

BACKGROUND & SIGNIFICANCE

Using Financial Technical Indicators



Figure 1. Exponential Moving Average Chart

LSTM Architecture for Time Series Analysis

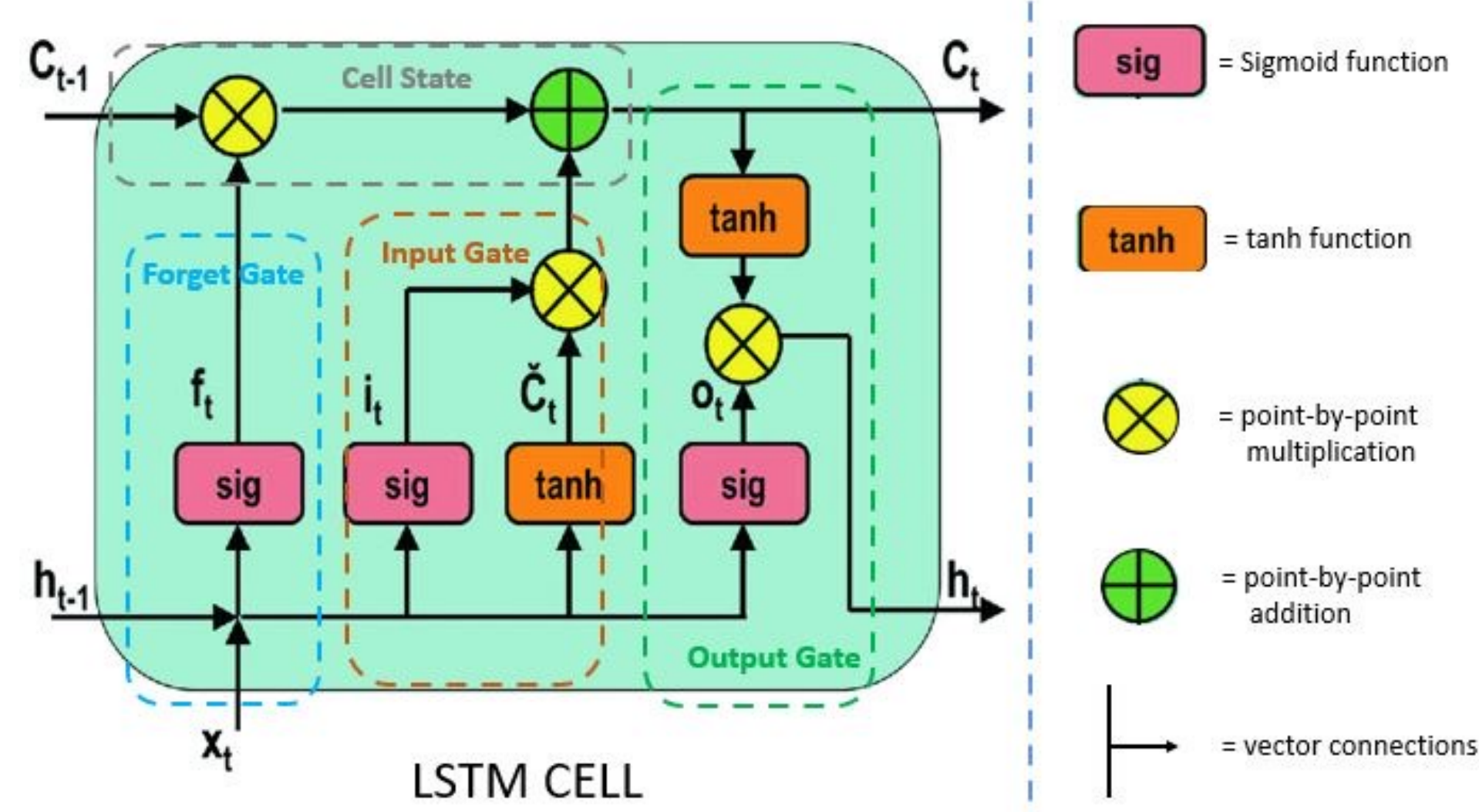


Figure 2. LSTM Cell

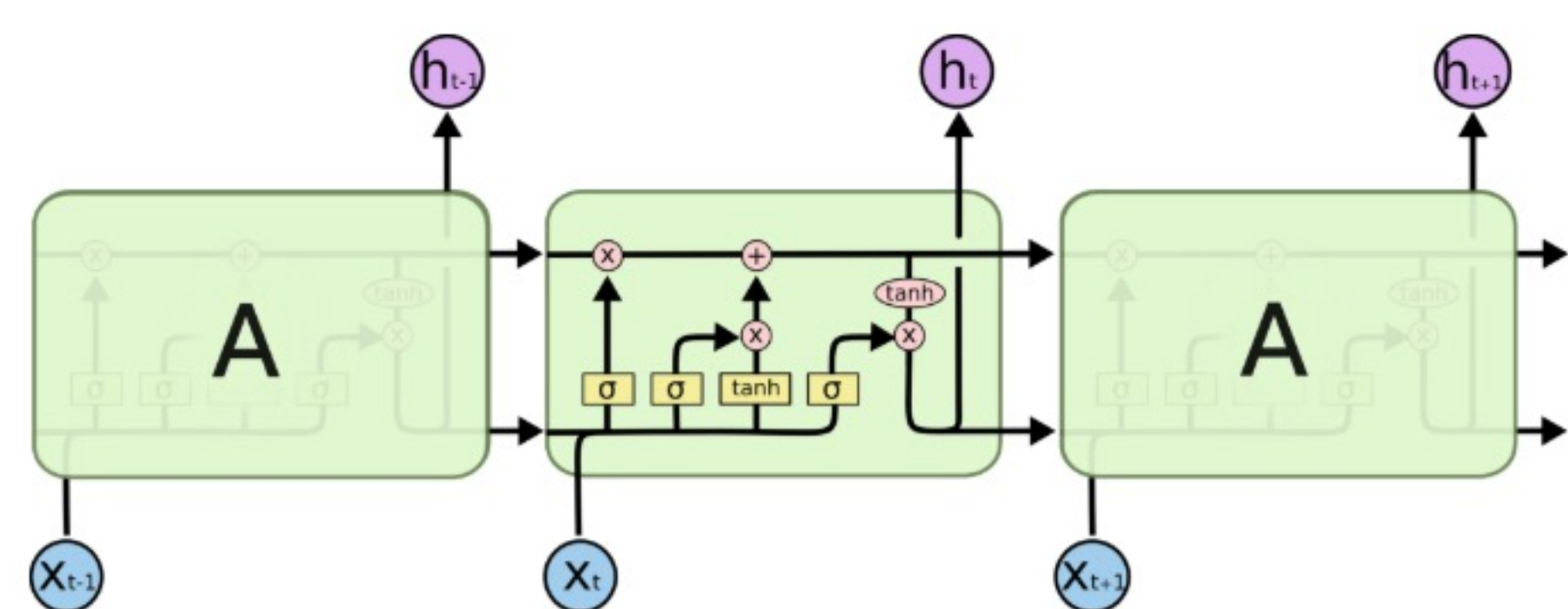


Figure 3. Layering LSTM Cells

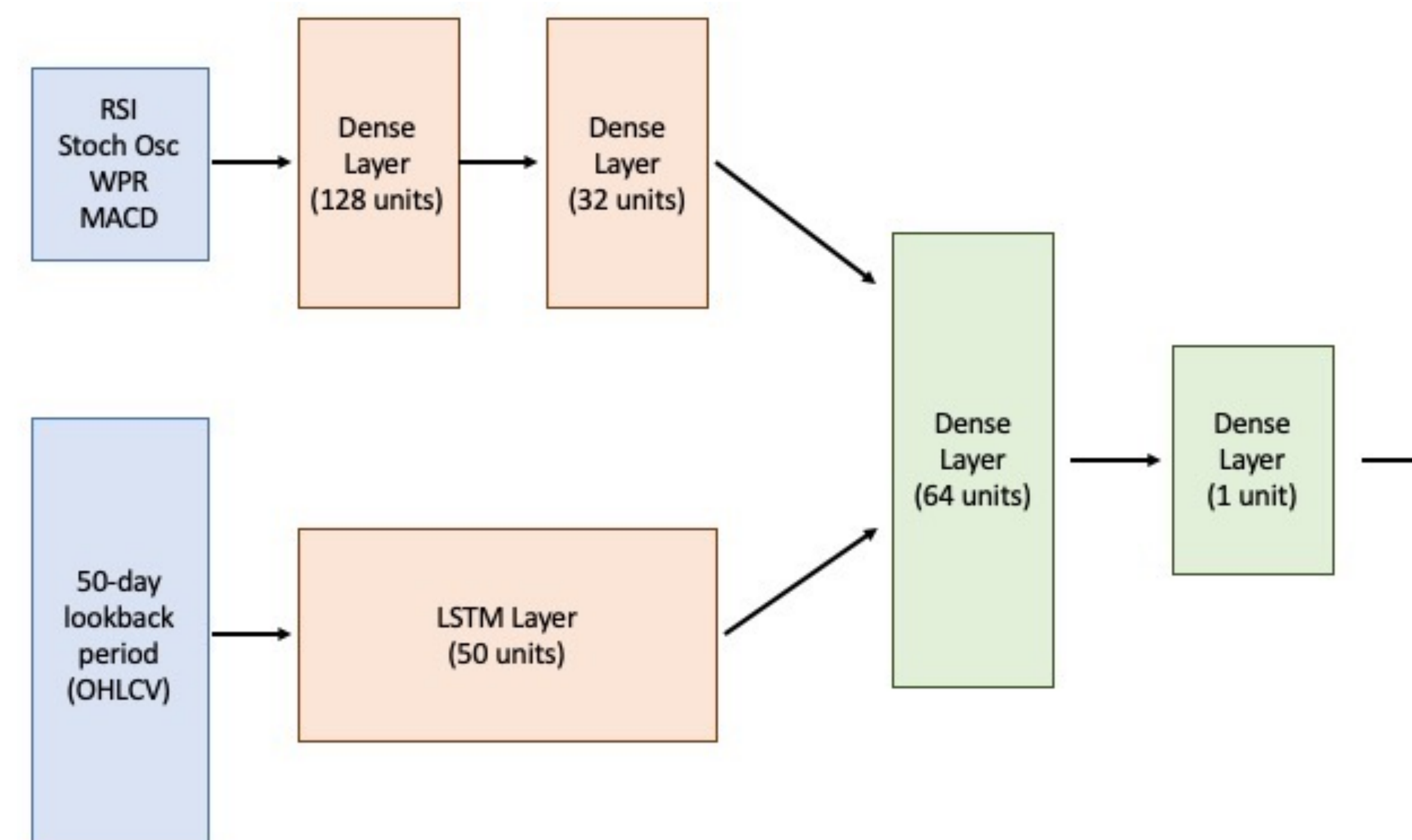
HYPOTHESIS & AIMS

We hypothesize that using an LSTM architecture along with financial indicators, we will be able to accurately predict opening stock prices.

Aim : To design a neural network-based algorithm which accurately combines technical indicators with historical stock price data to provide accurate pricing predictions.

METHODS/EXPERIMENTAL PLAN

Algorithm Structure



We used a dual branch structure. The input for the first branch is a concatenated vector of various financial technical indicators. The other branch takes in the 50 most recent pricing data and runs this data through an LSTM layer.

