

Department of Artificial Intelligence & Machine Learning

**AI19643 – FOUNDATIONS OF NATURAL LANGUAGE  
PROCESSING**



**PREPMASTER: AI-POWERED  
PERSONALIZED ACADEMIC ASSISTANT**

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# PROBLEM STATEMENT

Students often find it challenging to plan their studies, revise effectively, and practice smartly for exams. Traditional methods rely on fixed study materials and lack personalized guidance, making it harder to retain concepts. There is a need for an AI-powered assistant that offers smart tutoring, automated study plans with note summaries, and adaptive quizzes using past exam papers. This will help students study efficiently, improve retention, and boost exam performance.

# MOTIVATION

- **Personalized Learning Gap** – Traditional study methods don't adapt to individual student needs, leading to ineffective learning.
- **Time Management Issues** – Students struggle to create efficient study plans, often wasting time on less important topics.
- **Lack of Smart Revision Tools** – Manual note-taking and summarizing are time-consuming, making quick revision difficult.
- **Ineffective Exam Practice** – Static question banks don't adjust based on student performance, limiting targeted practice.
- **Technology-Driven Learning** – AI can provide real-time tutoring, smart study planning, and adaptive quizzes, revolutionizing exam preparation.

# OBJECTIVES

- Develop an AI tutor for personalized learning.
- Create smart study plans with note summaries.
- Generate adaptive quizzes from past exams.
- Enhance retention with tailored strategies.
- Boost exam performance using AI insights.

# ABSTRACT

In today's fast-paced academic world, students struggle to manage vast syllabi and increasing pressure to perform. Traditional methods often lack the personalization needed for effective learning. **PrepMaster** is an AI-powered platform offering **personalized support, smart planning, and adaptive assessments** through three key modules. The **AI Tutor**, powered by LLaMA, gives real-time, human-like explanations with a ROUGE-L F1 score of 0.59. The **Exam Strategy Planner** and **AI Quiz Generator**, both built on BART, deliver tailored study plans and adaptive quizzes, achieving ROUGE-1 and ROUGE-2 scores of 0.66 and 0.40. Built with **HTML, CSS, and JavaScript**, PrepMaster makes learning smarter and more efficient.

# PROBLEM ANALYSIS

- ❑ Traditional study methods lack **personalization**, making it hard to address individual learning needs.
- ❑ Students often face **difficulty in managing time** across vast syllabi and multiple subjects.
- ❑ **Last-minute preparation** and poor planning lead to increased stress and reduced performance.
- ❑ Manual study planning is often **inefficient and unstructured**, resulting in missed topics.
- ❑ Self-assessment is typically limited, with **static and repetitive question sets**.
- ❑ Access to **instant academic guidance** is limited, especially outside school hours or in remote areas.
- ❑ Inconsistent study habits and lack of feedback loops **impact academic confidence and outcomes**.

# EXISTING SYSTEM

Existing research explores AI's role in education through NLP applications like sentiment analysis, text summarization, and AI-driven tutoring. Studies focus on improving student feedback analysis, virtual teachers, and interactive learning tools, particularly for language acquisition. However, these solutions lack personalized, adaptive study planning and exam-oriented preparation. Context-aware NLP challenges in student queries also remain unaddressed. **PrepMaster** bridges these gaps by integrating AI tutoring, smart study plans, and adaptive quizzes, offering a **comprehensive and personalized learning experience.**



# SCOPE AND LIMITATIONS

- ❑ **Scope:** Existing systems enhance education through AI-driven tutoring, feedback analysis, and interactive learning, improving engagement and automating content processing using NLP techniques like text summarization, sentiment analysis, and question-answering.
- ❑ **Limitations:** They lack adaptive, personalized study plans and exam-oriented preparation, with challenges in context-aware NLP, ambiguity handling, and real-time customization based on individual learning needs.

