

A
MINI PROJECT REPORT
On
“Student Performance Analysis
For College Student”

Submitted to
Autonomous Institute,
Affiliated to The Rashtrasant Tukadoji Maharaj Nagpur University
Department of Emerging Technologies
Bachelor of Technology (B. Tech)

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2023 – 2024

CERTIFICATE

This is to certify that the mini project report entitled **Student Performance Analysis For College Student** submitted by 1. **Ritik Malviya** 2. **Sohail Ansari** 3. **Ankush Gupta** 4. **Ruchita Kumbhare** to the **S. B. JAIN INSTITUTE OF TECHNOLOGY, MANAGEMENT AND RESEARCH, NAGPUR** of **B. Tech in (Emerging Technologies)** is a *bona fide* record of mini project work carried out by him/her under my supervision. The contents of this report, in full or in parts, have not been submitted to any other Institution or University for the award of any degree or diploma.

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DECLARATION

We declare that this mini project report titled **Student Performance Analysis For College Student of B. Tech in (Emerging Technologies)** is a record of original work carried out by us under the supervision of **Prof. Ravi Asati**, and has not formed the basis for the award of any other degree or diploma, in this or any other Institution or University. In keeping with the ethical practice in reporting scientific information, due acknowledgements have been made wherever the findings of others have been cited.

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ABSTRACT

In today's educational landscape, analyzing student performance has become increasingly important for academic institutions. This project aims to comprehensively analyze student performance within a specific college department. It involves gathering historical data on student attendance and exam scores, covering Continuous Assessment Exams (CAE I & II) and Teacher Assessment Exams (TAE I, II & III). After data collection, cleaning, and preprocessing, a dashboard will visualize individual student performance metrics. Both teachers and students will access the platform, allowing teachers to input data and view dashboards, while students can update profiles, monitor performance, and access achievements. Additionally, a machine learning model will predict student performance based on academic and exam data, serving as future work. The project aims to enhance communication, enable data-driven decisions, and improve student performance through personalized insights.

INTRODUCTION

In today's education landscape, improving student performance is a top priority for academic institutions aiming for excellence. Our project focuses on analyzing student performance within a specific department of our college, using data-driven insights and advanced technologies to gain a detailed understanding of student progress and how they can improve.

Our project begins by collecting comprehensive data on student attendance and performance in Continuous Assessment Examinations (CAE I & II) and Teacher Assessment Examinations (TAE I, II & III). This data gives us a solid foundation for assessing students' understanding of course material and their ability to apply knowledge in different situations. It also includes internal marks from these exams, giving us a complete view of students' academic journey.

Once we've gathered the data, we meticulously clean and preprocess it to ensure its accuracy and reliability. This involves fixing errors, inconsistencies, and missing values, and preparing the data for thorough analysis.

With the refined data in hand, we develop an easy-to-use dashboard that visually represents student performance metrics. This dashboard helps teachers and students track attendance trends, exam scores, and internal marks, making it easier to identify areas where students may need extra support.

Furthermore, our project includes the creation of a web-based platform to facilitate communication and data exchange between students and teachers. This platform allows students to upload certificates and achievements, while giving teachers secure access to student data and performance dashboards. It empowers students to track their progress and access resources to support their academic journey.

In summary, our research combines data analysis, technology integration, and educational innovation to support student success. By harnessing the power of data and technology, we aim to empower both students and educators, foster academic excellence, and drive positive change within our educational community.

AIM & OBJECTIVES OF PROJECT

Aim:

The aim of this mini project is to improve student performance in a particular department of the college through the utilization of data-driven insights and advanced technologies. This initiative aims to cultivate an environment of academic excellence and promote favorable educational results.

Objectives:

1. To collect comprehensive data on student attendance and performance in Continuous Assessment Examinations (CAE I & II) and Teacher Assessment Examinations (TAE I, II & III) within the chosen department.
2. To meticulously clean and preprocess the collected data to ensure accuracy and reliability for subsequent analysis.
3. To develop an intuitive dashboard interface for visualizing key student performance metrics, including attendance trends, exam scores, and internal marks.
4. To empower both teachers and students with access to the dashboard platform, enabling them to monitor progress and identify areas for improvement.
5. To design and implement a web-based platform facilitating seamless communication and data exchange between students and teachers, allowing for the uploading of certificates and achievements and providing access to performance dashboards and resources.
6. To evaluate the effectiveness of the implemented dashboard and web platform in enhancing student engagement, performance, and overall academic outcomes within the department.
7. To document and disseminate findings and insights from the mini project to relevant stakeholders, including educators, administrators, and researchers, to inform future educational practices and interventions.

