

# CAPSTONE PROJECT

## AI-POWERED STUDENT PERFORMANCE WORKFLOW

**PRESENTED BY**

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# OUTLINE:

- **Problem Statement** (Should not include solution)
- **Proposed System/Solution**
- **System Development Approach** (Technology Used)
- **Algorithm & Deployment**
- **Result (Output Image)**
- **Conclusion**
- **Future Scope**
- **References**

# PROBLEM STATEMENT:

Generally used, student performance evaluation is mostly rule-based (pass/fail decided by marks threshold).

This approach:

- Does not account for predictive insights
- Lacks automation in reporting
- Provides limited comparative analysis

Challenge: Can we build a workflow that predicts student outcomes using AI/ML and integrates them into a dashboard for analysis?

# PROPOSED SOLUTION:

## ➤ Python ML Pipeline

- Build predictive models to forecast pass/fail outcomes and grade distributions
- Enable data-driven insights beyond static thresholds

## ➤ Power BI Dashboard

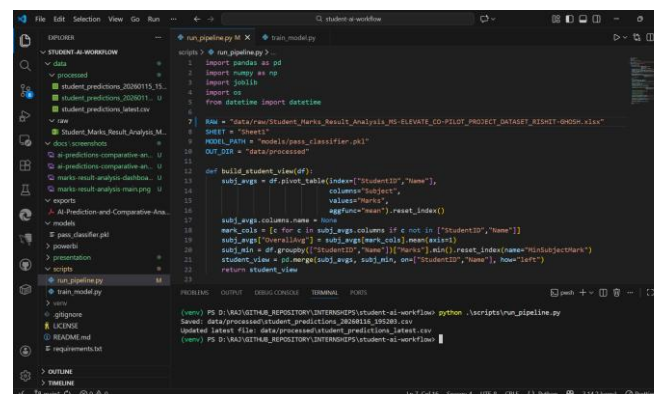
- Compare rule-based vs AI-driven predictions
- Provide interactive visualizations for deeper analysis

## ➤ Copilot Integration

- Support in workflow design
- Assist with repository organization and documentation
- Enhance collaboration and productivity

