

A Data Analytics Approach to Student Academic Performance Evaluation

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Abstract—The evaluation of student academic performance is essential for maintaining and improving the quality of higher education. Conventional evaluation methods mainly focus on pass–fail statistics and overall grades, which provide limited insight into learning outcomes. With the growing availability of academic data, data analytics offers effective techniques to analyze student performance systematically. This research proposes data analytics–based approach to evaluate student academic performance using historical examination result data. Statistical analysis and visualization techniques are applied to identify trends, subject-wise performance, and correlations between internal assessment and final examination results. The study highlights the importance of data-driven academic decision-making for continuous quality improvement.

Index Terms—Data Analytics, Student Academic Performance, Result Analysis, Educational Data Mining, Learning Analytics

I. INTRODUCTION

Higher education institutions generate a large amount of academic data every year, including student marks, grades, and examination results. Despite the availability of this data, it is often underutilized and restricted to basic reporting. Data analytics enables institutions to extract meaningful insights from academic data and understand student learning behavior. Evaluating academic performance using analytics helps identify weak subjects, learning gaps, and performance trends. This research focuses on applying data analytics techniques to evaluate student academic performance and support quality enhancement in education.

II. LITERATURE REVIEW

Educational data mining and learning analytics have gained significant attention in recent years. Previous studies have applied statistical methods and machine learning algorithms to analyze and predict student performance. Research indicates that internal assessment, attendance, and subject difficulty significantly influence final results. Visualization techniques have also been found effective in presenting academic trends. However, many institutions still lack a structured analytical framework for result evaluation. This study addresses this gap by proposing a systematic data analytics approach for academic performance evaluation.

III. PROBLEM STATEMENT

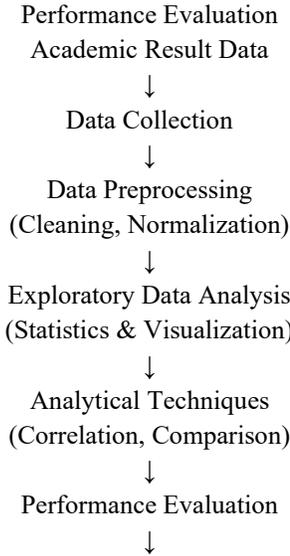
Although academic result data is widely available, it is mainly used for generating mark sheets and pass percentages. There is a lack of analytical approaches to study performance trends, identify weak areas, and support academic planning. Hence, an effective data analytics framework is required to evaluate student academic performance in a comprehensive manner.

IV. OBJECTIVES OF THE STUDY

- To analyze student academic performance using data analytics techniques
- To identify trends and patterns in examination results
- To evaluate subject-wise and semester-wise performance
- To study the relationship between internal assessment and final examination results
- To support data-driven academic decision-making

V. RESEARCH FRAMEWORK (DIAGRAM 1)

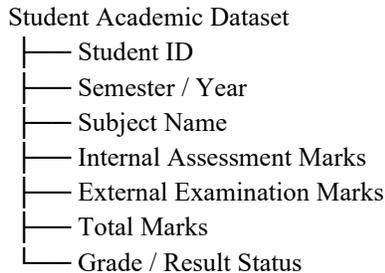
Figure 1: Framework for Student Academic



This framework explains the overall process followed in the research.

VI. DATASET DESCRIPTION (DIAGRAM 2)

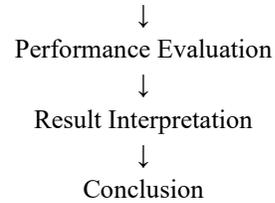
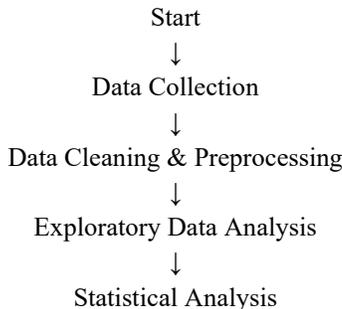
Figure 2: Structure of Student Academic Dataset



The dataset consists of structured academic result data collected from institutional records.

VII. METHODOLOGY (DIAGRAM 3)

Figure 3: Methodology Flow Diagram



The methodology ensures systematic analysis of academic data.

VIII. TOOLS AND TECHNIQUES USED

- Tools: Python, Excel, Power BI
- Libraries: Pandas, NumPy, Matplotlib
- Techniques:
 - Descriptive Statistics
 - Correlation Analysis
 - Comparative Analysis
 - Data Visualization

IX. RESULTS AND DISCUSSION

9.1 Subject-Wise Performance Analysis (Diagram 4)

Figure 4: Subject-Wise Average Marks (Bar Chart) (X-axis: Subject Name, Y-axis: Average Marks)

This analysis helps identify subjects with lower average performance, indicating the need for academic support or curriculum review.

9.2 Internal vs External Marks Analysis (Diagram 5)

Figure 5: Correlation Between Internal and External Marks (Scatter Plot) (X-axis: Internal Marks, Y-axis: External Marks)

The analysis shows a positive correlation between internal assessment and final examination performance, emphasizing the importance of continuous evaluation.

X. CONCLUSION

This research demonstrates that data analytics provides an effective approach to evaluating student academic performance beyond traditional methods. By analyzing result data using statistical and visualization techniques, institutions can gain deeper insights into performance trends and influencing factors. The proposed approach supports academic planning, improves teaching strategies, and enhances the overall quality of education.

XI. FUTURE SCOPE

- Integration of attendance and behavioral data
- Use of machine learning models for performance prediction
- Development of real-time academic dashboards
- Application of explainable analytics for transparent decision-making

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