Basic Trading Simulation

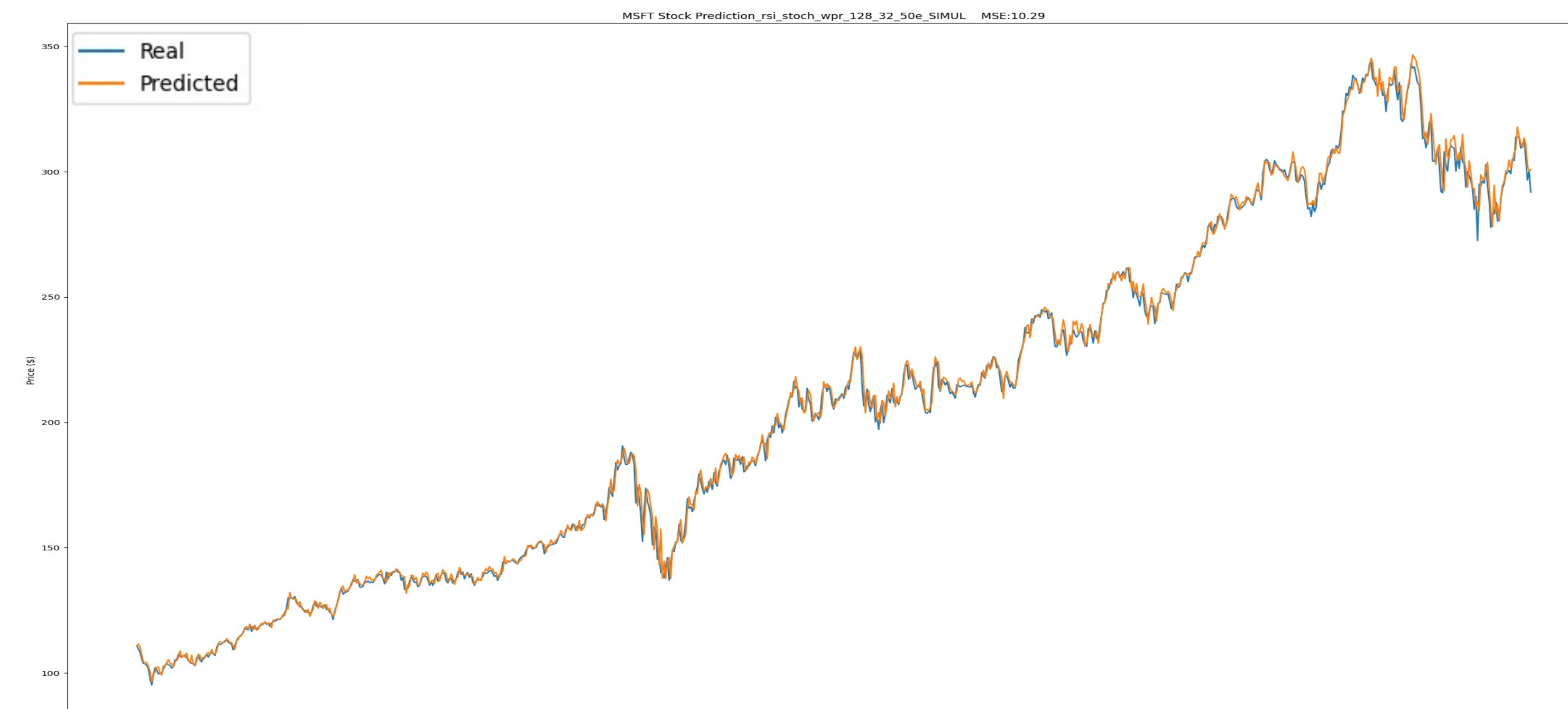


To test the capabilities of our predictions in a trading simulation, we employed a fundamental strategy: buy low and sell high. If the prediction is significantly higher the next day, buy 1 unit. If it was significantly lower, sell 1 unit.

This simulation assumed unlimited bankroll and ability to short-sell.

