***Trend Analysis with Confidence Measure for Cryptocurrencies and other Assets. (Team 6)***

**Introduction/Background:**

Cryptocurrency is drawing more and more attention from investors as more people are interested in decentralized finance. Predicting the trend of assets plays an important role in traders’ decision to buy or sell. There have been many studies on using machine learning techniques to predict the prices of Bitcoin. For example, Mallqui & Fernandes found the Support Vector Machines (SVM) algorithm performed best in forecasting the Bitcoin exchange rates, while the combination of Recurrent Neural Networks and a Tree classifier performed best in predicting the Bitcoin price direction (2019). Another study also found that SVM algorithm is a reliable forecasting model for cryptocurrency (Hitam& Ismail, 2018).

**Problem definition:**

We found several limitations in current literature. Firstly, most of them only predict price of assets, without any indication for traders whether to buy, sell or hold their investments. Also, cryptocurrency short-term predictability is difficult, thus day trading cryptocurrencies might be challenging (Liew, Li, Budavári, & Sharma, 2019). We believe that predicting trend is a better measure than predicting price.

Secondly, no studies have employed technical indicators commonly used by stock traders in their cryptocurrency price prediction model. As Mallqui & Fernades (2019) pointed out, the technical indicators such as Relative Strength Index (RSI), Moving Average Convergence/Divergence (MACD), etc. could be used in addition to economic indicators to better predict Bitcoin price direction. Therefore, we would like to propose a model that incorporates the indicators and predicts trend to help traders decide when to sell, hold, or buy cryptocurrencies at a given moment.

**Methods:**

Our data will be obtained from Binance using its API. We are planning to work on 5 most popular coins and our data dates to 2018.

Relevant methods include:

- *Unsupervised*: A study used PCA technique to uncover the uncommon drivers of price (Liew, Li, Budavári, & Sharma, 2019).

- *Reinforcement learning*: A study used a combination of double Q-network unsupervised pre-training using Deep Boltzmann Machine (DBM) to generate and enhance the optimal Q-function in cryptocurrency trading and achieved 599% more profit in simulation compared to conventional model (Bu & Cho,2018).

- *Supervised*: A study found that SVM performed best and gave consistent results in terms of predictive accuracy compared to the logistic regression, artificial neural networks and random forest classification algorithms (Akyildirim, Goncu & Sensoy, 2020)

**Potential results:**

We hope to see that our model can effectively signal whether traders should buy, sell, or hold their cryptocurrencies at a given moment and result in more profits compared to profits obtained from standard traditional baseline models such as ARIMA and GARCH.

**Discussion:**

We believe that our model would be practical and useful for traders, especially amateur traders to easily decide whether to buy, hold or sell their cryptocurrencies.

Based on previous studies, we are planning to use dimensionality reduction technique (unsupervised), Q-learning and decision tree (reinforcement learning), and SVM algorithm (supervised) for our model. We also plan to apply LSTMs in conjunction with reinforcement learning which have been proven to be useful in long-term prediction.

**References**

Akyildirim, E., Goncu, A., & Sensoy, A. (2020). Prediction of cryptocurrency returns using machine learning. *Annals of Operations Research,* *297*(1-2), 3-36. doi:10.1007/s10479-020-03575-y

Bu, S., & Cho, S. (2018). Learning optimal q-function using deep boltzmann machine for reliable trading of cryptocurrency. *Intelligent Data Engineering and Automated Learning – IDEAL 2018,* 468-480. doi:10.1007/978-3-030-03493-1\_49

Hitam, N. A., & Ismail, A. R. (2018). Comparative performance of machine learning algorithms for cryptocurrency forecasting. *Indonesian Journal of Electrical Engineering and Computer Science,* *11*(3), 1121. doi:10.11591/ijeecs.v11.i3.pp1121-1128

Mallqui, D. C., & Fernandes, R. A. (2019). Predicting the DIRECTION, maximum, minimum and closing prices of daily Bitcoin exchange rate using machine learning techniques. *Applied Soft Computing,* *75*, 596-606. doi:10.1016/j.asoc.2018.11.038

Liew, J., Li, R., Budavári, T., & Sharma, A. (2019). Cryptocurrency investing examined. *The Journal of the British Blockchain Association,* *2*(2), 1-12. doi:10.31585/jbba-2-2-(2)2019