IT4010 Research Project – 2025 July

Topic Assessment Form

Project ID: 25-26J-162

1. Topic (12 words max)

AI-Powered Student Grading and Teacher Rating Automation System

2. Research group the project belongs to

SST - Software Systems & Technologies

3. Specialization of the project belongs to

Information Technology (IT)

4. If a continuation of a previous project:

Project ID	
Year	

5. Brief description of the research problem including references (200 – 500 words max) – references not included in word count.

In modern educational environments, **manual student evaluation and teacher performance assessments are often time-consuming, subjective, and inconsistent across institutions**. This research proposes the development of an **AI-powered system** that automates student grading and teacher rating by leveraging **Optical Character Recognition (OCR)** and **Machine Learning (ML)** techniques [1], [2].

The primary objective is to build a **smart system** that can **extract text-based responses from educational documents** such as exam papers, answer sheets, assignments, and feedback forms using **OCR technology** [2]. These textual inputs will be processed using **Natural Language Processing (NLP)** and ML models [1], [3] to **evaluate student answers based on keyword relevance, context understanding, and logical structure**. The grading will not only **generate automated scores** but also **provide personalized feedback**, **identifying specific areas of improvement for each student** [3], [5]. This ensures a **fairer, faster, and more consistent evaluation method** compared to traditional manual grading.

Alongside student evaluation, the system will implement a **teacher rating mechanism** based on multiple **quantifiable parameters** such as student performance trends, anonymous feedback, lesson delivery analytics, and classroom engagement (where data is available) [4]. The aim is to build a **balanced and objective performance review system** that supports **continuous improvement** for both students and educators.

The system is especially relevant in **large-scale academic institutions**, **online learning platforms**, and **remote education environments** where **scalability and efficiency** are critical. It addresses **core challenges in the education sector**, such as **bias in assessments**, **inefficiencies in feedback delivery**, and a **lack of detailed analytics** to guide teaching methods and curriculum design.

This research will involve **training and validating ML models** using datasets of student responses and teacher evaluations, **designing feedback algorithms**, and **testing the OCR pipeline on handwritten and printed texts** [2], [4], [5]. The expected outcome is a **prototype application** that **streamlines the academic evaluation process** and **provides actionable insights** for academic growth.

Reference:

[1] K. Rani and R. Sujatha, “Automated Evaluation of Descriptive Answers using NLP Techniques,” *Int. J. Adv. Comput. Sci. Appl.*, vol. 11, no. 5, pp. 435–440, 2020.

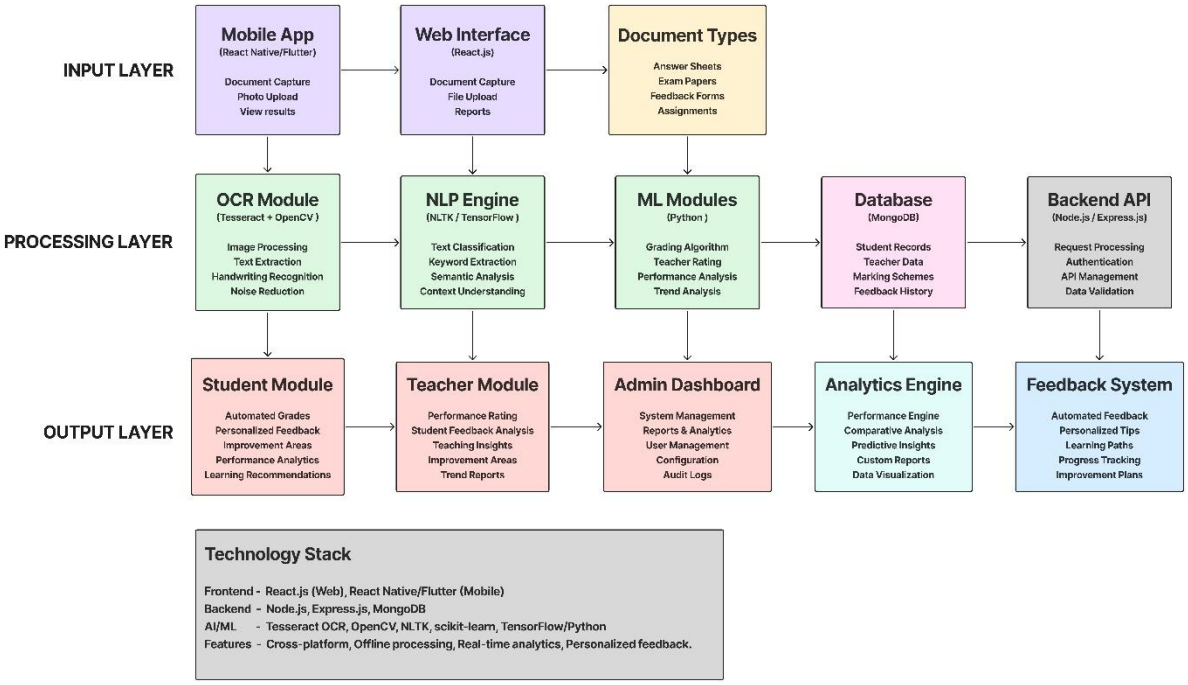
[2] M. Jain and V. Yadav, “Optical Character Recognition Using Tesseract and OpenCV,” *J. Emerg. Technol. Innov. Res.*, vol. 6, no. 2, pp. 112–116, 2019.

