Empowering Education: Insights into Student Performance and Progress

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Published in IJIRMPS (E-ISSN: 2349-7300), Volume 12, Issue 2, (March-April 2024)

Abstract

This transformative education project is dedicated to enhancing the learning experience by establishing an effortless system for collecting and interpreting vital student data. Anchored by user-friendly dashboards resembling computer screens, the project provides a comprehensive overview of students' academic performance, enabling insightful comparisons across various groups. Beyond data presentation, the system facilitates personalized support, offering resources and guidance tailored to individual needs, reminiscent of a personal tutor. Access to the system is secure, with unique logins for teachers, administrators, and students. Employing an analogy of a secret lock for a diary emphasizes the commitment to data safety. By seamlessly integrating understandable data with a secure system, the project aims to make education more personal, efficient, and secure. Teachers gain insights for targeted support, administrators streamline operations, and students track progress while accessing necessary assistance, marking a significant stride toward a more enriched educational landscape.

Keywords: Tableau, React, Node.js, JavaScript, Empowering Education, Student Performance and Progress

1. Introduction

This comprehensive project revolves around the meticulous collection and analysis of diverse student-related data, encompassing elements such as test scores, attendance records, and participation in internships. The overarching objective is to develop a nuanced understanding of each student's academic progress. Employing user-friendly dashboards as visual interfaces, the project aspires to present the analyzed data in an organized and visually appealing manner, facilitating a holistic comprehension of students' performance. Through comparative analyzes across different categories, including batches, divisions, and departments, the project aims to identify trends, recognize strengths, and pinpoint areas for improvement within these distinct segments. This multifaceted approach lays the foundation for personalized growth by identifying students in need of additional support, suggesting tailor-made learning resources, and offering guidance based on individual strengths and weaknesses. To ensure data security and confidentiality, the project implements a robust role-based access system, assigning distinct logins to teachers, administrators, and students, each with varying levels of access and permissions based on their roles. This strategic implementation guarantees that the right individuals can view and

interact with the appropriate information, maintaining the integrity and privacy of the data. In essence, this project goes beyond mere data collection and analysis; it underscores the significance of user-friendly interfaces and secure data access protocols in supporting and enhancing each student's unique academic journey. Through insightful data analysis and a commitment to user-friendly interfaces, this project aims to contribute to a comprehensive educational environment, fostering personalized growth and academic success.

2. Related Work

The authors have explained about the purpose of an Advanced Feature Selection Algorithm to effectively apply educational data mining for performance. In [1] algorithm is based upon the Hadoop and Map Reduce framework. The study also consists of a comparative analysis of various features selection algorithms such as jrip, Naive Bayes, decision table, etc. which evaluate the correctness of the data based on three parameters: memory, accuracy, and f-metrics. It helps the faculty to identify the students who are weak and are on the edge performing poorly in studies. It also helps the educational institute as they can predict the performance of the enrolled students based on prior data and stipulate plans according to predicted results. Overall, as per results received from comparative analysis, the proposed algorithm is a faster, accurate and efficient way for administering educational data mining when compared to another algorithm. In [2], the authors have discussed about how this paper studies the student and exercise modeling based on pass/fail log data gathered from an introductory programming course. Contemporary education capitalizes on communications technology and remote study. In many cases, various technological solutions are used to collect individual exercise submissions, but there are few resources for indexing or modeling the exercises in depth. It has demonstrated malfunctioning assessment systems and weak spots in the course material. The obtained model was also used to rearrange the exercises into providing for smoother student experience in future instances of the course.

In [3], the authors have explained that the research-to-practice category addresses the problem of organizing instructional materials and assessment activities in e-learning courses and their effects on learning outcomes. This paper aims to present the application results of PM techniques to verify the students' learning paths in an introductory programming course. A Moodle event log was used containing 24605 events collected from 73 undergraduate students. For experiments, it was divided from the original log file into five other segments of datasets among passed and failed student’s variations. The results showed that overall approved and failed students took different paths and event numbers to perform activities in the course. The analysis of these results provides general and specific information on students’ learning paths and can help teachers observe students’ behavior patterns and progress.

In [4], the authors have explained, Data Analysis and interpretation have now taken center stage with the advent of the digital age and the sheer amount of data can be frightening. Through the art of streamlined visual communication, data dashboards permit business to engage in real-time and informed decision making, and are key instruments in data interpretation. Dashboards not only bridge the information gap between the traditional data interpretation methods and technology, but they can help remedy and prevent the major pitfalls of interpretation. In [5], the authors have explained about how to accurately extract the data from unstructured Chinese text, this paper proposes a rule-based method based on natural language processing and regular expression. This method makes use of the language expression rules of the data in the text and other related knowledge to form the feature word lists and rule template to match the text. The experimental results show that the algorithm has a high accuracy in data

extraction, it still has several limitations through analysis, including the single source of experimental corpus, the lack of comprehensive matching content and the inability to automatically add new rules and new feature words. Experimental results show that the accuracy of the designed algorithm is 94.09%.

