INTERNATIONAL JOURNAL OF ADVANCE RESEARCH, IDEAS AND INNOVATIONS IN TECHNOLOGY

ISSN: 2454-132X
Impact Factor: 6.078
(Volume 12, Issue 3 - V12I3-1147)
Available online at: https://www.ijariit.com

Udaan Path – Data visualization and Interest Prediction with AI integration

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ABSTRACT

Traditional student evaluation systems primarily focus on academic performance and often overlook individual interests, co-curricular involvement, and overall development. This paper presents UdaanPath, a Django-based educational data-driven web platform that uses the academic and non-academic performance data of students to make predictive calculations and provide career guidance for them using AI. We aim to give teachers and parents a tool that helps them to determine the best possible insights for a child. We implement the built-in administration panel of Django, which gives a dynamic manager tool to the school admin for administrative processes. We develop features like a personalised student dashboard, an AI-generated study plan for each student, a parent portal and career path suggestions in the project presented in this paper.

Keywords: *Educational Analytics, Interest Prediction, Data Visualization, Django, Personalized Learning, Parent Portal, AI Study Plan Generation, Gemini API.*

1. INTRODUCTION

UdaanPath is proposed as an advanced educational analytics platform that aims to provide a holistic understanding of student performance. The system analyses subject-wise academic data along with co-curricular participation to identify strengths, weaknesses, and areas of interest. By utilizing data visualization techniques such as bar charts, pie charts, and radar charts, the platform presents complex data in an easy-to-understand format for teachers and parents, enabling informed decision-making and personalized guidance.

It is generally observed that teachers collect and store student academic data annually in excel files of their classes. This data is only stored as records for the school but rarely viewed as the student gets promoted to the next class forgetting about the specific skills which the student excelled in the previous grades. Those skills can also demonstrate that the student had a genuine interest in that field and can he/she can pursue a career in that field beacuse his natural inclination resulted in better performance.

The system incorporates several new features, including a dedicated parent portal that allows parents to monitor their child's progress in real time. Parents can find out that in which subject or sport their student is consistently performing better that other subjects which will be shown through detailed analysis in the dashboard. Thus, they will know the potential which their child carries.

Overall, UdaanPath aims to bridge the gap between traditional evaluation systems and modern educational needs by integrating analytics, visualization, and stakeholder engagement into a single platform, thereby supporting holistic student development and personalized learning.

2. LITERATURE REVIEW

A review of existing literature on performance dashboards in education reveals that such systems have evolved from simple gradereporting tools into sophisticated learning analytics platforms. Early dashboards primarily focused on static reporting of marks and attendance, which provided limited actionable insights. Later research in Learning Analytics (LA) and Educational Data Mining (EDM) emphasized the importance of interactive visualizations, predictive models, and role-based access to support both students and faculty. Studies show that student-facing dashboards improve self-regulation, motivation, and timely interventions by presenting GPA trends, attendance records, and assignment completion rates in an accessible format. On the other hand, faculty-facing dashboards enable instructors to monitor class-level performance, identify at-risk students, and evaluate teaching effectiveness through feedback and comparative analytics. Several works highlight the need for dashboards to integrate multiple data sources such as Learning Management Systems (LMS), Student Information Systems (SIS), and feedback surveys to provide a holistic view of academic progress. Research also stresses usability and actionability—dashboards must not only visualize data but also provide clear recommendations, alerts, and intervention pathways. However, limitations persist, including fragmented data integration, high false-positive alerts in predictive models, and lack of qualitative context such as narrative feedback. Recent advancements propose incorporating machine learning for risk prediction, cloud-based dashboards for scalability, and privacy-aware designs to ensure ethical use of student data. Overall, the literature suggests that effective performance dashboards should combine concise KPIs, explainable analytics, and user-friendly interfaces to foster transparency, accountability, and continuous improvement in academic environments.

[1] **Student Career Interest Prediction Using Machine Learning**: In this paper, the author has proposed how students often feel uncertain about their future careers because there are so many choices nowadays. They believe that predicting a student's career interests could help solve this problem. This prediction is based on things like their academic background and what they're interested in. The paper emphasizes how crucial it is to research this topic because it could greatly benefit students. By understanding what careers students are likely to be interested in, educators and counselors can offer better guidance. This could lead to students making more informed decisions about their futures. So, the paper suggests using machine learning to predict students' career interests, taking into account various factors like their past academic performance and personal interests. Ultimately, the goal is to help students navigate the complex world of career choices more confidently

3. RESEARCH QUESTIONS

Questions

i. How can educational data analytics be used to identify student strengths and weaknesses?
ii. How does combining academic and co-curricular data improve student evaluation?
iii. How effective are visualization tools in interpreting performance insights?
iv. How does parental involvement impact student progress monitoring?
v. How can interschool collaboration enhance student opportunities and benchmarking?
vi. What is the impact of automated communication systems on stakeholder engagement?

