**Machine Learning for Stock Price Prediction**

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Many forces can influence the price of stocks. The value of stocks can rise and fall depending on how companies perform individually as well the as the overall economic environment. Press releases with positive quarterly returns, the launch of new and exciting products can send prices sky-high, while negative news, and unpredictable “acts of God” can be just as powerful in sending prices down. Political unrest, change in policies, and interest rates, also play significant roles. With so much influx of information, and influence from so many different sources, deciding when and where to invest can be a daunting task. Even most of the so called “experts” can only get it right about 20% of the time.

Seasoned trading professionals will attest that there is an infinite number of ways to which someone could trade the stock markets. There are also many tails about how fortunes have been made overnight, or how one algorithm is the “Holy Grail” that prints money while one sleeps and wins at every trade. To that effect, one has only to realize that if this was the case, the smartest mathematicians and computer scientists would be multi-billionaires and own the world by now. The reality is that the stock prices are made up of more than financial statements and forecasts. In truth, human perception and emotions play an enormous part in determining what happens to stock prices.

Machine learning and AI have made enormous strides in predicting the future price of stocks, but because of the human element, and other unpredictable economic and natural forces, they remain imperfect at this task. This paper explores how various machine learning models can be used to aid in predicting the future price of stocks to provide an edge to traders and investment enthusiasts alike. It is important to emphasize, however, that there is no one “best” model, as each model comes with its own set of strengths and weaknesses. Each scenario, stock, and market will call for a unique set of rules and parameters. Additionally, the models and algorithms explained here are not intended as professional investment advice and should not be taken as recommendations for future investments.

**Analysis and Models**

**About the Data**

Stock price time series data has been downloaded from Yahoo Finance (www.yahoofinance.com), a website that provides free stock price data for download. The data has been manipulated to aggregate multiple stock symbols in a single file. Various transformations in the form of mathematical indicators have been added to the data set: Bollinger Bands, Simple Moving Average, Volatility, On Balance Volume, and Sharpe Ratio. All “NA” or missing values have been removed. The data set contains XXX rows and ### variables.

**Models**

There are several machine learning models that have been used for stock price prediction:

1. Time series models: Time series models such as ARIMA, SARIMA, and Facebook's Prophet can be used to forecast future stock prices based on historical data.
2. Artificial Neural Networks (ANNs): ANNs can be used to model complex relationships between multiple inputs and the stock price.
3. Support Vector Regression (SVR): SVR is a type of regression analysis that can be used for stock price prediction by modeling the relationship between stock prices and a set of independent variables.
4. Random Forest Regression: Random Forest is an ensemble learning method that can be used to predict stock prices by combining the outputs of many decision trees.
5. Long Short-Term Memory (LSTM) Networks: LSTMs are a type of Recurrent Neural Network (RNN) that can be used to predict stock prices by modeling the dependencies between historical stock prices.

It's important to note that stock price prediction is a complex task and there is no single "best" machine learning model for this problem. The choice of model will depend on the specific requirements of the problem, including the type and quality of the data available. Additionally, stock prices are highly unpredictable and there are many factors that can impact their movements, so even the best models will have limitations and should be used with caution.