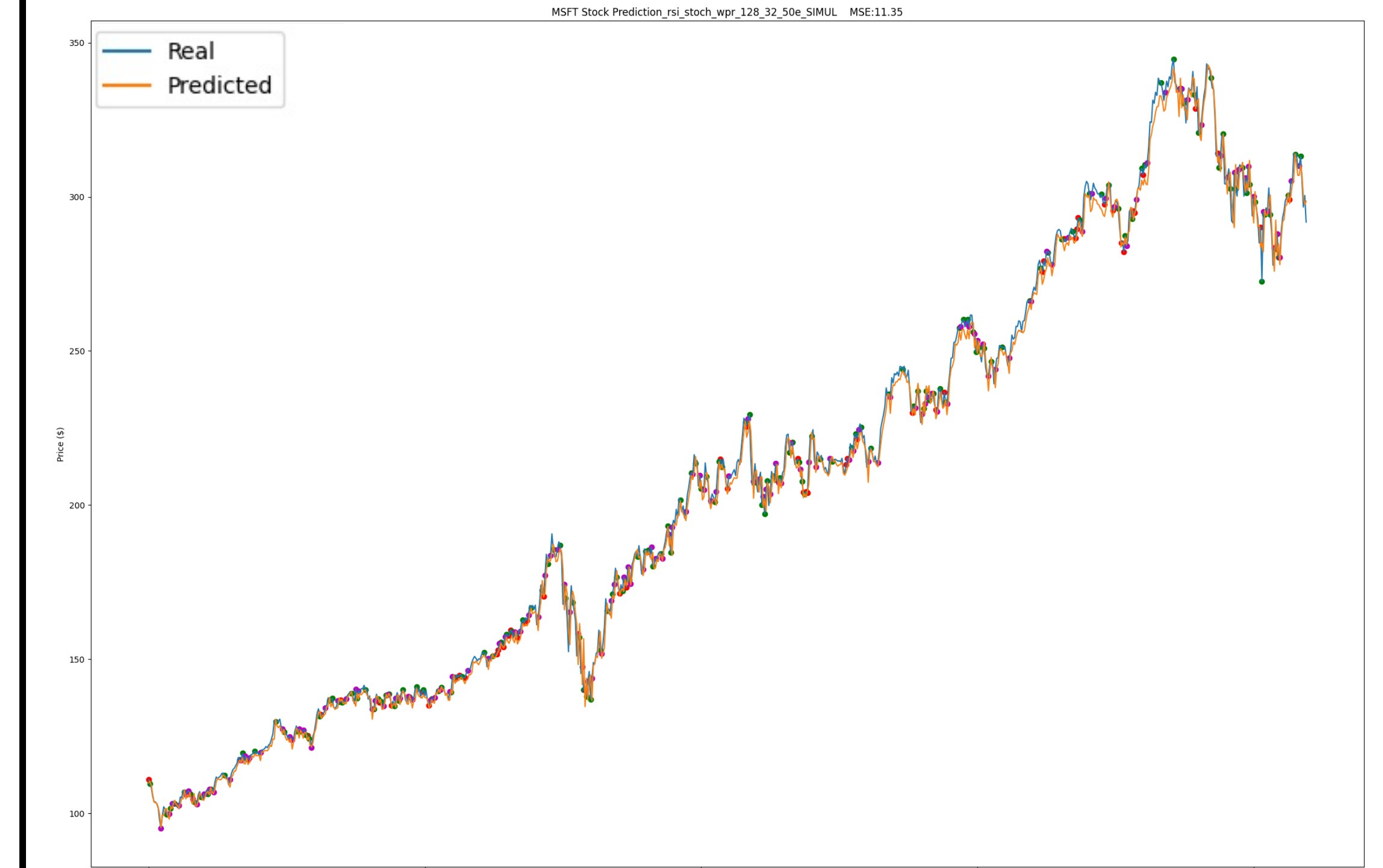
RESULTS

1. MSE of Prediction vs. True Stock Price



Average MSE of the predicted % change in price: 4.327

2. Trading Simulation



Our basic trading simulation tried a simplistic strategy based on the accuracy of the opening price predictions. In addition to buying/ selling 1 unit based on the prediction, if the price increase was significant enough, the simulation would buy as many shares as possible. This aggressive position was meant to rigorously test the reliability of the predictions.

Given an initial of \$2500, the algorithm returned an average profit of \$8901.02, or 356%, across 2.5 years.

CONCLUSIONS & FURTHER STUDIES

The results of this study show that using an LSTM-based algorithm provides reasonably accurate predictions. However, more research needs to be conducted to expand this algorithm to a real-world trading system.

In future studies, we can explore the use of Bayesian networks to better understand the margin of error and confidence levels behind each prediction. This would help provide more depth to the current binary approach in the simulation. Another potential area of exploration is diversifying the set of indicators and potentially increasing how many are included to provide the algorithm with more information.

ACKNOWLEDGMENTS

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