4. METHODOLOGY

This study follows a structured methodology to analyze student academic and co-curricular performance using educational data analytics. The proposed approach is designed to ensure systematic data handling, accurate analysis, and effective insight generation.

4.1. Data Acquisition

Student performance data is collected from educational institutions through authorized teachers. The dataset consists of subject-wise academic scores, unit test results, and records of participation in co-curricular activities such as sports, music, and other skill-based domains. Data access is controlled using role-based authentication to ensure confidentiality and data integrity.

4.2. Data Preprocessing

Prior to analysis, the collected data is preprocessed to improve quality and reliability. This includes handling missing values, removing duplicate records, and validating data consistency. Where necessary, score normalization is applied to enable uniform comparison across different subjects and activity domains.

4.3. Performance Analysis

Academic performance is analysed on a subject-wise basis to identify trends, strengths, and areas requiring improvement. Co-curricular data is evaluated to assess student engagement and interest levels across various domains. Basic statistical measures are used to identify dominant performance areas and overall student profiles.

4.4. Visualization and Insight Generation

To facilitate easy interpretation, the analysed data is presented using visual analytics techniques such as bar charts, pie charts, and radar charts. These visual representations enable comparative analysis and provide clear insights into academic and non-academic performance patterns for teachers and parents.

4.5. System Implementation

The proposed UdaanPath system is implemented as a web-based platform. The user interface is developed using React.js, while the backend processing is handled using Django. PostgreSQL is used for secure data storage and management. The system architecture supports scalability and controlled access through role-based user authentication.

4.6 Parent Portal Module

A dedicated parent interface allows real-time access to student performance and progress reports. This feature enhances parental involvement and supports better monitoring of student development.

4.7 School Collaboration Module

This module enables multiple schools to participate in interschool competitions and activities. It also allows comparative performance analysis and promotes healthy academic competition.

4.8 AI-Based Individual Study Plan Generation

The system uses AI techniques to generate personalized study plans based on student performance and learning patterns. It recommends subjects to focus on, practice activities, and improvement strategies tailored to each student.

4.6. System Evaluation

The effectiveness of the proposed methodology is evaluated based on the system's ability to identify student strengths and weaknesses and generate meaningful insights. User feedback from teachers and parents is used to assess system usability, clarity of visualizations, and overall effectiveness in supporting student guidance

4.7 Proposed System Methodology

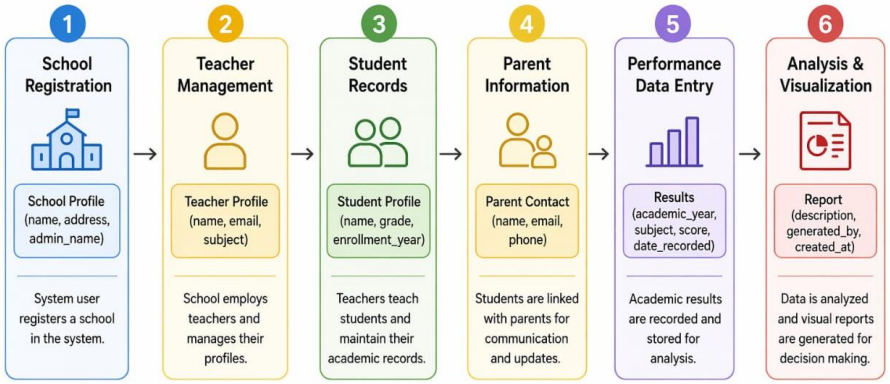


Figure-1: Methodology workflow of the proposed UdaanPath student performance analytics system.

5. PROCEDURE

The procedure adopted in this research for the UdaanPath system follows a systematic workflow, as described below:

5.1. Data Collection

Student performance data is collected from educational institutions through authorized teachers. The dataset includes subject-wise academic scores, unit test results, and records of participation in co-curricular activities such as sports, music, and skill-based domains. Data is uploaded securely to maintain confidentiality and integrity.

5.2. Data Preprocessing

The collected data is pre-processed to improve reliability and quality. This involves handling missing values, removing duplicate entries, validating data consistency, and normalizing scores to ensure uniform comparison across subjects and activities.

5.3. Performance Analysis

Pre-processed data is analysed to evaluate subject-wise academic performance and co-curricular participation. Statistical techniques are applied to identify trends, strengths, weaknesses, and dominant performance domains for each student.

5.4. Visualization of Insights

The analysed data is presented using visual analytics techniques including bar charts, pie charts, and radar charts. These visualizations allow teachers and parents to easily interpret overall performance patterns and identify areas requiring intervention.