In [6], the authors have explained the goal to describe the problems for the efficient construction of a data cube structure and to present several approaches for efficient extraction of information from a data cube structure. Using different approaches to reduce the time to retrieve data from a data cube by building a direct connection to the data using the Object-Oriented Model Data Cube (class) are presented. Other methods for reducing the data sparsity of a data cube structure by detecting semantic dependence of the data and dividing the data cube into higher density sub cubes are also described. In [7], authors propose an intelligent data placement strategy based on reinforcement learning which combines workflow characteristics and system information to make data placement decisions. Besides, this data placement strategy is integrated in a general hierarchical data management framework and tested in two real scientific workflows. The Experiments demonstrate that our strategy could optimize the I/O performance with diverse scientific work flows. In [8], the authors have explained about challenges remaining in teaching and learning data structure is to facilitate students' understanding of the dynamic presentation from the collection of data elements in memory. In this paper presents an interactive visualization tool for data structure in Python. The work focuses on visual and interactive methods to facilitate the communication of data structure and associated data operations by dynamic graph corresponding to the programming process.The resulting series of key frames featuring major data structure transformations are available for review and analysis. All these combines to fill the gap between the abstract data representation and a dynamic learning-by-coding process. In [9], the authors have explained about the public opinion entails emotions, wishes, attitudes and ideas among individuals and various social groups in certain historical stages and social space. The research aims to employ natural language processing (NLP), sentiment analysis and data mining technologies to build a public opinion analysis system to serve enterprises' need for online public opinion detection.

In [10], the authors have proposed three visualization techniques. Combined LBP LLE SMOTE the advantages of generalized data visualization by correcting unbalanced data characteristics through sparse data correction. Through this, it checks whether it is efficient in fake image discrimination. Also, the Visualization of pixel density similarity has an advantage of efficiently detecting when pixel position information is wrongly generated through similarity analysis of pixel positions and showing correlation information of pixel information. Visualization of pixel density frequency shows the advantage of extracting fake pixels through the frequency of pixel values generated through density distribution analysis. The method proposed in this paper can be used as a method for the detection of real-world images. In [11], the authors have explained about the data generated by the students including the scores, information on borrowing books, credit card information of dormitory access control and consumption data of campus one-card. By analyzing the behavioral data generated by the students in schools are found, which can provide a more scientific basis for the management of students. The paper makes use of the data such as achievement information of students in a vocational college and the consumption information of campus one-card. Then, the data after preprocessing is discretized with the data discretization technology so that the data can meet the requirement of the apriori algorithm of association rule. Finally, the Apriori algorithm is used to mine the correlation between students' academic performance and campus one-card consumption data.

In [12], the research method of Apriori algorithm using the algorithm of big data, in-depth analysis of rural preschool teaching classroom teaching performance survey data, access to the classroom teaching performance data characteristic, mining survey data in rural preschool teaching classroom teaching performance valuable knowledge, analysis of factors affecting the performance of the classroom teaching, and found that classroom teaching optimization methods and measures of performance. In [13], the authors have explained about application servers that generate daily log files with a significant part of their activity. This information is recorded sequentially over time but mixes various types of information. The Absence of a standard for formatting the data record and the respective volume, make it difficult to extract the corresponding information. The lack of work, specifically in the treatment of SOA server log files, did not allow the comparison with pre-existing Key Performance Indicators (KPI) or a set of best practices that could be followed. This work results in a description of the process that can serve as a guide for: definition of a logging structure; construction of a data extraction process; definition of a data structure to support the extracted information; definition of control metrics; definition of analysis and control processes for the extracted data.

3. Proposed System

The proposed system is an analytical tool designed to assess students' academic performance by analyzing various factors that influence their grades and overall success. It examines variables like study habits, attendance, and extracurricular activities to establish correlations. The system then generates insights that educators can use to enhance student outcomes and improve the overall learning experience. This system will assist educational institutions in making data-driven decisions to optimize the academic journey for students.

4. Hardware and Software Requirements

The required computer hardware must consist of minimum 2 GB RAM. The business model is implemented and supported on Operating System Windows 7 or greater versions. Software requirements include tableau, visual studio code and Xampp server. The required front-end programming languages include React, Node.js and JavaScript and backend.

5. System Architecture

The system architecture mentioned below in Figure 1 gives an overall view of working on the website. According to the system architecture the tasks performed by the user is done by Start then the User Login of the system. The User Login of the system has Four Login Modules Student, Mentor, Class Advisor, HOD, Admin. The user should have an Account if not user needs to Sign Up, create a new account. After creating new account, user needs to Login to access different modules of the Website. Some of the modules such as Mentor have the access to Update Training and Placement and Higher Studies data of the students. The Class Advisor is responsible for entering Academic Data of the students. After Login one can apply different Filters which will help them to analyze the academic data. By applying the Filters according to user’s needs, user can derive insights useful for Academic Progress and the performance.

