Stock Price Prediction Using LSTM

1. Introduction

The stock market is inherently unpredictable, with prices influenced by a multitude of factors. Predicting stock prices accurately is a challenging task due to the complex nature of market dynamics. In this project, we explore the use of Long Short-Term Memory (LSTM) neural networks for stock price prediction. LSTMs are a type of recurrent neural network (RNN) that are well-suited for sequence prediction tasks, making them suitable for capturing temporal dependencies in stock price data.

Objective:

The primary objective of this project is to develop an LSTM model capable of predicting future stock prices based on historical price data and technical indicators.

2. Data Collection and Preprocessing

Data Source:

We collected historical stock price data using the Yahoo Finance API. The dataset includes daily stock prices for the chosen ticker symbol (in this case, "AMD") over a period of time.

Features Used:

Close Price: The closing price of the stock for each day.
MACD (Moving Average Convergence Divergence): A trend-following momentum indicator.
RSI (Relative Strength Index): A momentum oscillator that measures the speed and change of price movements.
MA (Moving Average): The average closing price over a specified time period.
Preprocessing Steps:
Data Cleaning: Remove any missing or inconsistent data.
Normalization: Scale the features to a range between 0 and 1 using Min-Max scaling.
Sequence Generation: Create input-output sequences for training the LSTM model.

3. Model Architecture

LSTM Model:

The LSTM model consists of an input layer, an LSTM layer, and two fully connected (dense) layers. The model architecture is as follows:

Input Size: Number of features used (Close price, MACD, RSI, MA)
Hidden Size: Number of units in the LSTM layer
Number of Layers: Number of LSTM layers
Dropout Rate: Regularization technique to prevent overfitting
L2 Regularization: L2 regularization penalty on the weights
Output Size: 1 (Predicted stock price)

4. Training and Evaluation

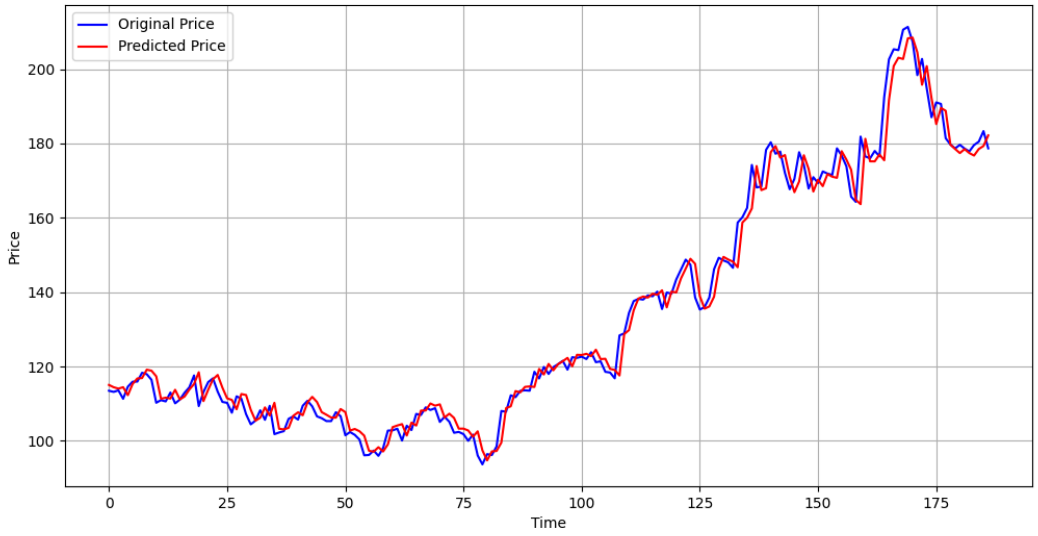
Training Process:

Loss Function: Mean Squared Error (MSE)

Optimization Algorithm: Adam optimizer
Training Loop: Iterate over epochs, updating model parameters based on training data.
Evaluation Metrics:
Mean Squared Error (MSE)
Mean Absolute Error (MAE)

Results:
In the table lookback 20 has the lowest errors for all the columns

Close				
loockback	5 days	10 days	15 days	Prediction on 23
10	69.6	127	198	92
20	11.6	23.65	47.6	173.5
30	34.3	59.9	94	130.54
50	62	114	176	90
100	26	47	75	138.98



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179.33375979382902 183.339996
182.18190038802328 178.699996
1   -> 183.33999633789062
2   -> 178.6999969482422
3   -> 182.18190038802328
4   -> 177.38339559406128
5   -> 181.1483610092747
6   -> 176.07336773072265
7   -> 180.15652585107213
8   -> 174.8026010031566
9   -> 179.21538470191769
10   -> 173.57584797471142
11   -> 178.32625453719703
12   -> 172.39322316498584
13   -> 177.487589342327
14   -> 171.2531423861971
15   -> 176.69696511913398
16   -> 170.15356337216747
17   -> 175.95167157044747
18   -> 169.09240568351956
19   -> 175.24913200529554
20   -> 168.06772248707458
21   -> 174.58690333890476
22   -> 167.07771964245205
23   -> 173.9626379195007
24   -> 166.12075570206986
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Number represent date : on 04/01/2024 actual was 183.33 our predicted was 179.33

7. Conclusion

In conclusion, this project showcased the effectiveness of LSTM neural networks in predicting stock prices based on historical data and technical indicators.

Stock Price on 04/23/2024 of AMD is going to be **$173.5**