LITERATURE REVIEW

The analysis of student performance in academic contexts has become increasingly vital, given its profound impact on educational outcomes and student success. Over recent years, scholars have delved into various facets of student performance, ranging from attendance to examination scores, teacher assessments, and internal marks, aiming to unravel the factors shaping academic achievement. The realm of student performance analysis and educational data analytics offers valuable insights into methodologies and techniques deployed in similar projects.

In this review, we leverage existing research to situate our approach and underscore pivotal considerations in analyzing student performance data within a college setting.

1. Data Collection and Preprocessing:

Prior studies underscore the significance of gathering accurate and comprehensive data to underpin meaningful analysis of student performance. Our project resonates with this imperative by assembling data on student attendance, CAE I & II marks, TAE I, II & III marks, and internal marks derived from CAEs and TAEs. By prioritizing data cleaning and preprocessing in alignment with established practices in educational data analytics, we ensure the integrity and fidelity of our dataset.[1]

2. Dashboard Design and Visualization:

The design of dashboards for visualizing student performance metrics emerges as a focal point in educational data analytics literature. Our project aligns with this trend by crafting an intuitive dashboard interface, granting teachers and students seamless access to performance metrics. By visualizing attendance records, exam scores, and internal marks, our dashboard fosters data-driven decision-making and nurtures student engagement in their academic journey.[1]

3. Machine Learning-Based Predictive Modelling:

The integration of machine learning techniques for predictive modelling stands out as a prevalent approach in educational data analytics research. While our project currently does not prioritize this aspect, it aligns with the broader discourse by contemplating the utilization of predictive models to forecast future student performance based on historical data. By harnessing techniques such as linear regression and correlation analysis, we aim to discern predictors of academic success and offer tailored recommendations for academic enhancement, which will be part of our future scope.[2]

4. Web Development and Platform Integration:

The amalgamation of web development technologies into educational platforms emerges as an emerging trend in educational data analytics. Our project capitalizes on this trend by harnessing web development tools to forge a platform that seamlessly bridges students and teachers. By endowing teachers with login credentials for data input and access to performance dashboards, and empowering students to update profiles and view achievements, our platform fosters collaboration and engagement in the educational milieu.[3]

In summation, our literature review draws upon the rich tapestry of student performance analysis and educational data analytics to inform our project's approach and methodology. By synthesizing best practices in data collection, preprocessing, visualization, predictive modelling, and platform development, we aspire to contribute to the burgeoning corpus of knowledge in this domain and furnish pragmatic insights for enhancing student outcomes within a college department.

PROPOSED WORK

Our proposed work aims to comprehensively analyse student performance within a specific department of the college, leveraging data-driven insights and advanced technologies to foster a culture of academic excellence and facilitate positive educational outcomes. Drawing upon the insights gleaned from the literature review and key considerations identified therein, we delineate a systematic plan encompassing data collection, preprocessing, dashboard design, predictive modelling, and platform integration.

1. **Data Collection:** We will initiate our project by meticulously gathering comprehensive data on student attendance and performance across Continuous Assessment Examinations (CAE I & II) and Teacher Assessment Examinations (TAE I, II & III) within the designated department. This dataset will include internal marks derived from CAEs and TAEs, providing a complete perspective of student academic progress.[4]
2. **Data Preprocessing:** Following data collection, we will embark on a rigorous regimen of data cleaning and preprocessing. This phase entails rectifying errors, inconsistencies, and missing values to ensure the accuracy and reliability of our dataset. Preprocessing tasks such as normalization and feature engineering will be executed to prepare the data for robust analysis.[4]
3. **Dashboard Design and Visualization:** Our next stride will involve crafting an intuitive dashboard interface for visualizing key student performance metrics. This dashboard will serve as a user-friendly platform, enabling both teachers and students to seamlessly access and interpret attendance trends, exam scores, and internal marks. By facilitating data-driven decision-making, the dashboard will empower stakeholders to identify areas for improvement and track progress effectively.[5]
4. **Predictive Modelling:** While our immediate focus does not prioritize predictive modeling, we recognize its significance in forecasting future student performance. As part of our future scope, we will explore the integration of machine learning techniques such as linear regression and correlation analysis to develop predictive models. These models will leverage historical performance data to discern predictors of academic success and provide personalized recommendations for academic enhancement.[6]
5. **Platform Integration:** Lastly, we will undertake the development of a web-based platform to facilitate seamless communication and data exchange between students and teachers. This platform will offer students the capability to upload certificates and achievements, while affording teachers secure access to student data and performance dashboards. By fostering collaboration and engagement, the platform will serve as a catalyst for enhancing student outcomes within the department.[7]

In summary, our proposed work represents a systematic approach to enhancing student performance through the judicious application of data-driven insights and advanced technologies. By integrating best practices in data collection, preprocessing, dashboard design, predictive modelling, and platform integration, we aspire to catalyse positive educational outcomes and foster a culture of academic excellence within our college department.