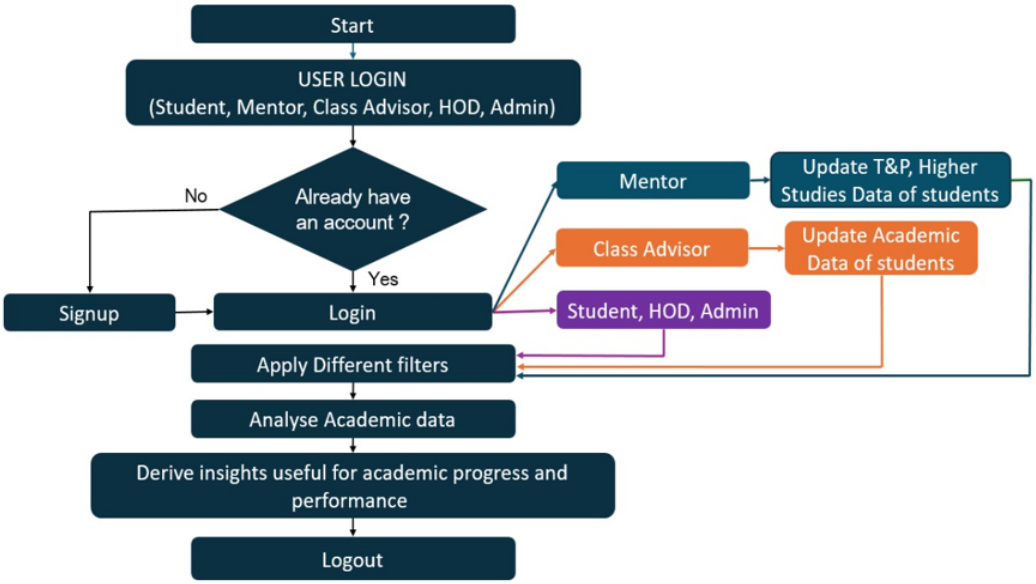

Figure 1: The System Architecture

6. Design and Development

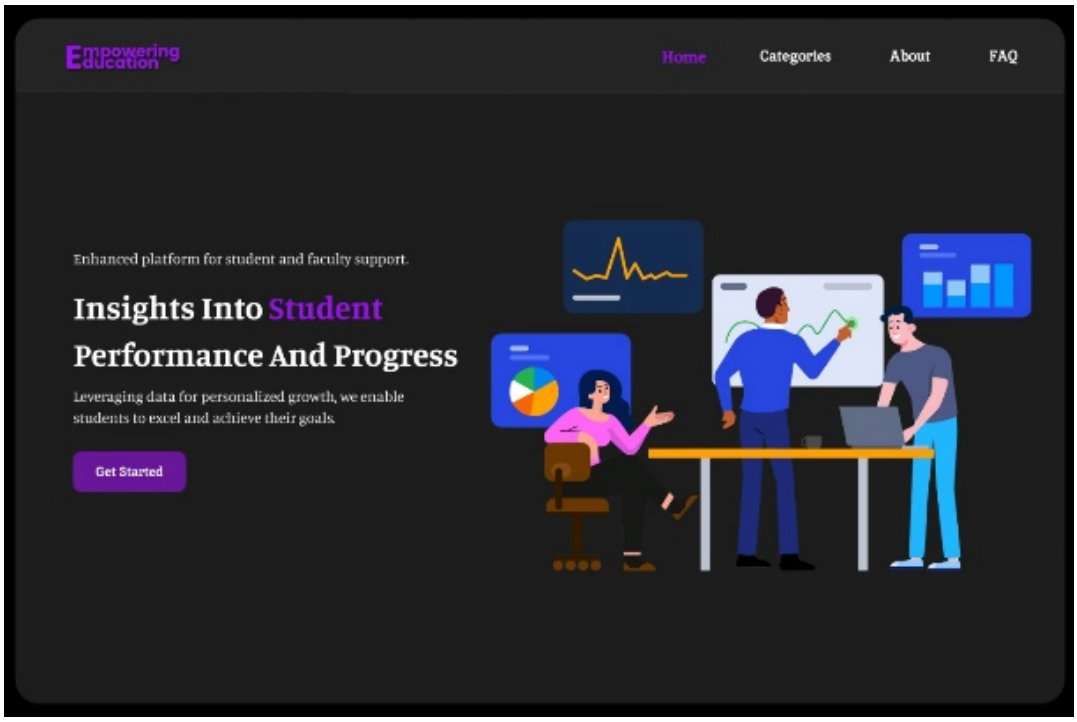

Figure 2: Home Page

Figure 2 represents the Home Page of Empowering Education which get you started to get an Insight into Student Performance.

