ALLIANCE UNIVERSITY

Private University established in Karnataka State by Act No.34 of year 2010
Recognized by the University Grants Commission (UGC), New Delhi

Generative AI Project Idea Proposal Documentation

Bachelor of Computer Applications

SEMESTER – IV

Generative AI & Agentic AI Winter Program

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Project Title

Generative AI–Based Answer Evaluation and Improvement Assistant

1. Introduction

In modern education systems, students are expected to write well-structured, conceptually accurate, and expressive answers in examinations and assignments. However, students rarely receive immediate or detailed feedback on their practice answers. Teachers often face time constraints and cannot evaluate every answer thoroughly, especially during exam preparation periods.

As a result, students repeatedly make the same mistakes related to structure, missing key points, poor explanations, and weak conclusions. Existing digital tools mainly focus on grammar correction and spelling, but they fail to evaluate conceptual understanding or answer quality.

This project proposes a Generative AI–based Answer Evaluation and Improvement Assistant that uses a Hybrid Agentic AI approach, combining the Tool-Based Pattern and the Reflection Pattern. The system evaluates a student's answer, assigns marks based on predefined criteria, provides feedback, and generates an improved version of the answer through reflection.

2. Problem Statement

•Students do not receive instant feedback on written answers
• Manual evaluation consumes significant faculty time
• Students are unaware of missing concepts and weak structure
• Practice answers lack proper self-evaluation mechanisms
• Existing tools do not support academic marks-based evaluation

3. Objectives of the Project

• To design a Generative AI–based answer evaluation system
• To implement a marks-based evaluation logic
• To apply a Hybrid Agentic AI pattern
• To improve students' academic writing skills
• To provide a low-cost and scalable educational tool

4. Proposed Solution

The proposed system is a **web-based academic assistant** where students can:

• Paste their written answers
• Select subject type and total marks
• Request evaluation and improvement

The system uses:

- **Tool-Based Pattern** for structured evaluation and scoring
- **Reflection Pattern** for answer refinement and improvement

The final output includes:
• Marks obtained
• Strengths and weaknesses
• Missing points
• Improved answer

5. Design Patterns Used (Hybrid Approach)

A. Tool-Based Pattern

The Tool-Based Pattern is responsible for objective evaluation tasks such as:

• Checking answer length
• Identifying keywords
• Evaluating structure (introduction, body, conclusion)
• Allocating marks using rule-based logic

Python-based evaluation rules act as tools that the AI invokes to score answers.

B. Reflection Pattern:

The Reflection Pattern allows the AI to:

• Review its own evaluation
• Identify weak explanations
• Improve clarity and structure
• Rewrite the answer in a refined academic manner

This enables iterative improvement without retraining the model**.**

6. Marks-Based Evaluation Logic

The system evaluates answers using a rule-based marking scheme**,** similar to university examinations.

Example (10-Mark Question):

Evaluation Criteria	Marks
Concept Accuracy	4
Explanation Depth	3
Structure & Flow	2

Evaluation Criteria	Marks
Language Clarity	1
Total	**10**

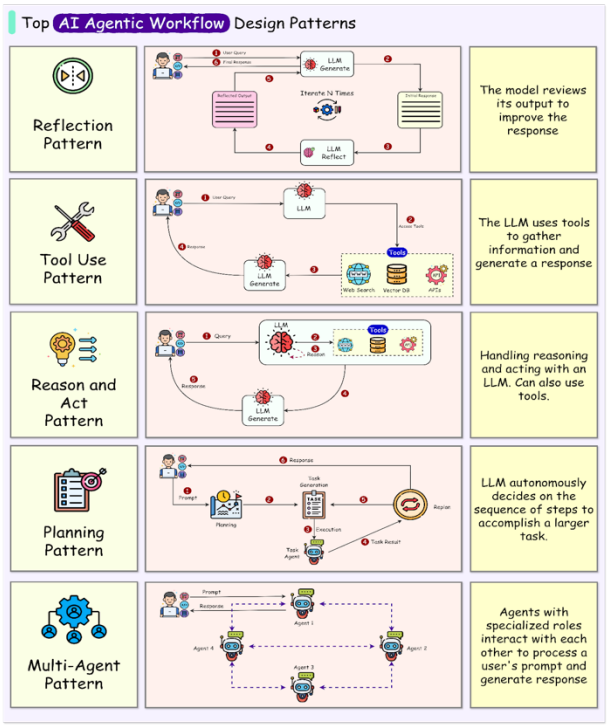
Evaluation Process:

