Weekly Report: Shalha Mucha Alpha AI

Week-04 (May 12 - May 16)

Tesla Project:

1. Data Collection & Exploration

- Loaded Tesla stock data using `pandas.read_csv()`
- Performed basic data inspection using `.describe()` and `.info()`.
- Visualized dataset characteristics using matplotlib and seaborn.

2. Exploratory Data Analysis (EDA)

- Conducted **seasonal decomposition** to break down price into trend, seasonality, and residuals.
- Visualized **volatility patterns** using moving standard deviations and volatility bands.
- Performed **feature correlation analysis** using heatmaps.
- Assessed **feature importance** to identify key drivers of stock price.

3. Feature Engineering

- Created features:
    - **Moving Averages (MA5, MA10, MA20)**
    - **Monthly Returns**
    - **Volatility (5-day and 10-day)**
- Scaled features using **MinMaxScaler**.

4. Train-Test Split

- Split the dataset into training and testing subsets for model development and evaluation.

5. Classical Machine Learning Models

- Trained models include:
    - **Random Forest Regressor**
    - **Linear Regression**
    - **Decision Tree Regressor**
- Evaluated performance using:
    - **MAE**, **RMSE**, and **R^2 score**
- Compared the results across traditional models.

6. Deep Learning Model

- Preprocessed data for deep learning.
- Implemented and trained an **LSTM-based neural network** using TensorFlow/Keras.
- Evaluated the model's performance on test data.

7. Prophet Model (Time Series Forecasting)

- Reformatted dataset for Prophet (`ds`, `y` columns).

- Trained and tested the **Facebook Prophet model** for time series forecasting.

- Evaluated the Prophet model using standard error metrics.
- Resolved certain issues in the inference code and continued enhancing its efficiency and modular structure.

Coding Practice

- Solved several Easy and Medium-level problems on LeetCode to strengthen problem-solving and algorithmic skills.

Git and GitHub:

- Completed the GitHub Documentation

Test-Driven Development (TDD) Session

Participated in a session centered on Test-Driven Development (TDD), emphasizing the practice of creating test cases before writing actual code.

Gained insights into various testing approaches, including:

- Unit Testing
- Integration Testing
- Functional Testing

Started documenting the TDD processes and began integrating them into the ongoing project.

Tasks for Upcoming Week (May 19 - May 23)

- Finished the initial module of the Mathematics for Machine Learning course.
- Completed the Test-Driven Development (TDD) documentation, including practical examples.