Task 1 – CampusPulse & Task 2 – The Rise of the WeatherMind

Submitted by: Palak Singhal
Event: Coding Week 2025 – Machine Learning Task (IIT Guwahati)

Objective : To build an intelligent, agentic AI capable of:

- Understanding user intent
- Performing tool-based actions (calculator, weather, fashion)
- Maintaining conversational memory
- Explaining model predictions with SHAP
  All implemented using LangGraph, LangChain, Gemini, and SHAP.

Task 1: Relationship Prediction

Insights of the graphs:(LEVEL 3)

1. Final Grades vs Romantic Relationship (Violin Plot)

Students in a relationship have similar grades to those who aren't. The distribution is tighter around the average, suggesting relationships don't significantly impact academic performance.

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2. Social Activity vs Final Grade (Scatter Plot)

There's no strong link between going out and grades. Students perform across the spectrum, whether they socialize a lot or not.

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3. Mother's Education vs Final Grade (Bar Plot)

Students with more educated mothers tend to score better. This suggests that a parent's education may positively influence academic performance.

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4. Alcohol Use vs Absences (Box Plot)

Higher daily alcohol use is linked to more absences. Heavy drinkers are more likely to skip classes, though some outliers exist.

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5. Social Activity vs Relationship Status (Violin Plot)

Students in relationships tend to go out more often. This shows that being in a relationship is linked to higher social activity.

LEVEL 2

Higher | Categorical (Yes/No) **Mode**
Most students opt for higher education. Using the most common value preserves dataset integrity.
Traveltime | Numerical (Ordinal: 1–4) **Median**
Travel time is ordinal. Median is robust against outliers and preserves central tendency.
Fedu | Numerical (0–4) | **Median**
Education level of the father is a discrete ordinal. Median reduces skew and is appropriate for such scales.
Absences | Numerical (Continuous**)** **Median**
Skewed distribution is likely. Median is preferred to avoid bias due to outliers.
Famsize | Categorical (LE3/GT3) **Mode**
Use the most common family size to maintain categorical consistency.
Feature_2 | Numerical (1–4) | **Median**
Earlier identified as "study time". Ordinal variable → use median.
Freetime | Numerical (1–5) **Median**
Ordinal Likert scale (discrete). Median is a safe imputation.
Feature_3 | Numerical (1–5) **Median**
Matches Likert-style "goout/social activity". Use median.
Feature_1 | Numerical (15–22) **Median**
Identified as "age". Median balances potential outliers.
G2 | Numerical (0–20) **Mean**
Grade variable, normally distributed → mean preserves average performance trends.

Key Insights:(LEVEL 4)

- **Random Forest** performed best in terms of F1-score and accuracy.
- **Logistic Regression** was interpretable but missed some complex patterns.
- **SVM** required feature scaling and had longer training time.

(ALSO , TRIED TO WORK WITH SHAP BUT UNABLE TO INSTALL IT THEREFORE DRAWN THE INSIGHTS FROM MATPLOTLIB.PYPLOT BUT WRITTEN THE CODE FOR SHAP TOO.)

Task 2: WeatherMind Agentic AI System

Level 1 – Core Activation

- Built LangGraph node: `chatbot`
- Added BODMAS-supporting `calculator_tool`
- Visualized graph using NetworkX

Level 2 – Real-World Senses

- Added `weather_tool` (via OpenWeather API or dummy)
- Added `fashion_recommender` (hardcoded per city)

Level 3 – Judgment & Memory

- Created `router`/supervisor node using Gemini LLM
- Enabled conversational memory across turns
- Dynamic tool routing based on intent

Level 4 – Multi-Agent Design

- Agents: `CalculatorAgent`, `WeatherAgent`, `FashionAgent`, `LLMChatAgent`
- Supervisor decides which agent acts next
- Structured prompt with options: [Weather, Fashion, Calculator, FINISH]

Key Learnings:

- Using LangGraph to coordinate agents
- Tool chaining and decision logic via LLM
- Explainability in ML using SHAP
- Managing AI memory and tool integration in one workflow

API KEYS USED:
level1 of task 2: "AIzaSyC7BULYhXbJhLuoLlrlUvbijhAhhO46xuw"
Level 4 of task 2:”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”