



Mini Project Report On

Edu-AI

*Submitted in partial fulfillment of the requirements for the
award of the degree of*

Bachelor of Technology

in

Computer Science & Engineering

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CERTIFICATE

*This is to certify that the mini project report entitled "**Edu-AI**" is a bonafide record of the work done by **Saira Sunny (u2103187)**, **Therese Joe (u2103207)**, **Thomas Biju (u2103208)** and **Thomas John (u2103209)**, submitted to the APJ Abdul Kalam Technological University in partial fulfillment of the requirements for the award of the degree of Bachelor of Technology (B. Tech.) in Computer Science and Engineering during the academic year 2023-2024.*

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Abstract

This project presents a comprehensive website designed to analyze user behavioral traits using the Myers-Briggs Type Indicator (MBTI) and VARK (Visual, Auditory, Reading/Writing, Kinesthetic) learning styles theory. Users are invited to complete a detailed questionnaire, the responses to which are then analyzed by a Random Forest AI model operating in the backend, utilizing extensive existing datasets. The AI model processes the questionnaire data to accurately determine each user's MBTI personality type and preferred learning style according to the VARK framework. Based on this in-depth analysis, the website generates an ideal learning style tailored to each individual, which is then displayed on the insights page. In addition to these personalized insights, the website also provides curated educational materials specifically suited to the identified learning style, ensuring that users receive resources that best match their unique preferences. This personalized approach aims to significantly enhance individual learning experiences by aligning educational content with the user's inherent learning modality. The project underscores the potential of AI-driven personalization in educational contexts, offering users valuable tools to better understand their behavioral traits and optimize their learning strategies for improved engagement and effectiveness. Through this innovative integration of psychological and educational theories with advanced AI technology, the project aspires to foster a more personalized and effective learning environment for each user.

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Chapter 1

Introduction

1.1 Background

In today's rapidly evolving educational landscape, personalized learning platforms have emerged as pivotal tools for fostering individualized learning experiences. These platforms leverage technology to tailor educational content and experiences to the unique needs, interests, and abilities of each learner. This section will delve into the background of personalized learning platforms, their current scenarios, and underscore their importance in modern education. Traditional one-size-fits-all educational approaches often struggle to accommodate the diverse learning styles and paces of students. This limitation becomes particularly apparent in today's digitally-driven world, where learners expect flexibility, interactivity, and relevance in their educational experiences. Additionally, the global COVID-19 pandemic has accelerated the adoption of online and hybrid learning models, further emphasizing the need for adaptive and personalized educational solutions. Amidst these challenges, personalized learning platforms have gained prominence for their ability to address individual learner needs effectively. These platforms harness data analytics, artificial intelligence, and adaptive learning algorithms to deliver tailored content, assessments, and support mechanisms. By analyzing each student's learning patterns, preferences, and performance metrics, these platforms offer customized learning paths that optimize engagement and outcomes. In summary, personalized learning platforms represent a transformative approach to education, tailored to the needs of each learner. By harnessing the power of technology and data-driven insights, these platforms hold the potential to revolutionize teaching and learning paradigms, fostering more inclusive, effective, and engaging educational experiences for all. As we navigate the complexities of 21st-century education, personalized learning platforms stand as beacons of innovation and promise, shaping the future of learning in profound ways.

1.2 Problem Definition

The aim of this personalized learning platform is to revolutionize education by providing tailored learning experiences that cater to the unique needs, interests, and abilities of each learner. Through data-driven insights and adaptive technology, it seeks to optimize engagement, comprehension, and outcomes, fostering a more inclusive and effective educational ecosystem.

1.3 Scope and Motivation

1.3.1 Scope

The scope of this personalized learning platform encompasses a wide range of educational domains, including K-12 education, higher education, vocational training, and professional development. It aims to cater to diverse learners, regardless of age, background, or learning objectives, by offering customizable learning paths, resources, and assessments. Additionally, the platform will support various instructional modalities, such as self-paced learning, blended learning, and collaborative learning environments, to accommodate different learning styles and preferences. Furthermore, it will provide comprehensive analytics and reporting features to track learner progress, identify areas for improvement, and inform instructional decision-making. Overall, the platform's scope is designed to be flexible, scalable, and adaptable to the evolving needs of learners and educators across multiple educational settings.

1.3.2 Motivation

The motivation behind developing this personalized learning platform stems from the recognition of the limitations of traditional, one-size-fits-all educational approaches. By harnessing the power of technology and data analytics, we aim to address these limitations and empower learners to achieve their full potential. Moreover, the growing demand for flexible, accessible, and effective educational solutions, particularly in the wake of the COVID-19 pandemic, underscores the urgency and relevance of this initiative. Furthermore, our motivation is driven by a commitment to fostering inclusivity, equity, and innovation in education, ensuring that every learner has the opportunity to thrive and succeed. Ultimately, our goal is to revolutionize the way education is delivered and experienced,

making learning more personalized, engaging, and impactful for learners worldwide.

1.4 Objectives

- **Needs Analysis:** Conduct comprehensive surveys, interviews, and assessments to identify the diverse learning needs, preferences, and challenges of students across different demographics, learning styles, and academic levels.
- **Platform Development:** Utilize machine learning and AI algorithms to develop sophisticated content recommendation systems and adaptive learning pathways that dynamically adjust based on individual learner performance, preferences, and feedback.
- **Data Integration and Analysis:** Integrate user data from various sources, including learning management systems, user interactions, and performance metrics, and employ advanced analytics techniques to uncover patterns, trends, and correlations that inform personalized recommendations and interventions.
- **Testing and Evaluation:** Conduct rigorous pilot studies and user testing sessions to evaluate the effectiveness and usability of personalized learning features, gathering feedback from students, educators, and administrators through surveys, interviews, and performance metrics analysis.
- **Continuous Improvement:** Implement a feedback loop mechanism to continuously refine and improve the personalized learning platform based on insights gained from data analysis, user feedback, and emerging educational trends, ensuring ongoing optimization and relevance to diverse learner needs.

1.5 Challenges

The project faces challenges related to ensuring the privacy and security of user data while leveraging it effectively for personalization. Additionally, overcoming technical complexities in developing robust algorithms for accurate content recommendations and adaptive learning pathways presents a significant hurdle. Furthermore, achieving seamless integration with existing educational systems and overcoming resistance to change among

educators may pose implementation challenges.

1.6 Assumptions

- Availability of suitable third-party APIs or libraries.
- Compatibility across operating systems and devices.
- Adequate server infrastructure and cloud services.
- Compliance with data privacy regulations.
- Continuous availability of resources.
- User willingness to engage with the application.

1.7 Societal / Industrial Relevance

The project holds relevance for both the education sector and various industries seeking to enhance learning and training experiences. In education, the personalized learning platform can be applied across K-12 schools, colleges, and universities, catering to diverse student populations with individualized learning paths and resources. Additionally, it can benefit vocational training programs and corporate learning initiatives by providing tailored training modules and professional development opportunities. Moreover, industries such as healthcare, technology, and finance can leverage the platform for employee training and skill development, ensuring workforce readiness and competitiveness in dynamic market environments. Overall, the project's applicability extends across sectors, offering transformative solutions for personalized learning and skill enhancement.

1.8 Organization of the Report

- **Chapter 1-Introduction:** Provides a background to what the project is. Gives a total idea regarding the scope and problems that are solved by the making of the PLP. States the objectives of the project and challenges faced. Emphasises on the societal and industrial relevance the project has.

- **Chapter 2-Software Requirements Specification:** Outlines the essential components necessary for understanding and implementing the software. It begins with an introduction, providing an overview of the document's purpose and scope. Following this, the overall description moves into the wider context of the software, detailing its intended functionality and objectives. External interface requirements are then outlined, specifying any interactions with external systems, users, or hardware. The chapter proceeds to highlight system features, presenting a comprehensive list of functionalities that the software is expected to deliver. Finally, it concludes with a discussion on other nonfunctional requirements, which include performance, security, and usability considerations essential for the software's success.
- **Chapter 3-System Architecture and Design:** Provides a comprehensive overview of the system's architecture and design. It starts with a System Overview, giving description of the system's components and functionality. Following this, the Architectural Design section dives deeper into the structure and organization of the system, outlining how different modules interact and communicate with each other. The section on Dataset Identified discusses the datasets that have been identified and will be used in the system. Proposed Methodology/Algorithms details the methods and algorithms that will be employed for data processing and analysis. User Interface Design focuses on the visual aspects and usability of the system interface, while Database Design outlines the structure and organization of the system's database. Description of Implementation Strategies discusses the strategies and approaches that will be used for implementing the system. Module Division provides a breakdown of the system into smaller modules, along with the responsibilities of each module. Finally, the Work Schedule - Gantt Chart presents a timeline and schedule for the project's implementation, outlining milestones and deadlines.
- **Chapter 4-Results and Discussions:** Provides the results and discussions stemming from the implementation and testing of our system. It commences with an Overview, providing a concise summary of the findings and outcomes of our analysis. After this, the Testing section outlines the methodologies and procedures employed to validate the functionality and performance of the system. Quantitative Results present the numerical data and metrics obtained from the testing phase, offering

insights into the system's performance. Graphical Analysis supplements the quantitative data with visual representations to facilitate a clearer understanding of the results. Finally, Discussions offer an in-depth analysis and interpretation of the results, addressing the model performance, feature importance and certain areas for improvement.

- **Chapter 5-Conclusion:** This serves as the ending of our study, offering a Conclusion that synthesizes the key findings and implications derived from our research. This section provides a comprehensive summary of the project. Additionally, the chapter explores the Future Scope of the project, discussing potential avenues for further research, development, and application. It outlines potential areas for expansion, improvement, and innovation, offering insights into how our work can pave the way for contributions to the field.

Chapter 2

Software Requirements Specification

2.1 Introduction

2.1.1 Purpose

The purpose of the application is to personalise the learning experience for users by assessing their learning style, personality traits, and study habits using a machine learning-driven questionnaire.

2.1.2 Product Scope

An AI-powered web app personalized learning by assessing user learning styles, personality traits, and study habits through a questionnaire, delivering tailored study strategies and content. Enhance learning outcomes and engagement by providing personalized study strategies aligned with each user's unique learning style and preferences.

The product scope includes:

- User registration/authentication
- Learning style assessment
- Machine learning analysis
- Adaptive content delivery
- User dashboard
- Security/usability/accessibility features
- Testing/deployment requirements

2.2 Overall Description

2.2.1 Product Perspective

This product is a new, self-contained web application designed to revolutionise personalised learning experiences. It stands as an independent solution, not directly replacing existing systems or belonging to a product family. However, it can integrate as a component within larger educational platforms, enhancing their capabilities by providing personalised learning features. Interfaces with these platforms facilitate data exchange, user authentication, and content synchronisation.

2.2.2 Product Functions

The product offers a comprehensive suite of functions tailored to enhance the learning experience. Users can seamlessly register and authenticate their accounts, ensuring secure access to the platform. Through a sophisticated learning style assessment, individuals receive personalized insights into their preferred learning methods. This information is utilized to generate tailored learning profiles, optimizing content delivery to match each user's unique preferences and needs. The platform dynamically adapts its content delivery, ensuring an engaging and effective learning journey. Users can easily track their progress and access detailed insights via a user-friendly dashboard, empowering them to monitor their advancement and make informed decisions about their learning path.

2.2.3 Operating Environment

The Personalized Learning Platform (PLP) operates in a web-based environment, accessible through any standard web browser on a variety of devices.

- Target users:Learners, educators, or administrators (depending on functionalities) with internet access and a web browser.
- Web Browsers:Supported browsers include current versions of Chrome, Firefox, Safari, and Edge.
- Responsive Design:The PLP utilises responsive design principles to ensure optimal user experience across devices (desktops, tablets, smartphones).

Note:

While the PLP itself has no specific operating system requirements for user access, the server-side environment where the application is hosted will have its own operating

system needs (detailed in section 3.4 - Hardware and Software Requirements).

2.2.4 Design and Implementation Constraints

The development of the product is subject to various limitations and constraints that must be carefully managed. Compliance with regulatory policies is paramount, necessitating thorough adherence to legal requirements and standards throughout the development process. Additionally, hardware constraints, such as limitations in memory and processing power, must be considered to ensure optimal performance across various devices and environments. Interfaces with other applications need to be seamlessly integrated to enhance functionality and user experience. The selection of required technologies, tools, and databases is crucial for building a robust and scalable platform. Security considerations are of utmost importance to safeguard user data and privacy, requiring the implementation of robust encryption protocols and access controls. Moreover, adherence to design conventions and programming standards is essential for maintaining consistency, readability, and maintainability throughout the codebase. By addressing these limitations and constraints, the product can be developed to meet high standards of quality, usability, and compliance.

2.2.5 Assumptions and Dependencies

Assumptions:

- Availability of suitable third-party APIs or libraries.
- Compatibility across operating systems and devices.
- Adequate server infrastructure and cloud services.
- Compliance with data privacy regulations.
- Continuous availability of resources.
- User willingness to engage with the application.

Dependencies:

- Integration with external systems or databases.
- Access to research on learning styles and personality assessment.

2.3 External Interface Requirements

This section details the various interfaces users and external systems interact with to utilize the Personalized Learning Platform (PLP).

2.3.1 User Interfaces

The PLP web application will feature a user login screen with fields for username and password. Upon successful login, users will be directed to a personalized dashboard with the following features:

- **Learning Style Assessment:** Users may take a survey to determine their learning preferences.
- **Personalized Learning Results:** Displays the user's learning style (e.g., visual, auditory, kinesthetic).
- **Course Selection:** Allows users to browse and select courses based on their interests and learning goals.
- **Personalized Learning Resources:** Presents learning materials tailored to the user's learning style, including videos, articles, and interactive exercises.

2.3.2 Hardware Interfaces(Not Applicable)

The PLP is a web-based application and does not require specific hardware interfaces beyond standard user devices such as computers, tablets, and smartphones with internet access. Detailed specifications for supported devices and interaction protocols will be documented as needed.

2.3.3 Software Interfaces

The PLP will integrate with various software components to provide its functionalities:

- **Frontend Technologies:** The user interface will be built with HTML, CSS, and JavaScript, handling user interactions and displaying information.
- **Backend Framework:** The backend will use Flask (Python) to manage communication and data flow between components.
- **Database:** A relational or NoSQL database will store user data, course information, and AI models as needed.
- **AI Libraries:** Integration with libraries like scikit-learn and pandas for processing assessment data and determining learning styles.

2.3.4 Communications Interfaces

The PLP will support communication over standard web protocols such as HTTP and HTTPS to ensure secure data transmission

- **Data Transfer:** Use of standard web protocols to ensure compatibility with various web browsers and servers.
- **Security:** Encryption of sensitive data during transmission to protect user privacy and confidentiality.
- **API Integration:** Interaction with external Learning Management Systems (LMS) and content providers through APIs to fetch personalized learning content.
- **Performance Optimization:** Efficient data transfer and synchronization mechanisms to ensure smooth performance, particularly for loading learning resources and saving user progress.

2.4 System Features

This section details the key functionalities of the Personalized Learning Platform (PLP). The features are organized by user journey, outlining the experiences and functionalities

users will encounter as they interact with the platform..

2.4.1 User Onboarding and Style Assessment (Combined)

2.4.1.1 Description and Priority

This feature guides new users through the onboarding process and determines their learning style and personality type. It is a high-priority feature.

2.4.1.2 Stimulus/Response Sequences

- Stimulus: User visits the PLP and clicks "Sign Up."
- Response: System displays a sign-up form.
- Stimulus: User fills out the sign-up form and clicks "Submit."
- Response: System validates user information and creates a new account.
- Stimulus: System presents a combined learning style and personality assessment (quiz).
- Response: User completes the combined assessment.
- Stimulus: System analyzes user responses.
- Response: System determines the user's learning style (e.g., visual, auditory, kinesthetic) and personality type (e.g., Myers-Briggs) and displays personalized feedback and insights to the user.

2.4.1.3 Functional Requirements

- REQ-4.1.1: The system shall provide a user-friendly sign-up form for new user registration.
- REQ-4.1.2: The system shall validate user-entered information during sign-up (e.g., email format, password strength).