## ➤ Future Extension: Power Automate

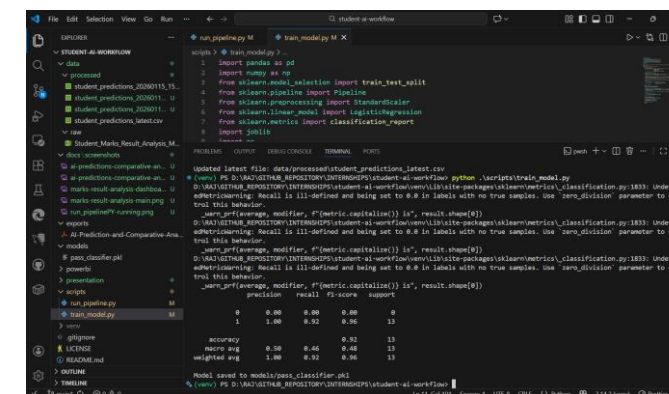
- Automate scheduled data refreshes
- Streamline report distribution to stakeholders



```

1 import pandas as pd
2 import numpy as np
3 import joblib
4
5 from datetime import datetime
6
7 raw = "data/raw/Student_Markets_Result_Analysis_MS-ELEVATE_CO-PILOT_PROJECT_DATASET_RESULT-0000.xlsx"
8 SWEET = "Sweet"
9 MODEL_PATH = "models/pass_classifier.pkl"
10 OUT_DIR = "data/processed"
11
12 def build_student_view(df):
13     subj_wags = df.pivot_table(index=["StudentID", "name"],
14                               columns="Subject",
15                               values="Marks",
16                               aggfunc="mean", reset_index=True)
17     subj_wags.columns_name = None
18     mark_cols = [x for x in subj_wags.columns if x not in ["StudentID", "name"]]
19     subj_wags["averaging"] = subj_wags[mark_cols].mean(axis=1)
20     subj_wags = df.groupby(["StudentID", "name"])["averaging"].agg("mean").reset_index(name="MarkSubjectMark")
21     student_view = pd.merge(subj_wags, subj_wags, on=["StudentID", "name"], how="left")
22     return student_view
23
24 # Run the pipeline
25 student_view = build_student_view(raw)
26 student_view.to_csv(f"{OUT_DIR}/student_view.csv", index=False)
27
28 # Save the model
29 model = LogisticRegression()
30 model.fit(student_view[mark_cols], student_view["averaging"])
31 joblib.dump(model, MODEL_PATH)
32
33 # Load the model
34 model = joblib.load(MODEL_PATH)
35
36 # Predict
37 student_view["predicted"] = model.predict(student_view[mark_cols])
38
39 # Save the predictions
40 student_view.to_csv(f"{OUT_DIR}/student_predictions.csv", index=False)
41
42 # Print the results
43 print(student_view.head())
44
45 # Save the report
46 report = {
47     "raw": raw,
48     "processed": f"{OUT_DIR}/student_view.csv",
49     "model_path": MODEL_PATH,
50     "predicted": f"{OUT_DIR}/student_predictions.csv",
51 }
52
53 # Save the report to a JSON file
