CSE299 Project Brief

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Project: Automated Assessment Student answers using LLMs and Prompt Engineering

1. Introduction

This project aims to develop a web-based system that leverages Large Language Models (LLMs) and prompt engineering to automatically assess student answers based on pre-defined rubrics provided by teachers. The system will streamline the assessment process, reduce marking workload, and provide faster feedback to students.

2. System Functionality

2.1 Data Input:

- **Teacher:**
  - Shares a Google Sheet containing student information (Name, ID, Email) in three separate columns.
  - Creates another Google Sheet containing questions and corresponding marking rubrics in a specified format (see section 2.2).

2.2 Marking Rubric Format:

The Google Sheet containing the marking rubrics will follow a specific structure:

Column 1	Column 2	Column 3	...	Column n
Question	**Level**	**Criteria**	...	**Marks**
Question 1 (Max Marks:	Level 1	Description of Level 1	...	Marks awarded for

Column 1	Column 2	Column 3	...	Column n
X)		criteria		Level 1
Question 1	Level 2	Description of Level 2 criteria	...	Marks awarded for Level 2
...	...	...	...	...
Question n	Level m	Description of Level m criteria	...	Marks awarded for Level m

Key Points:

- **Question:** Specify the question being assessed.
- **Level:** Identify each level of achievement (e.g., Level 1, Level 2, ...).
- **Criteria:** Provide specific description of criteria expected for each level.
- **Marks:** Allocate a specific mark value for each level (consider aligning with total possible marks for the question).
- **Number of columns:** Adjust the number of "Criteria" columns to adequately describe each level for the particular question.

2.3 Assessment Process:

- **System:**
  - Reads and stores relevant information from both Google Sheets securely.
  - Automatically generates a Google Form with the provided questions.
  - Sends unique email invitations to students with the generated Google Form link and a completion deadline.
  - Receives student responses through the Google Form.
  - Utilizes prompt engineering techniques tailored to each question and specific rubrics.
  - Leverages LLMs to assess each response against the provided rubrics.
  - Generates a score based on the LLM analysis and rubric criteria.
  - Calculate the student's total achievable marks by summing the "Marks" for each achieved level in the rubric. Award the higher score between this calculated total and the total possible marks for the question.

2.4 Output:

- **System:**
  - Creates a new Google Sheet with student names, IDs, email addresses, and obtained marks.
  - Optionally, sends personalized feedback emails to students based on their scores and identified strengths/weaknesses (subject to further design).
  - The new google sheet link should be emailed to the teacher.

3. Technical Requirements

- Web-based application accessible through standard web browsers.
- Integration with Google Sheets API for data exchange.
- Open-source LLM integration (specified LLM model, e.g., Hugging Face Transformers).
- Using access control mechanisms.

4. Additional Considerations

- User interface design.
- Error handling and feedback mechanisms.
- Logging and auditing functionalities.
- Potential ethical considerations and fairness in automated assessment.

5. Deliverables

- Functional web-based application prototype.
- Documentation for teachers and students on system usage.
- Technical documentation for developers.

8. Conclusion

This project proposes a novel approach to automated assessment using LLMs and prompt engineering. It has the potential to improve efficiency, provide faster feedback, and personalize the learning experience for both teachers and students. By outlining the key functionalities, technical requirements, and considerations, this specification serves as a starting point for further development and project realization.