5.5. Data Storage and Access

All processed data and insights are stored in a secure database. Authorized users, such as teachers and parents, access the results through the UdaanPath web-based platform, supporting informed decision-making and personalized student guidance.

5.6. User Access

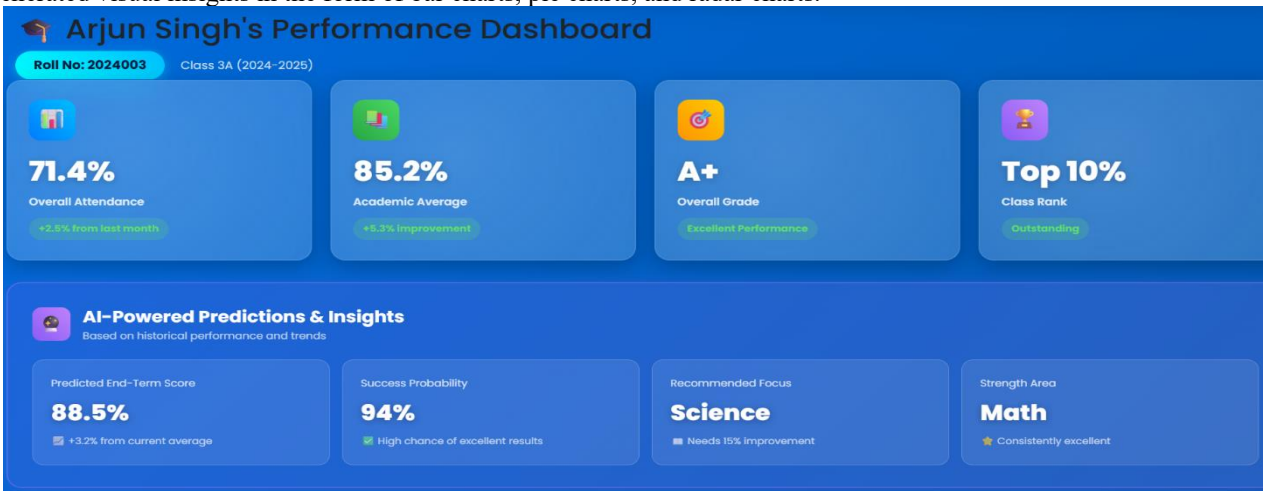
The system provides role-based access to different users such as teachers, parents, and school administrators through secure authentication. Each user can access specific features, including performance dashboards, reports, and student insights based on their role. This ensures data privacy, controlled access, and efficient management of student information within the platform.

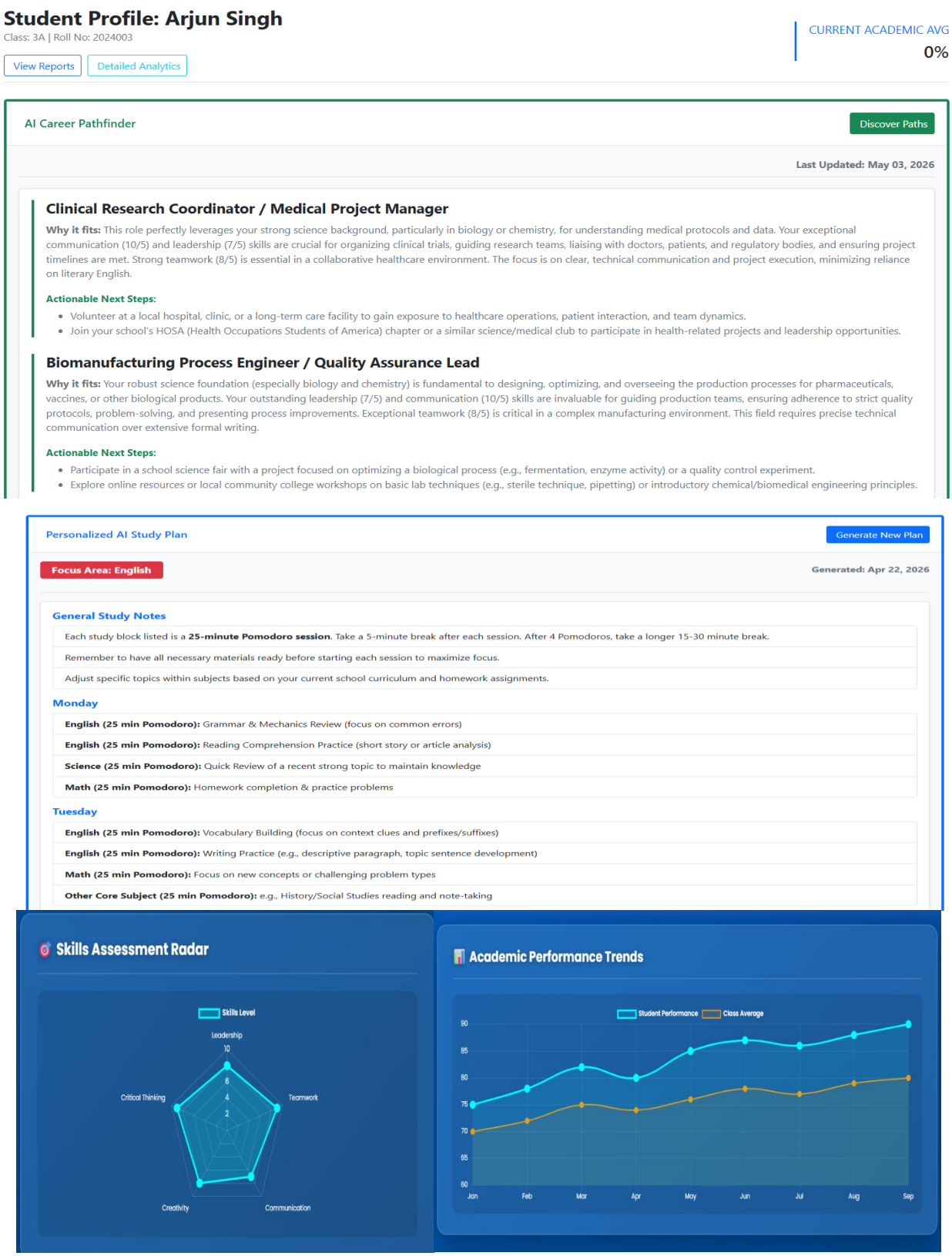
5.7 AI-Based Individual Study Plan Generation