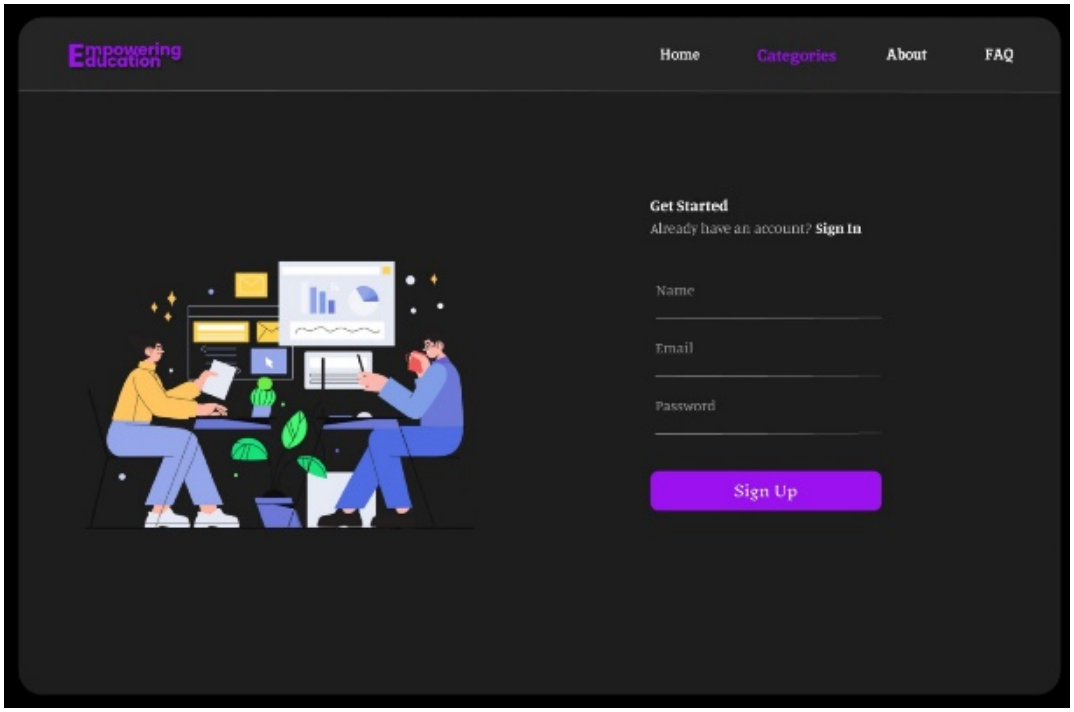

Figure 3: Sign-up Page

Figure 3 represents the Sign-up page of Empowering Education where the user can create an account to sign-in in the website. It includes three fields Name, Email and Password.

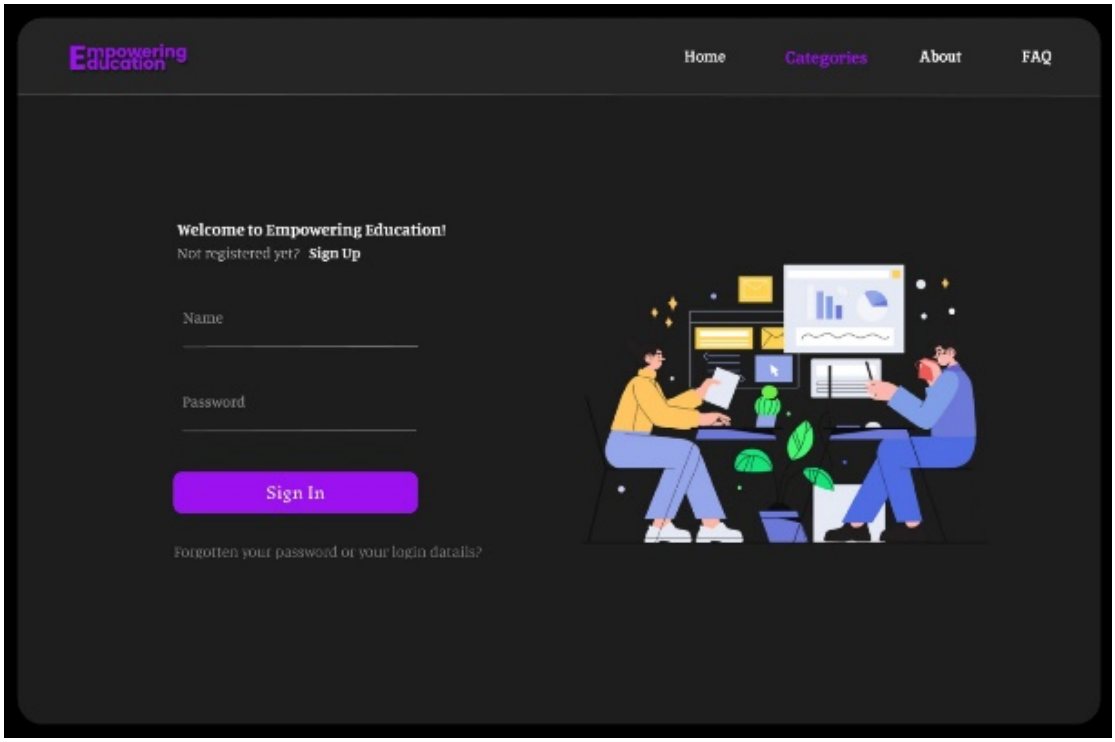

Figure 4: Sign-in Page

Figure 4 represents the Sign-in page of Empowering Education, user can directly Sign into the website using Name and Password.