# LITERATURE REVIEW

Paper Title	Author & year	Methodology	Inference	Limitations
Intelligent Deep-Learning Tutoring System to Assist Instructors	D. Roldán-Álvarez and F. J. Mesa,2024	AI-driven analysis of exam patterns	Improves student study plans	Lacks personalization for different subjects
NLP in Education Feedback	Shaik et al., 2023	NLP for sentiment analysis in student feedback	Identifies trends for improvement	Struggles with sarcasm, ambiguity
Semantic Feedback Analysis	Masood et al., 2022	Semantic NLP for deeper insights	Enhances teaching improvement strategies	Struggles with complex sentence structures
Deep Learning for Course Evaluation	El-Demerdash et al., 2022	SSA-optimized deep learning model	High accuracy in course sentiment analysis	Needs high computational power
Text Analytics for Course Improvement	Gottipati et al., 2018	Extracted improvement suggestions from feedback	Guides curriculum enhancement	Needs context-aware models

# LITERATURE REVIEW

Paper Title	Author & year	Methodology	Inference	Limitations
ML and Lexicon Sentiment Analysis	Nasim et al., 2017	Compared ML and lexicon-based methods	ML is accurate; lexicon is interpretable	ML needs large datasets
Best Tools for Feedback Analysis	Ullah, 2016	Evaluated sentiment analysis tools	Helps institutions choose optimal solutions	Tools vary in effectiveness
Student Feedback Analysis	S. Ulfa, R. Bringula, 2016	NLP-based sentiment analysis	Insights on teaching effectiveness	Variations in expression affect accuracy
Real-Time Sentiment in Class	Altrabsheh et al., 2014	Live sentiment tracking for interventions	Helps adjust teaching strategies instantly	Requires high-speed processing
Feature-Based Opinion Mining	Rashid et al., 2013	Pattern mining for opinion extraction	Identifies key student concerns	Complex and requires heavy preprocessing

# SUMMARY

- The reviewed studies demonstrate AI and NLP's potential in enhancing education through sentiment analysis and exam strategy optimization. While AI-driven models improve accuracy in student feedback analysis and curriculum enhancement, many rely on large datasets and complex computations, limiting real-time adaptability.
- AI-driven exam analysis does not offer personalized study plans. Feature-based opinion mining requires heavy preprocessing, making it inefficient for real-time applications.
- In contrast, **PrepMaster** goes beyond passive feedback analysis by actively assisting students in exam preparation. It integrates **AI tutoring, structured study plans, and quiz generation**, ensuring a **personalized and interactive learning experience**. Unlike existing systems.

# PROPOSED SYSTEM AND ITS METHODOLOGY

PrepMaster is an AI-powered academic assistant proposed to enhance learning through personalized tutoring, smart study planning and adaptive quiz generation.

## ❏ AI Tutoring :

- Provides context-aware explanations using Llama model.

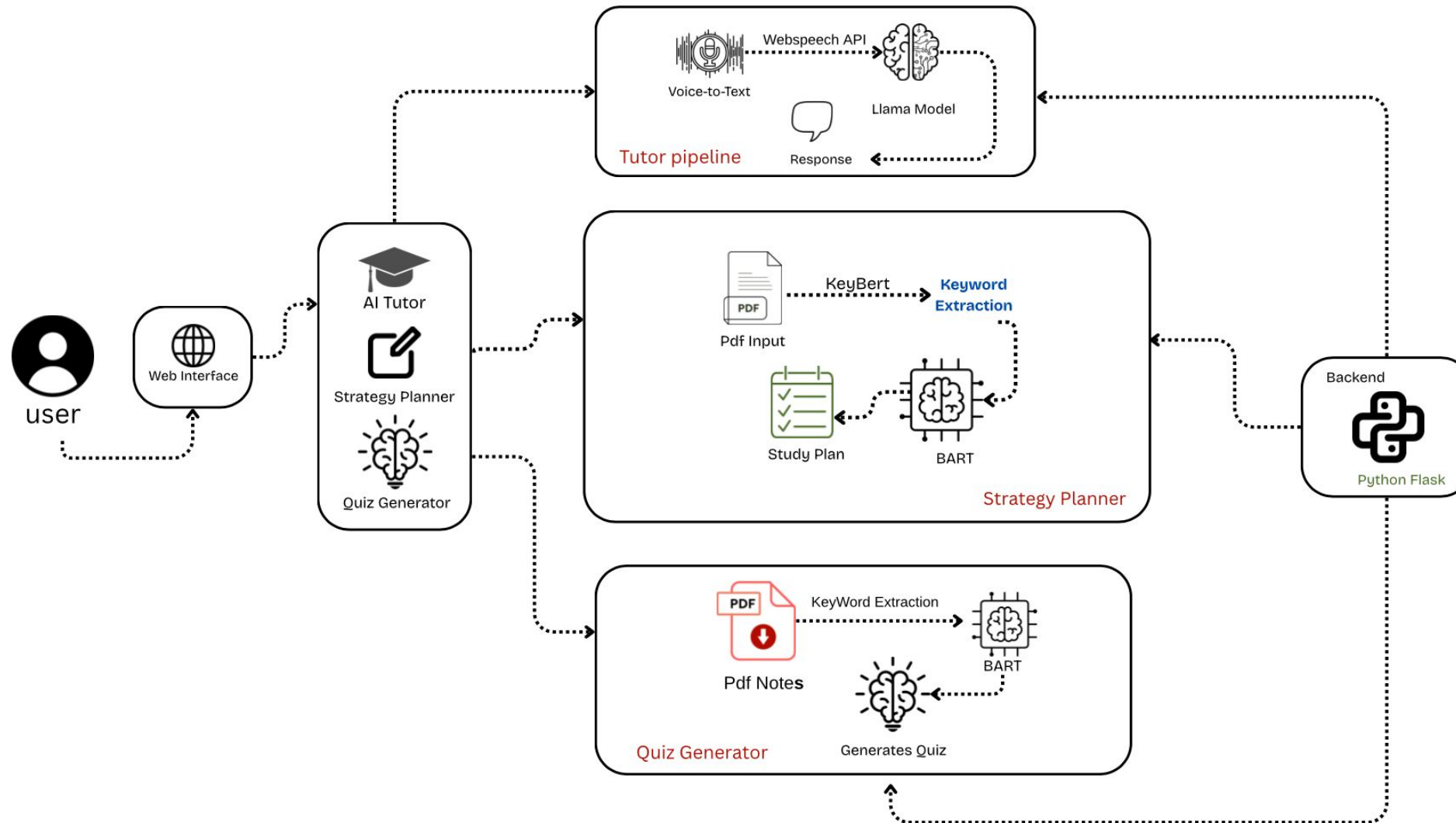
## ❏ Exam Strategy Planner :