- REQ-4.1.3: The system shall offer a combined learning style and personality assessment (quiz) upon user registration. (High-level design TBD - chosen format and question types)
- REQ-4.1.4: The system shall utilise AI libraries to analyse user assessment data and determine the learning style and personality type.
- REQ-4.1.5: The system shall display personalised feedback and insights to the user based on their determined learning style and personality type.

2.4.2 Personalized Learning Path (Enhanced with Content Delivery)

2.4.2.1 Description and Priority

This feature curates a personalised learning path based on the user's combined learning style, personality type, and interests, with content delivery tailored to individual preferences. It is a High Priority feature.

2.4.2.2 Stimulus/Response Sequences

- Stimulus: User completes the combined assessment.
- Response: System analyzes user responses and determines learning style and personality type.
- Stimulus: User searches for a specific course or browses available courses.
- Response: System filters and displays course options based on the user's combined profile and search criteria.
- Stimulus: User selects a course.
- Response: System presents personalized learning materials based on the user's profile and content type.

2.4.2.3 Functional Requirements

- REQ-4.2.1: The system shall leverage the user’s learning style, personality type, and interests to filter and display relevant course options during searches and browsing.
- REQ-4.2.2: The system shall present a course catalogue or search functionality for users to explore available learning materials.
- REQ-4.2.3: The system shall integrate with external LMS or content providers (if applicable) using APIs to retrieve course content. (API details TBD based on chosen integrations)
- REQ-4.2.4: The system shall display personalised learning materials tailored to the user’s combined learning style and personality for the selected course. This may include:
 - REQ-4.2.4.1: Visually appealing content with diagrams, infographics, concept maps, and images for visual learners
 - REQ-4.2.4.2: Audio lectures, podcasts, and transcripts for auditory learners.
 - REQ-4.2.4.3: Interactive exercises, simulations, practice activities, and case studies for kinesthetic learners.
 - REQ-4.2.4.4: Content pacing and delivery style adjusted based on personality type (e.g., shorter modules with frequent quizzes for impatient users or detailed explanations with real-world examples for analytical users). (Future iteration - TBD)
- REQ-4.2.5: The system shall allow users to track their course progress and access learning materials at any time.
- REQ-4.2.6: The system shall explore offering a variety of content types within modules to cater to users with a combination of learning styles. (Future iteration)

2.4.3 Adaptive Learning and Style/Personality Reassessment (Complete)

2.4.3.1 Description and Priority This feature allows users to reassess their learning style and personality type and adjust their learning path to reflect evolving preferences. It is a medium-priority feature.

2.4.3.2 Stimulus/Response Sequences

- Stimulus: User requests a reassessment.
- Response: System presents a combined learning style and personality reassessment option.
- Stimulus: User completes the reassessment.
- Response: System analyzes reassessment data and compares it to the user's initial profile.
- Stimulus: Significant changes are detected.
- Response: System updates the user's profile and suggests adjustments to the learning path based on the new profile.
- Stimulus: User reviews and approves suggested adjustments.
- Response: System implements the user's chosen adjustments to the learning path.

2.4.3.3 Functional Requirements

- REQ-4.3.1: The system shall provide an option for users to request a learning style and personality type reassessment at any time.
- REQ-4.3.2: The system shall offer a mechanism for users to retake the combined learning style and personality assessment.
- REQ-4.3.3: The system shall analyse reassessment data and compare it to the user's initial profile.
- REQ-4.3.4: The system shall define thresholds to determine significant changes in learning style or personality type based on reassessment results.
- REQ-4.3.5: If significant changes are detected, the system shall update the user's learning profile with the new data.
- REQ-4.3.6: The system shall analyse the updated learning profile and suggest adjustments to the user's current learning path based on the changes.

- REQ-4.3.7: The system shall present the suggested learning path adjustments to the user for review and approval.
- REQ-4.3.8: The system shall allow users to accept, partially accept, or decline the suggested learning path adjustments.
- REQ-4.3.9: Based on the user's choice, the system shall implement the chosen adjustments to the learning path. Additional Considerations:

2.5 Other Nonfunctional Requirements

2.5.1 Performance Requirements

1. Personalization Speed: Deliver personalised content quickly based on user interactions.
2. Scalability: Scale seamlessly to handle increased user demand without performance issues.
3. Real-time Updates: Reflect changes in user preferences instantly in personalised recommendations.
4. Data Processing Efficiency: Optimise algorithms for efficient analysis of user data.
5. User Engagement Tracking: Track user engagement and adjust recommendations to improve metrics.
6. Content Delivery Optimization: Optimise content delivery for format, size, and user preferences.
7. Adaptive Learning Performance: Dynamically adjust learning pathways based on user progress with minimal latency.
8. Compatibility: Ensure consistent performance across devices and browsers.
9. Feedback Loop: Collect user feedback to continuously improve recommendation accuracy.
10. Security: Handle personalised user data securely to maintain privacy and comply with regulations.

2.5.2 Safety Requirements

The product prioritizes data security by implementing robust encryption measures and access controls to safeguard user information against unauthorized access or breaches. Upholding user privacy is fundamental, with transparent handling of personal data and obtaining consent for its use. Content filtering mechanisms are in place to prevent the dissemination of harmful content, ensuring a safe and conducive learning environment. Accessibility features are integrated to guarantee that users with disabilities can fully engage with the platform. Reliability is paramount, with continuous efforts to minimize system failures and disruptions to ensure user safety and satisfaction. In times of emergencies, clear support channels are provided to swiftly address any issues and ensure users receive timely assistance and guidance. These measures collectively reinforce the product's commitment to security, privacy, accessibility, reliability, and emergency response, enhancing the overall user experience and trust in the platform.

2.5.3 Security Requirements

The security and privacy requirements for the product are comprehensive and stringent to ensure the protection of user information. User authentication protocols are implemented to provide secure access to the platform, preventing unauthorized entry. Data encryption measures are applied during both transmission and storage processes to safeguard sensitive information from interception or unauthorized access. Compliance with relevant regulatory policies, such as GDPR and HIPAA, is strictly adhered to, ensuring that user data is handled in accordance with established guidelines and standards. Additionally, obtaining necessary security certifications, such as ISO 27001, further demonstrates the commitment to maintaining robust security practices and upholding the highest standards of data protection and privacy for users. These measures collectively contribute to establishing trust and confidence in the platform's security and privacy measures, fostering a safe and secure environment for users to engage with the product.

2.5.4 Software Quality Attributes

- Usability: Ensure intuitive interface and navigation for users, with a target usability score of at least 80 percent in user testing.
- Reliability: Aim for a system uptime of 99.9 percent to minimise disruptions in user access. Maintainability: Achieve a codebase maintainability index score of at least 70 to facilitate future updates and enhancements.

- Scalability: Design the system to handle a minimum of 10,000 concurrent users without significant performance degradation.
- Security: Implement security measures to achieve a penetration test score of at least 90 percent to protect user data from breaches.
- Interoperability: Ensure compatibility with major browsers (Chrome, Firefox, Safari, Edge) and operating systems (Windows, macOS, iOS, Android).
- Adaptability: Enable customization of user preferences and settings to accommodate varying learning needs and preferences.
- Testability: Maintain a code test coverage of at least 80 percent to ensure thorough testing and identify potential issues early in development.

Chapter 3

System Architecture and Design

3.1 System Overview

Personalized learning platforms are pivotal in this transformation, catering to individual learning styles. Edu-AI tailors content to individual preferences and progress. Increases student engagement by presenting relevant content formats. The trained AI of the system learns about each user specifically according to the answers given during a questionnaire session. Our AI model, a team of "learning detectives," analyzes your profile to predict your preferred learning style (visual, auditory, kinesthetic). It then generates a personalized way of effective learning for the user. Aims to enhance learning outcomes and retention. Based on your learning style, the system suggests educational materials that match your preferences, maximizing your learning potential. Along with that it also provides valuable insights for educators through real-time analytics. Materials are at last provided either in the form of media or links that can direct the users to a specified address. Edu-AI facilitates continuous learning beyond traditional settings. Adjust your profile over time and retake the survey to receive updated recommendations as your learning style evolves. This system empowers you to learn more effectively, engage with materials that resonate with you, and ultimately achieve your educational goals. Detailed Process flow:

- User Registration: Register with basic information (name, email, phone number).
- Login: Users login with already created usernames and passwords.
- Quiz/Questionnaire: A new user is directed to the survey session. If an already existing user logs in, they are directed to their personal dashboard.
- AI Model: The trained Ai model runs in the background using random forest algorithm. The AI generates a personalized learning style.

- Course Selection: User selects his required course or subject.
- Materials: The required material in the form of media or as links that direct them to a specific address to access material.
- Database: The database structure allows for the efficient storage and retrieval of information related to users, their survey responses, predicted learning styles, learning materials, and associations between users and materials, facilitating personalized learning material recommendations based on predicted learning styles.

Figure 3.1 provides a breakdown of system.

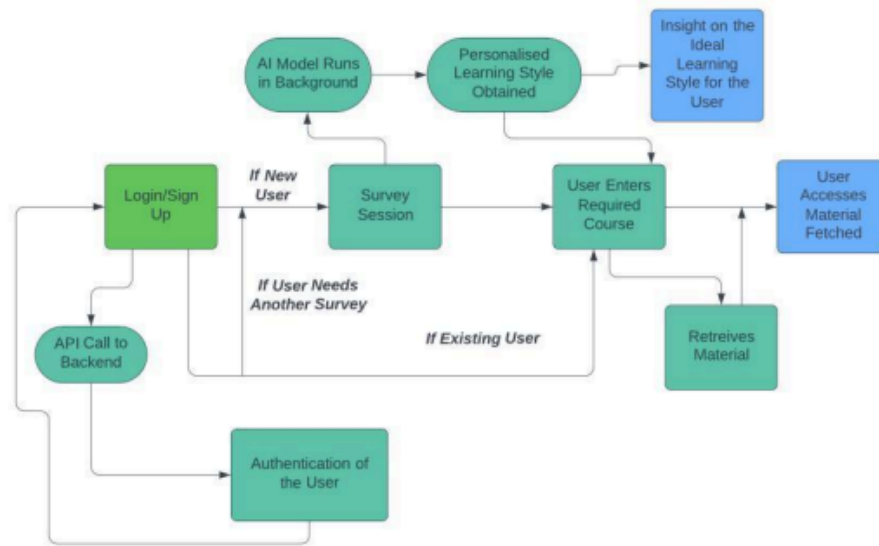


Figure 3.1: System Design

3.2 Architectural Design

Figure 3.2 shows the architecture design of our website.

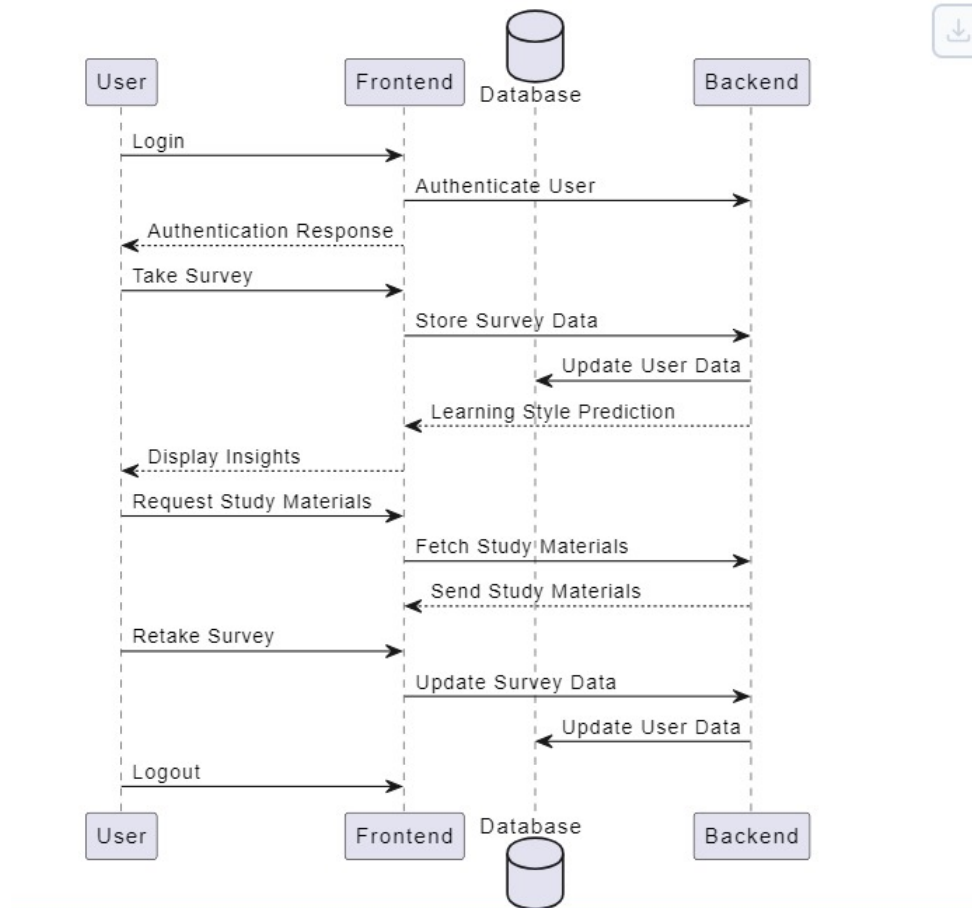


Figure 3.2: System Architecture

3.3 Dataset identified

- The dataset used in this system is obtained from mainly two sources. Myers Briggs Personality Test: Personality type is the term used to describe the 16 personalities in the Myers-Briggs system based on the work of Isabel Briggs Myers. We can see sample of dataset in Figure 3.3.
- <https://www.myersbriggs.org/>

- The VARK Theory: The acronym “VARK” stands for Visual, Aural, Read, and Kinaesthetic - and refers to the different learning styles we as humans have when learning new information. Individuals are identified by the style they identify with the most while learning.
- <https://www.melioeducation.com/blog/vark-different-learning-styles/>
- Another source of data for this project is:
E-Learning Industry: <https://elearningindustry.com/>
The dataset is stored in an excel sheet, link:
<https://docs.google.com/spreadsheets/d/1EuoCc-YWIs6-KWc5hUYSgO8ktV6HDREnflpGzcyyWD4/edit?usp=sharing>

Record No.	E	I	S	N	T	F	J	P	VisualScore	Auditory Score	Read/Write Scor	Kinesthetic Scor	Final Learning Style
1	1	0	0	1	0	1	0	1	4	2	3	1	Visual
2	0	1	0	1	1	0	0	1	1	3	4	1	Auditory
3	1	0	0	1	1	1	0	0	1	3	4	2	1 Auditory
4	0	1	1	1	0	1	0	0	1	4	1	2	3 Visual
5	1	0	0	1	1	0	1	0	1	1	4	3	2 Auditory
6	0	1	1	1	0	1	1	0	1	1	4	2	3 Kinesthetic
7	1	0	0	1	1	0	1	0	1	1	4	2	3 Kinesthetic
8	0	1	1	1	0	1	0	0	1	4	1	2	3 Visual
9	1	0	0	1	1	1	0	0	1	3	4	2	1 Visual
10	0	1	1	1	0	1	1	0	1	3	2	4	1 Read/Write
17	0	1	1	1	0	0	1	1	1	4	3	2	4 Kinesthetic,Auditory
18	1	0	0	1	1	1	1	1	2	4	3	1	2 Kinesthetic
19	0	1	1	1	0	1	0	0	3	1	4	2	4 Read/Write,Auditory
20	1	0	0	1	1	0	0	1	4	3	2	1	3 Visual
21	0	1	1	0	1	0	0	1	2	3	4	1	4 Kinesthetic,Auditory
19	0	1	1	1	0	1	0	0	3	1	4	2	1 Read/Write,Auditory
27	0	1	1	1	0	1	0	1	3	2	4	3	1 Auditory
28	1	0	0	1	1	0	1	0	4	3	2	1	4 Kinesthetic,Visual
29	0	1	1	1	0	0	0	1	2	4	1	3	3 Kinesthetic
30	1	0	0	1	1	1	0	1	3	4	2	1	3 Visual
31	0	1	1	1	0	0	1	0	4	1	4	2	2 Read/Write
32	1	0	0	1	1	0	0	0	2	3	4	1	4 Kinesthetic
33	0	1	1	1	0	1	1	1	4	2	3	1	3 Kinesthetic,Auditory
34	1	0	0	1	1	1	1	0	3	1	4	2	4 Kinesthetic,Visual
35	0	1	1	1	0	0	0	1	2	4	3	1	4 Kinesthetic
36	1	0	0	1	1	0	1	0	4	2	1	3	3 Visual
37	0	1	1	1	0	1	0	1	3	1	4	2	4 Kinesthetic,Read/Wr
38	1	0	0	1	1	1	1	1	2	4	3	1	2 Auditory
39	0	1	1	1	0	0	1	0	4	3	2	1	3 Auditory
94	0	1	0	1	1	1	0	0	1	2	4	3	1 Kinesthetic,Auditory
95	1	0	0	1	1	0	1	0	1	4	3	2	4 Kinesthetic,Visual

Figure 3.3: Dataset

3.4 Proposed Methodology/Algorithms

1.Dataset Preprocessing:

Addressed missing values and encoded categorical variables for compatibility with the Random Forest Classifier.

