

Project Proposal - Sophie Meyrick-Vernon

by Sophie Meyrick-Vernon

Submission date: 27-Oct-2025 12:21PM (UTC+0000)

Submission ID: 266112226

File name: 41934_Sophie_Meyrick-Vernon_Project_Proposal_-_Sophie_Meyrick-Vernon_695044_1357205619.docx (56.02K)

Word count: 1727

Character count: 10913

Using Artificial Intelligence for Cryptocurrency Trend Prediction and Trading Strategy

Research Proposal
Sophie Meyrick-Vernon
Mark Huntley
Word count: 1415

Table of Contents

Introduction 3

Background to the Proposed Research.....4

Research Problem statement 6

Research Aim & Objectives 6

 Aim 6

 Objectives 6

Methodology.....7

 Methods.....7

 Materials 7

Project Plan 8

 Gantt Chart 9

References 10

Introduction

In modern financial markets, cryptocurrencies have emerged as one of the most dynamic and unpredictable assets in today's financial landscape. Unlike traditional stocks or currencies, their prices are highly volatile; they move in non-linear ways [1]. They react quickly to changes in market sentiment, on-chain activity, and global economic events. These characteristics make it challenging for those attempting to forecast prices or form trading strategies. Therefore, the development of models capable of producing accurate forecasts carries substantial chance of profitability.

In recent years, the advancement of Artificial Intelligence (AI) has made headway in identifying hidden patterns within large and noisy datasets [2]. In particular, through the application of machine learning and deep learning techniques, these models can capture hidden patterns in large datasets and adapt to non-linear complex relationships. This is particularly important for short-term forecasting of price movements to identify potentially profitable trading opportunities.

Long Short-Term Memory (LSTM) networks have demonstrated a strong capability to model non-linear and temporal dependencies [3]. This makes them particularly well-suited for short-term forecasting of cryptocurrency price movements and the identification of potentially profitable trading opportunities.

The practical value of developing an AI-based cryptocurrency trading system is its ability to support decision making driven by data. With the use of integrated predictive models and back testing mechanisms to evaluate trading performance in realistic market conditions, the system aims to conduct accurate forecasting with strategic evaluation to provide useful

insights for cryptocurrency traders. This tool will enable cryptocurrency traders to adapt to the rapidly changing market in real time.

The expected outcome is a fully functional prototype that demonstrates how AI can be effectively applied to assist and improve short-term cryptocurrency trading decisions. By developing this prototype, the project highlights the potential of intelligent systems to enhance trading efficiency and performance in today's highly volatile world of digital assets.

Background to the Proposed Research

Cryptocurrencies such as Bitcoin, Ethereum, and Tether have become increasingly popular in the past decade. Unlike traditional assets such as stocks or shares cryptocurrencies are decentralised, meaning that they are not regulated by any bank or government [4].

Cryptocurrencies rely on blockchain technology, this is a transparent and secure way to make transactions using cryptocurrencies as there is no single point of failure [5]. This decentralised structure is one of the key reasons why cryptocurrencies are often seen as both innovative and risky. The risk comes from criminal uses, as cryptocurrencies are pseudonymous [6]. This decentralised structure is one of the key reasons why cryptocurrencies are often seen as both innovative and risky.

This has created more interest in understanding how their prices move and how the markets behave. Unlike traditional financial assets cryptocurrencies are highly volatile. Influenced by investor sentiment, speculation, and wider economic factors [7]. Their prices can change within minutes and often move in unpredictable and non-linear ways. For instance, a single tweet from a major influencer or announcement of new regulations can

cause rapid price changes. These factors make accurate forecasting using traditional statistical methods very challenging as they often assume a more stable market behaviour.

In recent years Artificial Intelligence has changed how financial prediction is approached.

This is particularly true for Machine Learning and Deep Learning. Traditional models like ARIMA and GARCH struggle to capture the complex patterns in cryptocurrency data [8].