- Extracts key concepts from study materials & previous year papers.
- Uses Llama Index for retrieval and BART for Plan generation.

## ❏ Adaptive Quiz Generation :

- Generates quizzes based on retrieved content using BART.

# ARCHITECTURE DIAGRAM



# LIST OF MODULES

1. Document Upload & Preprocessing
2. Study Plan & Mind Map Generation
3. AI Tutoring
4. Adaptive Quiz Generation
5. Integrated Frontend & User Interface

# MODULE DESCRIPTION

## 1. Document Upload & Preprocessing

Handles the upload of study materials (PDFs) and extracts text using **PyMuPDF**. The extracted content is cleaned, tokenized, and split into chunks to prepare it for retrieval and model input across other modules.

## 2. Study Plan Generation

Extracts key concepts from the preprocessed content using **KeyBert**. These are summarized into a structured study plan using a **pre-trained BART model**.

## 3. AI Tutoring (Voice & Text-Based)

Accepts student queries through voice (via **Web Speech API**) or text. Relevant content is fetched using **Keywords**, and **LLaMA** model generates detailed, context-aware explanations using the uploaded study material as reference.



# MODULE DESCRIPTION

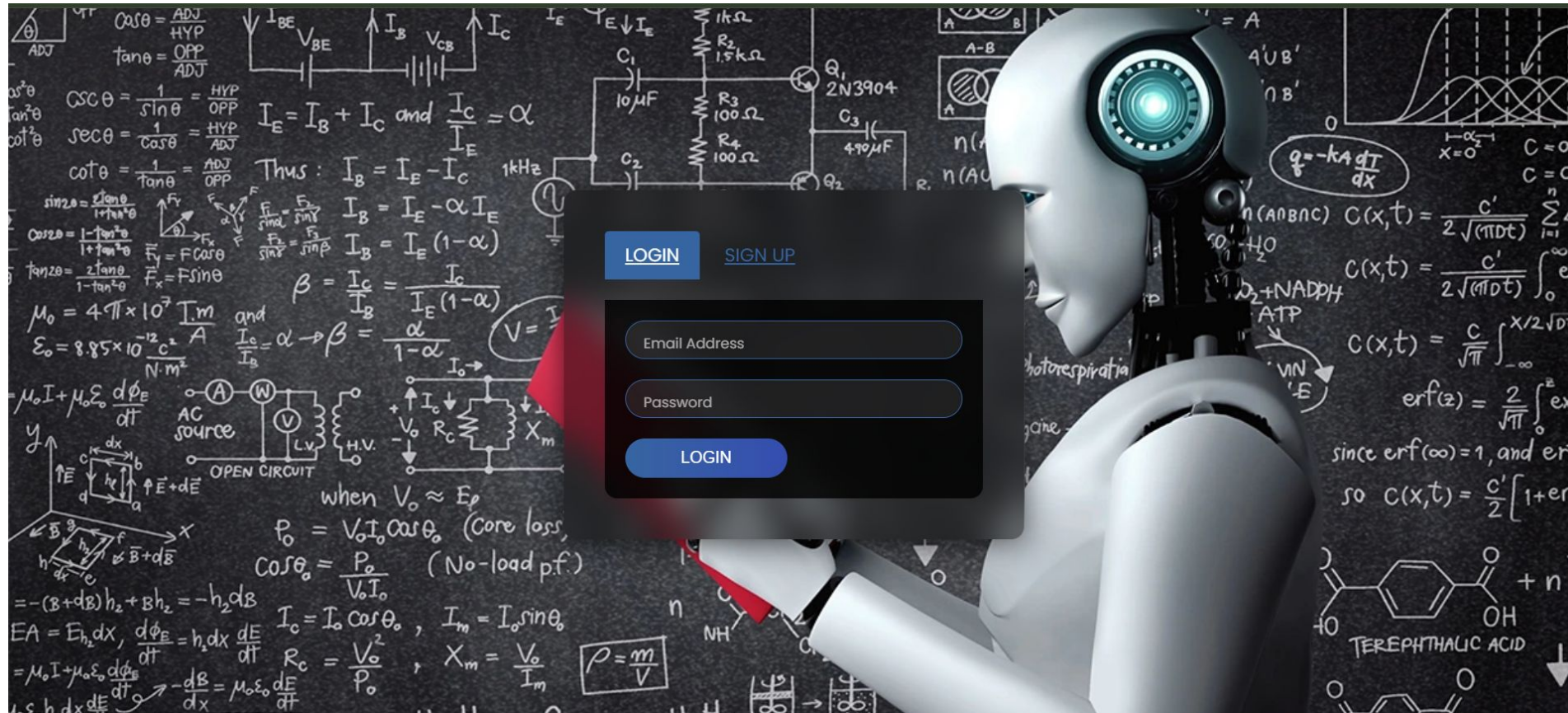
## 4. Adaptive Quiz Generation

Utilizes the extracted keywords and retrieved content to generate questions using **BART**. Users select a topic, and the quiz adapts based on their performance, gradually increasing or decreasing difficulty to support progressive learning.

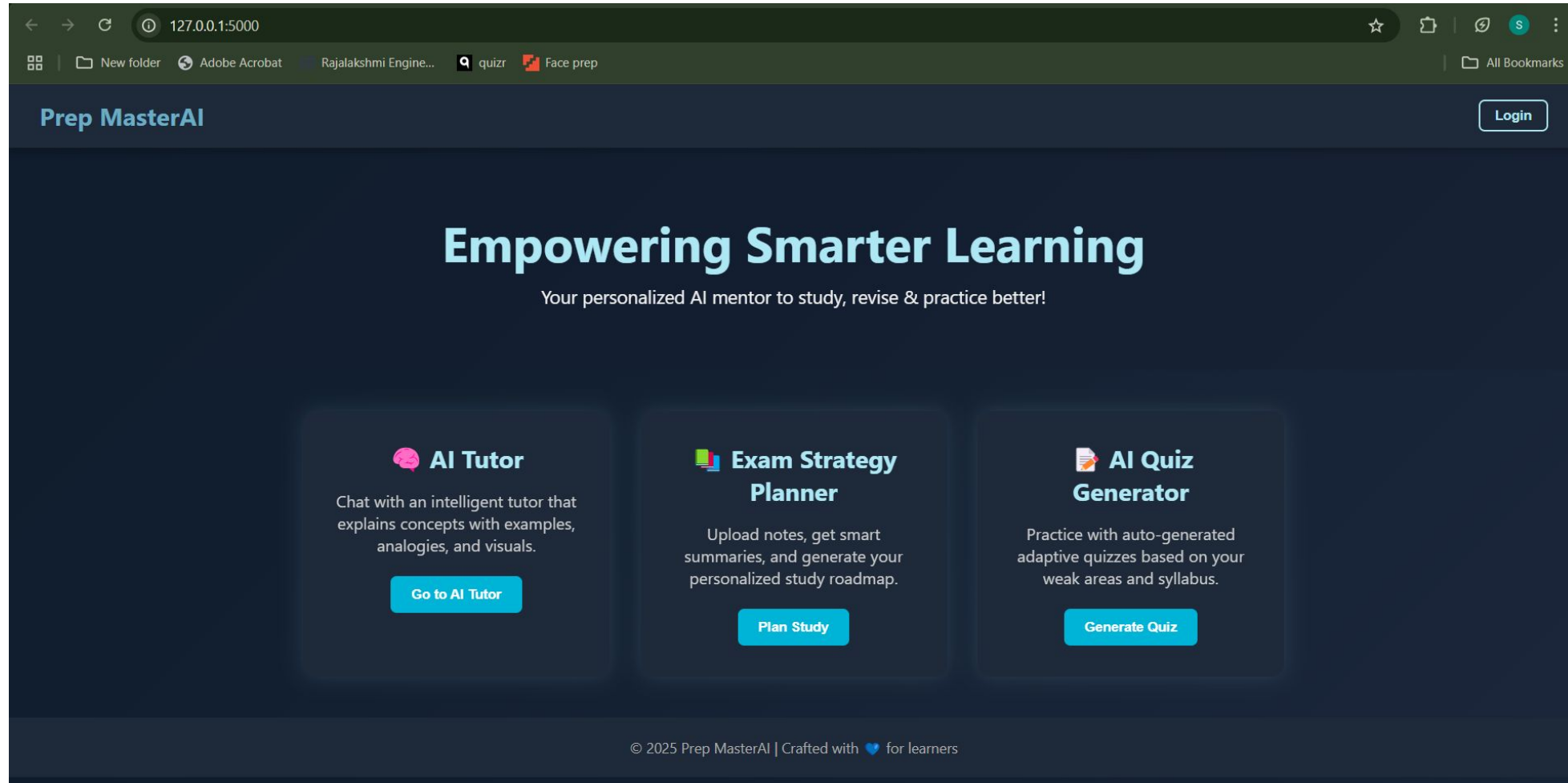
## 5. Integrated Frontend & User Interface

