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AI - Tutor: An Intelligent System That Adapts Teaching to Neurodiverse Learners

Mrs.Udhaya MS, Ramani R, Samyuktha MA, Sivaranjani S, Vidhya P
Meenakshi College of Engineering, Chennai-78, Tamil Nadu, India

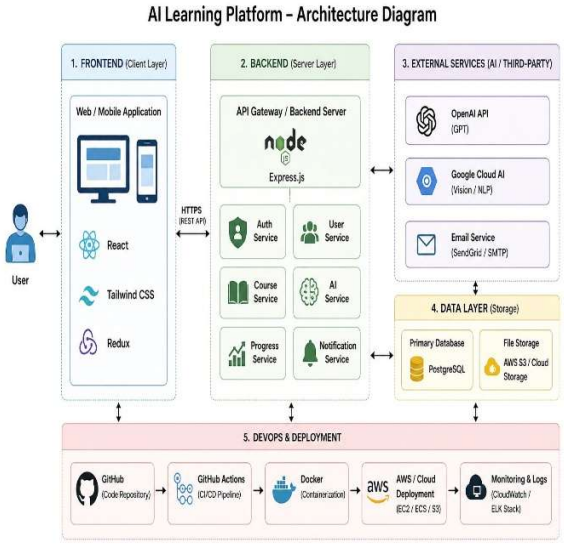
Abstract: Due to a lack of adaptive support, accessibility obstacles, and limited personalization, many students still have unequal access to high-quality education. Empower-Learn AI, an educational platform intended to foster a more inclusive learning environment, is shown in this project. To support various learning demands, the system integrates computer vision, natural language processing, and machine learning. It has voice interaction for simpler access, eye-tracking navigation for hands-free operation, and an AI instructor that provides structured explanations of subjects. In order to suggest appropriate courses and career options, the portal also evaluates resumes. The suggested solution seeks to enhance learning outcomes and increase the accessibility of digital education for a larger user base by incorporating these aspects.

Keywords: Machine learning, voice interaction, eye-tracking navigation, personalized learning, and artificial intelligence.

I. INTRODUCTION

The demands of learners who need individualized support or accessible interfaces are frequently overlooked by the majority of current online learning systems, which are built for general users. Users with motor or visual impairments may find it challenging to use standard platforms because they typically rely on keyboards, touchpads, or mouse input. Furthermore, a number of AI learning systems offer straightforward solutions but fail to lead students through an appropriate learning process.

In order to solve these problems, Empower-Learn AI was created as an adaptable and user-friendly learning platform. Voice commands, eye-based navigation, and an AI instructor that provides step-by-step instruction rather than just responses are all supported. The project's main goal is to increase comprehension and engagement while assisting users in learning on their own.



ITNDS Architecture Diagram

II. LITERATURE SURVEY

Recent developments in educational technology show increasing use of artificial intelligence for personalized learning. Large language models and intelligent tutoring systems can respond to user questions and generate explanations. However, many of these tools still lack structured teaching strategies.

Researchers have also explored accessibility solutions such as webcam-based eye tracking and speech recognition. These technologies help users interact with digital systems without relying entirely on physical input devices. Studies indicate that combining multiple interaction methods can significantly improve usability for differently-abled learners.

A. Organized Pedagogical Frameworks for AI Education

Structured teaching approaches have been created to solve the shortcomings of unstructured AI tutoring. Explain, Example, Question, Practice, and Evaluate is a five-step process that allows AI systems to operate as active teachers instead of passive respondents. By leading users through a methodical learning process, these methods enhance learner engagement, critical thinking, and knowledge retention.

B. Eye-tracking technologies for accessibility

In digital education, accessibility is still a major problem, especially for people with physical disabilities. Computer vision-based gaze tracking is a useful approach, according to recent research. Real-time face mesh identification and eye tracking using common webcams are made possible by tools like MediaPipe, which remove the need for pricey specialized gear and increase the technology's affordability and scalability.

C. Multimodal Interfaces and Voice Interaction

Another essential element of accessible systems is voice-based communication. People with visual or motor disabilities greatly benefit from speech-to-text technologies, which enable users to explore programs and complete tasks with voice instructions. Overall usability and inclusion are enhanced by the integration of multimodal interfaces that combine speech and gaze.

THE CURRENT SYSTEM

Conventional learning management systems primarily offer discussion boards, papers, recorded videos, and tests. These systems are helpful, but they frequently provide the same knowledge to all students, regardless of their learning preferences or skill levels.

Typical restrictions consist of:

• Reliance on mouse and keyboard input.

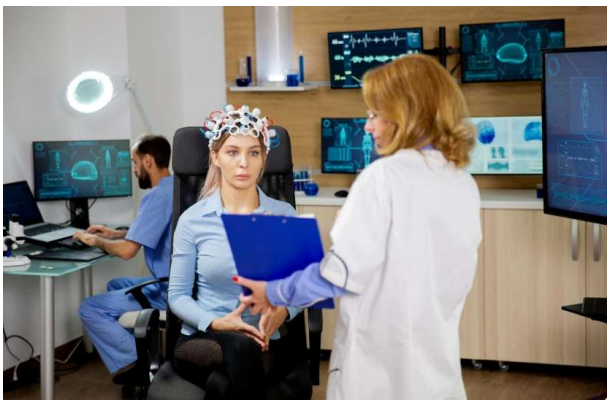
• Limited assistance for those with physical or visual impairments.