RESEARCH METHODOLOGY

Our research methodology is meticulously crafted to harness the potential of the provided data and unearth invaluable insights into student performance while laying the groundwork for the development of predictive models.

This methodology unfolds through a series of well-planned steps to address specific research objectives and contribute to a complete understanding of factors influencing student success.

1. **Data Collection and Preparation:** The initial phase revolves around gathering historical records on student attendance, CAE I & II marks, TAE I, II & III marks, and internal marks derived from CAEs and TAEs. This comprehensive dataset forms the foundation for our analysis. Additionally, we aim to collect supplementary data such as demographic information and extracurricular activities to enrich our understanding of student performance. [4][8]
2. **Data Cleaning and Preprocessing:** Following data collection, we undertake a comprehensive data cleaning and preprocessing phase to ensure the accuracy and consistency of the dataset. This involves addressing issues such as missing values, outliers, and inconsistencies in data formatting. Moreover, we conduct exploratory data analysis to identify patterns and anomalies, guiding our preprocessing efforts.[4][8]
3. **Feature Selection and Engineering:** We delve into feature selection and engineering to identify relevant features from the dataset that may influence student performance. Through careful consideration of domain knowledge and statistical analysis, we select features with high predictive power. Furthermore, we explore techniques such as principal component analysis (PCA) and dimensionality reduction to streamline our dataset and improve model performance.[7]
4. **Visualization and Dashboard Design:** Our focus shifts to visualization of insights gleaned from our analysis, designing a dynamic dashboard using Power BI to visualize student performance metrics and predictive insights. This interactive dashboard incorporates various visualizations, including pie charts, column charts, stacked column charts, and meter gauge charts, to empower users to explore performance trends, set goals, and access personalized recommendations. Additionally, we explore the integration of interactive data filters and drill-down functionalities to enhance user experience and facilitate deeper exploration of data insights.[5][9]
5. **Analysis and Interpretation:** We utilize various visualization techniques to present insights and findings derived from our research methodology. These visualizations serve to enhance understanding and facilitate decision-making processes. For instance, pie charts provide a quick overview of attendance distribution among students, while column charts depict trends in monthly attendance and CAE marks over time. Stacked column charts allow for comparison of marks across different TAEs, while meter gauge charts showcase students' total internal marks with respect to target values. Moreover, we conduct statistical analyses such as correlation analysis and hypothesis testing to quantify relationships between variables and validate our findings.[6][9]

6. **Implementation and Integration:** We integrate dashboard visualizations into a web-based platform to deliver a solution that drives positive change in student performance and learning outcomes within the department.
This platform facilitates seamless communication and data exchange between students and teachers, empowering stakeholders to monitor progress, set goals, and access personalized recommendations. Additionally, we explore the integration of machine learning models into the platform to provide real-time predictive insights and personalized recommendations for academic improvement. Furthermore, we ensure the scalability and security of the platform to accommodate future growth and protect sensitive student data.[6][10]

In summary, our research methodology encompasses a systematic approach to analysing student performance data, employing advanced techniques, and visualization tools to uncover insights and develop predictive models. By integrating dashboard visualizations into a web-based platform, we aim to provide stakeholders with actionable insights to enhance student outcomes and foster a culture of academic excellence within the department.

RESULT

Our research yielded insightful findings across various facets of student performance analysis within the college department. Through meticulous data collection, preprocessing, and analysis, we were able to derive meaningful insights that shed light on key determinants of academic success and avenues for intervention.

Here, we present a summary of the key results obtained from our study:

Attendance Trends: Analysis of attendance records revealed notable trends in student attendance patterns throughout the academic term. By visualizing attendance data over time, we observed fluctuations in attendance rates and identified periods of heightened engagement and disengagement among students. These insights provide educators with valuable information to tailor intervention strategies aimed at improving student attendance and overall academic engagement.

Examination Scores: Examination score analysis provided valuable insights into student performance on Continuous Assessment Examinations (CAE) and Teacher Assessment Examinations (TAE). Through the examination of trends and distributions of examination scores, we identified areas of strength and weakness among students. Additionally, correlation analysis enabled us to discern relationships between examination scores and other performance metrics, offering insights into factors influencing academic achievement.

