Stock Price Prediction

UNDERSTANDING THE FLOW

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Objective:

The aim was to create a Stock Price Prediction Model to predict the Closing Price of the Stock.

Key Components and Features:

1. **Importance**

Predicting stock prices is crucial for investment decisions, risk management, and financial planning. Accurate forecasts can lead to increased profitability and reduced losses.

2.General Challenges

- Market volatility
- Influence of external factors (economic indicators, news)
- Complexity of financial data
- Non-stationarity of time series data

3.Exploratory Data Analysis Results(EDA):

- Conducted initial data analysis to understand the distribution of stock prices and key features and different plots.
- **Issues Identified**:
  - Missing values in historical data as it was shifted for the approach.
  - Outliers that could affect model performance.

4.Technical Overview(Model Selection)

- **Random Forest:** Chosen for its robustness and ability to handle non-linear relationships.

- **XGBoost:** Selected for its performance with tabular data and regularization capabilities.
- **Holt-Winters Model:** Used for its effectiveness in time series forecasting.
- LSTM: Implemented for its ability to capture temporal dependencies in sequential data.
- **Facebook Prophet:** Considered for its flexibility in modeling seasonality and external factors.

5.Evaluation Metrics

Metrics Used:

- **MAE, MSE, RMSE:** Assess the accuracy of predictions.
- **MAPE, SMAPE:** Understand the percentage error relative to actual values.
- **R^2 and EVS:** Evaluate the model's explanatory power.
- **Directional Accuracy:** Measures the ability to predict the trend direction.

6.Verification Content

Hypothesis Behind Improvement:

- Utilizing ensemble methods (Random Forest, XGBoost) improves prediction accuracy due to their ability to reduce overfitting.
- Feature engineering enhances model performance by providing relevant information.
- Temporal models (LSTM, Holt-Winters) effectively capture trends and seasonality.

7.Result 1

Verification Results for Random Forest:

- Achieved the lowest RMSE and highest R^2 values, indicating a strong fit.
- **Discussion:**
  - The model's robustness against noise and ability to capture complex relationships contributed to its superior performance.

8.Result 2

Verification Results for XGBoost:

- Comparable results to Random Forest but slightly higher MAE.
- **Discussion:**
  - The regularization feature of XGBoost helps in preventing overfitting, making it a solid choice for predicting stock prices.

9.Result 3

Verification Results for Holt's Winter model:

- Comparable results to Random Forest but slightly higher MAE.
- **Discussion:**
  - The better trend and seasonality feature helps in predicting short term prices accurately, making it a solid choice for predicting stock prices.

10.Summary

Summary of Results:

- Random Forest emerged as the best-performing model, followed by XGBoost and Holt-Winters.
- **Future Prospects:**
  - Exploring advanced hybrid models that combine strengths of different algorithms.
  - Incorporating more external factors (economic indicators, market sentiment) to enhance predictive accuracy.
  - Continuous refinement of feature engineering techniques based on model performance.