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SmartEval: An AI-Powered Automated Project Evaluation System for Academic Institutions

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***Abstract*— Academic project submissions are increasing in both volume and complexity as institutions move toward digitally driven learning environments. In such a scenario, maintaining consistency, fairness, and timely evaluation becomes difficult using traditional manual assessment methods. To address these limitations, emerging AI techniques such as Natural Language Processing, automated code analysis, and machine-learning–based scoring models can be integrated into evaluation systems to assist faculty in reviewing student work efficiently.**

This paper presents an AI-based project evaluation framework that analyzes uploaded project reports and GitHub repositories using teacher-defined rubrics, enabling accurate and unbiased assessment. We discuss recent advances in AI-driven academic evaluation, demonstrate how automated techniques improve the effectiveness of project assessment, and highlight the system's practical benefits, such as reduced manual workload, improved transparency, and enhanced consistency. Additionally, we outline the challenges involved in AI-assisted evaluation and propose future directions for integrating advanced analytics and automated feedback generation.

***Keywords*—Artificial Intelligence, Project Evaluation, Automated Assessment, Natural Language Processing, Academic Projects, Rubric-Based Evaluation**

I. INTRODUCTION

In recent years, the rapid growth of engineering and technology programs has led to a substantial increase in academic project submissions. These projects serve as a crucial component of outcome- based education, enabling students to demonstrate creativity, problem-solving skills, and technical proficiency. However, traditional evaluation methods rely heavily on manual assessment, which is often time-consuming, subjective, and inconsistent due to variations in evaluator experience and workload. As institutions embrace digital learning platforms and continuous assessment models, there is an urgent need for a more efficient, transparent, and intelligent evaluation mechanism.

Artificial Intelligence (AI) has emerged as a transformative tool across domains such as healthcare, finance, and education. Its ability to process large datasets, identify patterns, and automate decision- making offers immense potential for academic assessment as well.

Integrating AI into project evaluation can assist faculty by automating routine checks, analyzing content against rubrics, detecting originality, assessing code quality, tracking project complexity, and generating objective scores. Such systems can complement human judgment,ensuring fairness while significantly reducing evaluation time.

This paper proposes an AI-based project evaluation framework capable of analyzing project reports, code repositories, and presentation artifacts using machine-learning models, natural language processing, and automated code evaluation techniques. The framework enhances the overall evaluation process by providing unbiased scoring, detailed feedback, and improved transparency for students and educators. The goal of this approach is not to replace faculty involvement, but to empower evaluators with intelligent tools that improve accuracy, consistency, and productivity.

II. LITERATURE REVIEW

Early studies in automated evaluation primarily focused on computer-based testing and objective question scoring. Techniques such as rule-based grading and keyword matching were explored, but these methods lacked contextual understanding and performed poorly when evaluating complex artifacts like project reports or programming assignments. With advancements in machine learning and Natural Language Processing (NLP), modern systems are now capable of understanding semantic meaning, project structure, and knowledge depth (Ghosh & Das, 2021).

Recent work in NLP-driven assessment includes automated essay scoring systems such as e-rater and IntelliMetric, which use linguistic features and machine-learning models to evaluate coherence, grammar, and content relevance. These tools highlight the feasibility of AI-driven textual analysis for project reports. Similarly, automated programming evaluation platforms like CodeRunner and MOSS have demonstrated effectiveness in analyzing code quality, detecting plagiarism, and identifying logical errors using similarity detection and static code analysis.

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More advanced frameworks combine multimodal inputs—text, code, documentation, and presentation slides—to produce holistic evaluations. Deep learning models, particularly transformer-based architectures, have shown promising results in content understanding, originality detection, and rubric-based scoring.

A few studies also explore integrating AI with Learning Management Systems to provide continuous formative feedback during project development phases (Rana et al., 2022).

Despite these advancements, research indicates a noticeable gap in unified AI-based systems tailored specifically for engineering project evaluation. Most existing tools analyze isolated components—either code, written content, or originality—but fail to provide comprehensive assessment. This gap motivates the present work, which aims to develop a centralized evaluation framework combining NLP, machine learning, and automated code analysis to enhance academic project assessment.

III. Background And Motivation

With the rapid expansion of engineering education and project-based learning models, academic institutions are required to evaluate an increasing number of student projects every semester. These projects often include detailed reports, source code repositories, documentation, and presentations. Evaluating such diverse and complex submissions manually demands significant time and effort from faculty members, especially when handling large class sizes. As a result, evaluators may face challenges in maintaining consistency, objectivity, and fairness across assessments.

Traditional project evaluation methods primarily rely on human judgment, predefined rubrics, and manual review processes.

While these approaches are effective to an extent, they are prone to subjectivity, fatigue, and variability among evaluators. Moreover, manual evaluation does not scale well when multiple projects must be assessed within limited academic timelines. This situation highlights the need for intelligent systems that can assist faculty by automating repetitive evaluation tasks while preserving academic rigor.

