

STOCK PRICE TREND PREDICTION USING LSTM

ABSTRACT

Stock market prediction plays a crucial role in financial decision-making. This project focuses on predicting future stock price trends using Long Short-Term Memory (LSTM), a deep learning technique suitable for time-series data. Historical stock price data is collected using the Yahoo Finance API, preprocessed, and used to train an LSTM model. Technical indicators such as Moving Average (MA) and Relative Strength Index (RSI) are also integrated to improve trend understanding. The model successfully learns past price patterns and predicts future trends with reasonable accuracy. This system can help investors analyze stock behavior and make informed decisions.

1. INTRODUCTION

The stock market is highly dynamic and influenced by multiple factors such as company performance, market sentiment, and global events. Traditional statistical methods often fail to capture complex time-based dependencies in stock prices.

To overcome this limitation, this project uses LSTM neural networks, which are capable of learning long-term dependencies in sequential data. The goal of this project is to predict future stock prices using past trends and deep learning techniques.

2. OBJECTIVES

The main objectives of this project are:

- To collect historical stock price data using Yahoo Finance API
 - To preprocess and normalize stock price data
 - To build an LSTM-based deep learning model
 - To predict future stock price trends
 - To visualize actual vs predicted stock prices
 - To integrate technical indicators like Moving Average and RSI
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3. TOOLS AND TECHNOLOGIES USED

- Programming Language: Python
 - Libraries: NumPy, Pandas, Matplotlib, Scikit-learn
 - Deep Learning Framework: TensorFlow / Keras
 - Data Source: Yahoo Finance API (yfinance)
 - Development Platform: Google Colab
 - Model Type: Long Short-Term Memory (LSTM)
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4. METHODOLOGY

4.1 Data Collection

Historical stock price data is fetched using the yfinance library. The dataset includes Open, High, Low, Close, and Volume prices over multiple years.

4.2 Data Preprocessing

- Missing values are removed
- Closing prices are selected for prediction
- Data is normalized using MinMaxScaler
- Data is converted into sequences using a look-back window of 60 days

4.3 Technical Indicators

- Moving Average (MA): Helps identify trend direction
- Relative Strength Index (RSI): Indicates overbought or oversold conditions

4.4 Model Building

An LSTM neural network is built using:

- Two LSTM layers

- Dropout layers to prevent overfitting
- Dense output layer for prediction

4.5 Model Training

The model is trained using historical data with:

- Adam optimizer
- Mean Squared Error loss function
- Early stopping to avoid overfitting

4.6 Prediction and Visualization

The trained model predicts stock prices, and results are visualized by plotting actual vs predicted prices.

5. SYSTEM ARCHITECTURE

1. Stock data collection (Yahoo Finance API)
 2. Data preprocessing and normalization
 3. Feature engineering (MA & RSI)
 4. LSTM model training
 5. Prediction generation
 6. Visualization and result analysis
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6. RESULTS AND DISCUSSION

The LSTM model successfully learns historical stock price patterns and predicts future price trends. The predicted price curve closely follows the actual price curve, indicating good learning capability.

While exact price prediction is challenging due to market volatility, the model performs well in identifying overall trends.

7. LIMITATIONS

- Stock market is influenced by unpredictable external factors
 - Model does not consider news or sentiment analysis
 - Accuracy may vary for highly volatile stocks
 - Short-term price prediction is more challenging
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8. FUTURE SCOPE

- Integrate news sentiment analysis
 - Add more technical indicators
 - Improve accuracy using hybrid models
 - Deploy the system as a Streamlit web dashboard
 - Extend prediction to cryptocurrency and forex markets
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9. CONCLUSION

This project demonstrates the effectiveness of LSTM neural networks in predicting stock price trends using historical data. By leveraging deep learning and technical indicators, the system provides valuable insights into stock market behavior. Although exact price prediction is difficult, the model successfully captures trends and can support better investment decisions.

10. REFERENCES

1. Yahoo Finance API Documentation
2. TensorFlow and Keras Official Documentation

3. Research papers on LSTM-based time series forecasting
4. Stock Market Analysis using Machine Learning