2.Training the Random Forest Classifier:

Utilized hyperparameter tuning to optimize the classifier's performance.

3.Evaluation:

Rigorously evaluated the model's performance using metrics such as accuracy, precision, recall, and F1-score to assess its ability to predict users' learning styles accurately.

4.Implementation of Personalized Learning Approach:

Leveraged the trained classifier to map users' predicted learning styles to appropriate learning materials.

5.Delivery of Learning Materials:

Delivered a range of materials, including courses, articles, and exercises, tailored to individual learning preferences, thereby enhancing the learning experience.

6.Establishment of Feedback Loop:

Implemented a feedback loop to continuously refine the recommendation algorithm based on user engagement and performance metrics.

7.Iterative Refinement:

Continuously adapted educational resources to meet the diverse needs and preferences of learners, fostering a more engaging and effective learning environment.

3.5 User Interface Design

Figure 3.2 shows the welcome page of our website

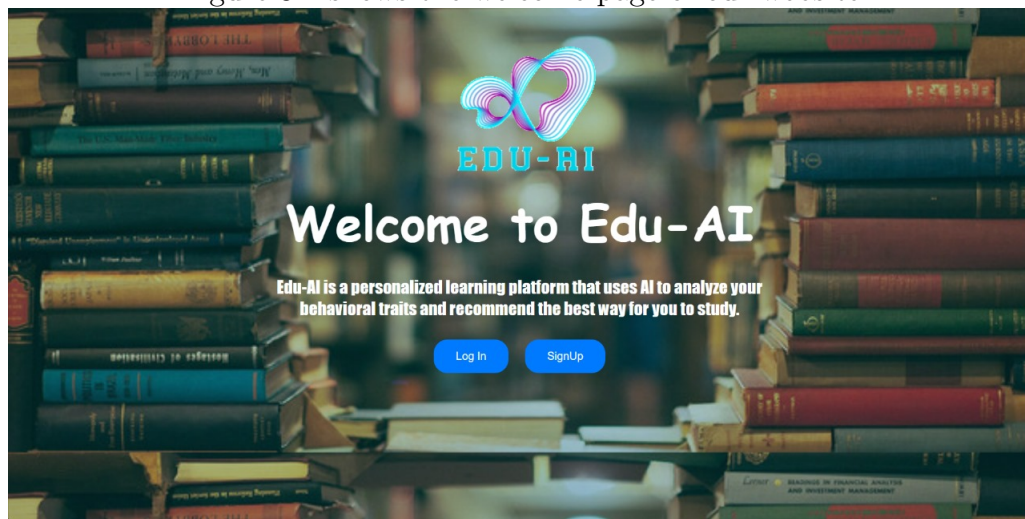


Figure 3.4: Welcome Page

Figure 3.2 shows the login page of our website

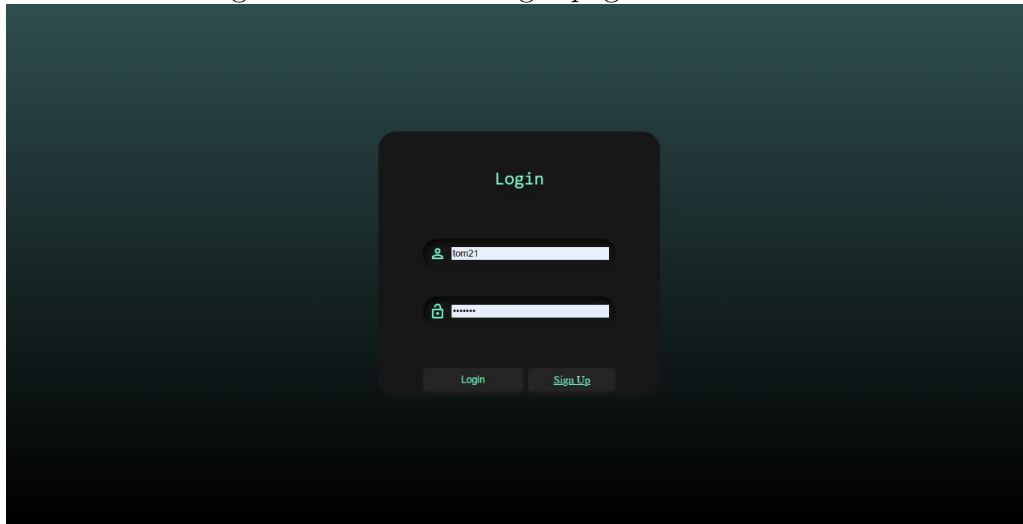


Figure 3.5: Login Page

Figure 3.2 shows the signup page of our website

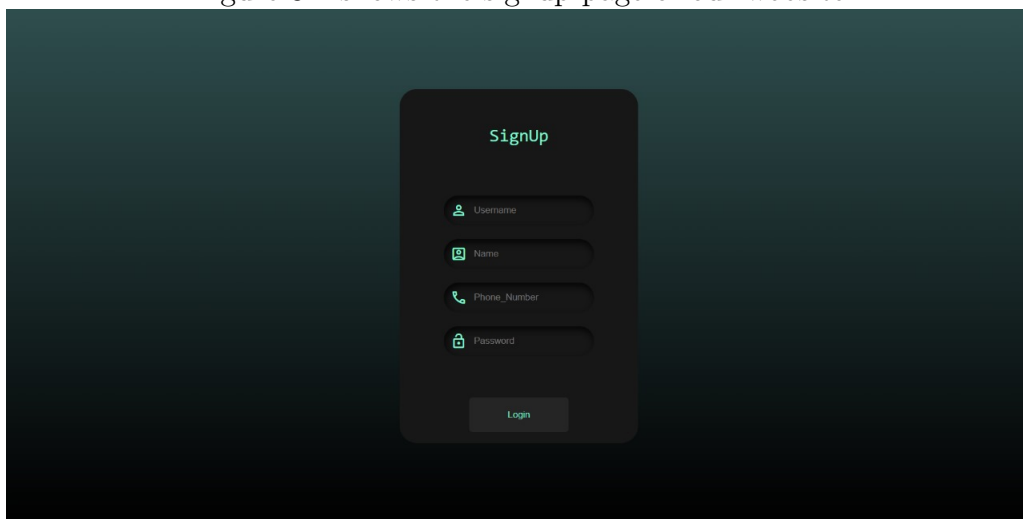


Figure 3.6: Sign Up Page

Figure 3.2 shows the survey page of our website

PLP Survey

Welcome to the survey!

When attending professional networking events, do you:

- ☐ Approach new contacts with ease, eager to build connections and expand your network?
- ☐ Feel apprehensive or uncomfortable initiating conversations with strangers in a professional setting?

When engaging in hobbies or leisure activities, do you:

- ☐ Prefer activities that involve tangible objects and physical involvement?
- ☐ Enjoy abstract or intellectual pursuits, such as reading, writing, or contemplating ideas?

Figure 3.7: Survey Page

Figure 3.2 shows the insights page of our website

Personalized Learning Insights

Required Learning Insights

Key Insights for Auditory Learners

- * Information is best absorbed through listening and speaking.
- * They excel in discussions and group projects.
- * They prefer to listen to explanations, lectures, and recordings.

Recommendations for Effective Study Patterns

- * Attend lectures regularly and actively participate in discussions.
- * Record lectures for later review and listen to key points.
- * Utilize audio recordings for studying, such as audiobooks or podcasts.
- * Create study groups to discuss and explain concepts to others.
- * Use mnemonic devices (e.g., songs, rhymes) to enhance memory.
- * Find a quiet study environment free from distractions.
- * Read aloud study materials to reinforce understanding.
- * Discuss and explain concepts to yourself or others to clarify your thoughts.
- * Seek support from teachers, tutors, or classmates who are strong auditory learners.

Back

Thank you for choosing our platform for your learning journey. We look forward to empowering you with the resources you need to succeed!