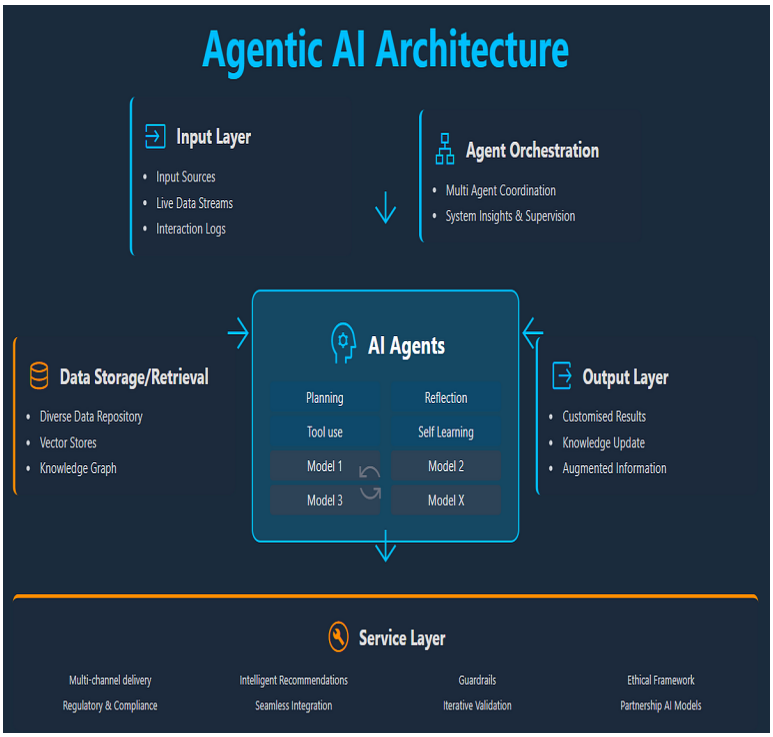
- Keywords matched using predefined lists
- Section detection (intro, body, conclusion)
- Length and coherence checks
- AI assigns marks per criterion
- Final score is generated

This logic ensures fair, explainable, and consistent evaluation**.**

7. Step-by-Step Workflow

Step 1: Student submits a written answer
Step 2: Tool-based agent evaluates structure and keywords
Step 3: Marks are allocated using evaluation rules
Step 4: AI generates detailed feedback
Step 5: Reflection agent analyzes weaknesses
Step 6: AI produces an improved answer
Step 7: Student reviews and re-evaluates if required





8. Architecture Diagram Explanation

The system architecture follows a **layered agentic design**:

User Interface Layer

- Built using Streamlit
- Allows answer input and evaluation requests

Controller Layer

- Manages user requests
- Sends data to agentic modules

Tool-Based Evaluation Layer

- Executes keyword detection
- Applies marking rules
- Calculates marks

Reflection Agent Layer

- Reviews evaluation results
- Improves explanations
- Refines final output

Output Layer

- Displays marks
- Feedback
- Improved answer

This architecture ensures modularity, clarity, and scalability**.**

9. Technology Stack (Cost-Effective & Open Source)

Backend

- Python

Generative AI

- Gemini API

Evaluation Tools

- Python rule-based logic

Frontend

• Streamlit

Version Control

• GitHub

10. Cost Effectiveness

The proposed system is highly cost-effective as it relies entirely on open-source libraries and frameworks for development and deployment. No paid evaluation platforms or proprietary software are required, which makes the project affordable for students and educational institutions. The Generative AI component is used efficiently with minimal API calls, ensuring low operational cost. Additionally, the application is lightweight and can run smoothly on low-end systems such as standard student laptops, making it suitable for academic projects and learning environments.

11. Scope of the Project (MVP)

The scope of this project is limited to a Minimum Viable Product (MVP) that focuses on core functionality. The system supports only text-based answers submitted by users for evaluation. It performs marks-based assessment and generates academic feedback along with an improved version of the answer. The application processes one answer at a time and does not include advanced features such as plagiarism detection or multi-user support, keeping the project simple and focused.

12. Expected Deliverables

The expected outcome of the project includes a fully functional web-based prototype that demonstrates the proposed concept. The system will provide a marks-based evaluation mechanism, answer improvement functionality, and detailed feedback reports for submitted answers. In addition, the complete source code of the project will be maintained in a GitHub repository to ensure version control, transparency, and ease of future enhancement.

13. Real-World Applications

The proposed system has several real-world applications in the education domain. It can be used by students for exam preparation and assignment practice by enabling self-evaluation and continuous improvement. Online learning platforms can integrate such a system to provide instant feedback to learners. The tool also serves as an effective self-evaluation mechanism, helping students improve their academic writing skills and conceptual understanding.

16. Conclusion

This project demonstrates a **unique and practical application of Hybrid Agentic AI** in education. By combining **Tool-Based evaluation** with **Reflection-based improvement**, the system provides structured feedback and enhanced learning outcomes. The cost-effective design and real-world relevance make it ideal for academic environments.

17. Source Code

GitHub Repository (Proposed):

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