Developed using **Flask**, the interface supports PDF uploads, voice-based tutoring, quiz interaction and study plan visualization. Ensures smooth navigation and integration across all AI-powered modules.

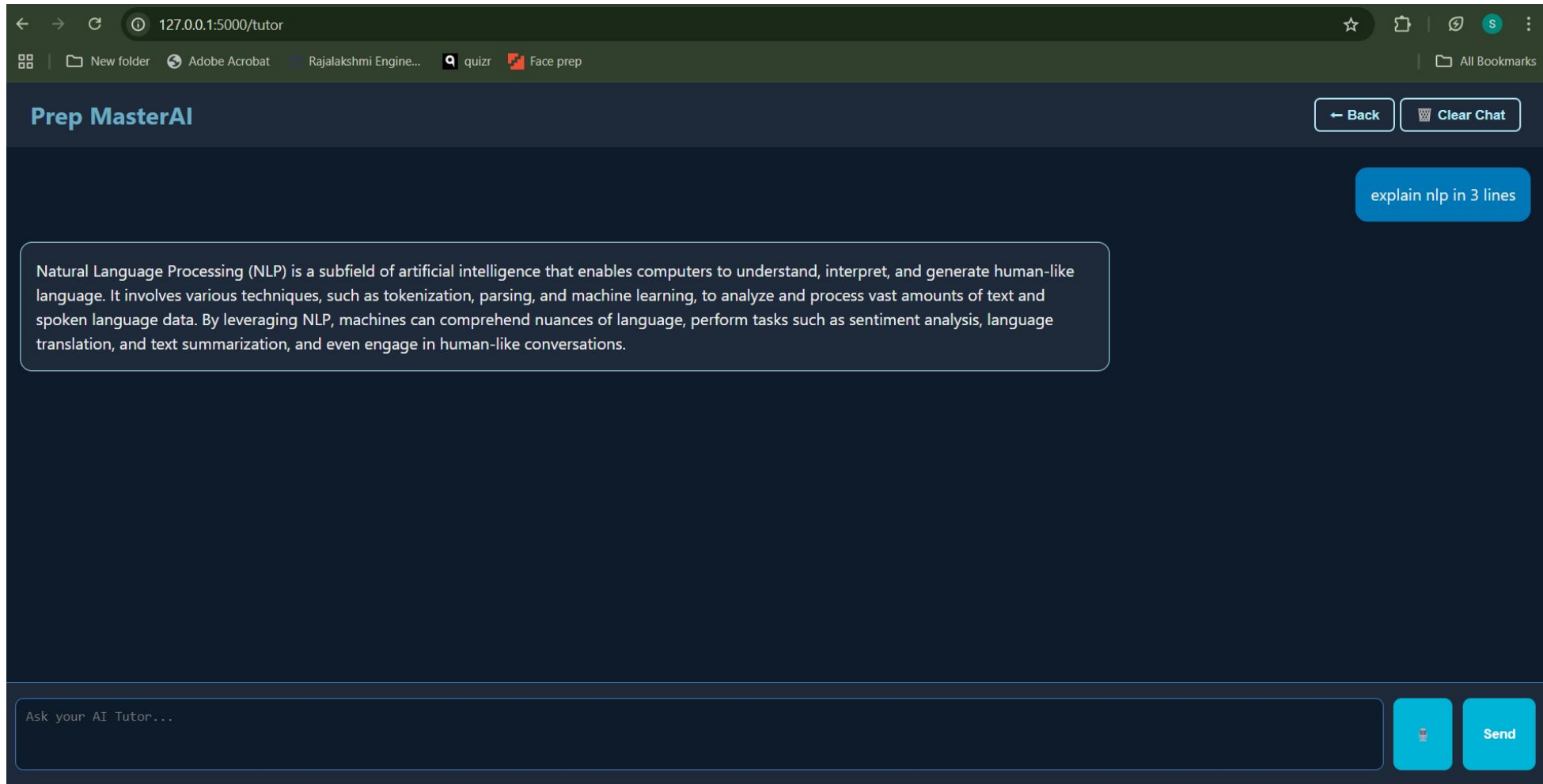
# OUTPUT AND SCREENSHOTS



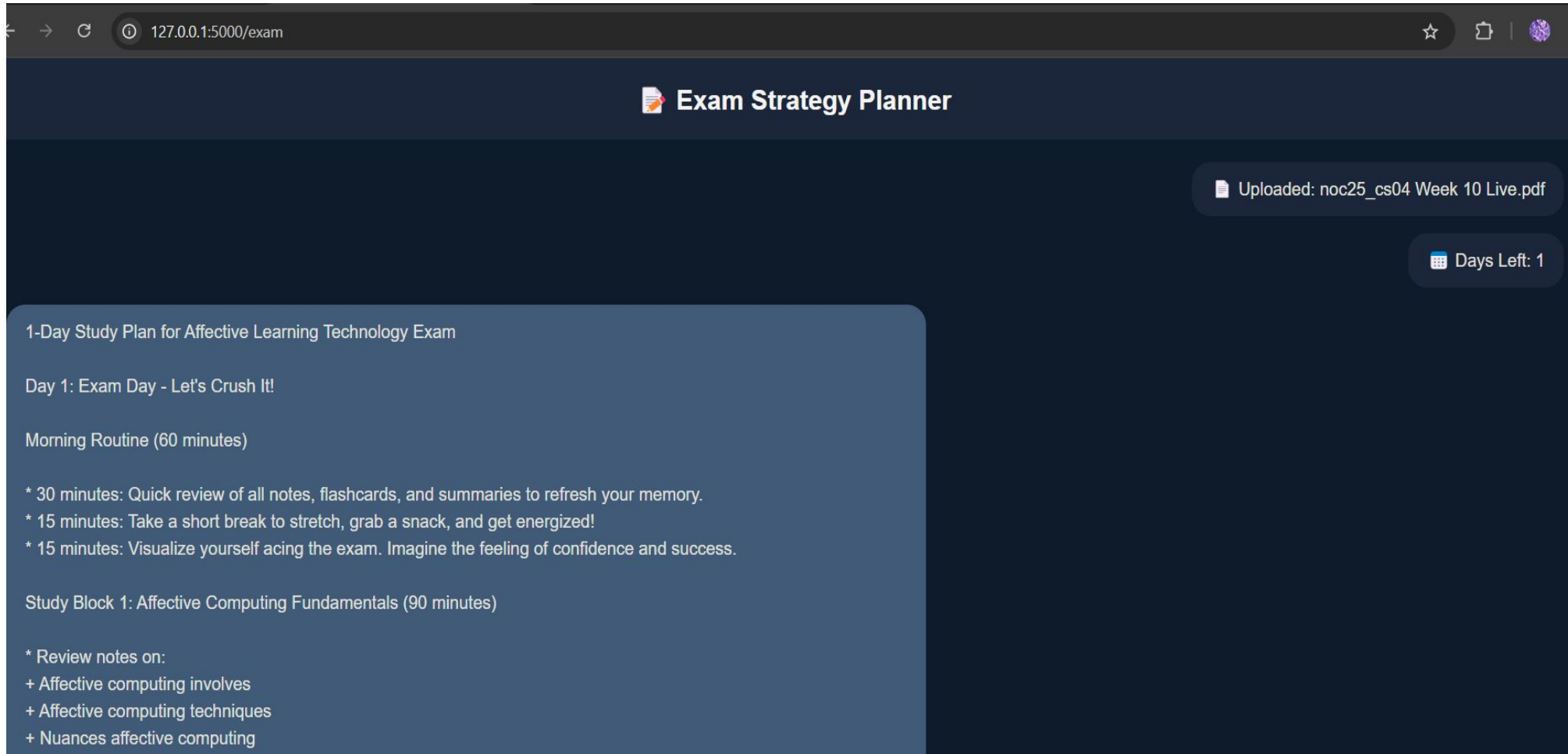
# OUTPUT AND SCREENSHOTS



# OUTPUT AND SCREENSHOTS



# OUTPUT AND SCREENSHOTS



The screenshot shows a web browser window with the address bar displaying "127.0.0.1:5000/exam". The page title is "Exam Strategy Planner". The interface has a dark blue background. In the top right corner, there are two notification boxes: "Uploaded: noc25\_cs04 Week 10 Live.pdf" and "Days Left: 1". The main content area is a light blue box with the following text:

