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**University Of Toronto: FinTech Bootcamp**

**Project Title: Stock Portfolio Optimizer**

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**Project Description/Outline**

Our project aims to determine if a Random Forest (machine learning) model or an Artificial Neural Network can establish better trading rules (using various statistical and technical indicators) than the traditional algorithms current used in the market. For a more complete picture and understanding of how these systems perform, our research was extended to multiple asset classes which included Stocks, Commodities, Foreign Exchange and Crypto Currencies.

It is envisaged that traditional trading strategies can be supplemented and hopefully enhanced by the inclusion of machine learning algorithms.

**Research Question to be Answered**

Investigate whether a Random Forest Model or Artificial Neural Network can perform better than established Technical Analysis trading strategies across asset classes.

**Datasets to be Used**

For our research we used Stock Indices, Commodity, Foreign Exchange and Crypto Currency prices using the Yahoo Finance API. The research period was taken from 2006-06-30 to 2022-09-30 with the securities considered for each asset class shown below:

* Stocks Indices – Russel2000 and S&P500
* Commodity – Oil and Gold
* Foreign Exchange – EUR/USD and GBP/JPY
* Crypto – BTC and ETH

**Trading Strategies**

Before looking at the daily trading strategies, we first tried to determine the current market trend by looking at the data one timeframe higher, i.e. by considering weekly data instead of daily. The idea behind this was to determine daily trading rules that aligned with the weekly trend, which is envisaged to indicate a better or stronger signal.

It is hoped that by following this system and only trading on daily signals that line up with the weekly move, we would be able to reduce the number of trades and false signals produced by the daily trend following technical indicators, thereby saving on transaction costs as well as whipsaws and potential losses.

With this in mind, the following trading systems were considered for the weekly and daily strategies:

**Weekly Trend**

* Exponential Moving Average – identifies trend
* Average Directional Index – measures strength of trend

**Daily Trading Strategies**

* MACD (Trend) – trending market
* Impulse System (MACD Histogram: Trend) – trending market
* Elder-Ray (Oscillator) – trending market
* Bollinger Bands (Volatility) – flat to quiet market

After applying these strategies to the chosen assets and determining their performance, we will then incorporate all the statistics from the trading systems into one data frame, which we would run through a Random Forest Model and an Artificial Neural Network. The models would then be fine-tuned in the training period and after obtaining satisfactory results, we then want to compare these models results to the performance of that produced by the trading systems in the test period.

**Not in Scope**

The above analysis is a simplified investigation into trading systems and machine learning models. As such, the below factors, although highly important, will not be considered in our research:

* Trade Size
* Transaction Costs

Accordingly for a more accurate and complete investigation, these factors amongst others, would need to be considered in any trading system, however due to time constraints and ensuring that the project is completed on time, we have chosen not to consider these factors for our project.

We hope that further researchers can build of our work and extend our project with these factors in future studies.