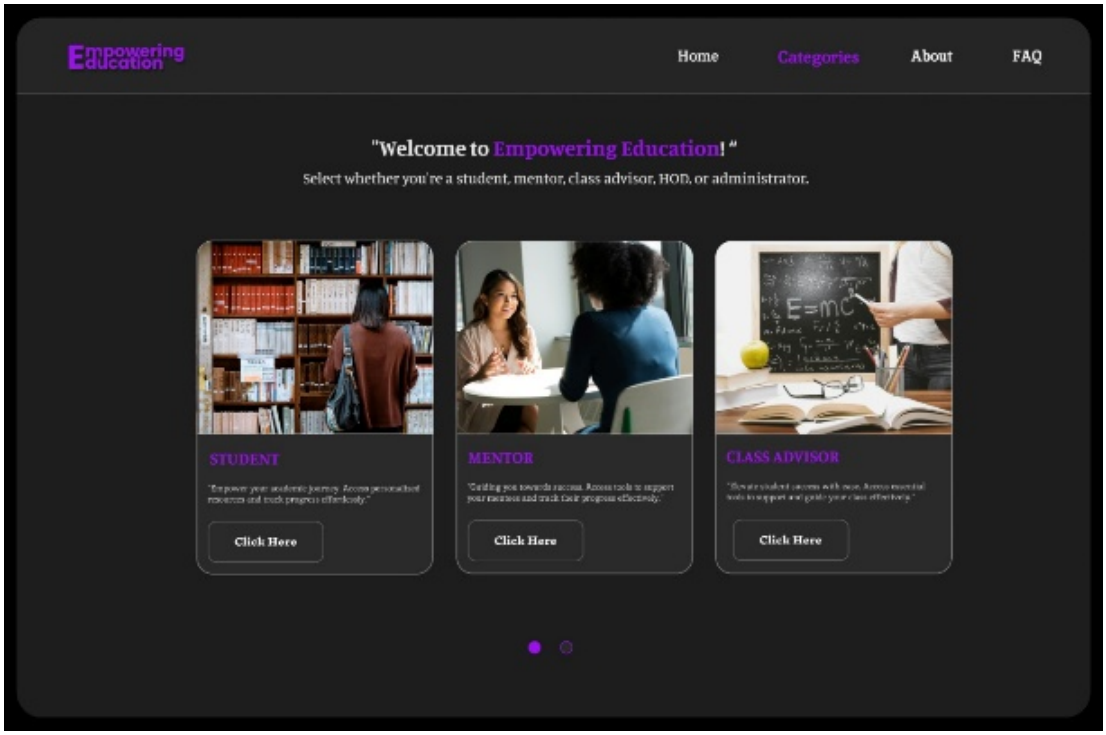

Figure 5: Categories Page

Figure 5 represents different roles the user can access according to the role of the users. The roles include Students, Mentor, Class Advisor, HoD, Admin.