1-Day Study Plan for Affective Learning Technology Exam

Day 1: Exam Day - Let's Crush It!

Morning Routine (60 minutes)

- \* 30 minutes: Quick review of all notes, flashcards, and summaries to refresh your memory.
- \* 15 minutes: Take a short break to stretch, grab a snack, and get energized!
- \* 15 minutes: Visualize yourself acing the exam. Imagine the feeling of confidence and success.

Study Block 1: Affective Computing Fundamentals (90 minutes)

- \* Review notes on:
  - + Affective computing involves
  - + Affective computing techniques
  - + Nuances affective computing

# OUTPUT AND SCREENSHOTS

## Generated Quiz:

**\*\*Q1:\*\* What is the process of simulating how a 3D scene is called in computer vision?**

- A) Photometric image formation
  - B) Image formation
  - C) 3D Reconstruction
  - D) Vision Processing
- 

**\*\*Q2:\*\* Which camera model is a basic representation of image formation in computer vision?**

- A) Pinhole camera model
  - B) Perspective camera model
  - C) Fish-eye camera model
  - D) Thermal camera model
- 

**\*\*Q3:\*\* Why is understanding image formation important in computer vision?**

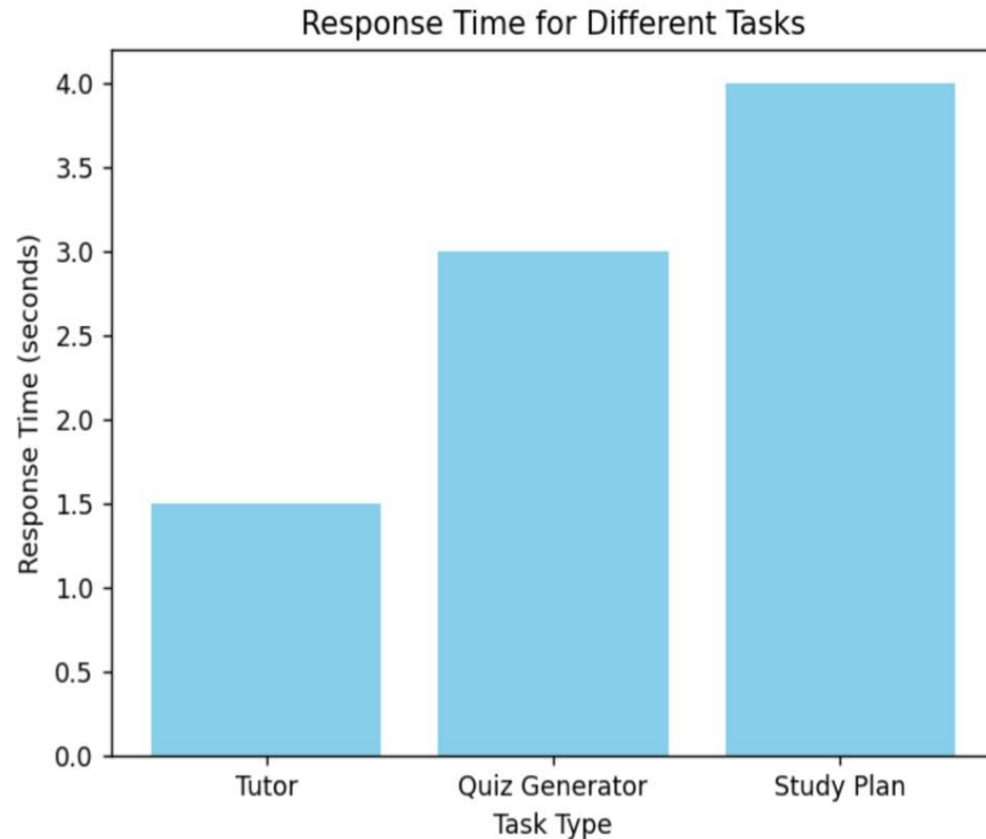
- A) For robust image processing
  - B) For 3D reconstruction
  - C) For photometric image formation
  - D) All of the above
- 