Figure 3.8: Insights Page

Figure 3.2 shows the dashboard page of our website

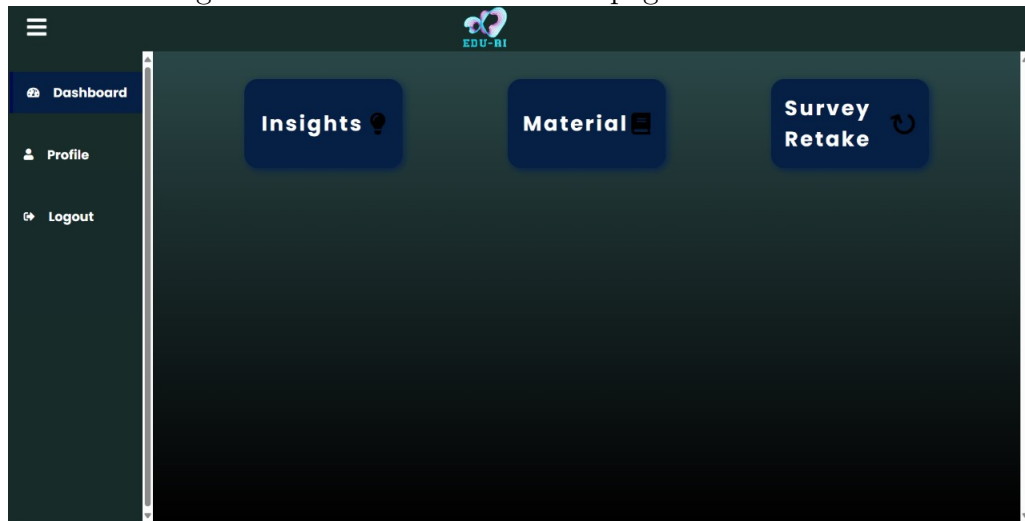


Figure 3.9: Dashboard Page

Figure 3.2 shows the materials page of our website

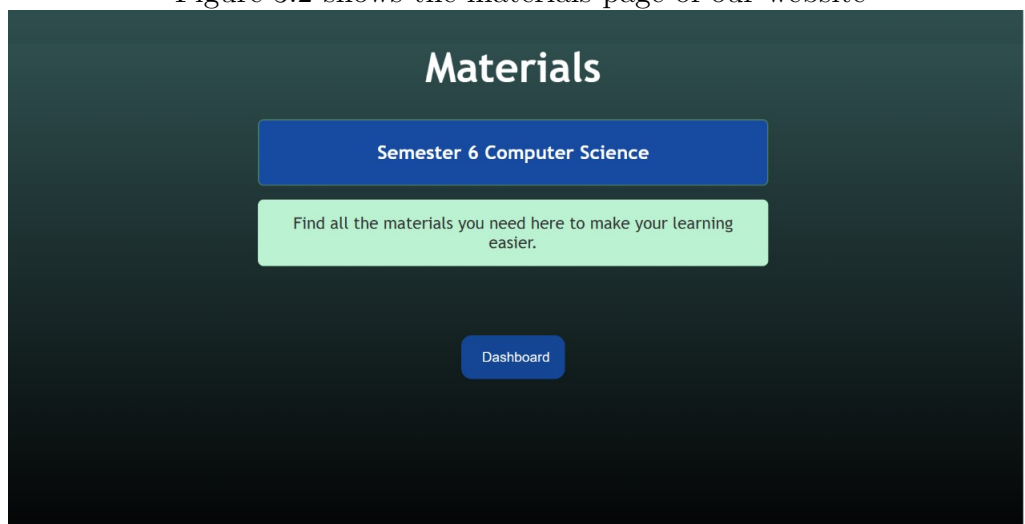


Figure 3.10: Dropdown Menu

Figure 3.2 shows the subject selection page of our website

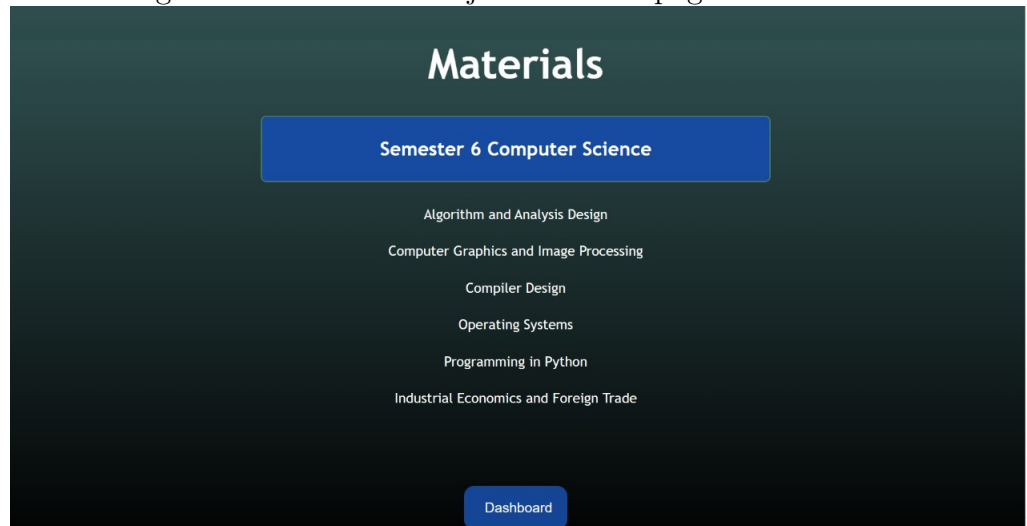


Figure 3.11: Subjects

Figure 3.2 shows the material url page of our website



Figure 3.12: Materials Page

Figure 3.2 shows the profile page of our website

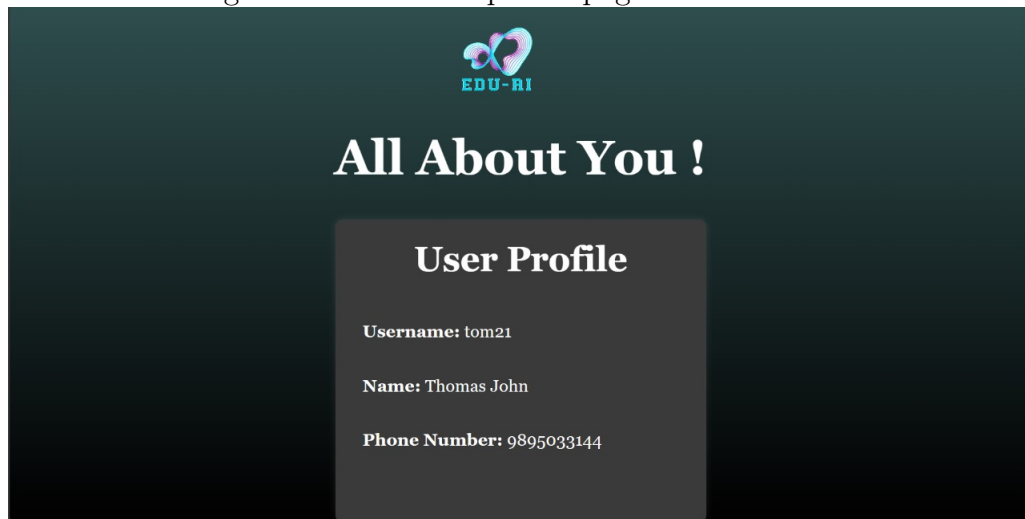


Figure 3.13: Profile Page

3.6 Database Design

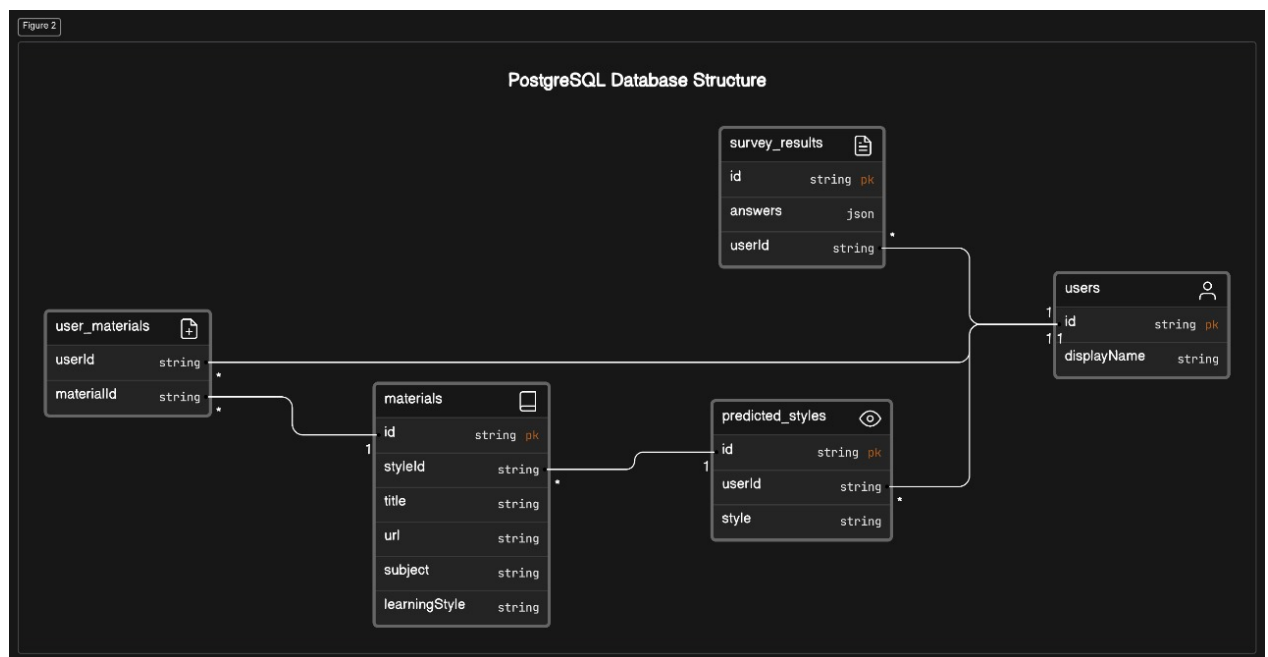


Figure 3.14: Database Design

The database used in the personalised learning platform is SQLite. We have used SQLite as provides a very lightweight, highly performing database. It is a database with low overhead as well. Figure 3.14 shows a detailed database design of our website.

3.7 Description of Implementation Strategies

An innovative approach utilizing the Random Forest algorithm is employed to tailor educational experiences to individual users. This method depends on understanding the unique interplay between personality types and learning styles, thereby optimizing the learning process for each user.

Understanding Personality Types: This feature is facilitated by the Myers Briggs Personality Test. This renowned psychological assessment tool moves into various branches of an individual's personality, categorizing them into distinct personality types. Through a structured survey session, users are prompted to respond to inquiries that probe their behavioral tendencies and social interactions. This enables the algorithm to discern patterns and correlations associated with different personality types.

Understanding Learning Styles: VARK Theory Supplementing the Myers Briggs assessment is the incorporation of the VARK theory, which elucidates the various learning modalities individuals employ when acquiring new knowledge. VARK, an acronym for Visual, Aural, Read/Write, and Kinesthetic, encapsulates the spectrum of learning preferences prevalent among learners. By aligning survey questions with the principles of VARK, the algorithm gains insights into users' preferred modes of information intake and processing.

3.8 Module Division

The project divided into four modules, each with a designated team members. Here's a breakdown of the modules and their assigned members:

- **Web Application**(Saira Sunny and Thomas Biju): They focused on leading the design efforts to create an intuitive and engaging user interface and user experience for the personalised learning platform.
- **Random Forest Classification**(Thomas John and Therese Joe): This module involves developing and implementing the Random Forest AI model to analyze user questionnaire responses. Thomas John and Therese Joe are responsible for designing and training the Random Forest algorithm to accurately classify user traits into MBTI personality types and VARK learning styles. Their tasks include data analysis, integrating and preprocessing existing datasets, and validating and testing the

model to ensure reliable predictions.

- Dataset Creation(Saira Sunny, Therese Joe, Thomas John, Thomas Biju): The dataset creation module focuses on compiling and preparing the datasets required for training and validating the Random Forest model.
- Material Suggestion(Thomas John and Therese Joe): In this module, Thomas John and Therese Joe are responsible for developing the system that suggests personalized learning materials based on the user's classified learning style. They curate educational content aligned with different VARK learning styles and design the algorithm to match users with appropriate materials.

3.9 Work Schedule - Gantt Chart

We can see the gantt chart representation in Figure 3.15

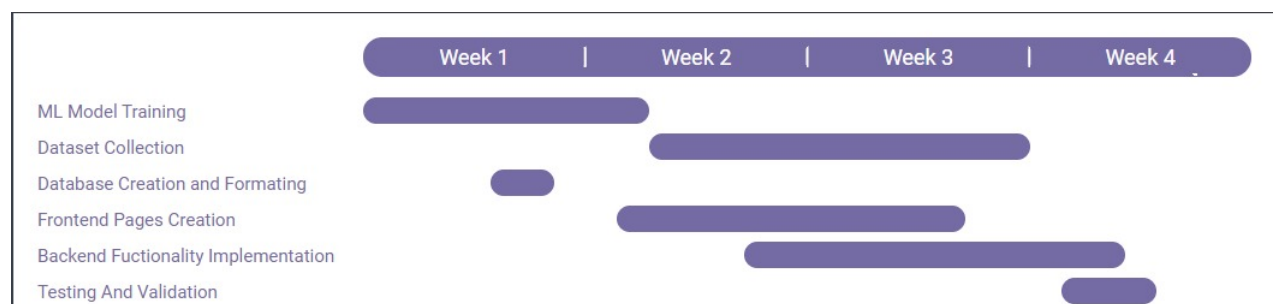


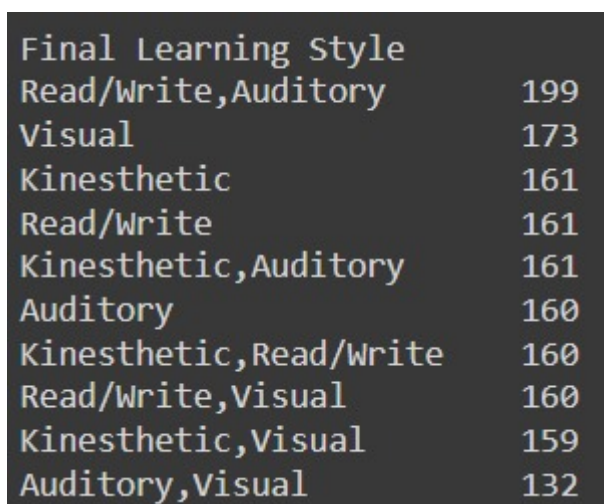
Figure 3.15: Gantt Chart

Chapter 4

Results and Discussions

4.1 Overview

The results of our project provide a comprehensive overview of the insights page and materials designed for learning, featuring both qualitative and quantitative analyses. The quantitative analysis includes key performance metrics such as accuracy, precision, recall, and F1 score, offering a detailed assessment of the system's performance. Additionally, graphical analysis is presented to visually interpret the data, highlighting trends and patterns that support the findings. These results collectively underscore the effectiveness and reliability of the implemented methods, offering valuable insights and educational resources for further application and study. The dataset overview can be seen in Fig 4.1.

A table with a dark background and light-colored text, showing the distribution of learning styles. The table has two columns: the learning style and its corresponding count.

Final Learning Style	
Read/Write,Auditory	199
Visual	173
Kinesthetic	161
Read/Write	161
Kinesthetic,Auditory	161
Auditory	160
Kinesthetic,Read/Write	160
Read/Write,Visual	160
Kinesthetic,Visual	159
Auditory,Visual	132

Figure 4.1: Dataset Overview

4.2 Testing

Testing for the Insights obtained can be seen in Figure 4.2.

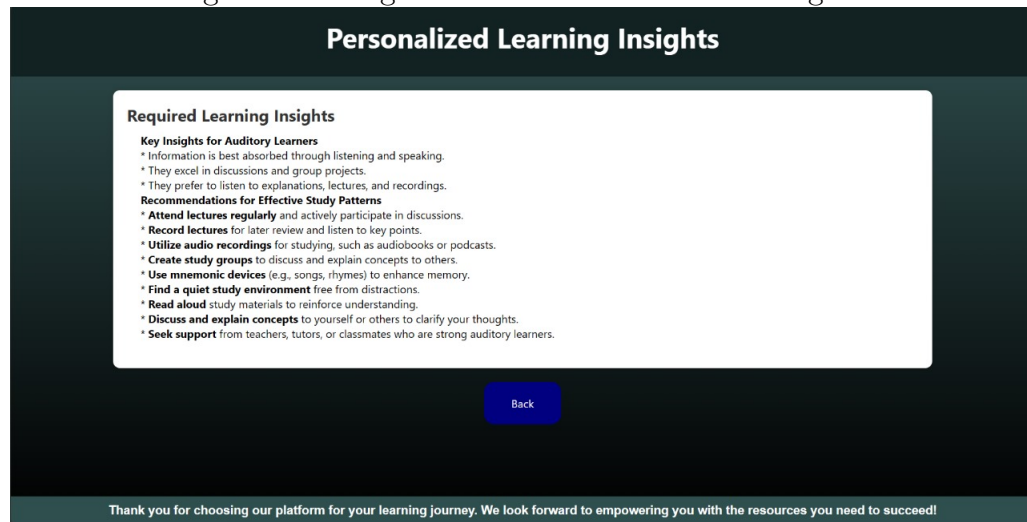


Figure 4.2: Insights Obtained

Testing for the Materials provided can be seen in Figure 4.2.



Figure 4.3: Materials Provided

4.3 Quantitative Results

4.3.1 Accuracy:

The accuracy of our Random Forest classifier is 84.77. This metric indicates that out of 100 instances, the model correctly predicts the learning style for approximately 85 instances.

4.3.2 Precision:

The ratio of correctly predicted positive observations to the total predicted positives. For our model, the overall precision is 85 percentage.

4.3.3 Recall (Sensitivity):

The ratio of correctly predicted positive observations to all observations in the actual class. For our model, the overall recall is 84 percentage.

4.3.4 F1-Score:

The weighted average of Precision and Recall. For our model, the F1-score is 84 percentage.

4.4 Graphical Analysis

4.4.1 Confusion Matrix Heatmap:

The confusion matrix heatmap visually represents the performance of the Random Forest classifier by displaying the number of true positives, false positives, false negatives, and true negatives for each learning style class. Each cell's color intensity reflects the frequency of the predictions, with darker colors indicating higher values. In the given confusion matrix in Figure 4.4, the cell corresponding to the true positives of the 'Visual' learning style is dark, indicating a high accuracy in predicting 'Visual' instances correctly. In contrast, lighter cells in the areas representing false positives or false negatives highlight where the model frequently is misclassified. This detailed visualization helps in analyzing the accuracy of the prediction and also how much of the predictions have went wrong.

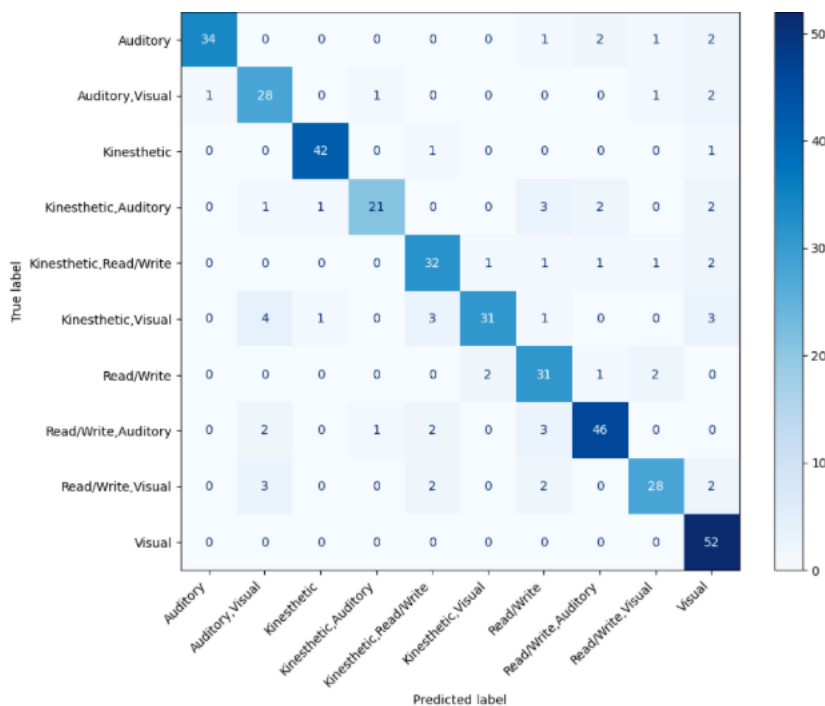


Figure 4.4: Confusion Matrix

4.4.2 ROC Curve:

The ROC curve in Figure 4.5 illustrates the model's ability to distinguish between different learning styles by plotting the true positive rate against the false positive rate at various threshold settings. Each curve represents a different learning style class, with the area under the curve (AUC) providing a single metric to summarize the model's performance. A curve closer to the top-left corner indicates better performance, meaning the model

has a high true positive rate and a low false positive rate for that class. In the given ROC curve, it is evident that the AUC of almost all the learning style classes are high with the AUC being highest for the class “Kinesthetic”. In future, efforts will be made to equalize the AUC of all classes.

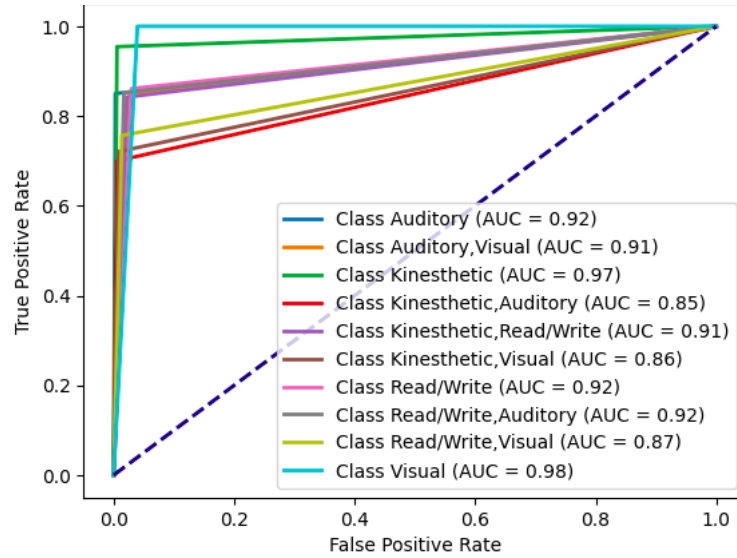


Figure 4.5: ROC Curve

4.4.3 Precision-Recall Curve

The precision-recall curve in Figure 4.6 plots precision against recall for different thresholds, which is particularly useful for evaluating models on imbalanced datasets. This curve helps in understanding the trade-off between precision and recall for each learning style. A high area under the precision-recall curve indicates that the model maintains high precision and high recall across different thresholds. For instance, a high precision-recall curve for the 'Read/Write' learning style shows the model performs well in predicting this style without sacrificing precision for recall. This is crucial for making informed decisions about threshold settings, especially when dealing with classes that are less frequent.

