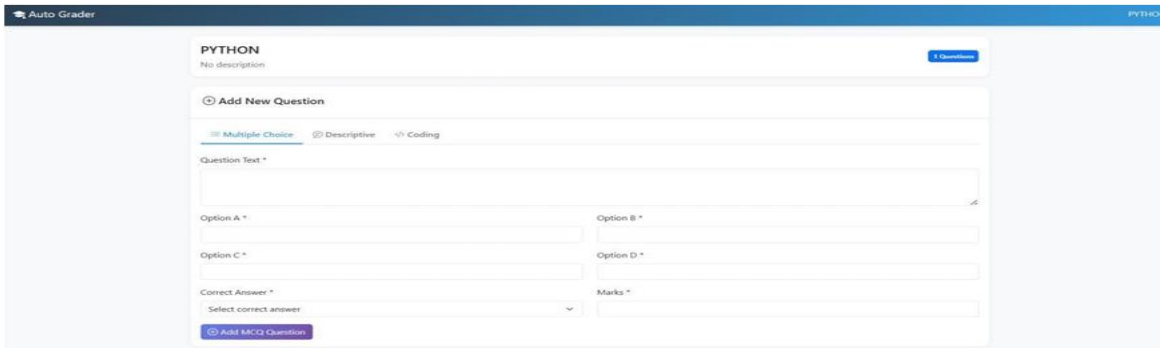

Figure 5: Question creation

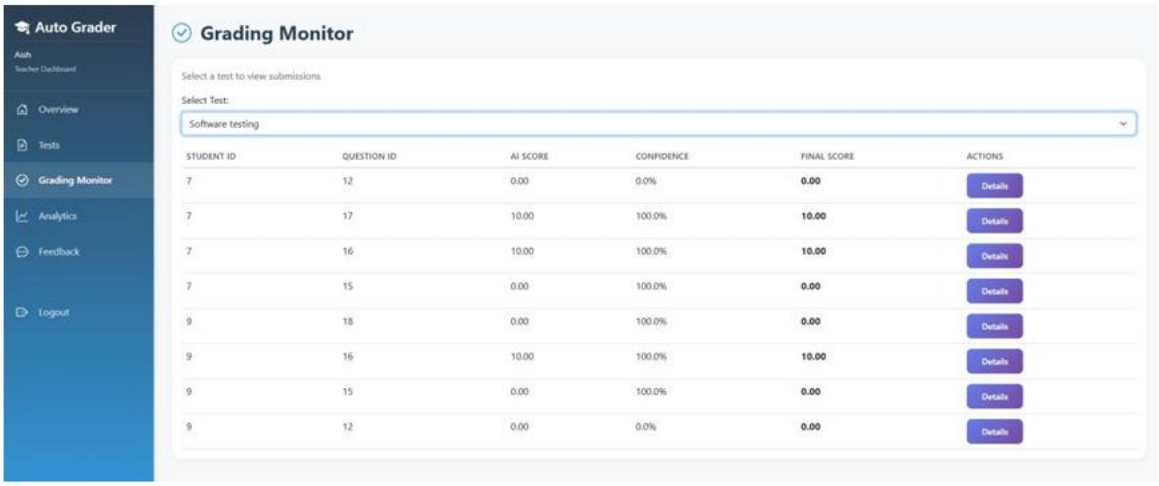

Figure 6: Grading Monitor

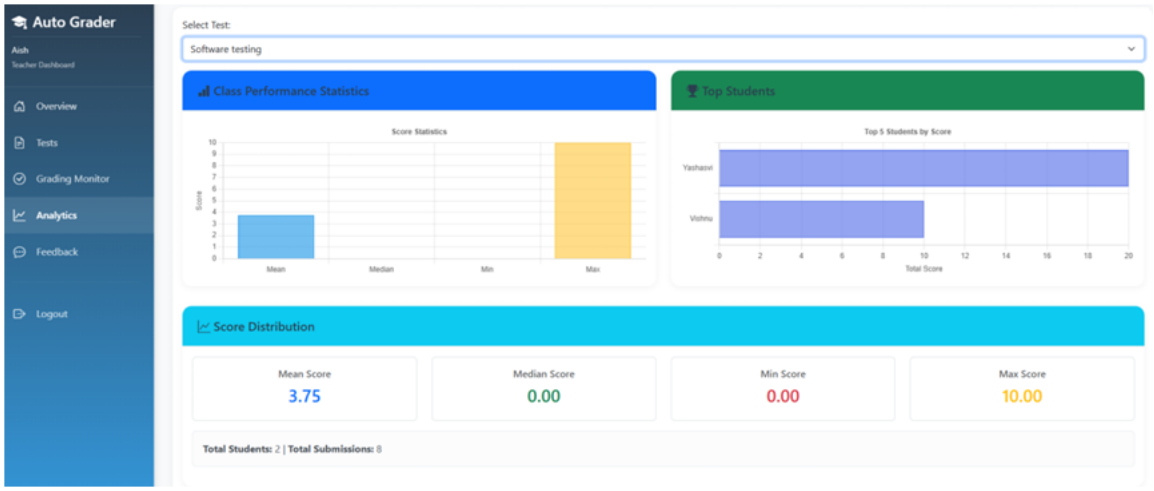

Figure 7: Analytics

Objectives:

1. To design and develop an AI-driven automated grading platform for multiple types of assessments
2. To improve grading accuracy using semantic analysis and machine learning techniques.
3. To provide real-time, personalized feedback to enhance student learning outcomes.
4. To ensure scalability, modularity, and integration capability with existing systems.
5. To maintain fairness and consistency through adaptive rubric generation.

Methodology:

The project follows a modular and scalable architecture for automated evaluation. The process begins with user authentication and role-based access control to ensure secure interaction between students, instructors, and administrators.
Instructors create assessments consisting of multiple-choice questions, descriptive questions, and programming tasks. Student responses are collected through a web-based interface and stored in a structured database.

Upon submission, responses are processed through an automated evaluation pipeline:

1. MCQ Evaluation: Answers are evaluated using deterministic matching techniques, ensuring instant and accurate scoring.
2. Descriptive Answer Evaluation: Responses undergo preprocessing steps including tokenization, normalization, and stop-word removal. Semantic embeddings are generated using transformer-based models such as Sentence-BERT. Cosine similarity is computed between student responses and reference answers to determine correctness, enabling context-aware evaluation.
3. Programming Evaluation: Code submissions are executed within a secure sandboxed environment. Programs are compiled and tested against predefined test cases, capturing outputs, execution time, and runtime errors. Evaluation is based on correctness, efficiency, and performance.
4. Plagiarism Detection: Both textual and programming submissions are analyzed using semantic similarity, token matching, and structural analysis techniques such as Abstract Syntax Tree (AST) comparison.