• Simple chatbot functions without instruction.

• There are no tailored suggestions.

• Little in-the-moment feedback while learning.

AI-Powered Tutoring for Visually Impaired Learners



AI-Driven Neurological Evaluation

III. CONNECTED WORK

AI is used by a number of contemporary learning platforms to automate responses and make content recommendations. While some systems concentrate on accessibility features, others modify difficulty levels according to learner performance. Few solutions integrate multimodal accessibility, customisation, and structured teaching in one setting, despite these advancements. The goal of this project is to close that gap.

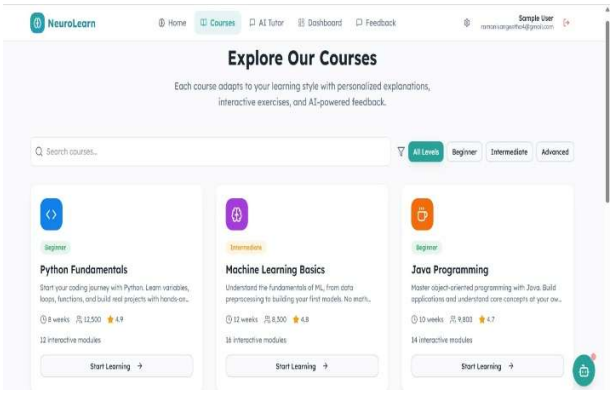
IV. PROPOSED SYSTEM

Empower-Learn AI is intended to be an integrated learning platform that blends accessible interaction techniques with intelligent teaching. Using a guided procedure that includes explanation, example, questioning, practice, and evaluation, the AI tutor explains concepts. This method promotes improved retention and active learning. To assist users in navigating the interface through gaze movement, the platform employs eye-tracking via a camera. Voice commands provide hands-free page opening, option selection, and function control. In order to improve career preparedness, resume analysis is used to determine user skills and recommend pertinent courses. React is used to build the frontend, and backend services handle system operations, AI processing, and user data.

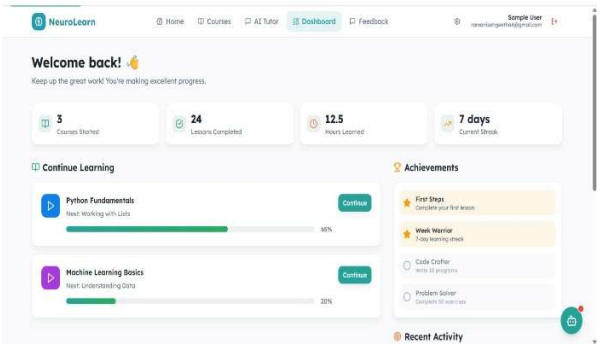
V. METHOD AND OUTCOMES

Frontend design, backend logic, and AI modules are all integrated in a full-stack development process. Performance and usability tests were conducted on individual modules.

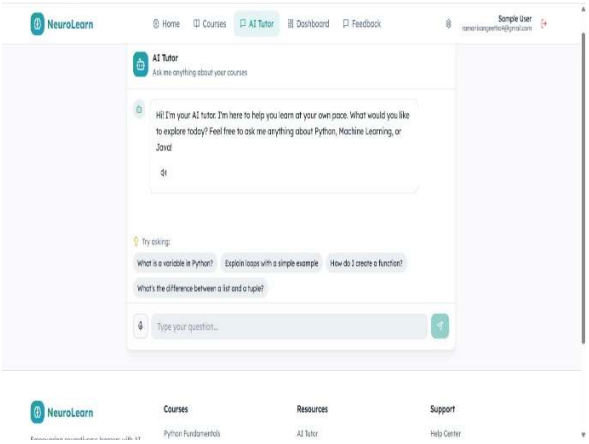
The findings demonstrated that, in typical lighting circumstances, eye-tracking could provide basic navigation with good accuracy. Convenience during hands-free operation was enhanced by voice commands. When short, straightforward replies were replaced with structured ones, the AI tutor provided more understandable learning support. Based on identified talents, resume analysis also generated helpful recommendations.



COURSE PAGE



DASHBOARD



AI-TUTOR CHATBOT

VI. FINAL THOUGHTS AND UPCOMING WORK

Empower-Learn AI shows how intelligent tutoring and accessibility may be integrated into a single educational platform. The technology helps students who might have trouble using traditional digital tools by utilizing voice interaction, eye tracking, and adaptive teaching techniques. Future developments could incorporate deeper analytics to comprehend student progress, smarter predictive typing using gaze input, multilingual learning help, and emotion recognition for engagement analysis. These improvements have the potential to fortify the platform and increase its usefulness.

VII. CITATIONS

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