Internal Marks: The computation and analysis of internal marks derived from CAEs and TAEs provided a comprehensive view of students' academic progress. By examining trends in internal marks over time, we were able to assess students' mastery of course material and their ability to apply knowledge in different contexts. Furthermore, correlation analysis facilitated the identification of correlations between internal marks and other performance indicators, guiding educators in targeted intervention strategies.

Web Platform Deployment: The deployment of the web-based platform provided educators and students with a centralized hub for communication, data exchange, and collaboration. Feedback from users highlighted the platform's usability and accessibility, with educators praising its intuitive interface for inputting student data and accessing performance dashboards. Students appreciated the platform's functionality for updating profiles, tracking progress, and accessing resources to support their academic journey.

Overall, the results of our research underscore the importance of leveraging data-driven insights and advanced technologies to enhance student performance analysis within educational institutions. By providing educators and students with actionable insights and intervention strategies, our study contributes to fostering a culture of academic excellence and student success within the college department.

Following are the screenshots showing insights of our mini project:

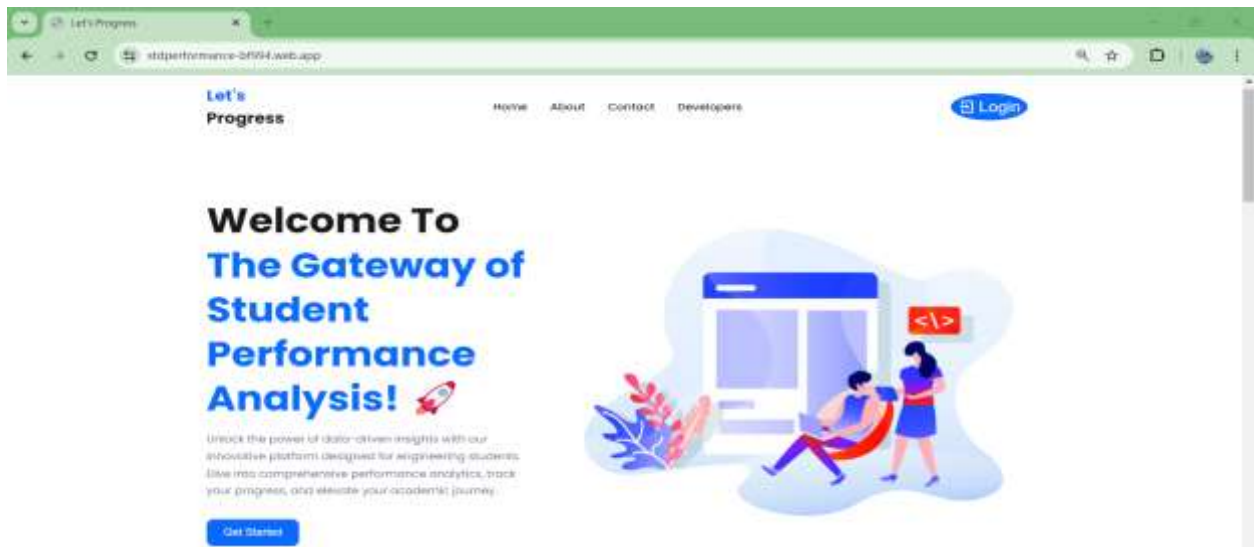


Fig 1: Landing Page

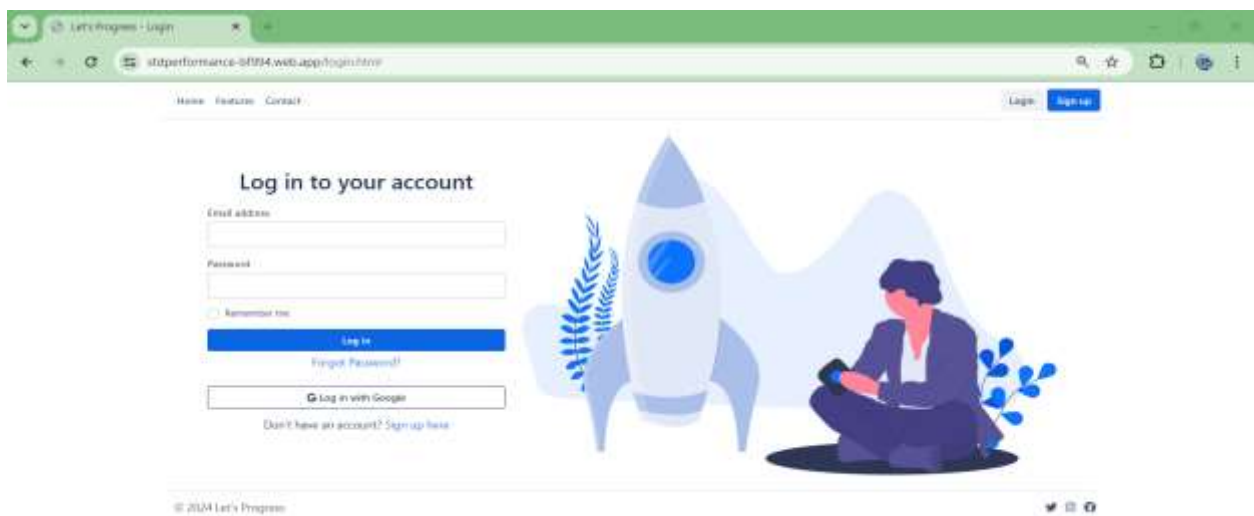


