**Project Report: Student Performance Analyzer**

**1. Project Overview**

The Student Performance Analyzer is a Python-based project designed to help schools analyze and monitor the academic performance of students. The project collects student data, processes it using NumPy and Pandas, and applies Object-Oriented Programming (OOP) concepts to manage and analyze student records efficiently. It also includes exception handling to ensure robust execution.

**2. Objectives**

* Collect and store student data (name, roll number, age, class, and marks).
* Calculate individual and class-level performance metrics.
* Identify top and bottom performers.
* Generate structured reports in CSV format.
* Apply OOP principles for clean and scalable code.
* Handle invalid inputs and file errors gracefully.

**3. Tools & Technologies**

* **Programming Language:** Python
* **Libraries:** NumPy, Pandas
* **Concepts Applied:** Object-Oriented Programming (OOP), Exception Handling
* **Output:** Console output, Pandas DataFrame, CSV reports

**4. Project Modules**

**4.1 Student Class**

* Attributes: name, roll\_no, age, student\_class, marks
* Methods:

1.display\_details(): Prints student info and marks

2.calculate\_grade(): Returns grade based on average marks

**4.2 Classroom Class**

* Stores multiple Student objects
* Methods:

1.add\_student(), remove\_student()

2.overall\_performance(): Returns mean, median, and standard deviation of class marks

3.to\_dataframe(): Converts data into Pandas DataFrame for analysis

**5. Key Functionalities**

* Accepts student data from user input.
* Uses NumPy arrays for calculations: average marks, highest/lowest marks, class statistics.
* Uses Pandas for:
  + Top 5 and bottom 5 performers
  + Grouping by class for average marks
  + Exporting CSV report for record-keeping
* Implements exception handling for:
  + Invalid input (e.g., strings instead of numbers)
  + File handling errors

**6. Sample Output**

**Overall Class Performance:**

* Mean Marks: 85.03
* Median Marks: 88.0
* Standard Deviation: 10.16

**Top 5 Students:** Vishakha, Vaishnavi, Nimish, Vinit, Jayanti  
**Bottom 5 Students:** Jagruti, Yadnesh, Shreeya, Swara, Harshal

**CSV Report:** Saved as student\_report.csv with all student details, averages, and grades.

**8. Learning Outcomes**

* Strengthened understanding of Python, NumPy, and Pandas for data processing.
* Learned to apply OOP concepts for scalable and maintainable code.
* Gained experience in data-driven insights and reporting.
* Enhanced problem-solving skills through exception handling.

**10. Conclusion**

The Student Performance Analyzer is a complete Python project that demonstrates practical application of programming, data analysis, and OOP concepts. It provides meaningful insights into student performance and can help educators make data-driven decisions.