**CS 4641-A**

**Final Project:**

**Project Proposal**

Submitted to:

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**Introduction**

The S&P 500 stock index consists of many of the top global companies in terms of market cap across many sectors. To assess a company's financial performance, shareholders and investors utilize a wide variety of metrics to predict how market factors (ex. changes in supply chain demand, industry competitor sales growth) or business developments (ex. new product launch, company merger) may impact a company's stock price on a given day. As these prices can fluctuate greatly on an inter-day and intra-day basis, machine learning algorithms can help tune models which predict daily stock price changes and give insight into how historical trends may influence future stock price volatility.

**Problem Definition**

The main problem we are seeking to solve in this project is providing a more accurate method of predicting future stock prices using machine learning algorithms. Given a generic set of numerical company data such as revenue, earnings, past stock performance, as well as macroeconomic data and news, we seek to discover patterns in stock performance to provide more accurate predictions of future share price. We anticipate that relying on cutting-edge machine learning algorithms to solve this problem will result in a far more accurate share price prediction technique, although we still must keep in mind that there is a certain degree of unpredictability and volatility in global stock markets.

**Methods**

We will be using several methods of supervised learning to find the one that is the most effective at predicting stock prices. We can evaluate the effectiveness by calculating the root mean square error (RMSE) and the mean absolute percentage error (MAPE). The lower the score of RMSE and MAPE, the better the prediction. The algorithms that we may use are the moving average method, auto ARIMA, Long Short-Term Memory (LSTM) based deep neural network, and random forest. In the moving average method, the predicted value will be the average value over the past X number of days (X will be chosen based on our RMSE value). Using the error values as well as previously recorded values, we can predict future values using an Auto ARIMA test (Singh). An LSTM algorithm can be created to use stocking trading knowledge to create a trading system that can predict future prices (Gu et al.). Random forests can be used to predict prices of stocks and then pick stocks with high returns (Han).

**Results / Discussion**

At the most basic level, the algorithm will return a positive or negative trend for the stock price. While daily fluctuations vary dramatically, the weekly trend tends to according to the fundamentals that our algorithm can hopefully define. We also expect that monthly returns will involve too much new information as the month progresses, making our algorithm less accurate. As we work through the semester, we will consider different timeframes to determine the most accurate. We will also consider looking at predicting a percent increase, but we want to make sure we can accurately predict trends before adding any additional complexities.

**Proposed Timeline**

10/1: Project proposal memo finished

10/7: Submit project proposal

10/21: Identify data sources

10/28: Complete cleaning / pre-processing

11/4: Decide on and complete first model

11/16: Submit midterm report

11/23: Decide on and implement other models

11/30: Compile first draft of final report

12/7: Submit final report

Currently, team members have agreed to split tasks evenly. As the semester progresses, more specific roles may be defined.

Works Cited

Gu, Yanlei, et al. “Prediction of Stock Performance Using Deep Neural Networks.” *MDPI*, Applied Sciences, 17 November 2020, https://www.mdpi.com/2076-3417/10/22/8142#cite. Accessed 04 October 2021.

Han, Shangxuan. “Stock Prediction with Random Forests and Long Short-term Memory.” Creative Components, 2019, https://lib.dr.iastate.edu/cgi/viewcontent.cgi?article=1437&context=creativecomponents. Accessed 04 October 2021.

Singh, Aishwarya. “Stock Price Prediction Using Machine Learning: Deep Learning.” *Analytics Vidhya*, 25 October 2018, https://www.analyticsvidhya.com/blog/2018/10/predicting-stock-price-machine-learningnd-deep-learning-techniques-python/. Accessed 03 October 2021.