

# AI-Integrated Peer Learning & Resource Sharing Platform for Engineering Students

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## ABSTRACT

The rapid growth of digital education has transformed the way engineering students learn and collaborate. However, many students still face challenges such as limited access to quality learning resources, lack of peer interaction, and difficulty in understanding complex technical concepts. Traditional learning methods often fail to provide personalized support and collaborative opportunities, leading to gaps in knowledge sharing and skill development. To address these challenges, this project proposes an **AI-Integrated Peer Learning and Resource Sharing Platform for Engineering Students**. The system is designed to create a collaborative learning environment where students can share study materials, discuss concepts, and learn from one another. By integrating Artificial Intelligence (AI), the platform provides personalized recommendations for learning resources, suggests relevant study materials based on user interests, and facilitates intelligent peer matching for collaborative learning. The platform includes features such as discussion forums, resource uploading and sharing, doubt clarification modules, and AI-driven content recommendation systems. Additionally, natural language processing techniques are used to analyze user queries and provide relevant answers or direct users to appropriate resources and peers. The system promotes active learning, knowledge exchange, and skill enhancement by combining peer

interaction with intelligent automation. Artificial Intelligence (AI), peer learning, resource sharing, personalized learning, recommendation systems

## Keywords

Artificial Intelligence (AI), Peer Learning, Resource Sharing, Personalized Learning, Recommendation System, Natural Language Processing (NLP), Collaborative Learning, Educational Technology, Student Interaction, Knowledge Sharing

## INTRODUCTION

The rapid advancement of digital technologies has significantly transformed the education sector, particularly in engineering education where continuous learning and collaboration are essential. Students today have access to vast amounts of online resources; however, they often face challenges such as information overload, lack of structured guidance, and limited peer interaction. Traditional classroom-based learning methods are no longer sufficient to meet the dynamic needs of modern engineering students, especially when it comes to understanding complex technical concepts and staying updated with evolving technologies.

Peer learning has emerged as an effective approach to enhance understanding through collaboration, discussion, and knowledge sharing among students. When students learn from one another, they gain diverse perspectives, improve problem-

solving skills, and build stronger conceptual clarity. However, existing platforms for peer learning are often unstructured and lack intelligent mechanisms to connect learners with relevant resources and suitable peers.

To overcome these limitations, the proposed project introduces an **AI-Integrated Peer Learning and Resource Sharing Platform for Engineering Students**. The system leverages Artificial Intelligence (AI) to create a smart and collaborative learning environment. It provides personalized recommendations for study materials, suggests relevant topics based on user interests, and intelligently matches students with peers who have similar learning goals or expertise.

The platform incorporates features such as resource sharing, discussion forums, doubt clarification modules, and AI-driven recommendation systems. Natural Language Processing (NLP) techniques are

used to understand user queries and provide meaningful responses or direct users to appropriate resources. This ensures that students receive timely and relevant support in their learning journey.

## LITERATURE REVIEW

The integration of Artificial Intelligence (AI) and collaborative learning platforms has gained significant attention in recent years, especially in the domain of engineering education. Researchers have explored various approaches to enhance learning experiences through peer interaction, resource sharing, and intelligent recommendation systems.

Anderson et al. studied the impact of peer learning in higher education and found that collaborative learning environments significantly improve student engagement, problem-solving skills, and knowledge retention. Their work highlights the importance of interaction among students; however, it lacks technological support for intelligent matching and personalized learning. Johnson and Johnson emphasized cooperative learning strategies, demonstrating that structured peer collaboration leads to improved academic performance and interpersonal skills. While their research provides a strong theoretical foundation, it does not

incorporate modern digital platforms or AI-based enhancements. Kumar and Bansal proposed an online resource-sharing platform for students, enabling them to upload and access study materials. Although the system improved accessibility, it lacked personalization and intelligent filtering, resulting in information overload for users.

Zhang et al. developed an AI-based recommendation system for e-learning platforms that suggests learning materials based on user preferences and behavior. Their approach improved content relevance and user engagement, but it did not include peer interaction or collaborative learning features.

Chen and Li introduced a Natural Language Processing (NLP)-based system for automated doubt clarification in educational platforms. Their model could analyze student queries and provide relevant answers, enhancing learning efficiency. However, the system was limited to automated responses and did not facilitate peer-to-peer interaction.

Singh et al. proposed a collaborative learning platform that integrates discussion forums and group-based learning. While the system encouraged communication among students, it lacked intelligent

mechanisms to recommend peers or resources based on individual needs.

## PROBLEM DEFINITION

In modern engineering education, students have access to a vast amount of online learning resources, yet they often face significant challenges in effectively utilizing them. The abundance of information leads to confusion, lack of direction, and difficulty in identifying high-quality and relevant study materials. Additionally, traditional learning environments provide limited opportunities for continuous peer interaction and collaborative problem-solving outside the classroom.