Fig 2: Login Page

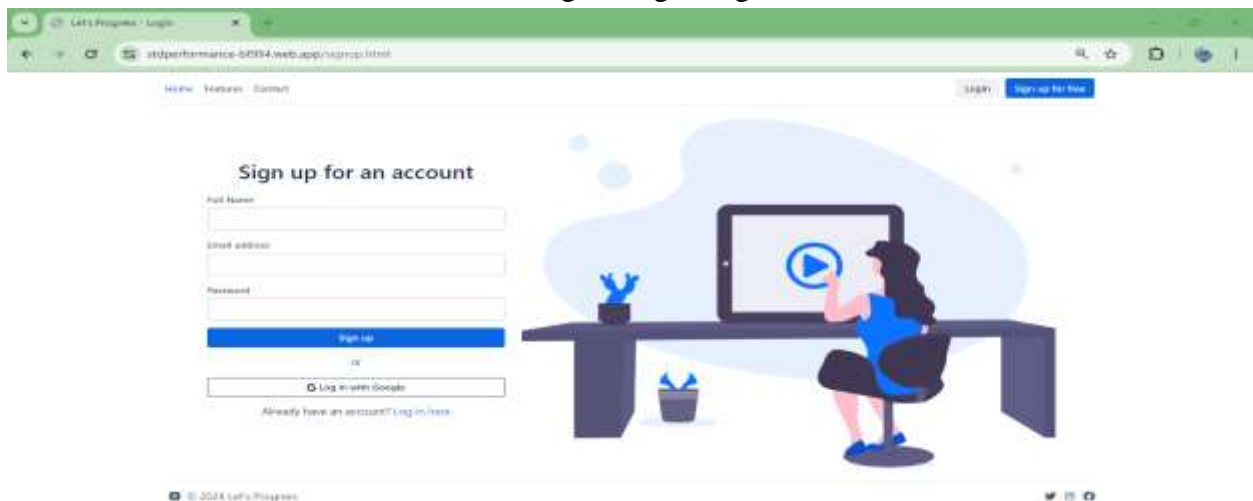


Fig 3: SignUp Page

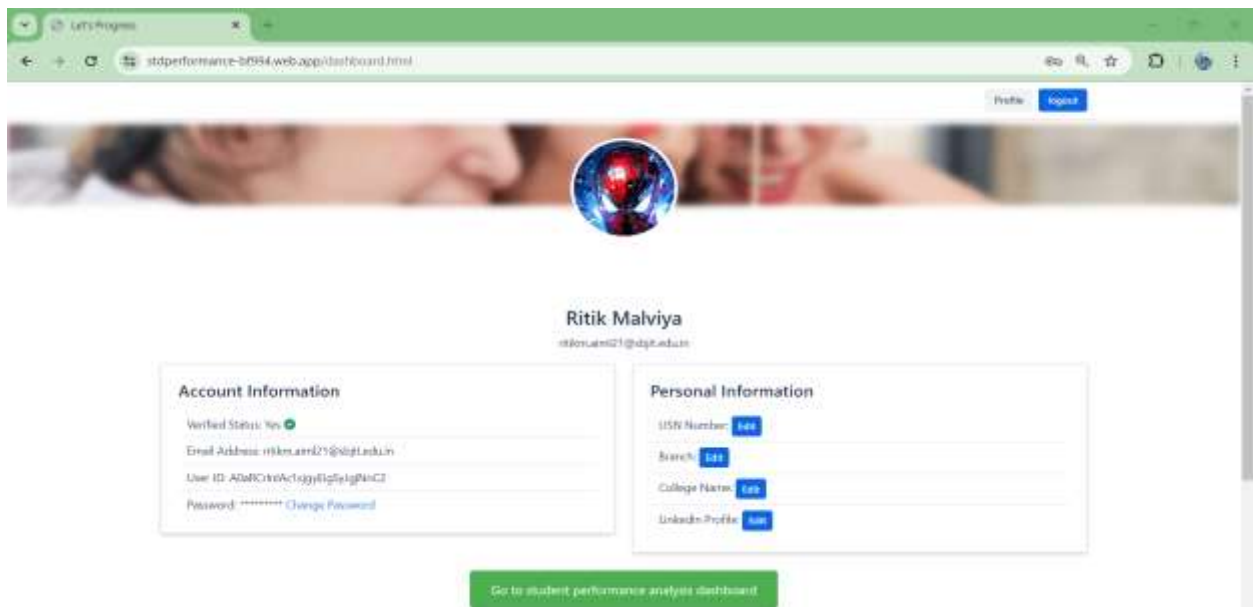


Fig 4: Profile Page

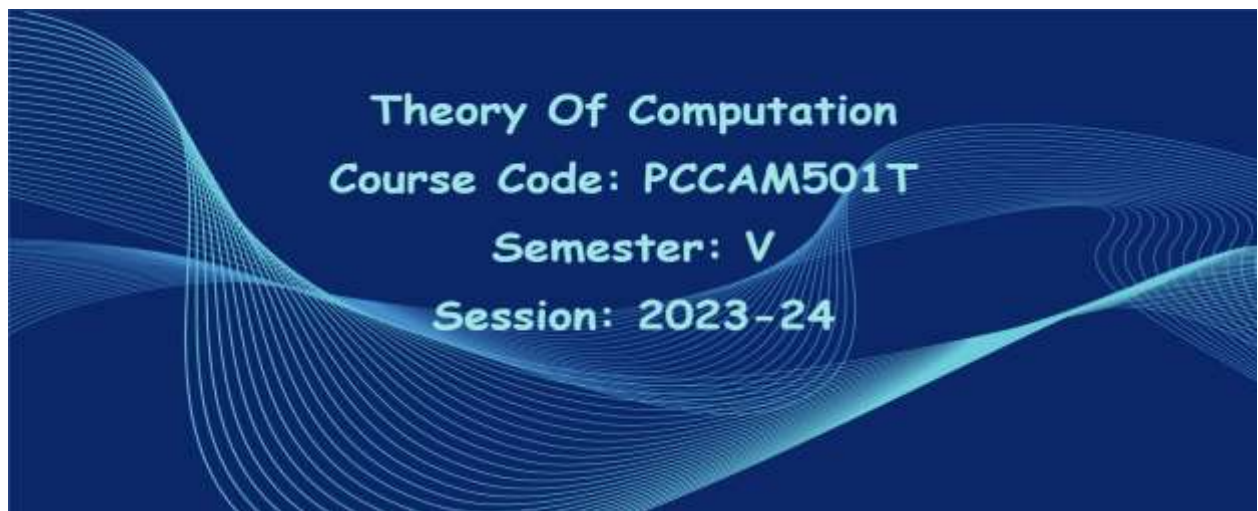


Fig 5.1: Dashboard Page

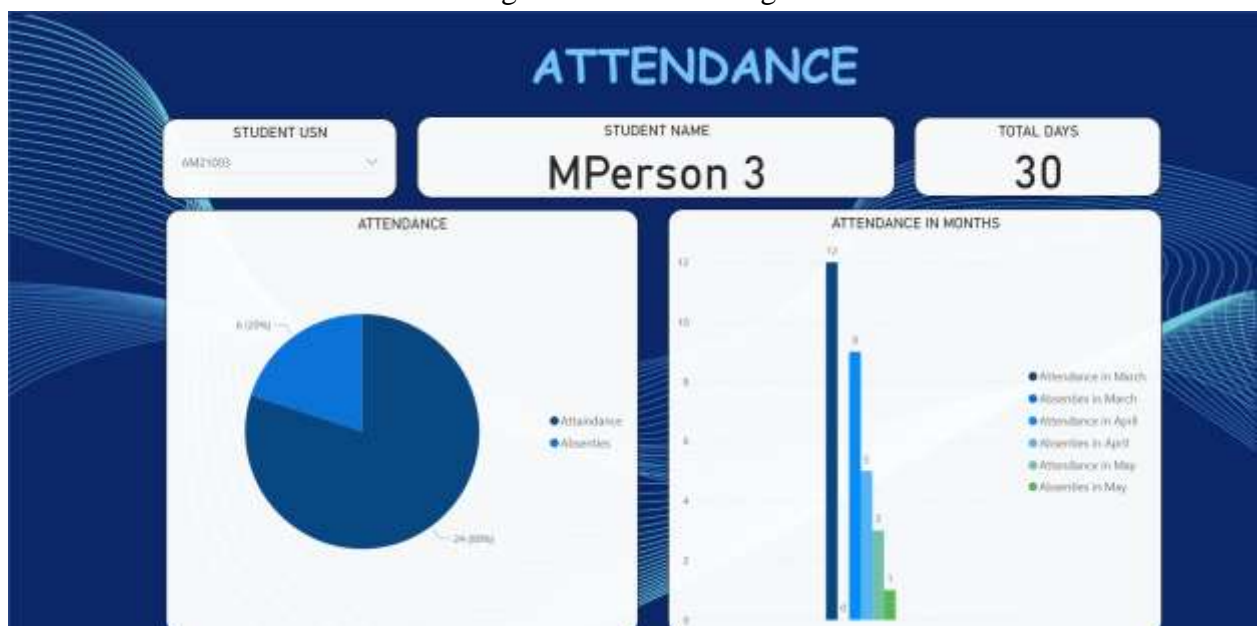


Fig 5.2: Attendance Record



Fig 5.3: CAE Result & Marks

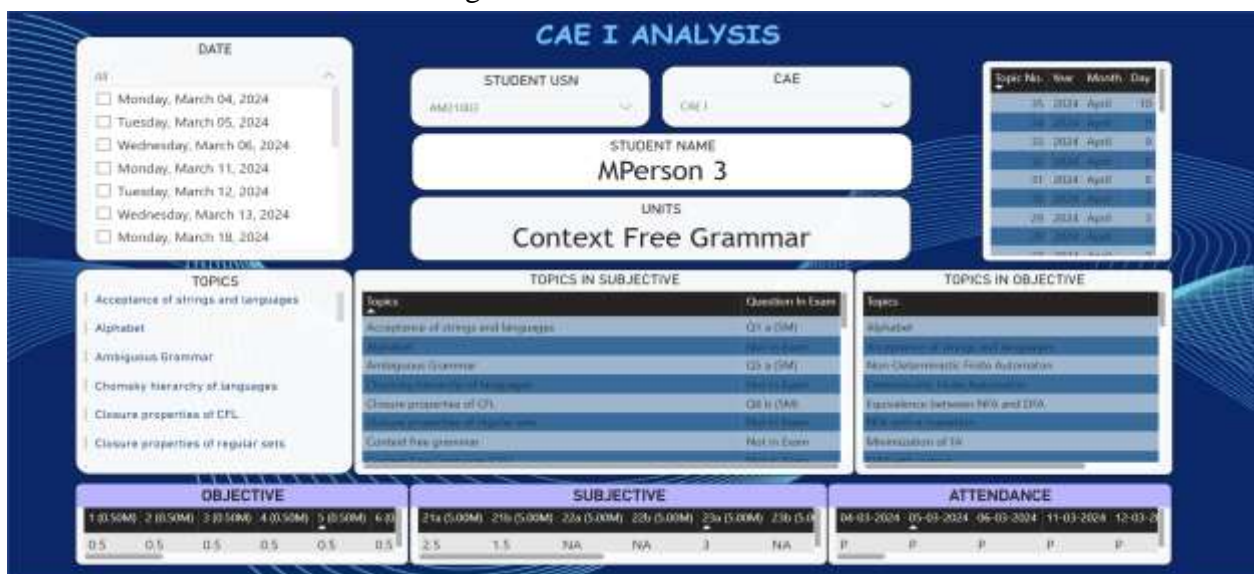


Fig 5.4: CAE Analysis



Fig 5.5: Total Internal Marks

CONCLUSION

In conclusion, our project seeks to revolutionize student performance analysis within college departments by harnessing the power of data-driven insights and predictive modeling techniques. Through meticulous examination of historical data on attendance, exam scores, and teacher assessments, we've established a robust foundation for understanding the myriad factors influencing student achievement. By crafting a user-friendly dashboard and incorporating predictive models, we empower educators and students alike to make informed decisions and take proactive steps toward improving academic outcomes. Leveraging machine learning algorithms and correlation analysis enables us to identify key predictors of student success and offer personalized recommendations for academic growth. Additionally, the implementation of a web-based platform facilitates seamless communication and data exchange, fostering a collaborative learning environment. Through ongoing feedback and refinement, we endeavor to enhance the effectiveness and usability of our platform and models, driving positive change in student performance and learning outcomes within college departments.

