

Machine Learning-Based Prediction of Student GPA from Academic Behaviors

Group 6

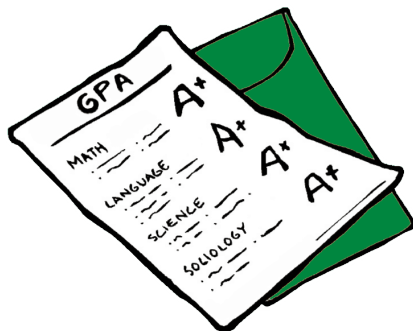
Vương Hồng Minh Nguyễn Quang Anh Đỗ Nguyễn gia Như
Trần Thanh Phát Nguyễn Quang Minh

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Problem definition



Project Goals

- **Predict** student academic performance
- **Analyze** learning patterns
- **Identify** at-risk students
- **Provide** early interventions

Summary Dashboard

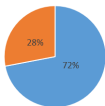


NUMBER OF SURVEYS

157

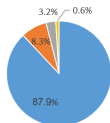
GENDER

Male Female



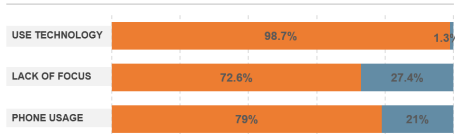
CURRENT EDUCATION LEVEL

University
Highschool
Middle school
Graduated



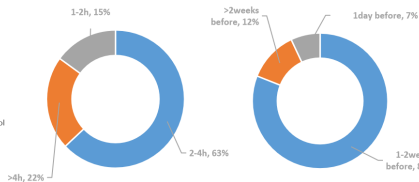
THE IMPACT OF EXTERNAL FACTORS

TRUE FALSE

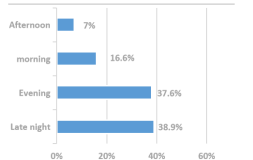


DAILY STUDY DURATION

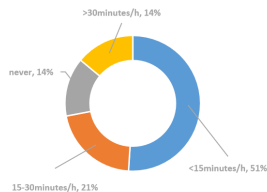
EXAM PREPARATION APPROACH




MOST EFFECTIVE STUDY TIME

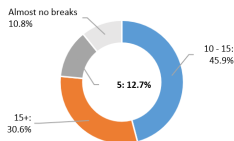


SOCIAL MEDIA USAGE DURING STUDY TIME

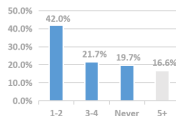


Summary Dashboard

 Study break frequency (min/h)



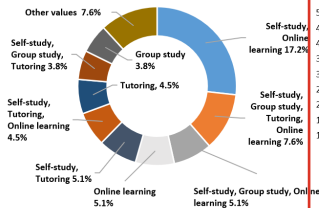
 Weekly exercise frequency(times)



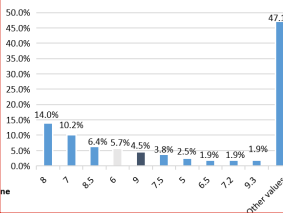
 Daily sleep duration (hours)



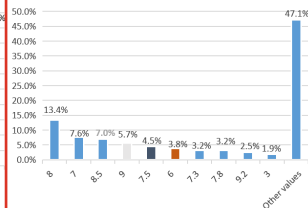
Preferred study method

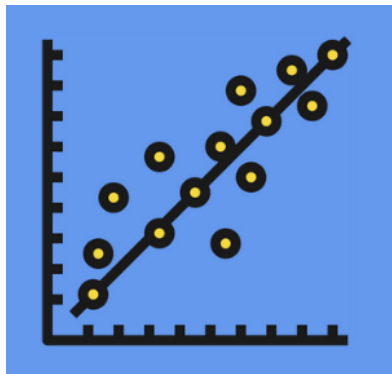


Latest semester GPA



Latest academic year GPA





Linear Regression



with some libraries

① Data preprocessing

- The dataset is divided into three types: **numerical**, **ordinal**, and **nominal** features.
- Missing values are handled using `SimpleImputer`.
- The data is split into 80% training and 20% testing sets.

② Training the model using Linear Regression

- Apply a bounded Linear Regression model with pipeline integration.

③ Evaluating the model

- Use MAE, MSE, and R^2 to assess performance.

④ Predicting output using the test set

- Generate predicted GPA values and compare with actual outcomes.

● Predicted & Actual GPA:

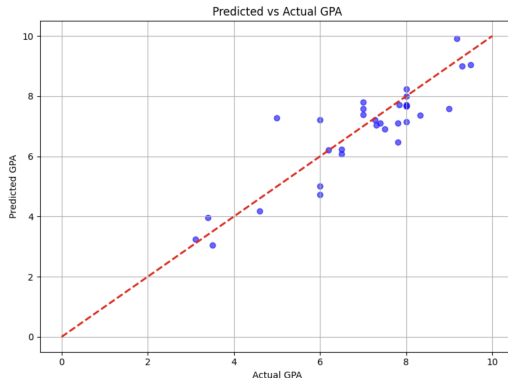
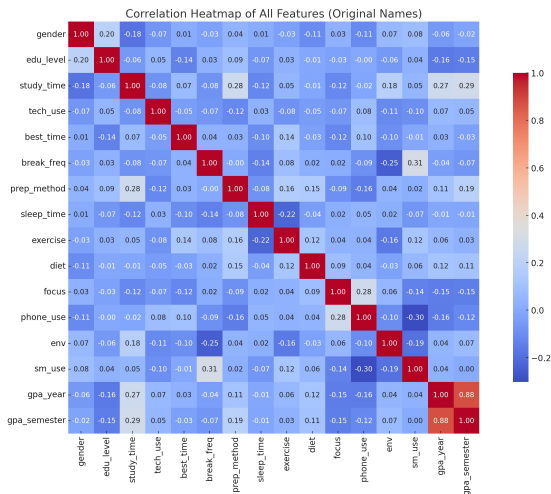


Figure 3.1: Predicted vs Actual GPA

Correlation Heatmap of all Features:



Evaluate Model Results

- **Mean Absolute Error (MAE)** ≈ 0.597 — The average of absolute differences between predicted and actual GPA values.
- **Mean Squared Error (MSE)** ≈ 0.5972 — Gives more weight to large errors, useful for identifying outliers.
- **Coefficient of Determination (R^2 score)** ≈ 0.755 — Indicates that the model explains about 77.5% of the variance in GPA.

⇒ **The model shows good predictive performance overall.**

Disadvantages

- Only works well if data is simple and linear
- Can be wrong if data has outliers
- Cannot learn complex patterns
- Gets confused if features are too similar

Future Work

- Try better models like Random Forest or Neural Network
- Add more useful features (class time, mental health, etc.)



Thank you
for listening