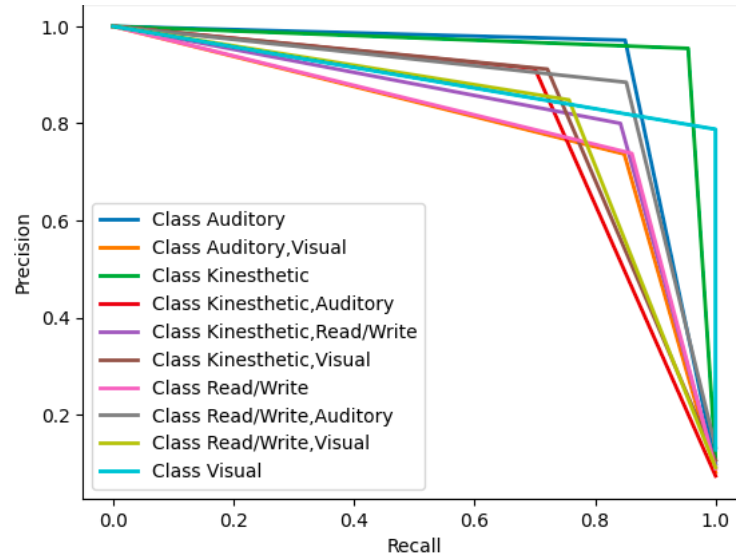


Figure 4.6: Precision Recall Curve

4.4.4 Feature Importance:

The feature importance plot in Figure 4.7 displays the significance of each feature used by the Random Forest model, with higher scores indicating greater importance. This plot helps identify which features are most influential in predicting learning styles. For our model, 'Visual Score,' 'Auditory Score,' and 'Read/Write Score' have the highest importance scores, it means these features play a crucial role in the model's predictions. Understanding feature importance is valuable for improving the model by focusing on the most impactful predictors and possibly refining the feature set for future iterations.

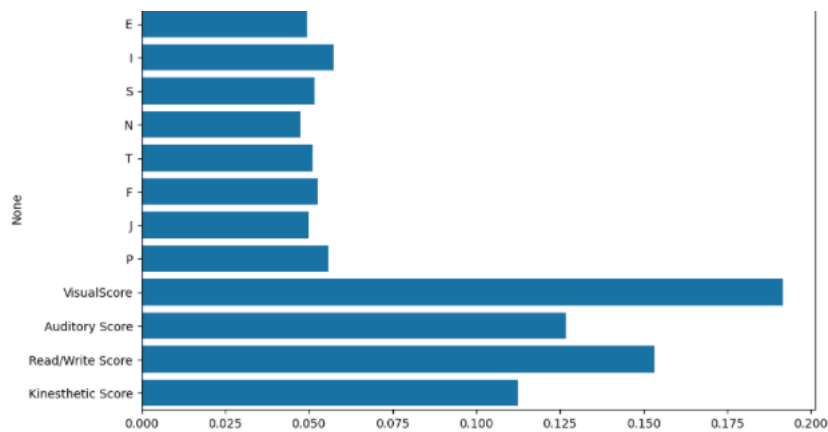


Figure 4.7: Feature Importance

4.4.5 Class Distribution:

The class distribution plot in Figure 4.8 shows the frequency of each learning style in the dataset, either as a bar plot or pie chart. This visualization helps in understanding the balance of the dataset, which is critical for training and evaluating the model. This helps us to understand the distribution of the records in the dataset in each learning style classification and also helps us to improve the dataset to again reduce the class imbalance in the labeled dataset.

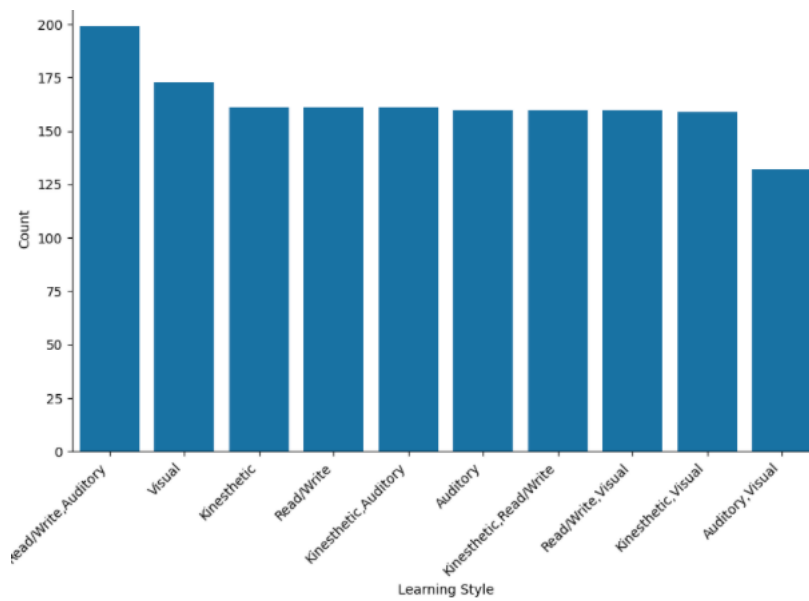


Figure 4.8: Class Distribution

4.4.6 Pair Plot:

The pair plot in Figure 4.9 visualizes pairwise relationships between features along with their distributions. It includes scatter plots for each pair of features and histograms for individual features. This plot helps in identifying correlations and interactions between features, which can be crucial for feature engineering. For instance, if 'Visual Score' and 'Kinesthetic Score' show a strong positive correlation, it suggests that these scores are related in predicting the learning style. Such insights can lead to more effective feature selection and potentially better model performance.

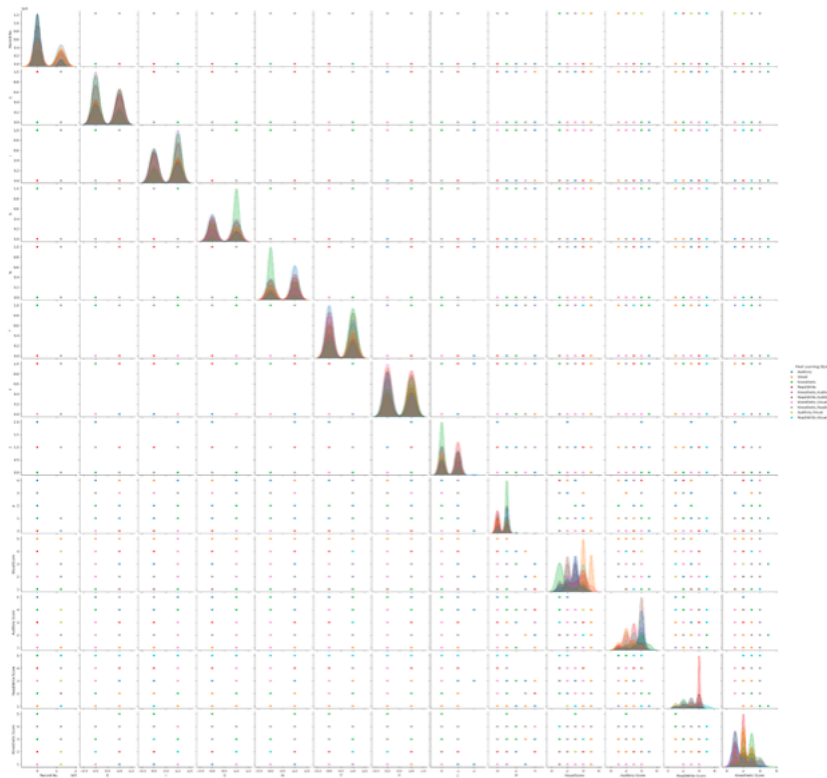


Figure 4.9: Pair Plot

4.4.7 Heat map of Feature Correlation:

The heatmap of feature correlation in Figure 4.10 displays the relationships between different features, with darker colors indicating stronger correlations. This visualization helps in identifying multicollinearity issues, where two or more features are highly correlated and might provide redundant information. This helps our model to work more fastly and efficiently.

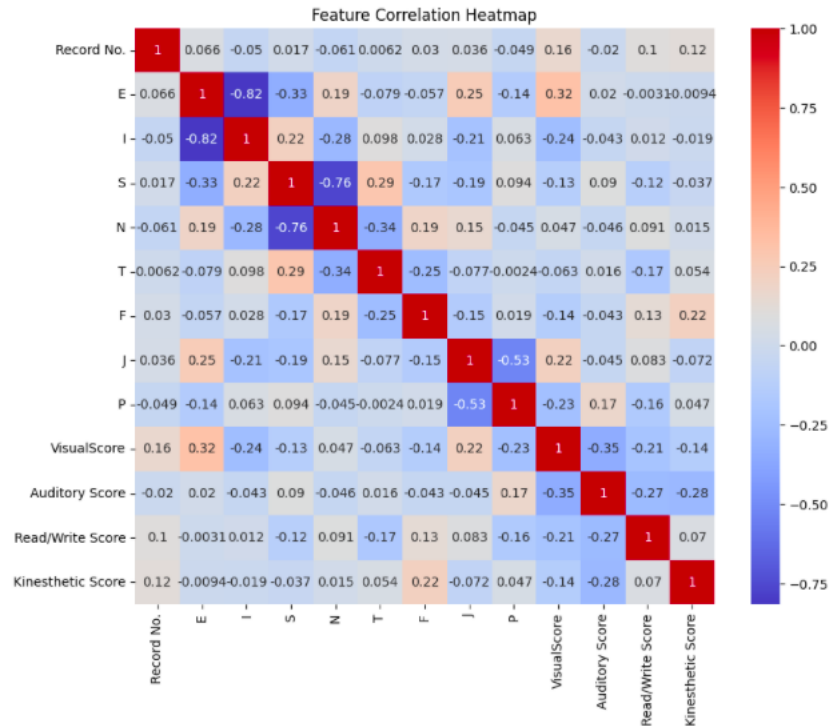


Figure 4.10: Feature Correlation Heat Map

4.5 Discussion

- Model Performance

The Random Forest classifier achieves an overall accuracy of 84.77 percentage, indicating robust performance in predicting learning styles. The detailed metrics from the classification report show that the model performs well across various learning styles but has room for improvement in certain classes.

- Feature Importance

The feature importance plot shows that 'Visual Score', 'Auditory Score', and 'Read/Write Score' are among the most significant features. This aligns with the expectation that these scores would be pivotal in determining learning styles. Understanding the importance of these features can help in refining the model and focusing on the most impactful predictors.

- Areas for Improvement

The confusion matrix and classification report indicate that some learning styles, like 'Auditory' and 'Visual', are predicted with higher precision and recall compared to others. Efforts can be made to balance the classifier's performance across all classes, possibly through techniques like resampling, feature engineering, or using more advanced algorithms.

Chapter 5

Conclusion

5.1 Conclusion

PLP is a web-based application delivering tailored learning experiences, utilizing front-end technologies and AI algorithm to enhance learning outcomes. PLP employs HTML, CSS, JavaScript, Flask, and databases for seamless user interaction and data storage, while scikit-learn and pandas analyze user data to personalize learning styles. Accessible from any internet-connected device, it offers customized study strategies and content, optimizing learning experiences for users.

5.2 Future Scope

- **Expanded Subject Offerings:** As part of our ongoing efforts to enhance our personalized learning platform, we would hope to significantly broaden the range of subjects available.
- **Enriched Resource Library:** We've bolstered our platform's resource library by curating a wealth of additional materials to support personalized learning journeys.
- **Advanced Recommendation Algorithms:** Leveraging advanced recommendation algorithms, we've enhanced the platform's ability to suggest relevant subjects and materials tailored to each user's unique preferences, learning style, and proficiency level.

Bibliography

- [1] Gifts Differing by Isabel Briggs and Peter P. Myers
- [2] <https://www.youtube.com/watch?v=QoYzFyp3Ezk>
- [3] <https://m3.material.io/>
- [4] <https://vark-learn.com/>
- [5] <https://www.engr.ncsu.edu/stem-resources/legacy-site/learning-styles/>
- [6] <https://louis.uah.edu/cgi/viewcontent.cgi?article=1138context=honors-capstones>

Appendix A: Presentation

Personalized Learning Platform Edu-AI

Dr. Renu Mary Daniel

Thomas John
Thomas Biju
Saira Sunny
Therese Joe

Contents

- 1.Introduction
- 2.Problem Definition
- 3.Objectives
- 4.Scope and Relevance
- 5.System Design
- 6.Datasets
- 7.Work Division – Gantt Chart
- 8.Software/Hardware Requirements
- 9.Results
- 10.Conclusion
- 11.Future Enhancements
- 12.References

Introduction

- Personalized learning platforms are pivotal in this transformation, catering to individual learning styles.
- Tailors content to individual preferences and progress.
- Increases student engagement by presenting relevant content formats.
- Aims to enhance learning outcomes and retention.
- Provides valuable insights for educators through real-time analytics.

Problem Definition

- To develop an AI-powered web app personalised learning by assessing user learning styles, personality traits, and study habits through a questionnaire, delivering tailored study strategies and content.
- Enhance learning outcomes and engagement by providing personalised study strategies aligned with each user's unique learning style and preferences.

Objectives

- **Needs Analysis:** Identify the diverse learning needs and preferences of students
- **Platform Development:** Implement algorithms for content recommendation and adaptive learning pathways.
- **Data Integration and Analysis:** Analyze user data to understand patterns and preferences for personalized recommendations.
- **Testing and Evaluation:** Evaluate the effectiveness of personalized learning features through pilot studies or user surveys.

Scope and Relevance

- **Scope:** Our platform focuses on personalized learning, offering tailored content delivery, real-time analytics, enhanced engagement, and continuous support.
- **Relevance:** It meets the demand for personalized learning, enhances engagement, provides insights for educators, and improves learning outcomes.
- **Application:** Ideal for schools, universities, online platforms, and corporate training, benefiting educators, learners, and professional development programs.

System Design

- **System Overview**

1. User Profile: Build your profile by completing a survey and sharing your MBTI preferences.

2. Learning Style Prediction: Our AI model, a team of "learning detectives," analyzes your profile to predict your preferred learning style (visual, auditory, kinesthetic, read/write).

3. Smart Recommendations: Based on your learning style, the system suggests educational materials that match your preferences, maximizing your learning potential.

4. Continuous Learning: Adjust your profile over time and retake the survey to receive updated recommendations as your learning style evolves.

System Design

Module-Wise Division:

1.Login Page

Purpose: The login page facilitates user authentication, allowing registered users to securely access their accounts within the application. It presents users with a form where they can input their credentials, typically a username and password, to verify their identity.

2.Welcome Page

Purpose: The welcome page serves as the initial landing page for users accessing the application. Its primary goal is to provide users with a warm introduction to the platform, offering a friendly greeting or message.

System Design

3. Dashboard Page

Purpose: The Dashboard page acts as the homepage for the users to interact with the website. The user can access the insights , perform a resurvey , access tailored materials and the other basic functionalities like logout and profile info .

4. Sign-up Page

Purpose: The sign-up page enables new users to create accounts and register for access to the application's services. It presents users with a registration form where they can provide necessary information such as their name, email address, username, and password.

System Design

5. Survey Page

Purpose: The survey page facilitates the collection of user feedback or references through a survey. Users provide responses to these questions, which are then analyzed or processed by the application to derive insights, and to provide tailored recommendations.

6. Material Selection Page

Purpose: This page allows users to access the correct study material tailored to their learning style for a particular subject on entry. It typically presents users with a list of available materials based on the suitable learning style to choose from.