The motivation behind this work stems from the growing adoption of Artificial Intelligence in educational technologies.

AI-driven systems have demonstrated strong potential in automating assessment, analyzing textual and code-based artifacts, and providing data-driven insights.

By leveraging AI techniques such as Natural Language Processing and automated code analysis, project evaluation can become more structured, transparent, and efficient. This research is motivated by the need to bridge the gap between traditional evaluation practices and modern intelligent assessment systems .

IV. Problem Statement

The manual evaluation of academic projects is a complex and time-consuming process that often suffers from subjectivity and inconsistency. Faculty members are required to analyze project reports, source code, and documentation individually, which becomes inefficient as the number of student submissions increases. Variations in evaluation standards, human bias, and limited time availability further affect the reliability and fairness of the assessment process.

Existing automated evaluation tools focus on isolated aspects such as plagiarism detection or code compilation but fail to provide a comprehensive, rubric-based evaluation of complete project submissions. There is a lack of integrated systems that can analyze both project documentation and implementation while allowing flexibility for teacher-defined evaluation criteria. This creates a significant challenge in achieving standardized, transparent, and scalable project evaluation in academic institutions.

V. Objectives

The primary objective of this research is to design and implement an AI-based project evaluation system that assists academic institutions in assessing student project submissions efficiently and objectively. The study aims to reduce the manual workload of evaluators while ensuring fairness and transparency in the assessment process.

The specific objectives of the study are as follows:

- To develop an automated evaluation framework using Artificial Intelligence techniques.
- To enable faculty members to define customized evaluation rubrics for different projects.
- To analyze project reports using Natural Language Processing techniques.
- To allow manual review and override of AI-generated results by faculty members.

VI. Proposed System Architecture

The proposed AI-based project evaluation system is designed as a web-based, modular framework that integrates user management, project submission, automated evaluation, and result analysis.

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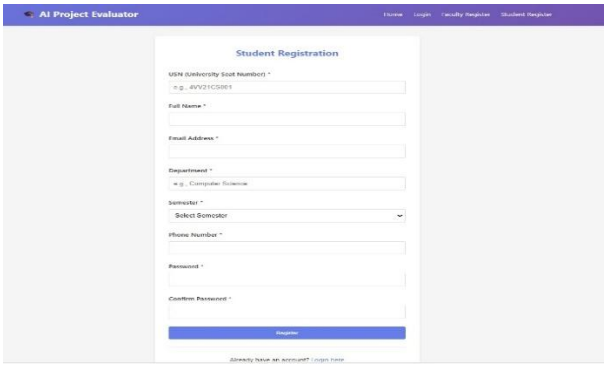
The architecture ensures scalability, security, and ease of use for both faculty and students.



6.1 *System Overview*

The system consists of three major components: the Teacher Module, the Student Module, and the AI Evaluation Module. Each component interacts with the backend server and database to ensure smooth data flow and real-time processing.

6.2 *Teacher Module*

The Teacher Module allows faculty members to:

- Create project groups and assign student members.
- Designate a group leader responsible for submissions.
- Define project-specific evaluation rubrics.
- View AI-generated evaluation results.
- Modify or finalize scores based on expert judgment.

6.3 *Student Module*

The Student Module is accessible only to designated group leaders and enables them to:

- Log in using system-generated credentials.
- Upload final project reports.
- Submit GitHub repository links.
- Track submission status and evaluation progress.

VII. METHODOLOGY

The methodology adopted in this research follows a systematic approach to automate project evaluation using AI techniques.

1. Input Data Collection

The system accepts project reports in document format and GitHub repository links as primary inputs. These inputs serve as the basis for AI-driven analysis.

2. Report Analysis Using NLP

Natural Language Processing techniques are applied to extract meaningful features from project reports, including content relevance, completeness, clarity, and structure.

1. Code Repository Analysis

The GitHub repository is analyzed to assess parameters such as code structure, documentation presence, commit activity, and modularity.

2. Rubric-Based Scoring

Teacher-defined rubrics are mapped to extracted features. Machine-learning–based scoring logic is used to generate evaluation scores for each criterion.

3. Result Generation

The system generates a consolidated evaluation report consisting of scores, observations, and feedback suggestions.

VIII. SYSTEM WORKFLOW

The workflow of the proposed AI-based project evaluation system follows a structured and sequential process to ensure efficient submission, evaluation, and result generation. Initially, the teacher logs into the system and creates project groups by adding student members, with a maximum of four members per group.

One student is designated as the group leader, and system-generated login credentials are automatically sent to the leader via email.

Once authenticated, the group leader uploads the final project report and submits the GitHub repository link. The teacher then defines the evaluation rubric by assigning weightage to various criteria such as documentation quality, implementation complexity, and code structure.

Upon submission, the AI evaluation module processes the inputs using NLP-based report analysis and automated code assessment techniques.