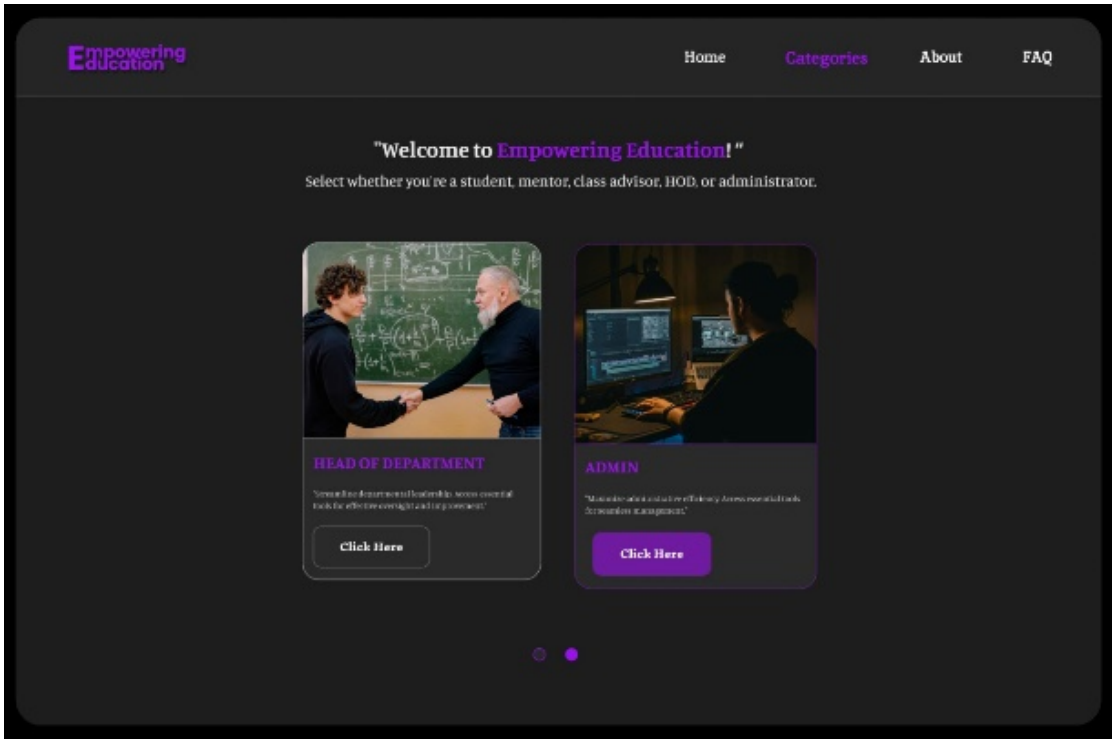

Figure 6: Categories Page

Figure 6 represents the second page of categories in Empowering Education for further accessibility.

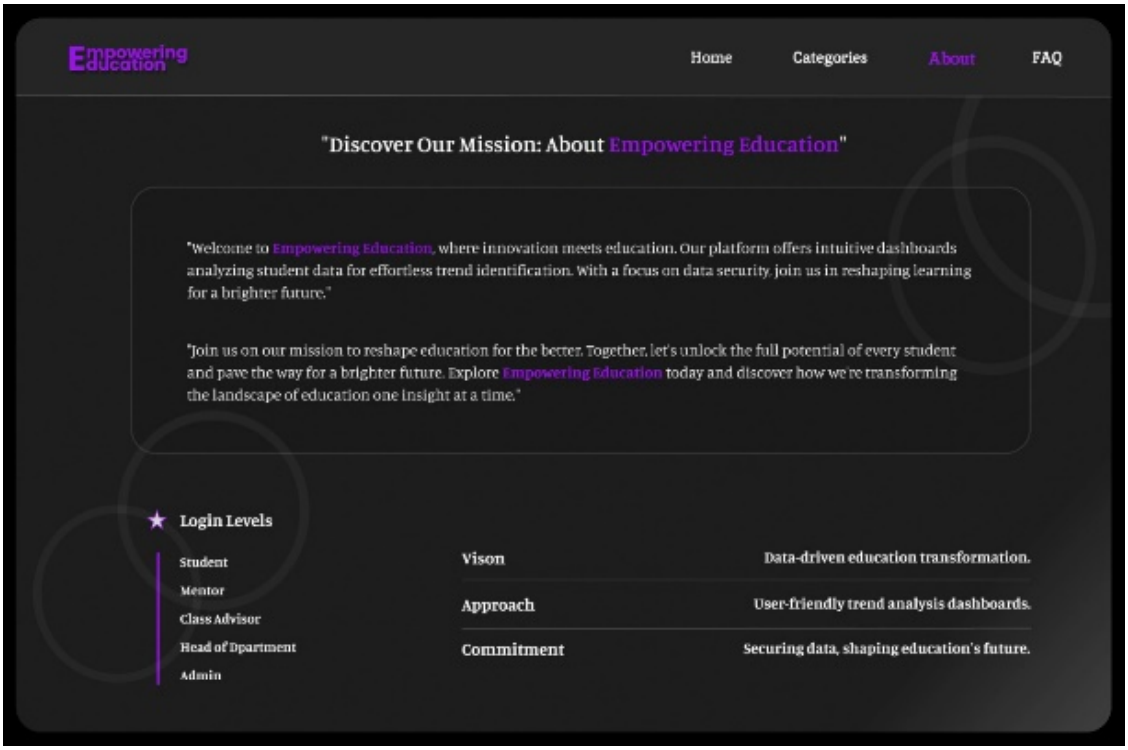

Figure 7: About Us Page

Figure 7 represents the About Us page that consist of the Mission of Empowering Education and the Vision, Approach and Commitment of the project.