[3] S. Poria, E. Cambria, and A. Gelbukh, “Aspect Extraction for Opinion Mining with a Deep Convolutional Neural Network,” *Knowl.-Based Syst.*, vol. 108, pp. 42–49, 2016.

[4] M. Balaji and R. Lavanya, “Machine Learning-Based Feedback Analysis for Teacher Evaluation,” *Procedia Comput. Sci.*, vol. 189, pp. 467–474, 2021.

[5] I. Goodfellow, Y. Bengio, and A. Courville, *Deep Learning*, Cambridge, MA: MIT Press, 2016.

System Diagram:



6. Brief description of the nature of the solution including a conceptual diagram (250 words max)

The proposed solution is a **cross-platform system** consisting of a **web application and a mobile application**, powered by **Optical Character Recognition (OCR)**, **Natural Language Processing (NLP)**, and **Machine Learning (ML)** to automate student grading and teacher performance evaluation.

The system begins with an **OCR module**, which extracts text from scanned or photographed answer sheets and feedback forms. The **mobile app** allows students or teachers to conveniently **capture answer scripts or feedback documents** using their smartphone cameras and upload them to the system. This enhances accessibility and streamlines input collection in both traditional and remote learning environments.

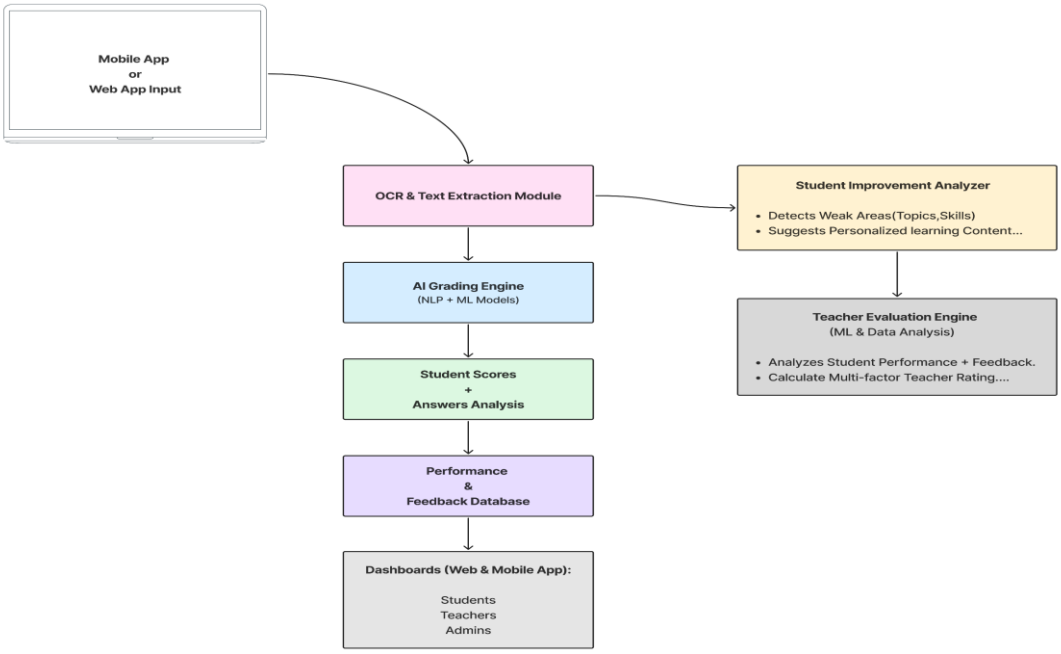
Once the content is extracted, the **AI grading engine** evaluates student answers using NLP and ML models, assigning scores and generating **personalized feedback**. This improves grading speed, accuracy, and fairness.

Simultaneously, the system performs **teacher evaluation** by analyzing student performance trends, anonymous feedback, and other metrics. Using ML-based analysis, the system generates a **composite teacher rating**.

The platform includes:

- **Admin dashboard (web)**: Manage submissions, view reports.
- **Student module (mobile/web)**: Access grades, feedback, improvement tips.
- **Teacher module (mobile/web)**: View performance analytics and feedback.

This dual-platform approach increases usability and scalability, ensuring broader access for users in diverse educational environments.