The outputs from all modules are aggregated to generate comprehensive results, including scores, detailed feedback, and performance analytics. The system ensures real-time processing, scalability, and modular extensibility.

Result and Conclusion:

1. In conclusion, the proposed Auto Assess system successfully demonstrates the effectiveness of an AI-driven automated grading platform capable of evaluating diverse question types within a unified framework. The system significantly reduces manual grading effort while maintaining high levels of accuracy and consistency.
2. MCQ evaluation provides instant results, while descriptive answer evaluation using transformer-based models ensures semantic understanding aligned with human grading. The programming evaluation module effectively validates code through test cases and secure execution environments.
3. The integration of plagiarism detection enhances academic integrity, and the real-time feedback mechanism improves student engagement and learning outcomes. Additionally, instructor dashboards provide valuable insights into performance trends and assessment quality.
4. Overall, the system achieves substantial improvements in grading efficiency, reliability, and scalability, making it a viable solution for modern educational environments.

References:

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- N. Reimers and I. Gurevych, “Sentence-BERT: Sentence Embeddings using Siamese BERT-Networks,” 2019.
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Future Scope:

The future scope of this project includes:

1. Expand the system to support more complex and diverse assessment types, including long-form descriptive answers, handwritten responses, diagrams, and multimedia inputs using multimodal learning techniques.
2. Improve evaluation accuracy by integrating advanced transformer-based models and training on larger, domain-specific datasets across multiple subjects.
3. Incorporate explainable AI techniques to enhance transparency in grading and provide clear insights into how scores are generated.
4. Enhance personalization by analysing student performance trends to deliver adaptive assessments and targeted learning recommendations.