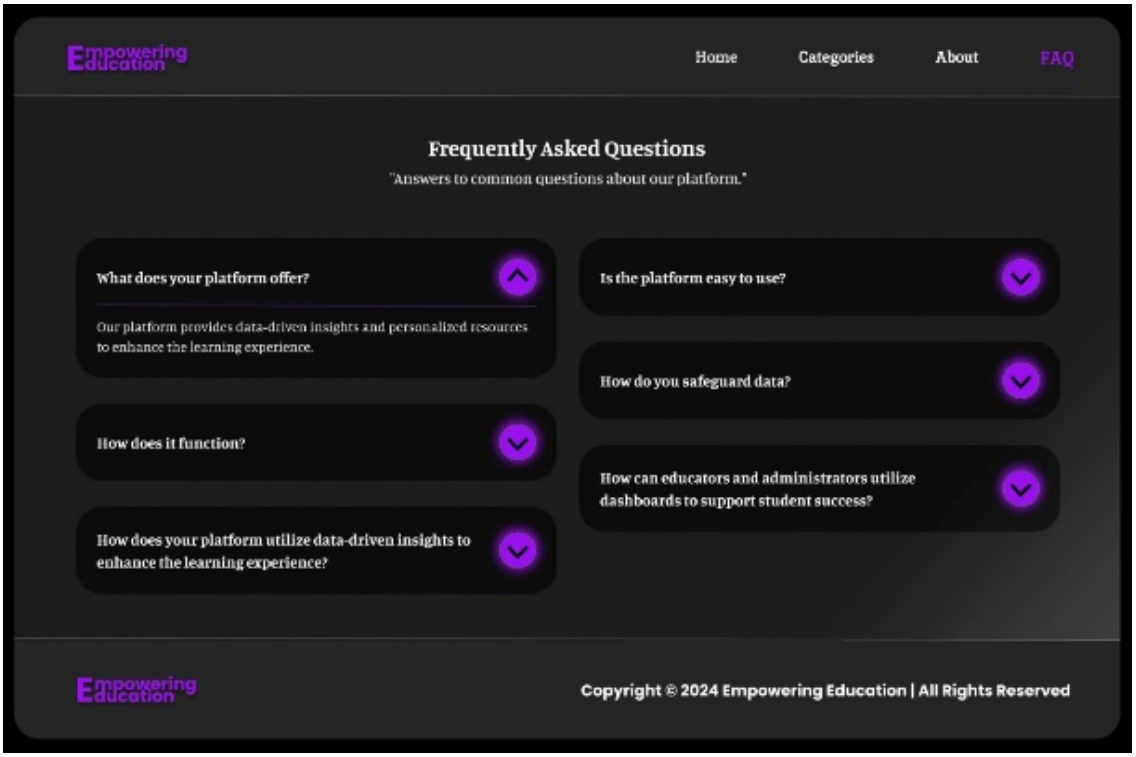

Figure 8: FAQs Page

Figure 8 represents the FAQs Page of the Empowering Education that consist of Frequently Asked Questions by the user and answers to the questions.

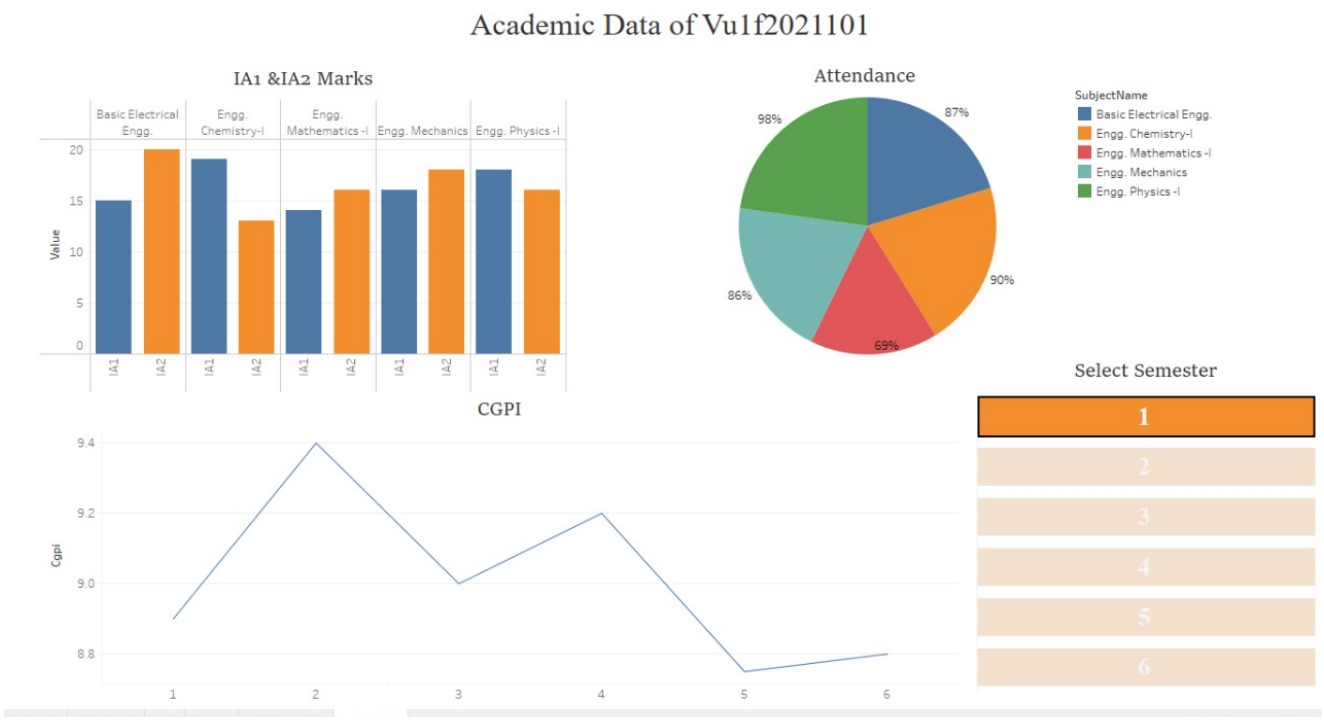

Figure 9: Academic Dashboard

Figure 9 represents the Academic Dashboard of the students based on the Internal Marks, Attendance, Overall Semesters attempted.