System Design

- Architectural Design

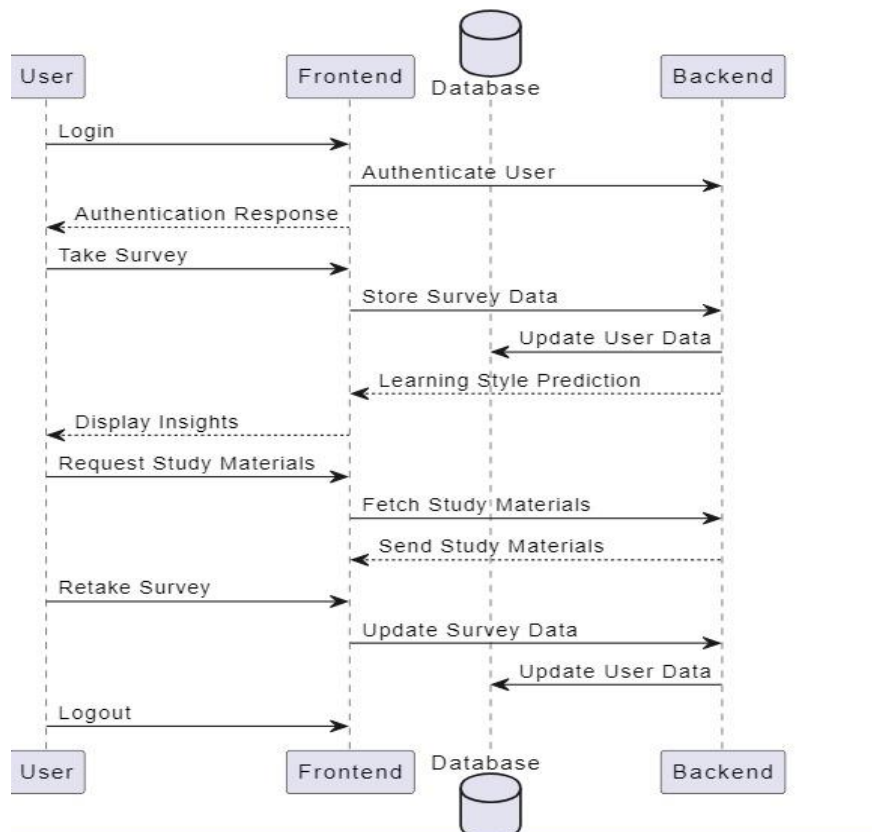


Fig 1. Architectural Design

Edu-AI

System Design

- **Algorithm**

1. Learn from Examples: The system gathers information from past users, including their MBTI preferences, learning styles, and potentially their experiences with learning materials. This data becomes the training ground for the algorithm.

2. Team of Decision Trees: Instead of one complex model, the algorithm creates a "forest" of simpler decision trees. Each tree analyzes the data and learns its own set of rules for predicting learning styles.

System Design

- **Algorithm**

3. Vote for the Winner: When a new user arrives, each decision tree in the forest makes a prediction about their learning style. The most frequent prediction among all the trees becomes the final recommendation

4. Testing for Accuracy: Before making real predictions, the system tests itself on unseen data. This helps ensure the predictions are reliable and accurate for new users.

5. Continuous Improvement: The system can learn and adapt over time. Based on feedback and results, it can fine-tune how the decision trees work, leading to even better learning style recommendations.

System Design

- Design Model

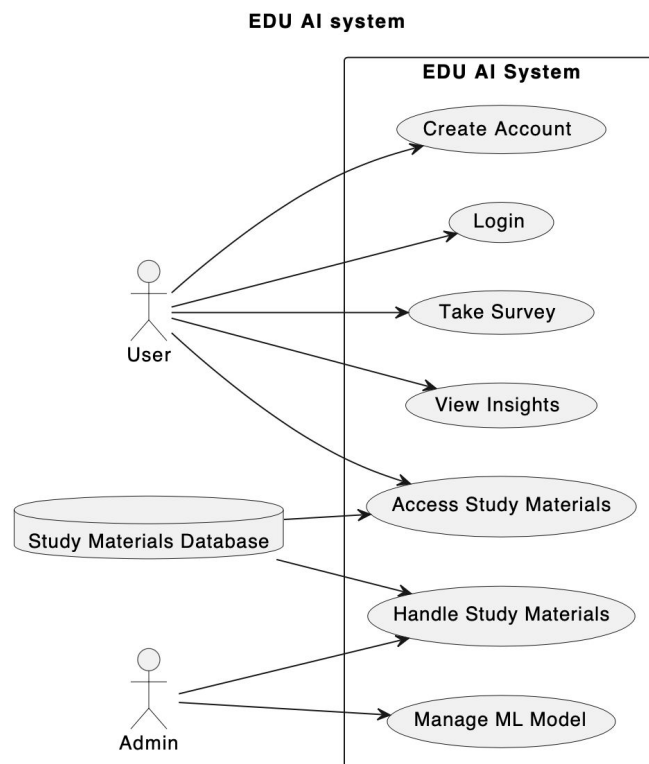


Fig 2. Use Case Diagram

Datasets and Sources

- https://docs.google.com/spreadsheets/d/1aTlOt-GG9qmxj78EU1hrw37tleu7QCmfs_TKKBw6J1k/edit#gid=793684958
- **The Myers & Briggs Foundation:**
<https://www.myersbriggs.org/>
- **VARK Learning Styles:**
<https://www.melioeducation.com/blog/vark-different-learning-styles/>
- **E-Learning Industry:** <https://elearningindustry.com/>

Record No.	E	I	S	N	T	F	J	P	Visual Score	Auditory Score	Read/Write Score	Kinesthetic Score	Final Learning Style
2	0	1	0	1	0	0	0	1	1	3	4	1	Auditory
3	1	0	0	1	1	1	0	0	1	3	4	2	1 Auditory
4	0	1	1	0	1	0	0	0	1	4	1	2	3 Visual
5	1	0	0	1	0	0	1	0	1	1	4	3	2 Auditory
6	0	1	1	0	1	1	1	0	1	1	4	2	3 Kinesthetic
7	1	0	0	1	0	0	1	0	1	1	4	2	3 Kinesthetic
8	0	1	1	0	1	0	0	0	1	4	1	2	3 Visual
9	1	0	0	1	1	0	0	0	1	3	4	2	1 Visual
10	0	1	1	0	1	1	1	0	1	3	2	4	1 Read/Write

Work Division

- **Gantt Chart**

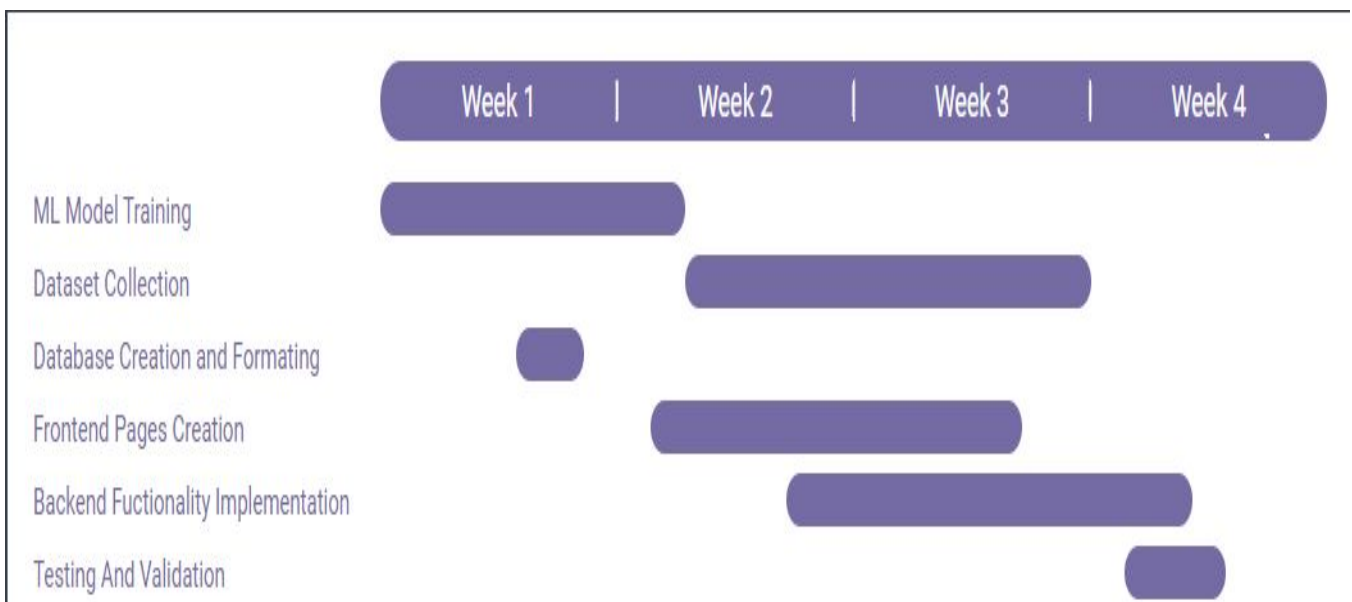


Fig 3. Gantt Chart

Edu-AI

Software/ Hardware Requirements

- **Frontend Development:**

- HTML:** Structure of web pages.

- CSS:** Designing the appearance.

- JavaScript:** Adding interactivity.

- **Backend Development:**

- Flask:** Python web framework for routing, requests, and responses.

- **Database:**

- SQLite**

- **AI Libraries:**

- scikit-learn:** Python library for implementing ML algorithms.

- pandas:** Python library for data manipulation and analysis.