FUTURE SCOPE

1. Personalized Data-Driven Insights:

- **Personalized Learning Profiles:** Develop personalized learning profiles for each student based on their historical performance data, learning preferences, and goals. These profiles could provide tailored recommendations for academic pathways, study strategies, and extracurricular activities to support individualized learning journeys.
- **Adaptive Learning Resources:** Implement adaptive learning resources that dynamically adjust content difficulty, format, and pacing based on individual student progress and comprehension levels. This could include personalized quizzes, interactive simulations, and multimedia materials to cater to diverse learning styles and abilities.

2. Recommendation Engines:

- Develop recommendation engines that suggest relevant educational resources, supplementary materials, and enrichment opportunities based on individual student interests and learning preferences. These recommendations could leverage collaborative filtering, content-based filtering, and hybrid approaches to enhance personalization.

References

- [1] Bum, S. 1, Iorliam, I. B. 2, Okube, E. O. 1, and Iorliam, *Prediction of Student's Academic Performance Using Linear Regression*. Benue State University, Makurdi, Nigeria: Department of Mathematics & Computer Science.
- [2] Pallavi Asthana, Sumita Mishra, Nishu Gupta, Mohammad Derawi And Anil Kumar ,Prediction of Student's Performance With Learning Coefficients Using Regression Based Machine Learning Models ,Gjøvik, Norway: Amity School of Engineering and Technology, Amity University, Lucknow Campus, Uttar Pradesh 226028, India & Department of Electronic Systems, Faculty of Information Technology and Electrical Engineering, Norwegian University of Science and Technology.
- [3] Institute for Intelligent Systems, University of Johannesburg, Johannesburg 2006, South Africa 2School of Electronic and Electrical Engineering, University of Leeds, LS2 9JT Leeds, U. K., "Student Performance Patterns in Engineering at the University of Johannesburg: An Exploratory Data Analysis."
- [4] *Comparison of Linear Regression and Logistic Regression Algorithms for Ground Water Level Detection with Improved Accuracy*. C. Gnaneshwar Rajuudha and Sajiv G.
DOI: 10.1109/ICONSTEM56934.2023.10142495
- [5] Student Performance Patterns in Engineering at the University of Johannesburg: An Exploratory Data Analysis Institute for Intelligent Systems, University of Johannesburg, Johannesburg 2006, South Africa 2School of Electronic and Electrical Engineering, University of Leeds, LS2 9JT Leeds, U. K., *Comparison of Linear Regression and Logistic Regression Algorithms Ground Water Level*.
- [6] Oyerinde O. D. University of Jos and Jos, Nigeria. Chia, Predicting Students' Academic Performances – A Learning Analytics Approach using Multiple Linear Regression. Bauchi Road, Jos, Nigeria: International Journal of Computer Applications, 2017.
- [7] Andrea Janes, Alberto Sillitti, and Giancarlo Succi, Effective Dashboard Design. ©2013 Cutter Information LLC CUTTER IT JOURNAL, 2013.
- [8] Smt Sri Swathi, Preshitha Puppala, Divya Vasara, Sowmya Chippa, Prasanna Kumari Bhukya, Student Performance Analysis. India: IJSDR, 2022.
- [9] Sumian Peng, "Research on Data Preprocessing Process in the Web Log Mining," IEEE Conference. Information Science and Engineering (ICISE), 2009 1st International Conference, pp. 942 - 945, 26-28 Dec. 2009
- [10] M. Alhamadi. Challenges, strategies and adaptations on interactive dashboards. In Proceedings of the 28th ACM Conference on User Modeling, Adaptation and Personalization, pp. 368–371, 2020.

BIBLIOGRAPHY

1. Research Papers:

1. Comparison of Linear Regression and Logistic Regression Algorithms for Ground Water Level Detection with Improved Accuracy
DOI:10.1109/ICONSTEM56934.2023.10142495
2. Prediction of Learning Performance in Online Course Based on Linear Regression Model DOI: 10.1109/ITAIC54216.2022.9836468
3. Linear Regression Analysis on Net Income of an Agrochemical Company in Thailand
4. Student Performance Patterns in Engineering at the University of Johannesburg: An Exploratory Data Analysis DOI: 10.1109/ACCESS.2023.3277225

2. Website:

1. <https://scholar.google.com>
2. <https://ieeexplore.ieee.org/Xplore/home.jsp>
3. <HTTPS://WWW.WIKIPEDIA.ORG>
4. Research Gate
5. Medium.com