7. Brief description of specialized domain expertise, knowledge, and data requirements (300 words max)

Specialized Expertise Required:

1. **OCR and Image Preprocessing:**
   Knowledge in implementing custom OCR pipelines using open-source libraries such as **Tesseract (offline)** or developing basic OCR models from raw image data. Preprocessing skills using **OpenCV** for noise reduction, image binarization, and segmentation will be essential.
2. **NLP and ML Model Development:**
   The team must be proficient in training NLP models for text classification, keyword extraction, and semantic understanding using frameworks like **scikit-learn**, **NLTK**, or **TensorFlow/PyTorch**. These models will evaluate student answers based on predefined rubrics.
3. **Teacher Evaluation Models:**
   Statistical and ML techniques such as **trend analysis**, **weighted scoring**, and **clustering** will be used to evaluate teacher performance based on student feedback and academic results over time.
4. **Full-Stack Web and Mobile Development:**
   Strong development skills using **React.js**, **Node.js**, and **MongoDB** for the web application, and **React Native** or **Flutter** for the mobile app, which will support document capturing and performance viewing.
5. **Educational Assessment Knowledge:**
   Understanding of marking schemes, assessment methods, and feedback structures to align model behavior with real-world academic standards.

Data Requirements:

- Scanned or photographed **student answer sheets** (typed and handwritten)
- Associated **marking schemes** and **model answers**
- **Anonymous student feedback** for teacher evaluation
- Sample **academic performance data**
- **Tagged learning content** for personalized improvement suggestions

All data will be manually collected, prepared, and labeled by the research group, following ethical and academic guidelines.

8. Objectives and Novelty

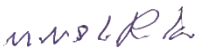
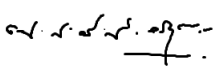
Main Objective To design and develop a fully self-trained AI-powered system that automates student grading and teacher performance evaluation using custom-built OCR, NLP, and ML models, without relying on external APIs or pre-trained solutions.			
Member Name with Registration No	Sub Objective	Tasks	Novelty
PATHIRAJA P.U.M – IT22243362	Develop OCR module and student answer grading model	Implement image preprocessing and OCR to extract handwritten/printed text; Train NLP models to score answers using marking schemes	Fully offline OCR and grading engine custom-built for academic answer sheets
W.A.P.M Wanniarachchi - IT22103154	Build mobile application and implement teacher rating engine	Develop cross-platform mobile app for uploading documents and viewing analytics; Build ML model to compute multi-factor teacher ratings	Mobile-supported AI teacher rating system, built entirely from scratch and teacher evaluation model.
JAYASOORIYA L. T – IT22095480	Identify student improvement areas through performance analysis	Use ML to analyze scores and errors to detect weak learning areas; Generate personalized improvement recommendations	Real-time AI feedback system for personalized academic support without external datasets
Hettiarachchi R.H - IT22120052	Identify teacher improvement areas through	Identify teacher improvement areas through performance and feedback analysis	Offline analytical model to provide actionable insights for teacher

	performance and feedback analysis		development and teacher improvement area model

9. Individual component description of how it is complied with the specialization.

Member Name with Registration No	Description
PATHIRAJA P.U.M – IT22243362	IT22243362 is responsible for developing the OCR module and the student answer grading engine. This includes applying image processing techniques and building NLP/ML models for automated grading. It directly applies AI/ML skills, model development, and software engineering principles like modularity and backend logic structuring.
M Wanniarachchi W.A.P - IT22103154	IT22103154 is developing the mobile application and implementing the teacher rating engine. This combines full-stack mobile development skills with ML techniques for evaluating multi-parameter feedback, aligning with both AI/ML and mobile software systems specialization.
JAYASOORIYA L.T – IT22095480	IT22095480 focuses on identifying student improvement areas through performance analysis using ML techniques such as clustering and pattern recognition. This requires understanding learning analytics, AI model training, and data visualization—all integral to AI/ML specialization.
Hettiarachchi R.H - IT22120052	IT22120052 is responsible for identifying teacher improvement areas by analyzing student performance trends and feedback data. The task involves statistical analysis and supervised ML models, applying AI/ML knowledge while following software engineering best practices for system integration.

10. Supervisor details

	Title	First Name	Last Name	Signature
Supervisor	Professor	Samanth	Rajapaksha	
Co-Supervisor	Senior Lecture	Bhagyanie	Chathurika	

External Supervisor				
Summary of external supervisor's (if any) experience and expertise				

SLIIT UNI
THE KNOWLEDGE UNIVERSITY

IT4010 Research Project – 2025 July

Topic Assessment Form

<u>This part is to be filled by the Topic Screening Staff members.</u>

a) Does the chosen research topic possess a comprehensive scope suitable for a final-year project?

Yes		No	

b) Does the proposed topic exhibit novelty?

Yes		No	

c) Do you believe they have the capability to successfully execute the proposed project?

Yes		No	

d) Do the proposed sub-objectives reflect the students' areas of specialization?

Yes		No	

e) Supervisor's Evaluation and Recommendation for the Research topic:

SLIIT UNI
THE KNOWLEDGE UNIVERSITY

IT4010 Research Project – 2025 July

Topic Assessment Form

Acceptable: Mark/Select as necessary

Topic Assessment Accepted	
Topic Assessment Accepted with minor changes*	
Topic Assessment to be Resubmitted with major changes*	
Topic Assessment Rejected. Topic must be changed	

* Detailed comments given below

Comments

Staff Member's Name	Signature

*__Important__:

1. According to the comments given by the evaluator, make the necessary modifications and get the approval by the **Evaluator**.
2. If the project topic is rejected, identify a new topic, and request the RP Team for a new topic assessment.