54 with open(f"{OUT_DIR}/report.json", "w") as f:
55     json.dump(report, f)
56
57 # Print the report
58 print(f"Report saved to {OUT_DIR}/report.json")
59
60 # End of pipeline
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# SYSTEM APPROACH:

## ➤ System Requirements:

- **Python 3.11** → Used for data preprocessing, model training, and prediction pipeline.
- **Power BI Desktop** → Used for visualization of both rule-based and AI-based results.

## ➤ Libraries Used:

- **pandas** → Data cleaning, preprocessing, and tabular manipulation.
- **scikit-learn** → Training the ML classifier (Logistic Regression) and generating predictions.
- **joblib** → Saving and loading the trained model (*pass\_classifier.pkl*) for reuse.
- **openpyxl** → Reading/writing Excel files for raw student marks dataset.

## ➤ Workflow Structure:

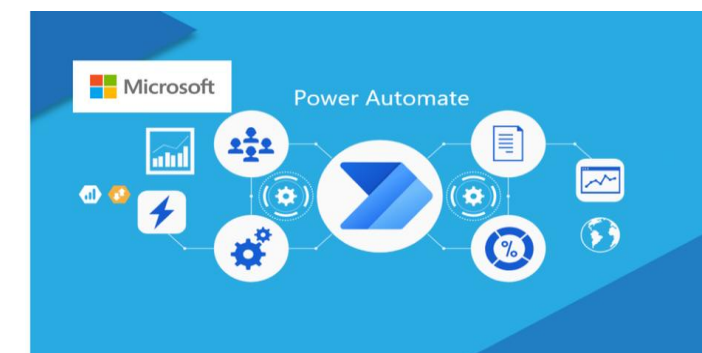
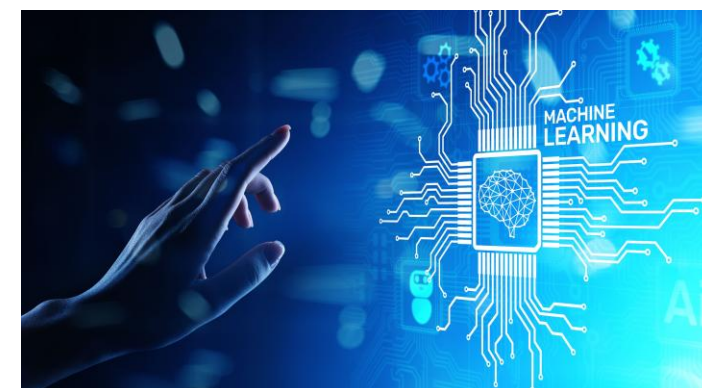
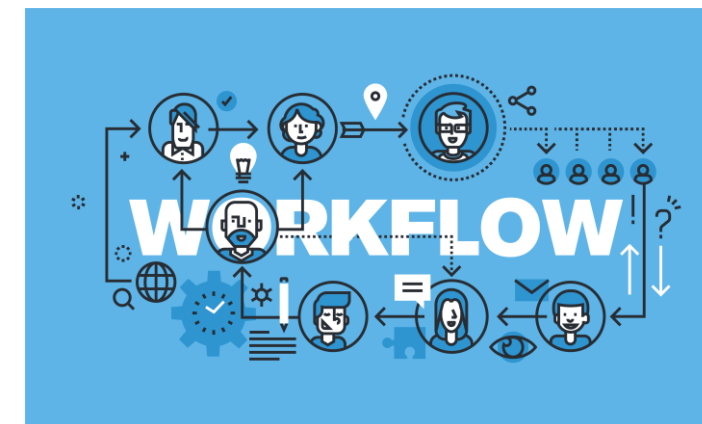
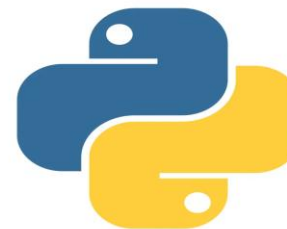
- Raw Data (Excel[.xlsx])
  - ❑ Student marks dataset collected in .xlsx format.
  - ❑ Stored in *data/raw/*.
- Processed Predictions (CSV)
  - ❑ Data cleaned and passed through ML pipeline.
  - ❑ Predictions (pass/fail, grade) exported to *data/processed/student\_predictions\_latest.csv*.
- Trained Model (PKL)
  - ❑ Logistic Regression model trained on historical marks.
  - ❑ Saved as *models/pass\_classifier.pkl* for reproducibility.
- Dashboard Visualization (PBIX)
  - ❑ Power BI dashboard integrates both rule-based and AI predictions.

## ➤ Two pages:

- Marks & Result Analysis (rule-based)
- AI Predictions & Comparative Analysis (ML-based)

## ➤ Final Flow:

- Raw Data → Preprocessing → ML Model Training → Predictions Export → Power BI Dashboard Visualization



# ALGORITHM & DEPLOYMENT:

## ➤ Algorithm Selection:

- The project uses a Logistic Regression classifier.