Existing online platforms for learning and resource sharing are often unstructured and lack intelligent mechanisms to personalize content according to individual student needs. Students frequently struggle to find appropriate resources, connect with peers who can help them understand difficult concepts, and get timely answers to their queries. This results in reduced learning efficiency and lower engagement.

Moreover, most current systems either focus on content delivery or discussion forums, but they do not effectively integrate both with advanced technologies like Artificial Intelligence. The absence of

intelligent recommendation systems, peer matching, and automated query handling further limits the effectiveness of these platforms.

## PROPOSED SYSTEM

The proposed system, titled “**AI-Integrated Peer Learning & Resource Sharing Platform for Engineering Students,**” aims to create a smart, collaborative, and personalized learning environment by integrating Artificial Intelligence with peer learning and resource sharing mechanisms. The system is designed to overcome the limitations of traditional learning platforms by providing structured access to learning resources and enabling intelligent interaction among students.

The platform allows students to upload, share, and access study materials such as notes, assignments, coding resources, and project documents. A centralized repository is maintained where resources are categorized based on subjects, topics, and difficulty levels, making it easier for users to find relevant content.

A key feature of the proposed system is the integration of **AI-based recommendation techniques**. The system analyzes user behavior, interests, and learning patterns to suggest relevant study materials and

topics. This personalized recommendation approach helps students focus on important content and improves learning efficiency.

Another important component is the **intelligent peer matching system**, which connects students with peers who have similar interests, academic goals, or expertise in specific subjects. This enables effective collaboration, discussion, and knowledge sharing among students.

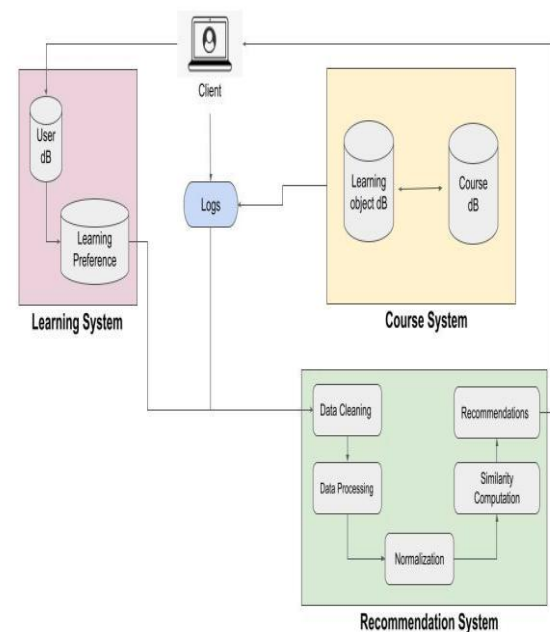
The system also incorporates **Natural Language Processing (NLP)** techniques to handle user queries. Students can ask questions in natural language, and the system either provides automated responses or directs them to relevant resources and peers who can help resolve their doubts. This ensures timely and efficient doubt clarification.

## SYSTEM ARCHITECTURE

The **AI-Integrated Peer Learning & Resource Sharing Platform for Engineering Students** is designed using a modular and layered architecture that integrates Artificial Intelligence, Natural Language Processing, and collaborative learning components. The architecture ensures scalability, efficient data flow, and a seamless user experience. The system architecture integrates **AI, NLP, and**

**collaborative learning modules** into a unified platform. This design ensures personalized learning, efficient resource sharing, and intelligent peer interaction, making the system highly effective for modern engineering education

## SYSTEM ARCHITECTURE



## IMPLEMENTATION

The implementation of the **AI-Integrated Peer Learning & Resource Sharing Platform for Engineering Students** is carried out using a combination of web technologies, machine learning algorithms, and Natural Language Processing techniques to create an intelligent and collaborative learning environment. The system is developed in a modular manner to ensure scalability, flexibility, and efficient performance.

Initially, the platform is built as a web-based application using frameworks such as Django or Flask for the backend and HTML, CSS, and JavaScript for the frontend. The system provides user authentication features including registration and login, enabling students to securely access the platform and manage their profiles. A centralized database is used to store user information, uploaded resources, interaction history, and system logs.

The resource management module allows users to upload, download, and categorize study materials such as notes, PDFs, videos, and project files. These resources are organized based on subjects and topics, making it easier for students to search and access relevant content.

A key component of the implementation is the **AI-based recommendation system**, which analyzes user behavior, learning preferences, and interaction patterns to suggest relevant study materials. Machine learning techniques such as collaborative filtering or content-based filtering are used to generate personalized recommendations. This helps students focus on the most useful learning resources.

