Cryptocurrency Analysis

(COMP3125 Individual Project)

Michael Olds   
*Wentworth Institute of Technology*

*Abstract*—Cryptocurrency has emerged as a significant asset class, with Bitcoin leading the charge in terms of popularity and market impact. This project investigates the historical trends of cryptocurrency prices, identifies the most volatile cryptocurrencies, and explores correlations between various cryptocurrencies. The study further examines the feasibility of predicting cryptocurrency prices using historical data and technical indicators. Machine learning, particularly the Long Short-Term Memory (LSTM) network, is employed for time series forecasting to predict future price movements. The research aims to provide valuable insights into the dynamics of cryptocurrency markets and the potential for predictive modeling in this volatile environment.

Keywords— cryptocurrency, Bitcoin, volatility, machine learning, LSTM

# INTRODUCTION

# Cryptocurrency has rapidly gained popularity and is increasingly being recognized as an alternative form of currency alongside traditional actual money. The growing interest in digital assets has led to significant market fluctuations and a dynamic trading environment. This project aims to analyze historical trends in cryptocurrency prices, identify the most volatile cryptocurrencies, and explore the relationship between global events and cryptocurrency prices. Additionally, the study will focus on predicting cryptocurrency prices based on historical data and technical indicators using machine learning models.

# Datasets

## Price History Dataset:

## This dataset provides historical price movements of various cryptocurrencies (Bitcoin was chosen as it is the most popular Cryptocurrency), available at [Kaggle](https://www.kaggle.com/datasets/sudalairajkumar/cryptocurrencypricehistory).

## All Cryptocurrencies Dataset:

# This dataset includes a comprehensive list of cryptocurrencies and their attributes, available at [Kaggle](https://www.kaggle.com/datasets/jessevent/all-crypto-currencies).

## Cryptocurrency Pairs Dataset

This dataset offers minute-resolution data on cryptocurrency pairs, available at [Kaggle](https://www.kaggle.com/datasets/tencars/392-crypto-currency-pairs-at-minute-resolution).

The All Cryptocurrencies Dataset, as well as the Cryptocurrency Pairs Dataset contained too many files so the data needed to be narrowed down to fit properly. This was done using excel. For the All Cryptocurrencies Dataset, I managed to delete data from very small cryptocurrencies that had very little volume and a very low market cap. For the Cryptocurrency Pairs Dataset, there were many different csv files, this meant getting meaningful data would be difficult, so I decided to go with a Bitcoin pairs dataset, as Bitcoin is the most popular cryptocurrency that almost everyone knows of.

# Methodology

This study will address four key research questions:

## What are the historical trends of cryptocurrency (Bitcoin) prices?

## Data analysis was performed using line charts to visualize historical price trends. Moving averages were also used to show bullish and bearish runs throughout the coins’ history.

## Which cryptocurrencies have the most volatility?

Standard deviation of daily returns was used to measure volatility across different cryptocurrencies. A bar chart was created to visualize the top 10 most volatile cryptocurrencies.

## How do different cryptocurrencies correlate with each other in terms of price movements?

## Correlation matrices will be used to evaluate the relationships between different cryptocurrency price movements.

## Can we predict the price of a cryptocurrency based on historical data and technical indicators?

A machine learning model, specifically a Long Short-Term Memory (LSTM) network, will be used for time series forecasting.

By analyzing these aspects, this project aims to provide insights into cryptocurrency market behavior and the feasibility of predicting future price movements based on historical trends and other influences.

# Results

In this section, present your findings using an appropriate method, such as equations, numerical summaries, or visualizations like charts and graphs. Clearly explain all results and provide guidance on how to interpret them. If any unexpected results arise, discuss possible reasons or contributing factors. To improve clarity and organization, consider using subsections (e.g., A, B) to separate different aspects of your results.

Example: After the text edit has been completed, the paper is ready for the template. Duplicate the template file by using the Save As command, and use the naming convention prescribed by your conference for the name of your paper. In this newly created file, highlight all of the contents and import your prepared text file. You are now ready to style your paper; use the scroll down window on the left of the MS Word Formatting toolbar.

## Result A

Example: XXX

### For papers with more than six authors: Add author names horizontally, moving to a third row if needed for more than 8 authors.

### For papers with less than six authors: To change the default, adjust the template as follows.

#### Selection: Highlight all author and affiliation lines.

#### Change number of columns: Select the Columns icon from the MS Word Standard toolbar and then select the correct number of columns from the selection palette.