- This algorithm was chosen because it is simple, interpretable, and effective for binary classification tasks such as predicting whether a student will pass (1) or fail (0).
- Logistic Regression also provides probability scores, which can be useful for understanding confidence in predictions.

## ➤ Data Input:

- The input dataset consists of student marks stored in Excel format.
- Each record includes subject-wise marks and a rule-based pass/fail outcome.
- This dataset forms the basis for training and testing the machine learning model.

## ➤ Training Process:

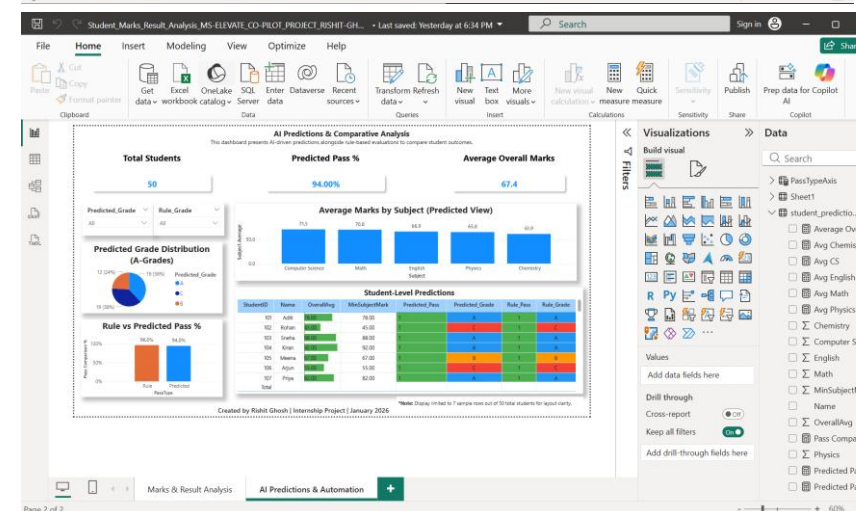
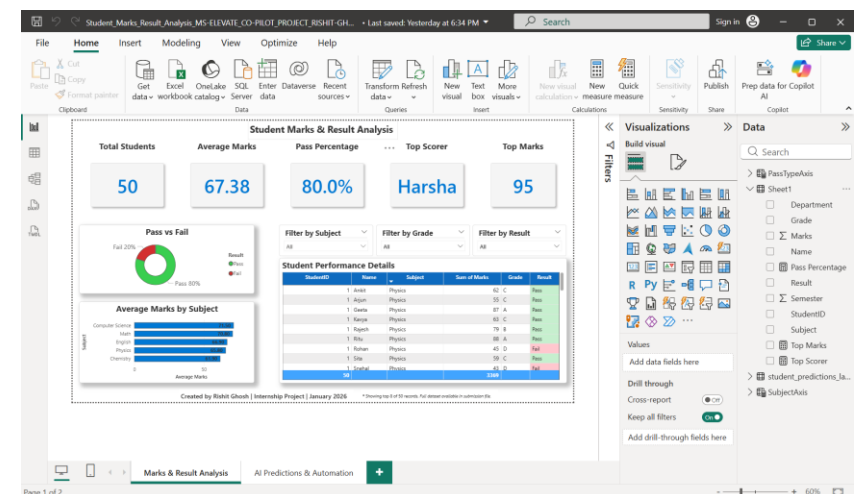
- Preprocessing → Clean the dataset, handle missing values, and prepare features.
- Model Training → Apply Logistic Regression using scikit-learn.
- Model Saving → Export the trained model as *pass\_classifier.pkl* using joblib.
  - ❑ This ensures reproducibility and allows the model to be reused without retraining.

## ➤ Prediction Process:

- Pipeline Execution → Run *run\_pipeline.py* to load the saved model.
- Generate Predictions → Predict pass/fail outcomes and assign grades (A/B/C).
- Export Results → Save predictions into *student\_predictions\_latest.csv*.
- Integration → Load the CSV into Power BI for visualization and comparative analysis.

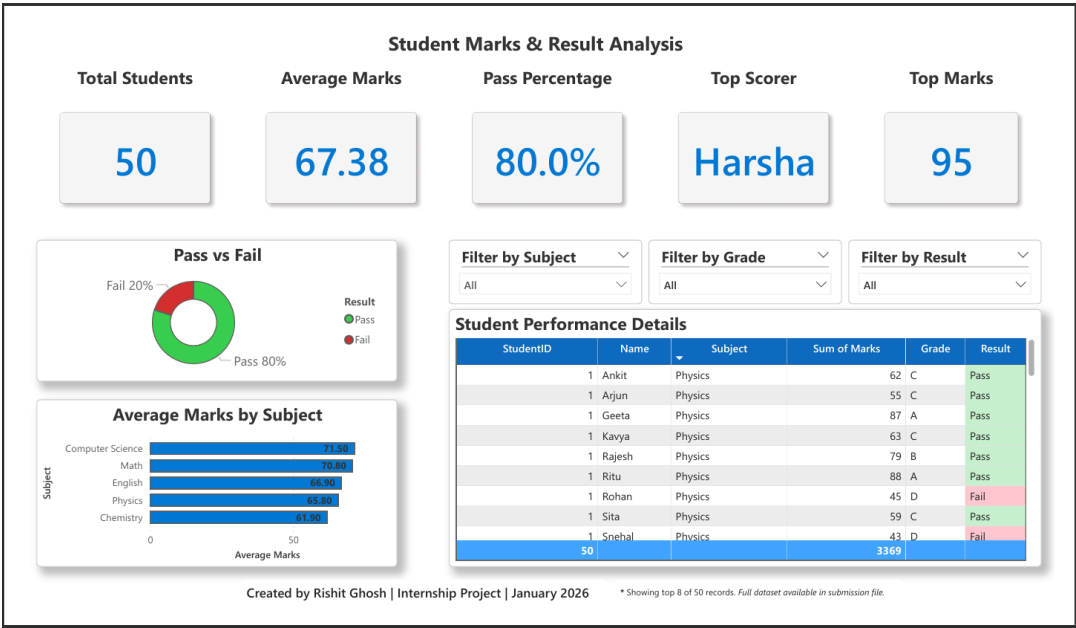
## ➤ Deployment:

- The Power BI dashboard is refreshed with the latest predictions.
- Two pages are maintained:
  - ❑ Marks & Result Analysis → Rule-based evaluation.
  - ❑ AI Predictions & Comparative Analysis → ML-driven outcomes.
- This deployment ensures that both traditional and AI-based insights are available in a single, interactive interface.

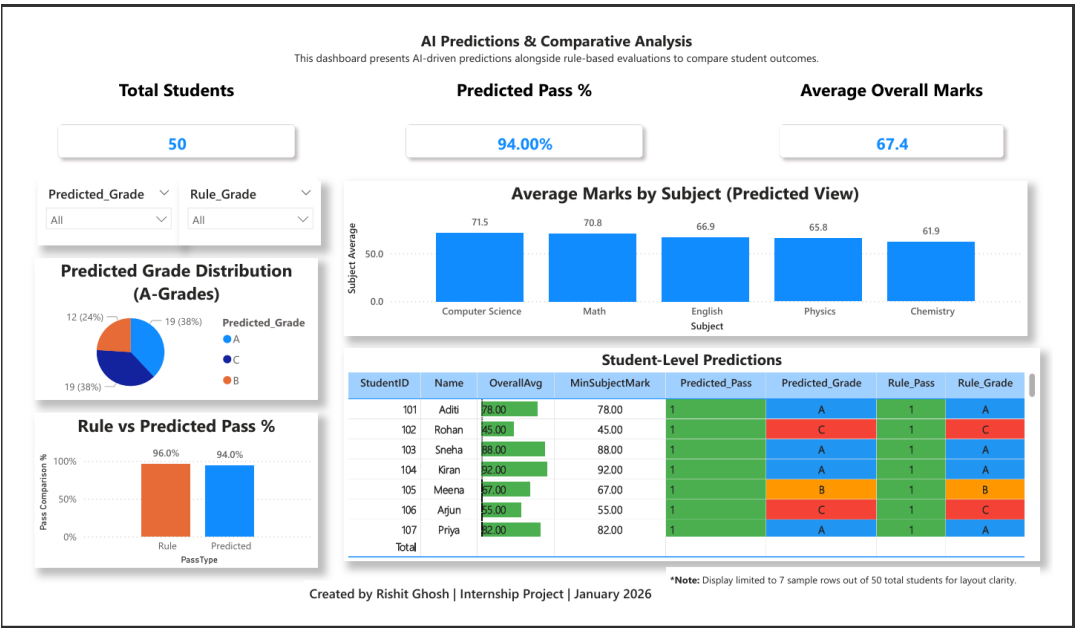


# RESULT:

The dashboards clearly show rule-based vs AI-predicted outcomes with KPIs, charts, and student-level tables. Comparative analysis highlights how the ML model aligns with traditional evaluation while adding predictive insights.



Marks & Result Analysis (Rule-based)