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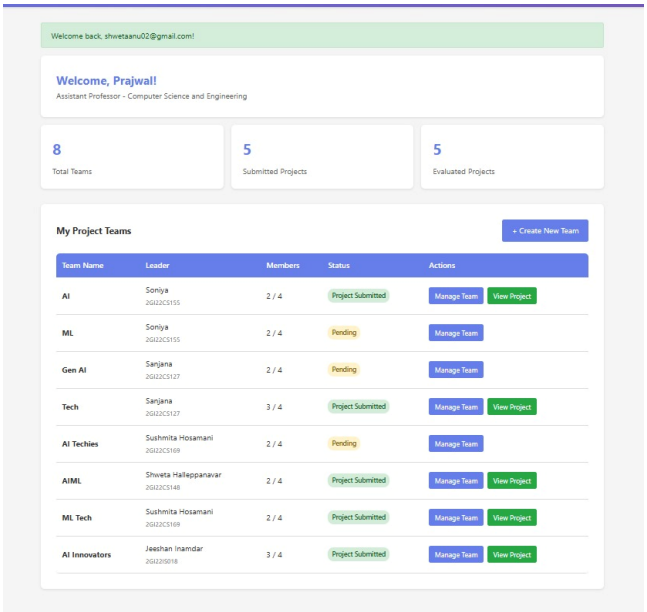


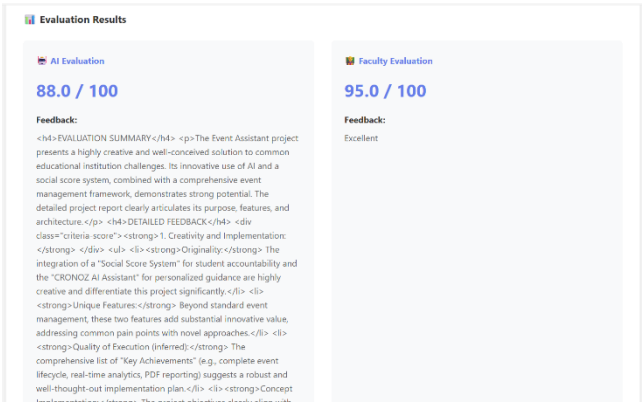
IX. Implementation Details

The proposed system is implemented as a web-based application using the Django framework and Python programming language. Django is used to handle user authentication, role-based access control, and request handling. MongoDB serves as the backend database to store user information, project details, evaluation rubrics, and results due to its flexibility and scalability.

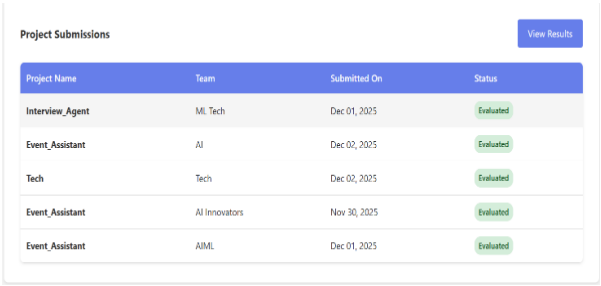
The AI evaluation module integrates NLP techniques to analyze project reports and extract meaningful features. Custom logic is implemented to assess GitHub repositories by analyzing commit history, documentation presence, and code structure. Email automation is implemented using an SMTP service to distribute login credentials securely. The frontend interface is developed using HTML, CSS, Bootstrap, and Django templates to ensure responsiveness .

X. Results And Discussion

The implementation of the AI-based project evaluation system demonstrates significant improvements in evaluation efficiency and consistency. Experimental observations show that the system reduces the time required for project assessment while maintaining standardized evaluation criteria. The AI-generated scores closely align with manual evaluations, highlighting the effectiveness of the rubric-based scoring approach.



The system enhances transparency by clearly presenting evaluation criteria and results to faculty members. Teachers retain full control over final grading decisions, ensuring that expert judgment complements AI-generated insights. The results indicate that the proposed framework effectively addresses the limitations of traditional project evaluation methods and improves overall assessment quality.



XI. Conclusion

This research presents an AI-based project evaluation system designed to assist academic institutions in automating and standardizing the assessment of student projects. By integrating Natural Language Processing, automated code analysis, and teacher-defined rubrics, the proposed system reduces manual effort, minimizes subjectivity, and improves evaluation transparency. The framework successfully combines AI-driven insights with human expertise, ensuring reliable and fair project assessment.

XII. Future Scope

The proposed system can be extended in several directions to enhance its capabilities:

- Integration of plagiarism detection mechanisms for reports and source code.
- Automated feedback generation for students.
- Advanced machine-learning models for in-depth code quality analysis.
- Analytics dashboards to visualize evaluation trends and performance.
- Chat-based AI assistants to guide students during project development.
- Multi-semester and multi-project support.
- Cloud-based deployment for multi-institution usage.
- Integration with Learning Management Systems such as Moodle and Google Classroom.

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