#### Deletion: Delete the author and affiliation lines for the extra authors.

## Results B

Example: Headings, or heads, are organizational devices that guide the reader through your paper. There are two types: component heads and text heads.

## Results C

#### Positioning Figures and Tables: Place figures and tables at the top and bottom of columns. Avoid placing them in the middle of columns. Large figures and tables may span across both columns. Figure captions should be below the figures; table heads should appear above the tables. Insert figures and tables after they are cited in the text. Use the abbreviation “Fig. 1”, even at the beginning of a sentence.

1. Table Type Styles

| Table Head | Table Column Head | | |
| --- | --- | --- | --- |
| Table column subhead | Subhead | Subhead |
| copy | More table copya |  |  |

1. Sample of a Table footnote. (*Table footnote*)
2. Example of a figure caption. (*figure caption*)

Figure Labels: Use 8 point Times New Roman for Figure labels. Use words rather than symbols or abbreviations when writing Figure axis labels to avoid confusing the reader. As an example, write the quantity “Magnetization”, or “Magnetization, M”, not just “M”. If including units in the label, present them within parentheses. Do not label axes only with units. In the example, write “Magnetization (A/m)” or “Magnetization {A[m(1)]}”, not just “A/m”. Do not label axes with a ratio of quantities and units. For example, write “Temperature (K)”, not “Temperature/K”.

# Discussion

Every method/project has its shortage or weakness. Please discuss the unsatisfied results in your project. And discuss the feasible suggestions of future work to revise/improve your result.

Example: xxx

# Conclusion

In this part, you should summarize your project. What important results did you find for your topic and what’s the effect of this result on the real-world?

Example: xxx

##### Acknowledgment *(Heading 5)*

The preferred spelling of the word “acknowledgment” in America is without an “e” after the “g”. Avoid the stilted expression “one of us (R. B. G.) thanks ...”. Instead, try “R. B. G. thanks...”. Put sponsor acknowledgments in the unnumbered footnote on the first page.

##### References

Use the IEEE format for the citation. The template will number citations consecutively within brackets [1]. The sentence punctuation follows the bracket [2]. Refer simply to the reference number, as in [3]—do not use “Ref. [3]” or “reference [3]” except at the beginning of a sentence: “Reference [3] was the first ...” Unless there are six authors or more give all authors’ names; do not use “et al.”. Papers that have not been published, even if they have been submitted for publication, should be cited as “unpublished” [4]. Papers that have been accepted for publication should be cited as “in press” [5]. Capitalize only the first word in a paper title, except for proper nouns and element symbols.

1. G. Eason, B. Noble, and I. N. Sneddon, “On certain integrals of Lipschitz-Hankel type involving products of Bessel functions,” Phil. Trans. Roy. Soc. London, vol. A247, pp. 529–551, April 1955. *(references)*
2. J. Clerk Maxwell, A Treatise on Electricity and Magnetism, 3rd ed., vol. 2. Oxford: Clarendon, 1892, pp.68–73.
3. I. S. Jacobs and C. P. Bean, “Fine particles, thin films and exchange anisotropy,” in Magnetism, vol. III, G. T. Rado and H. Suhl, Eds. New York: Academic, 1963, pp. 271–350.
4. K. Elissa, “Title of paper if known,” unpublished.
5. R. Nicole, “Title of paper with only first word capitalized,” J. Name Stand. Abbrev., in press.
6. Y. Yorozu, M. Hirano, K. Oka, and Y. Tagawa, “Electron spectroscopy studies on magneto-optical media and plastic substrate interface,” IEEE Transl. J. Magn. Japan, vol. 2, pp. 740–741, August 1987 [Digests 9th Annual Conf. Magnetics Japan, p. 301, 1982].
7. M. Young, The Technical Writer’s Handbook. Mill Valley, CA: University Science, 1989.

**IEEE conference templates contain guidance text for composing and formatting conference papers. Please ensure that all template text is removed from your conference paper prior to submission to the conference. Failure to remove template text from your paper may result in your paper not being published.**

We suggest that you use a text box to insert a graphic (which is ideally a 300 dpi TIFF or EPS file, with all fonts embedded) because, in an MSW document, this method is somewhat more stable than directly inserting a picture.

To have non-visible rules on your frame, use the MSWord “Format” pull-down menu, select Text Box > Colors and Lines to choose No Fill and No Line.