The **peer matching module** is implemented to connect students with

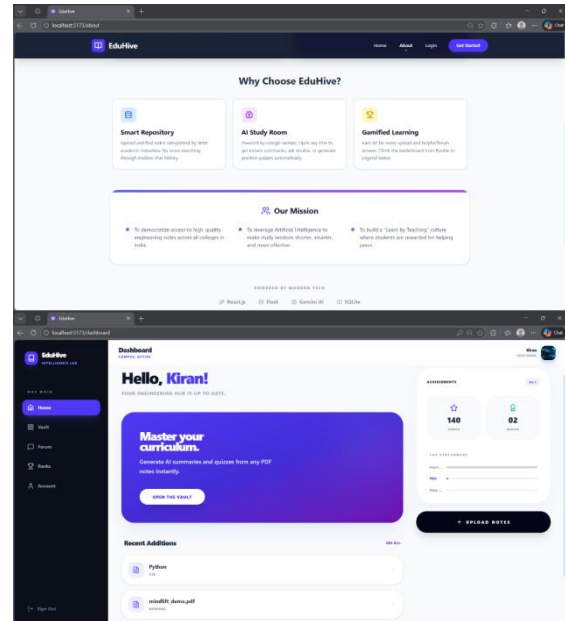
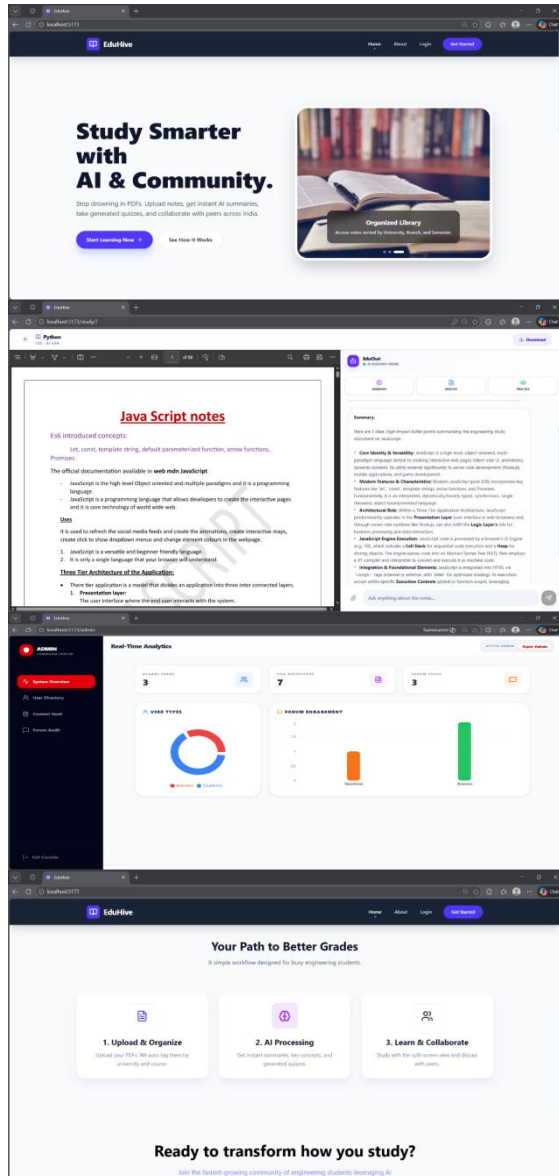
similar interests, academic goals, or expertise. Clustering or similarity-based algorithms are used to identify and recommend suitable peers for collaboration and discussion, enhancing the peer learning experience.

## RESULTS AND DISCUSSION

The **AI-Integrated Peer Learning & Resource Sharing Platform for Engineering Students** was evaluated based on its ability to enhance learning efficiency, improve collaboration, and provide personalized recommendations. The system was tested with multiple users interacting through resource sharing, discussion forums, and AI-driven features.

The results demonstrate that the **AI-based recommendation system** effectively suggests relevant study materials based on user interests, past interactions, and learning behavior. Students were able to quickly access useful resources without spending excessive time searching, thereby improving learning efficiency. The recommendation accuracy improved over time as the system learned from user activity. The integration of the **NLP-based query processing module** allowed users to ask questions in natural language and receive relevant responses or guidance. The system successfully identified user

intent and provided appropriate answers or redirected queries to suitable resources or peers. This feature reduced dependency on external sources and improved doubt clarification efficiency.



## CONCLUSION

The AI-Integrated Peer Learning & Resource Sharing Platform for Engineering Students successfully addresses the limitations of traditional learning methods by creating a smart, collaborative, and personalized educational environment. By integrating Artificial Intelligence with peer learning and resource sharing, the system enhances the overall learning experience and supports effective knowledge exchange among students.

The implementation of AI-based recommendation techniques enables personalized learning by suggesting relevant study materials based on user behavior and preferences. The peer matching module further strengthens collaboration by connecting students with

similar interests or complementary expertise, promoting active discussion and deeper understanding of concepts. Additionally, the integration of Natural Language Processing (NLP) allows efficient query handling, enabling students to receive timely assistance and guidance.

The system demonstrates strong performance in terms of usability, scalability, and responsiveness. Its user-friendly interface ensures easy access to resources, while the intelligent backend continuously adapts to user interactions, improving recommendations and system efficiency over time.

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