Final Project Report

Project Title: Stock Price Trend Prediction with LSTM
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1. Introduction

Stock price forecasting is a critical component of financial analysis and algorithmic trading, offering insights into potential market trends. During my internship at Elevate Labs, I developed a machine learning model to predict stock prices using a Long Short-Term Memory (LSTM) neural network. This approach leverages the capability of LSTMs to analyze time-series data and identify long-term patterns. The objective was to forecast the next day's closing price based on the prior 60 days of closing prices, acknowledging that while stock markets are influenced by numerous variables, historical data can reveal meaningful trends.

2. Abstract

This project focused on constructing an LSTM-based model to predict stock prices, utilizing historical data sourced from the Yahoo Finance API. The dataset spanned from 2012 to June 2025 and included stocks such as Reliance Industries (RELIANCE.NS) and Apple (AAPL). The model was designed to use 60-day sequences of closing prices to predict the subsequent day's price. Technical indicators, including 50-day and 200-day moving averages and the Relative Strength Index (RSI), were integrated to enrich the analysis. An interactive dashboard, built with Streamlit, enabled users to input stock symbols and view predictions alongside actual prices and indicators. The model effectively identified general trends, though it struggled with abrupt market changes.

3. Tools Used

The project relied on the following tools and libraries:

- **Languages:** Python, selected for its robust ecosystem in data science and machine learning.
- **Libraries:**
  - **Keras and TensorFlow:** Used to construct and train the LSTM model, with Keras simplifying neural network design and TensorFlow providing computational support.
  - **Pandas and NumPy:** Employed for data handling and numerical computations, respectively.
  - **Matplotlib :** Used for creating visualizations and charts in the project.

  - **Scikit-learn:** Provided the MinMaxScaler for data normalization.
  - **yfinance:** Enabled retrieval of historical stock data from Yahoo Finance.
  - **Streamlit:** Used to develop an interactive web application for predictions and visualization.
- **Environment:** Jupyter Notebook supported initial experimentation, while VS Code was used for final application development.
- **Deployment:** The Streamlit application was deployed locally for user interaction.

4. Steps Involved in Building the Project

The project was executed through the following steps:

- **Data Collection:** Historical stock data was obtained via the yfinance library, covering 2012 to June 2025 for stocks like RELIANCE.NS and AAPL.
- **Data Preprocessing:** Closing prices were normalized to a [0,1] range using MinMaxScaler, and the data was divided into training and testing sets with 60-day sequences for prediction.
- **Model Building:** An LSTM model with two layers of 50 units each and a dense output layer was developed in Keras, trained over 20 epochs with a batch size of 32 and mean squared error as the loss function.
- **Prediction and Visualization:** Predictions were generated, scaled back to original values, and plotted against actual prices using Matplotlib. Technical indicators were also visualized for context.
- **Deployment:** A Streamlit dashboard was created, allowing users to input stock symbols and access real-time predictions, static charts, moving averages, and RSI indicators.

5. Conclusion

This project demonstrated the practical application of LSTM networks in financial forecasting. The model successfully captured broad stock price trends, though it was less effective at predicting sudden market shifts due to external influences. The addition of technical indicators provided a more comprehensive analysis, and the Streamlit dashboard offered an accessible interface for exploring predictions. My internship at Elevate Labs enhanced my skills in data preprocessing, model development, and deployment, while highlighting areas for improvement, such as incorporating additional data sources like trading volume or news sentiment. This experience has solidified my interest in financial modeling and machine learning applications.