The system uses AI algorithms to analyse student performance data and identify strengths and weak areas. Based on this analysis, it generates personalized study plans including subject priorities, practice tasks, and improvement strategies. This helps students focus on targeted learning and supports personalized and efficient academic development.

6. RESULTS AND DISCUSSION

The proposed UdaanPath system was tested using simulated student performance data, including subject-wise academic scores and participation in co-curricular activities such as sports, music, and creativity-based tasks. The system successfully analysed the data and generated visual insights in the form of bar charts, pie charts, and radar charts.





The results show that UdaanPath can:

i. Identify Academic Strengths and Weaknesses: The subject-wise analysis clearly highlights students' top-performing subjects and areas needing improvement, enabling teachers to provide targeted support.

ii. Evaluate Co-Curricular Participation: Students' involvement in non-academic domains is effectively measured, providing a holistic understanding of their interests and talents.

iii. Provide Visual Insights: The visual analytics tools improve interpretability, allowing parents and teachers to quickly grasp performance trends without complex calculations.

iv. Support Personalized Guidance: By combining academic and co-curricular insights, the system enables early identification of student strengths and suggests suitable interventions or activities to nurture potential.

Compared to traditional mark-based evaluation systems, UdaanPath offers a more comprehensive and integrated approach. It not only highlights areas requiring academic attention but also emphasizes co-curricular talents, which are often overlooked in conventional assessments. Feedback from users indicates that the system's dashboards and charts significantly improve understanding and facilitate data-driven decision-making in student guidance.

7. CONCLUSION

This research presents UdaanPath, a data-driven platform for holistic student performance analysis and talent identification. The system integrates academic and co-curricular data to provide a comprehensive overview of student strengths, weaknesses, and areas of interest. By leveraging statistical analysis and visual analytics, UdaanPath supports teachers and parents in making informed decisions regarding student mentoring, personalized learning, and talent development.

The results demonstrate that UdaanPath is an effective tool for bridging the gap between traditional academic evaluation and holistic student assessment. It enables early identification of learning gaps, enhances understanding of student potential, and promotes a more inclusive approach to education that values both academic and non-academic abilities.

8. FUTURE WORK

While UdaanPath 2.0 represents a major step forward in personalized education, our vision for the platform continues to grow. Our immediate next steps include:

i. **Conversational AI for Parents:** We plan to develop an interactive chatbot that allows parents to ask natural-language questions about their child's academic metrics, making data easier to understand.

ii. **Going Mobile:** Developing a dedicated mobile application will ensure that teachers and parents can access real-time insights and AI-generated study plans on the go.

iii. **Gamifying the Experience:** By introducing reward systems and achievement badges, we hope to encourage higher student engagement in co-curricular activities and positive behaviors.

iv. **Expanding Beyond One Campus:** We aim to scale the platform to handle multi-school data, allowing educational boards to compare performance trends and improve administrative strategies on a larger scale.

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