Predicted Grade Distribution (A-Grades)

12 (24%)

19 (38%)

19 (38%)

Rule vs Predicted Pass %

96.0%

94.0%

Created by Rishit Ghosh | Internship Project | January 2026

\*Note: Display limited to 7 sample rows out of 50 total students for layout clarity.

AI Predictions & Comparative Analysis

# CONCLUSION:

- Designed and implemented a modular workflow for student performance analysis using Python and Power BI.
- Built a Logistic Regression model to predict pass/fail outcomes and grades from student marks.
- Developed dashboards that provide comparative insights between rule-based evaluation and AI predictions.
- Ensured the workflow is reproducible, well-structured, and ready for extension with automation or advanced models.



# FUTURE SCOPE:

- Power Automate Integration → Automate report generation and scheduled dashboard refresh, reducing manual effort.
- Dataset Expansion → Include additional features such as attendance, assignments, and demographics to improve prediction accuracy.
- Advanced ML Models → Experiment with Random Forest, XGBoost, or ensemble methods for higher performance and deeper insights.
- Online Deployment → Publish dashboards via Power BI Service for accessibility across devices and real-time collaboration.
- Copilot Studio Integration → Build AI agents that can answer queries, provide insights, and interact with the dashboard dynamically.

# REFERENCES:

- **scikit-learn Documentation** -> <https://scikit-learn.org/stable/index.html>
- **Power BI Official Docs (Microsoft Learn)** → <https://learn.microsoft.com/en-us/power-bi/>
- **Microsoft Copilot Resources:**
  - ❑ Copilot Success Kit: <https://adoption.microsoft.com/en-us/copilot/success-kit/>
  - ❑ Copilot Studio Resources: <https://microsoft.github.io/copilot-studio-resources/>
  - ❑ Microsoft 365 Copilot Chat: <https://copilot.cloud.microsoft/>
- **GitHub Repository** -> <https://github.com/rajghosh06-dev/student-ai-workflow/>  
[[Click here for GitHub!](#)].

# Thank You