Results

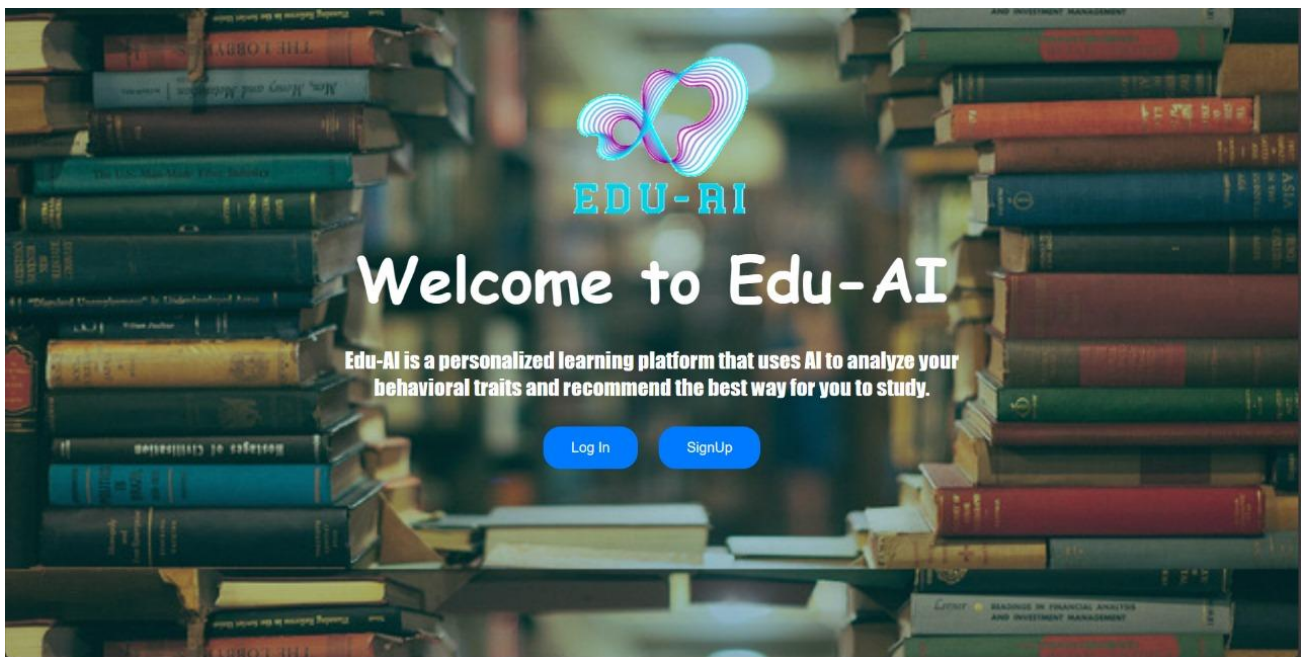


Fig 4. Welcome Page

Edu-AI

Results

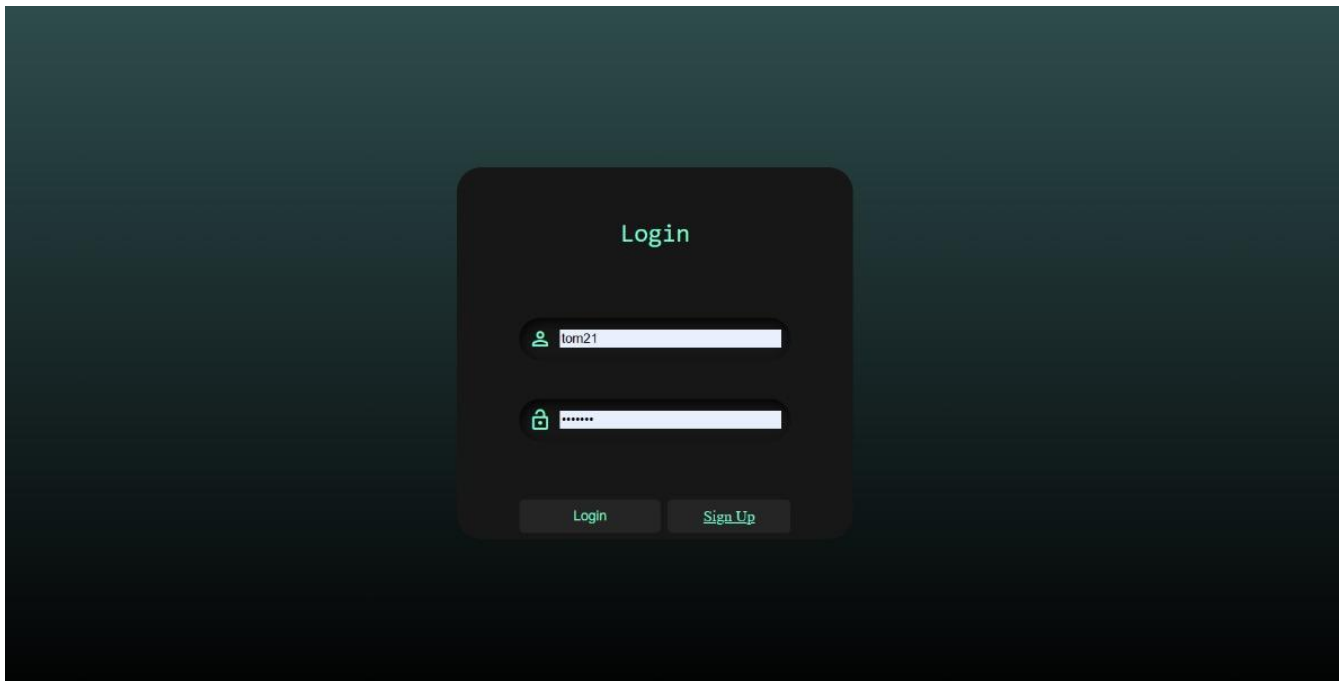


Fig 5. Login Page

Results

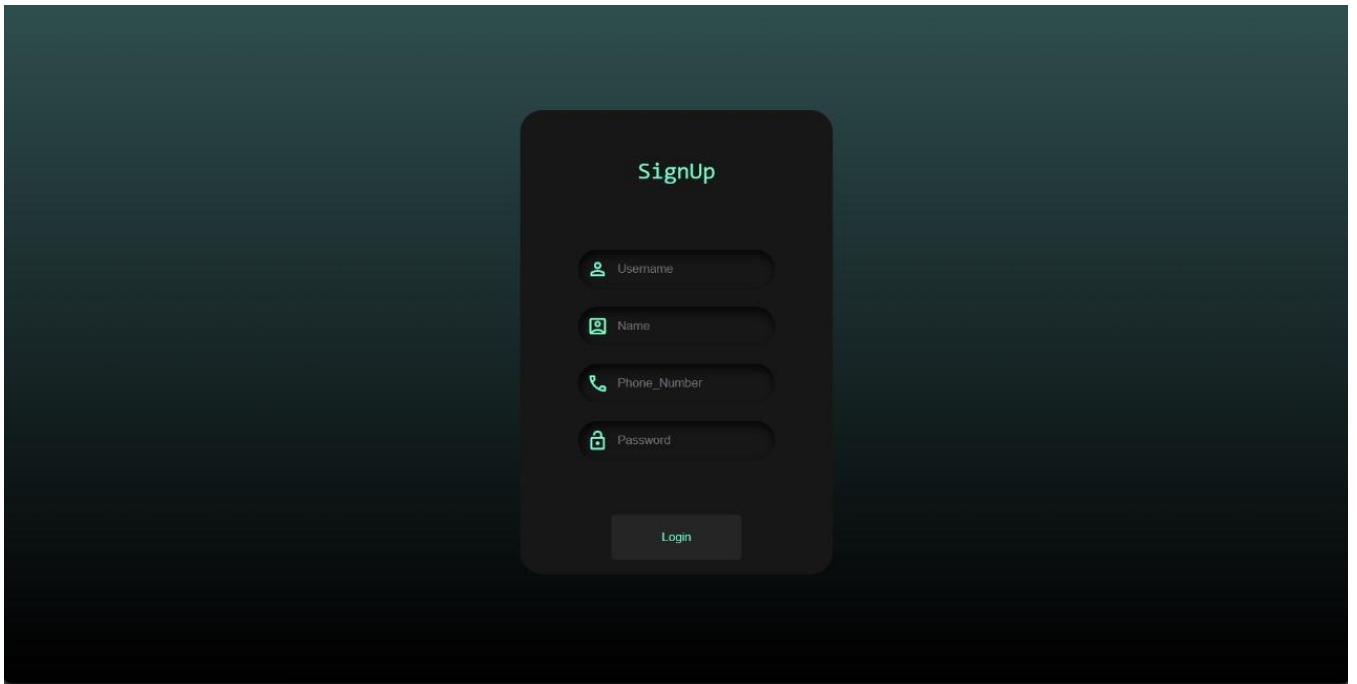
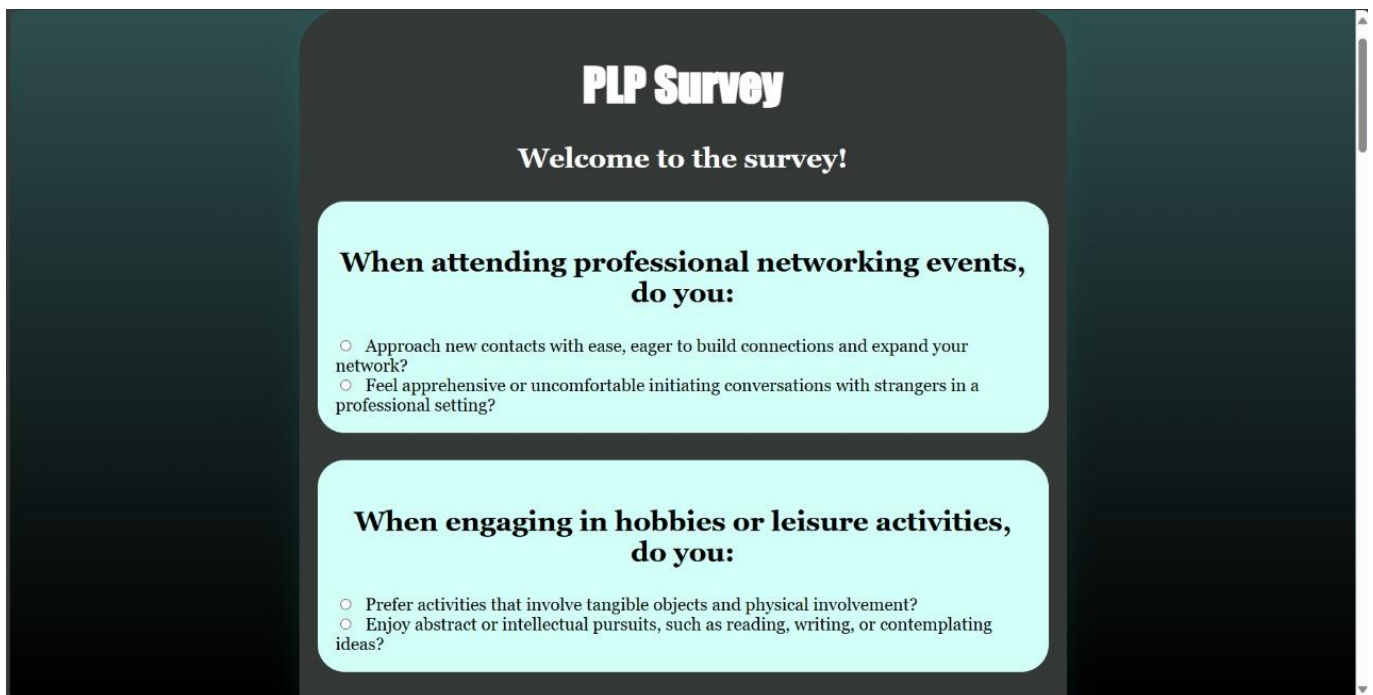


Fig 6. Sign Up Page

Results



PLP Survey

Welcome to the survey!

When attending professional networking events, do you:

- ☐ Approach new contacts with ease, eager to build connections and expand your network?
- ☐ Feel apprehensive or uncomfortable initiating conversations with strangers in a professional setting?

When engaging in hobbies or leisure activities, do you:

- ☐ Prefer activities that involve tangible objects and physical involvement?
- ☐ Enjoy abstract or intellectual pursuits, such as reading, writing, or contemplating ideas?

Fig 7. Survey Page

Results

Personalized Learning Insights

Required Learning Insights

Key Insights for Auditory Learners

- * Information is best absorbed through listening and speaking.
- * They excel in discussions and group projects.
- * They prefer to listen to explanations, lectures, and recordings.

Recommendations for Effective Study Patterns

- * **Attend lectures regularly** and actively participate in discussions.
- * **Record lectures** for later review and listen to key points.
- * **Utilize audio recordings** for studying, such as audiobooks or podcasts.
- * **Create study groups** to discuss and explain concepts to others.
- * **Use mnemonic devices** (e.g., songs, rhymes) to enhance memory.
- * **Find a quiet study environment** free from distractions.
- * **Read aloud** study materials to reinforce understanding.
- * **Discuss and explain concepts** to yourself or others to clarify your thoughts.
- * **Seek support** from teachers, tutors, or classmates who are strong auditory learners.

[Back](#)

Thank you for choosing our platform for your learning journey. We look forward to empowering you with the resources you need to succeed!

