

# Weekly Report: Rakib Abdullah-Alpha AI

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## Week-03 (May 5 - May 9)

### 1. Tesla-S Project:

- Took a comprehensive session on Machine Learning concepts, focusing on their application.
- Worked extensively on data preprocessing, including handling missing values, converting the date column to a datetime format, and setting it as the index.
- Engineered new features such as monthly returns, moving averages (MA5, MA10, MA20), and volatility (standard deviation of past N days) to improve model accuracy.
- Conducted detailed Exploratory Data Analysis (EDA) using visualizations to detect trends, seasonality, and volatility patterns over time.
- Built and trained multiple models: Linear Regression, XGBoost, Decision Tree Regressor, Random Forest Regressor, LSTM, GRU, and Voting Ensemble models for stock prediction.
- Focused on evaluating how models perform under high market volatility conditions, and applied appropriate error metrics such as MAE, MSE, RMSE,  $R^2$ , and MAPE to assess model accuracy.

- Performed walk-forward validation to ensure that the models generalize well on unseen data, while optimizing and fine-tuning the models for better performance.
- Compared the results of traditional models (e.g., Simple Moving Average, Linear Regression) with advanced models (e.g., LSTM, XGBoost) to find the most accurate forecasting approach.
- Produced a detailed analysis of model performance, including a breakdown of errors during high volatility periods, and identified opportunities for further model improvement.

## **2. Github Documentation**

- Started Working on making the Github Documentation

## **3. Mathematics for Machine Learning**

- Completed Week 1 of Module 1