**\*\*Q4:\*\* What happens when objects block light in the image formation process?**

- A) Brightness increases



# COMPARATIVE ANALYSIS



**Fig 6.1** *Response time for different tasks*

**PrepMaster's** three core modules show distinct performance in terms of response time, reflecting their task complexity and optimization.

- ❑ **AI Tutor:** Fastest response at **1.5 seconds**, enabling real-time academic interaction.
- ❑ **AI Quiz Generator:** Responds in **3 seconds**, balancing speed and content quality.
- ❑ **Exam Strategy Planner:** Takes **4 seconds**, as it generates personalized study plans based on multiple inputs.

# CONCLUSION

PrepMaster offers an intelligent and personalized solution for modern academic challenges through an AI-powered learning platform. By integrating the LLaMA model for real-time tutoring, BART for strategic study planning, and adaptive quiz generation, the system delivers tailored academic support and continuous self-assessment. The responsive interface, built with HTML, CSS, and JavaScript, ensures a smooth and accessible experience for students. Overall, PrepMaster enhances learning efficiency, reduces exam stress, and promotes consistent, goal-driven academic preparation.



# REFERENCES

- [1] Mayormonte, M. D., & Gumpal, B. R. (2025). NLP-based sentiment analysis for evaluating student feedback in English language education. In 2025 International Conference on Multi-Agent Systems for Collaborative Intelligence (ICMSCI) (pp. 112–118).
- [2] Bonde, L. (2024). A generative artificial intelligence based tutor for personalized learning. In 2024 IEEE SmartBlock4Africa (pp. 1–10). IEEE.
- [3] Roldán-Álvarez, D., & Mesa, F. J. (2024). Intelligent deep-learning tutoring system to assist instructors in programming courses. *IEEE Transactions on Education*, 67(1), 153–161.
- [4] Chang, C.-K., & Chien, L.-C.-T. (2024). Enhancing academic performance with generative AI-based quiz platform. In 2024 IEEE International Conference on Advanced Learning Technologies (ICALT) (pp. 193–195). IEEE.
- [5] Shahri, H., Emad, M., Ibrahim, N., Rais, R. N. B., & Al-Fayoumi, Y. (2024). Elevating education through AI tutor: Utilizing GPT-4 for personalized learning. In 2024 15th Annual Undergraduate Research Conference on Applied Computing (URC) (pp. 1–5).

# REFERENCES

- [6] Frankford, E., Sauerwein, C., Bassner, P., Krusche, S., & Breu, R. (2024). AI-tutoring in software engineering education: Experiences with large language models in programming assessments. In 2024 IEEE/ACM 46th International Conference on Software Engineering: Software Engineering Education and Training (ICSE-SEET) (pp. 309–319).
- [7] Barde, A., Thakur, R., Patel, S., Sinah, N., & Barde, S. (2024). AI-based smart education system to enhance the learning of students. In 2024 International Conference on Advances in Computing Research on Science Engineering and Technology (ACROSET) (pp. 1–7).
- [8] Duraes, D., Bezerra, R., & Novais, P. (2024). AI-driven educational transformation in secondary schools: Leveraging data insights for inclusive learning environments. In 2024 IEEE Global Engineering Education Conference (EDUCON) (pp. 1–9).
- [9] Besimi, N., Besimi, A., & Çiço, B. (2022). Artificial intelligence in education and learning (AI in research). In 2022 11th Mediterranean Conference on Embedded Computing (MECO) (pp. 1–6). IEEE.
- [10] Mavalankar, A., Kelkar, T., & Choppella, V. (2015). Generation of quizzes and solutions based on ontologies: A case for a music problem generator. In 2015 IEEE Seventh International Conference on Technology for Education (T4E) (pp. 73–76).