Fig 8. Insights Page

Results

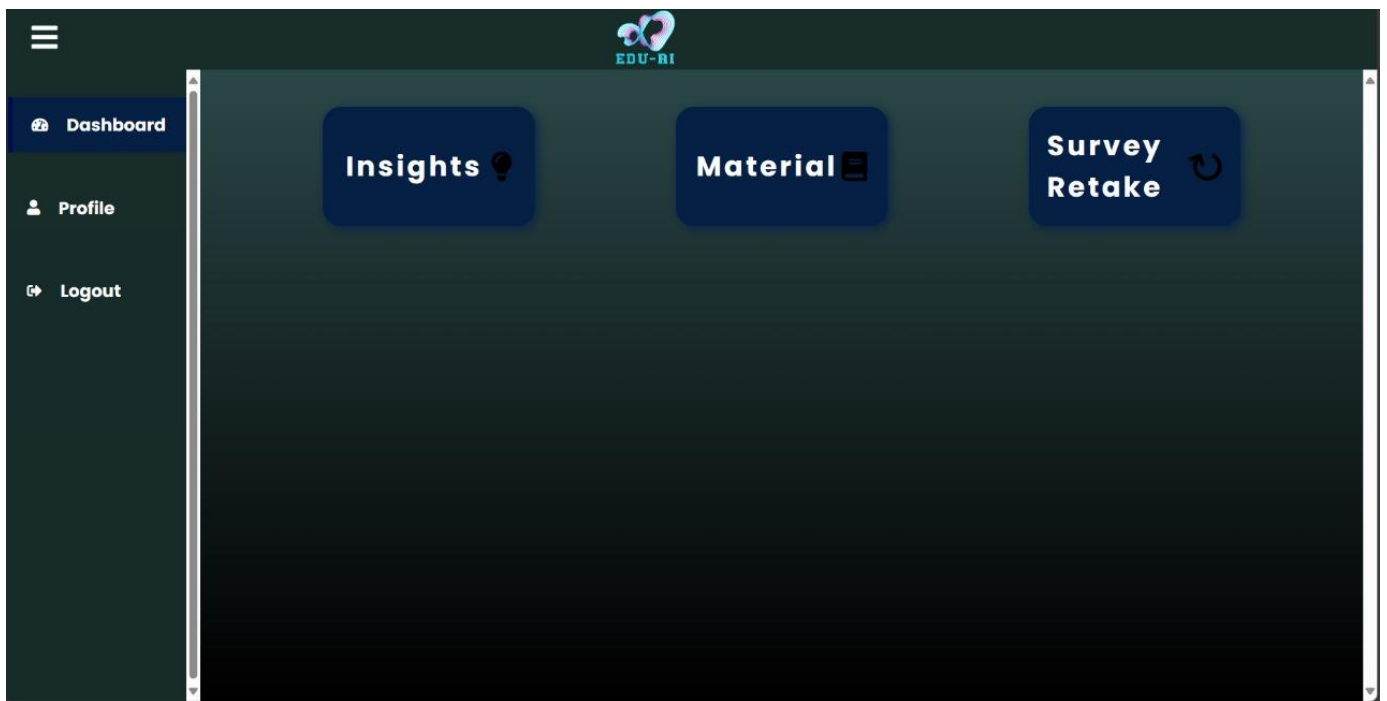


Fig 9. Dashboard Page

Edu-AI

Results

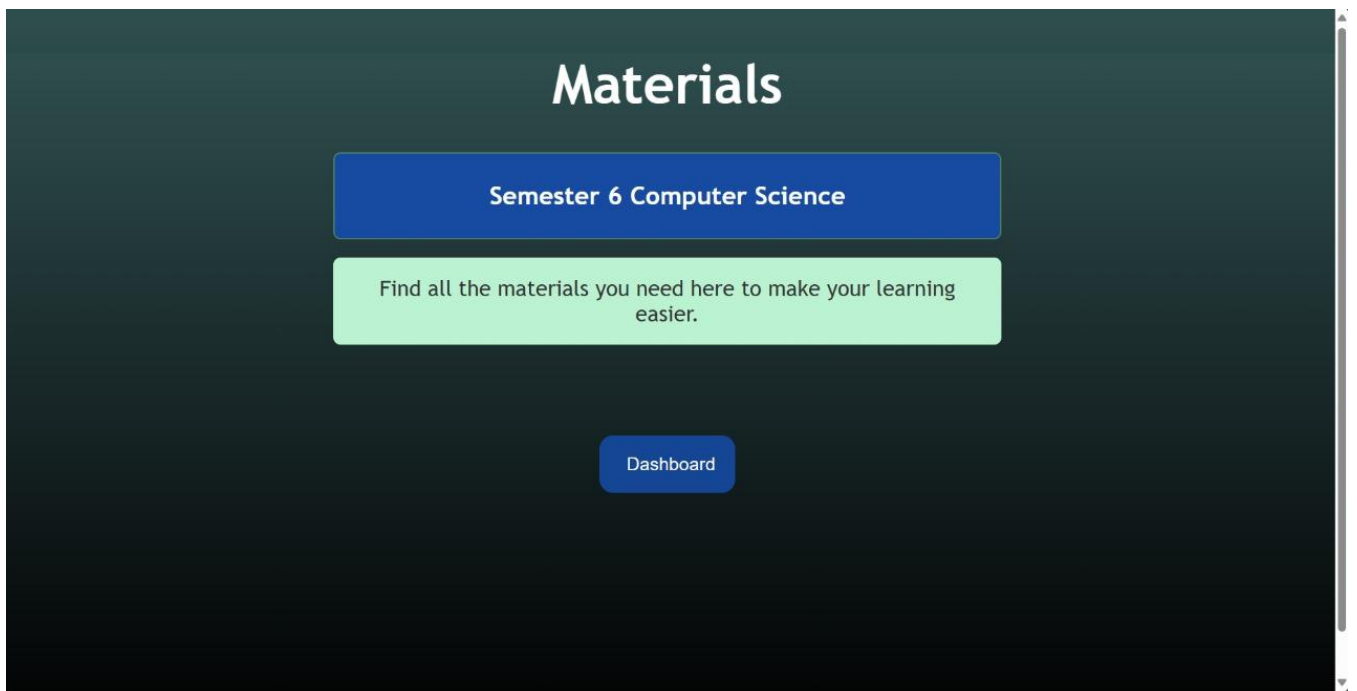


Fig 10. Drop-down Menu

Results

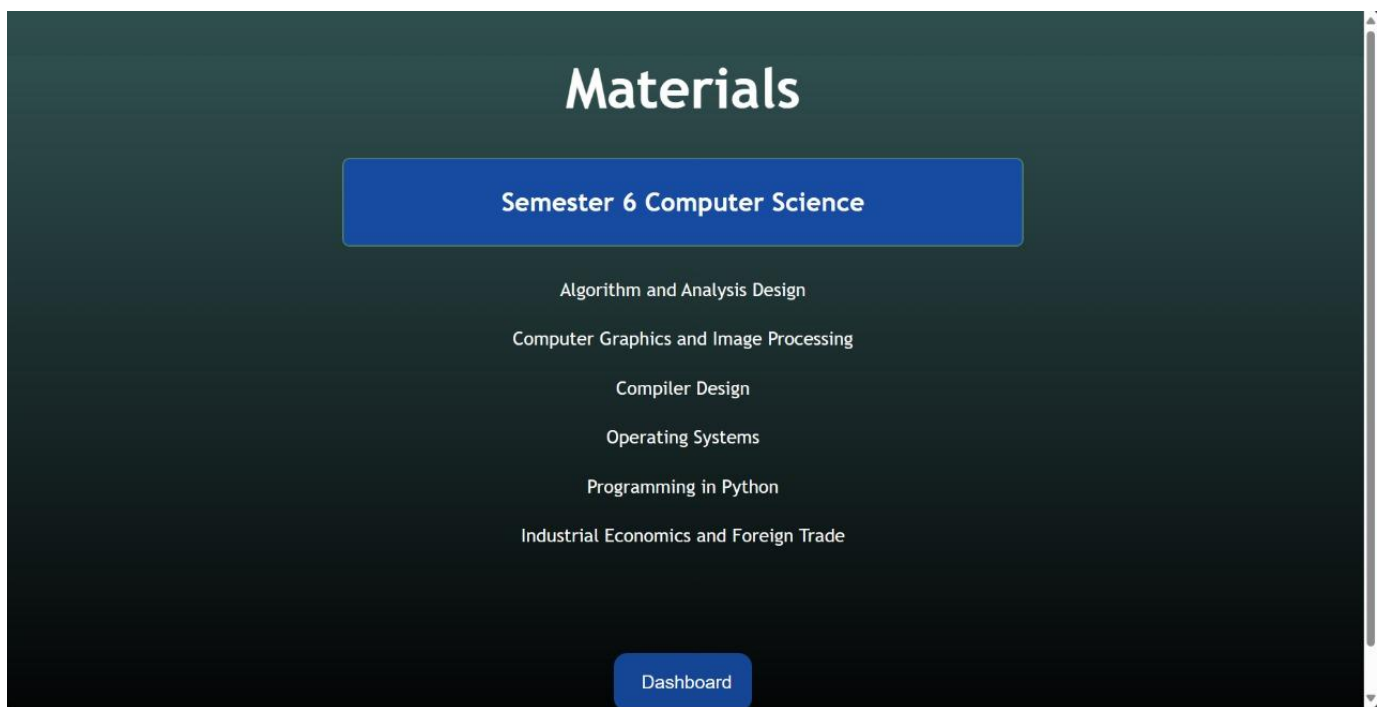


Fig 11. Select Subject

Results

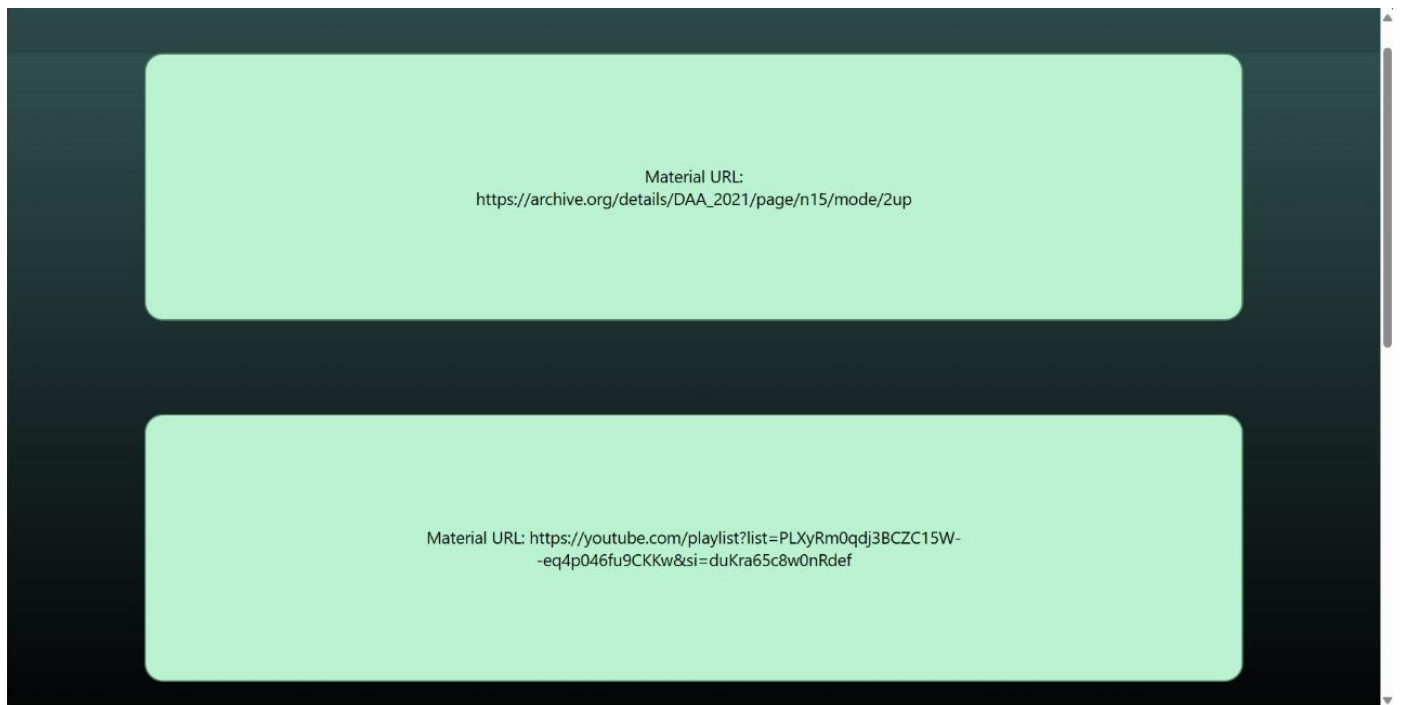


Fig 12. Materials Page

Conclusion

- PLP is a web-based application delivering tailored learning experiences, utilizing frontend technologies and AI algorithm to enhance learning outcomes.
- PLP employs HTML, CSS, JavaScript, Flask, and databases for seamless user interaction and data storage, while scikit-learn and pandas analyze user data to personalize learning styles.
- Accessible from any internet-connected device, it offers customized study strategies and content, optimizing learning experiences for users.

Future Enhancements

- **Expanded Subject Offerings:** As part of our ongoing efforts to enhance our personalized learning platform, we've would hope to significantly broaden the range of subjects available.
- **Enriched Resource Library:** We've bolstered our platform's resource library by curating a wealth of additional materials to support personalized learning journeys.

Future Enhancements

- **Advanced Recommendation Algorithms:** Leveraging advanced recommendation algorithms, we've enhanced the platform's ability to suggest relevant subjects and materials tailored to each user's unique preferences, learning style, and proficiency level.

References

- <https://www.youtube.com/watch?v=QoYzFyp3Ezk>
- <https://m3.material.io/>
- <https://vark-learn.com/>
- <https://www.engr.ncsu.edu/stem-resources/legacy-site/learning-styles/>
- <https://louis.uah.edu/cgi/viewcontent.cgi?article=1138&context=honors-capstones>

Appendix B: Vision, Mission, Programme Outcomes and Course Outcomes

DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING
RAJAGIRI SCHOOL OF ENGINEERING & TECHNOLOGY (AUTONOMOUS)
RAJAGIRI VALLEY, KAKKANAD, KOCHI, 682039
(Affiliated to APJ Abdul Kalam Technological University)



Vision, Mission, Programme Outcomes and Course Outcomes

Institute Vision

To evolve into a premier technological institution, moulding eminent professionals with creative minds, innovative ideas and sound practical skill, and to shape a future where technology works for the enrichment of mankind.

Institute Mission

To impart state-of-the-art knowledge to individuals in various technological disciplines and to inculcate in them a high degree of social consciousness and human values, thereby enabling them to face the challenges of life with courage and conviction.

Department Vision

To become a centre of excellence in Computer Science and Engineering, moulding professionals catering to the research and professional needs of national and international organizations.

Department Mission

To inspire and nurture students, with up-to-date knowledge in Computer Science and Engineering, ethics, team spirit, leadership abilities, innovation and creativity to come out with solutions meeting societal needs.

Programme Outcomes (PO)

Engineering Graduates will be able to:

- 1. Engineering Knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
- 2. Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. Conduct investigations of complex problems:** Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
- 5. Modern Tool Usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
- 6. The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
- 7. Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
- 8. Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Individual and Team work:** Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.

10. Communication: Communicate effectively with the engineering community and with society at large. Be able to comprehend and write effective reports documentation. Make effective presentations, and give and receive clear instructions.

11. Project management and finance: Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments.

12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

Programme Specific Outcomes (PSO)

A graduate of the Computer Science and Engineering Program will demonstrate:

PSO1: Computer Science Specific Skills

The ability to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas by understanding the core principles and concepts of computer science and thereby engage in national grand challenges.

PSO2: Programming and Software Development Skills

The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products meeting the demands of the industry.

PSO3: Professional Skills

The ability to apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs thereby evolving as an eminent researcher and entrepreneur.

Course Outcomes

After the completion of the course the student will be able to:

CO1:

Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)

CO2:

Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes (Cognitive Knowledge Level: Apply)

CO3:

Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (Cognitive Knowledge Level: Apply)

CO4:

Prepare technical report and deliver presentation (Cognitive Knowledge Level: Apply)

CO5:

Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)

Appendix C: CO-PO-PSO Mapping

COURSE OUTCOMES:

After completion of the course the student will be able to

SL. NO	DESCRIPTION	Blooms' Taxonomy Level
CO1	Identify technically and economically feasible problems (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO2	Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO3	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions of minimal complexity by using modern tools & advanced programming techniques (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO4	Prepare technical report and deliver presentation (Cognitive Knowledge Level: Apply)	Level 3: Apply
CO5	Apply engineering and management principles to achieve the goal of the project (Cognitive Knowledge Level: Apply)	Level 3: Apply

CO-PO AND CO-PSO MAPPING

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
C O1	3	3	3	3		2	2	3	2	2	2	3	2	2	2
C O2	3	3	3	3	3	2		3	2	3	2	3	2	2	2
C O3	3	3	3	3	3	2	2	3	2	2	2	3			2
C O4	2	3	2	2	2			3	3	3	2	3	2	2	2
C O5	3	3	3	2	2	2	2	3	2		2	3	2	2	2

3/2/1: high/medium/low

JUSTIFICATIONS FOR CO-PO MAPPING

MAPPING	LOW/ MEDIUM/ HIGH	JUSTIFICATION
101003/CS6 22T.1-PO1	HIGH	Identify technically and economically feasible problems by applying the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
101003/CS6 22T.1-PO2	HIGH	Identify technically and economically feasible problems by analysing complex engineering problems reaching substantiated conclusions using first principles of mathematics.
101003/CS6 22T.1-PO3	HIGH	Design solutions for complex engineering problems by identifying technically and economically feasible problems.
101003/CS6 22T.1-PO4	HIGH	Identify technically and economically feasible problems by analysis and interpretation of data.
101003/CS6 22T.1-PO6	MEDIUM	Responsibilities relevant to the professional engineering practice by identifying the problem.
101003/CS6 22T.1-PO7	MEDIUM	Identify technically and economically feasible problems by understanding the impact of the professional engineering solutions.
101003/CS6 22T.1-PO8	HIGH	Apply ethical principles and commit to professional ethics to identify technically and economically feasible problems.
101003/CS6 22T.1-PO9	MEDIUM	Identify technically and economically feasible problems by working as a team.
101003/CS6 22T.1-PO10	MEDIUM	Communicate effectively with the engineering community by identifying technically and economically feasible problems.
101003/CS6 22T.1-P011	MEDIUM	Demonstrate knowledge and understanding of engineering and management principles by selecting the technically and economically feasible problems.
101003/CS6 22T.1-PO12	HIGH	Identify technically and economically feasible problems for long term learning.
101003/CS6 22T.1-PSO1	MEDIUM	Ability to identify, analyze and design solutions to identify technically and economically feasible problems.
101003/CS6 22T.1-PSO2	MEDIUM	By designing algorithms and applying standard practices in software project development and Identifying technically and economically feasible problems.
101003/CS6 22T.1-PSO3	MEDIUM	Fundamentals of computer science in competitive research can be applied to Identify technically and economically feasible problems.
101003/CS6 22T.2-PO1	HIGH	Identify and survey the relevant by applying the knowledge of mathematics, science, engineering fundamentals.

101003/CS6 22T.2-PO2	HIGH	Identify, formulate, review research literature, and analyze complex engineering problems get familiarized with software development processes.
101003/CS6 22T.2-PO3	HIGH	Design solutions for complex engineering problems and design based on the relevant literature.
101003/CS6 22T.2-PO4	HIGH	Use research-based knowledge including design of experiments based on relevant literature.
101003/CS6 22T.2-PO5	HIGH	Identify and survey the relevant literature for getting exposed to related solutions and get familiarized with software development processes by using modern tools.
101003/CS6 22T.2-PO6	MEDIUM	Create, select, and apply appropriate techniques, resources, by identifying and surveying the relevant literature.
101003/CS6 22T.2-PO8	HIGH	Apply ethical principles and commit to professional ethics based on the relevant literature.
101003/CS6 22T.2-PO9	MEDIUM	Identify and survey the relevant literature as a team.
101003/CS6 22T.2-PO10	HIGH	Identify and survey the relevant literature for a good communication to the engineering fraternity.
101003/CS6 22T.2-PO11	MEDIUM	Identify and survey the relevant literature to demonstrate knowledge and understanding of engineering and management principles.
101003/CS6 22T.2-PO12	HIGH	Identify and survey the relevant literature for independent and lifelong learning.
101003/CS6 22T.2-PSO1	MEDIUM	Design solutions for complex engineering problems by Identifying and survey the relevant literature.
101003/CS6 22T.2-PSO2	MEDIUM	Identify and survey the relevant literature for acquiring programming efficiency by designing algorithms and applying standard practices.
101003/CS6 22T.2-PSO3	MEDIUM	Identify and survey the relevant literature to apply the fundamentals of computer science in competitive research.
101003/CS6 22T.3-PO1	HIGH	Perform requirement analysis, identify design methodologies by using modern tools & advanced programming techniques and by applying the knowledge of mathematics, science, engineering fundamentals.
101003/CS6 22T.3-PO2	HIGH	Identify, formulate, review research literature for requirement analysis, identify design methodologies and develop adaptable & reusable solutions.

101003/CS6 22T.3-PO3	HIGH	Design solutions for complex engineering problems and perform requirement analysis, identify design methodologies.
101003/CS6 22T.3-PO4	HIGH	Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
101003/CS6 22T.3-PO5	HIGH	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools.
101003/CS6 22T.3-PO6	MEDIUM	Perform requirement analysis, identify design methodologies and assess societal, health, safety, legal, and cultural issues.
101003/CS6 22T.3-PO7	MEDIUM	Understand the impact of the professional engineering solutions in societal and environmental contexts and Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions.
101003/CS6 22T.3-PO8	HIGH	Perform requirement analysis, identify design methodologies and develop adaptable & reusable solutions by applying ethical principles and commit to professional ethics.
101003/CS6 22T.3-PO9	MEDIUM	Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
101003/CS6 22T.3-PO10	MEDIUM	Communicate effectively with the engineering community and with society at large to perform requirement analysis, identify design methodologies.
101003/CS6 22T.3-PO11	MEDIUM	Demonstrate knowledge and understanding of engineering requirement analysis by identifying design methodologies.
101003/CS6 22T.3-PO12	HIGH	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change by analysis, identify design methodologies and develop adaptable & reusable solutions.
101003/CS6 22T.3-PSO3	MEDIUM	The ability to apply the fundamentals of computer science in competitive research and prior to that perform requirement analysis, identify design methodologies.
101003/CS6 22T.4-PO1	MEDIUM	Prepare technical report and deliver presentation by applying the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
101003/CS6 22T.4-PO2	HIGH	Identify, formulate, review research literature, and analyze complex engineering problems by preparing technical report and deliver presentation.

101003/CS6 22T.4-PO3	MEDIUM	Prepare Design solutions for complex engineering problems and create technical report and deliver presentation.
101003/CS6 22T.4-PO4	MEDIUM	Use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions and prepare technical report and deliver presentation.
101003/CS6 22T.4-PO5	MEDIUM	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools and Prepare technical report and deliver presentation.
101003/CS6 22T.4-PO8	HIGH	Prepare technical report and deliver presentation by applying ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
101003/CS6 22T.4-PO9	HIGH	Prepare technical report and deliver presentation effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings.
101003/CS6 22T.4-PO10	HIGH	Communicate effectively with the engineering community and with society at large by prepare technical report and deliver presentation.
101003/CS6 22T.4-PO11	MEDIUM	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work by prepare technical report and deliver presentation.
101003/CS6 22T.4-PO12	HIGH	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change by prepare technical report and deliver presentation.
101003/CS6 22T.4-PSO1	MEDIUM	Prepare a technical report and deliver presentation to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas.
101003/CS6 22T.4-PSO2	MEDIUM	To acquire programming efficiency by designing algorithms and applying standard practices in software project development and to prepare technical report and deliver presentation.
101003/CS6 22T.4-PSO3	MEDIUM	To apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs by preparing technical report and deliver presentation.
101003/CS6 22T.5-PO1	HIGH	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
101003/CS6 22T.5-PO2	HIGH	Identify, formulate, review research literature, and analyze complex engineering problems by applying engineering and management principles to achieve the goal of the project.

101003/CS6 22T.5-PO3	HIGH	Apply engineering and management principles to achieve the goal of the project and to design solutions for complex engineering problems and design system components or processes that meet the specified needs.
101003/CS6 22T.5-PO4	MEDIUM	Apply engineering and management principles to achieve the goal of the project and use research-based knowledge including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
101003/CS6 22T.5-PO5	MEDIUM	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools and to apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO6	MEDIUM	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities by applying engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO7	MEDIUM	Understand the impact of the professional engineering solutions in societal and environmental contexts, and apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO8	HIGH	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice and to use the engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO9	MEDIUM	Function effectively as an individual, and as a member or leader in teams, and in multidisciplinary settings and to apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO11	MEDIUM	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team. Manage projects in multidisciplinary environments and to apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PO12	HIGH	Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change and to apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PSO1	MEDIUM	The ability to identify, analyze and design solutions for complex engineering problems in multidisciplinary areas. Apply engineering and management principles to achieve the goal of the project.

101003/CS6 22T.5-PSO2	MEDIUM	The ability to acquire programming efficiency by designing algorithms and applying standard practices in software project development to deliver quality software products meeting the demands of the industry and to apply engineering and management principles to achieve the goal of the project.
101003/CS6 22T.5-PSO3	MEDIUM	The ability to apply the fundamentals of computer science in competitive research and to develop innovative products to meet the societal needs thereby evolving as an eminent researcher and entrepreneur and apply engineering and management principles to achieve the goal of the project.