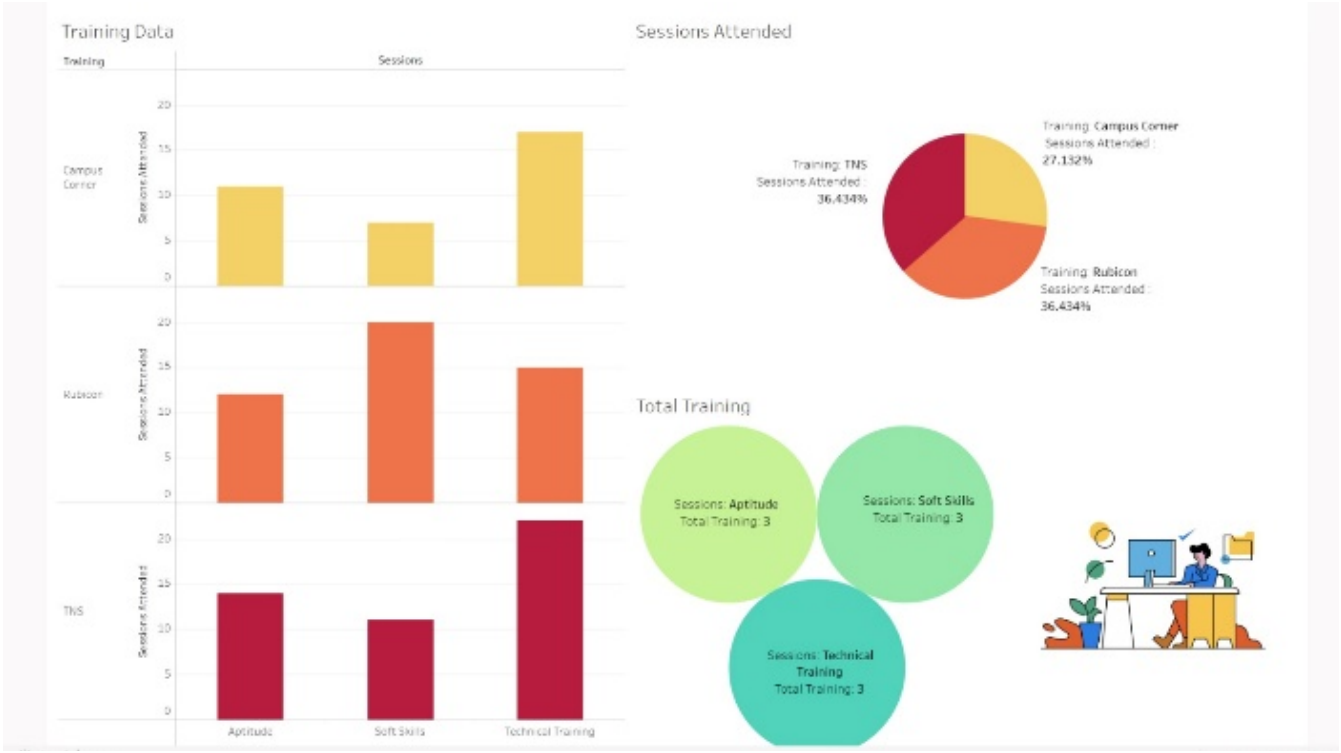

Figure 10: Training Dashboard

Figure 10 represents the Training Dashboard of the students attended the training based on the Sessions Attended and the total training conducted in the college.

7. Conclusions and Future Scope

Our project aims to comprehensively analyze various aspects of student performance. By presenting these insights through an accessible dashboard, we empower educators and administrators to make informed decisions. Through comparative analysis across different factors, we can offer personalized growth strategies for individual students. Ultimately, our project strives to enhance educational outcomes and support student success.

The academic performance analysis system is poised for advancements such as predictive analytics, AI integration, real-time feedback, and increased parental involvement. Ensuring ethical data use and privacy considerations will remain pivotal in these developments, contributing to a more effective and personalized education system. The system also has the potential for adaptation to remote learning and collaboration across institutions.

Acknowledgement

I express my gratitude to all the authors of research papers whose work has been instrumental in shaping my own paper. I appreciate their contributions to the field, which have greatly aided me in the preparation of my research. I extend my thanks to all those who have played a role in the development of this paper. Additionally, I acknowledge and thank the developers for their assistance in creating block diagrams, circuit diagrams, and platforms for this project. Your contributions have been crucial in the development of this paper, and I am thankful for the support received.

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