SoC Final Project Report

Project Title: Stock Price Prediction Using LSTM

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Project Objective

The aim of this project is to forecast the future closing price of Apple Inc. (AAPL) stock using a deep learning model. Stock price forecasting is a key challenge in financial analytics, and accurate predictions can support better trading and investment decisions. We employ an LSTM (Long Short-Term Memory) model due to its effectiveness in capturing long-term temporal dependencies in time-series data.

Data Used

Source: Yahoo Finance (via `yfinance` Python library)
Ticker: AAPL
Period Covered: January 1, 1998 – January 1, 2023
Structure: Daily records
Features Used: Only the `Close` price was used in this model.

Feature Selection

We selected the closing price as the sole input feature. This choice is motivated by its widespread use in stock forecasting and the availability of clean historical data. While only one feature is used in this version, future improvements can include:
Volume
Open, High, Low prices
Technical indicators (RSI, MACD, Bollinger Bands, etc.)

Models Used

Model Type: LSTM (Long Short-Term Memory)
Layers:
- LSTM Layer (units=50, return_sequences=True)
- Dropout Layer (rate=0.2)
- LSTM Layer (units=50)
- Dropout Layer (rate=0.2)

- Dense Output Layer (1 unit)
Loss Function: Mean Squared Error (MSE)
Optimizer: Adam

The LSTM architecture was chosen for its strong performance on sequential data and ability to retain long-term memory.

Results

- Train-Test Split: 80% training, 20% testing
- Window Size: 60 time steps
- Epochs: 25
- Batch Size: 32
- Metric: Mean Squared Error (printed in console)
- Visualization: Actual vs Predicted closing prices were plotted to visually assess model performance.

Evaluation

Strengths:
- LSTM effectively models temporal dependencies in time series.
- Captures overall price trends well.
- Scalable to include more features and complex architectures.

Limitations:
- The model ignores macroeconomic and real-world events (e.g., news, interest rate hikes).
- Single-feature input limits predictive power.
- Model performance is sensitive to parameters like time steps and dropout rate.

Conclusion & Future Scope

This project successfully demonstrates the use of LSTM for time-series stock prediction using historical closing prices. The model provides a foundation for more complex forecasting systems.

Future Enhancements:
- Include more features such as volume, open/high/low prices.
- Add technical indicators to enhance prediction capability.
- Deploy the model as a web dashboard using Flask or Streamlit for real-time usage.