Deep learning models, such as Long Short-Term Memory (LSTM) networks and transformers, can handle sequential data and detect meaningful patterns over time. LSTMs are particularly useful for time-series forecasting because they can recall important information from previous data points.

AI has also been applied in algorithmic trading, where systems can analyse data in real time, make predictions, and execute trades automatically. Using back testing to test trading strategies on historical data is important to check whether AI models would perform well in real markets.

Previous studies have shown that deep learning can improve cryptocurrency predictions.

LSTMs have been used to predict Bitcoin prices and achieved better accuracy than traditional methods [9]. RNNs have also been successfully applied for price forecasting. Transformer-based models have been used to capture long-term patterns in time-series data [10].

However, there is still a gap: many studies focus only on prediction accuracy and do not test whether the strategies would actually be profitable in real trading. Very few undergraduate projects build a full prototype that combines AI prediction with trading simulation.

This project aims to develop a working AI-based cryptocurrency trading system which uses LSTM for price prediction and a back testing module with real data from Coinbase. By combining prediction with strategy evaluation, the project will show how AI can help make short-term trading decisions more effectively.

Research Problem statement

Predicting cryptocurrency markets is challenging in today's market due to the volatility of cryptocurrency. Although AI models such as LSTM have been effective at improving prediction accuracy there is still little research that combines these models into fully working trading systems which can test and evaluate their performance. This project aims to close this gap by creating and testing an AI-based prototype which can predict short-term cryptocurrency price changes while also simulate trading strategies using real market data from Coinbase.

Research Aim & Objectives

Aim

The aim of this project is to design, implement, and evaluate an AI-based prototype system that is capable of predicting short-term cryptocurrency price movements and simulate trading decisions based on those predictions. It will also evaluate trading performance through back testing.

Objectives

1. To collect and prepare historical and live cryptocurrency market data from Coinbase.
2. To develop and train an LSTM-based model for short-term price prediction.

3. To connect the prediction model to a back testing system that evaluates trading strategies.
4. To examine the effectiveness and limitations of AI-based approaches for real-time cryptocurrency trading.

Methodology

Methods

This study uses a quantitative and experimental approach. It will focus on designing, building, and testing an AI-based cryptocurrency trading system. The project follows a software development and simulation method. This fits its goal of creating a working system which can make predictions and test how well they perform.

After training the model will be linked to a back testing system that simulates trading decisions to see how profitable or risky they would have been. The model's accuracy will be tested using statistical measures like Root Mean Square Error (RMSE) and Mean Absolute Error (MAE). The results will be measured using indicators such as total return and maximum loss. This combined approach helps test both how well the model predicts prices and how it might perform in real trading situations.

Materials

This project will use Python as the primary programming language for system implementation. It will utilise libraries such as Keras and TensorFlow for the development of deep learning models. Pandas and Matplotlib will be used for the data processing, analysis and visualisation. Streamlit will be used for a web based interface to display the models

outputs. To ensure all data used in this project follows compliance and ethical standards, publicly available marked data will be used from APIs such as Coinbase. By incorporating open-source technologies and adherence to ethical data practices this will meet the projects objective of developing a transparent, repeatable, and practically feasible AI-based cryptocurrency trading prototype.

Project Plan

Weeks 1-2 – Literature Review

The focus for the first two weeks of the project will be on conducting background research and composing a literature review. This will be to understand existing methods used in cryptocurrency forecasting and AI based trading. This is where the system requirements will be outlined, defining the technologies and datasets needed for implementation.

Weeks 3-4 – Data Collection

Using Coinbase this phase focuses on data collection and processing. This includes the collection of historical market data, and applying processing techniques such as normalisation to prepare the data for model training.

Weeks 5-7 – Development and Training

This stage covers model development and training, where the models architecture will be designed, created and trained. The models parameters will be optimised and will be validated for reliable use.

Weeks 8-9 – Back testing

The developed model will be integrated with a back testing framework. This will allow trading strategies to be simulated. It will be used to evaluate profitability.

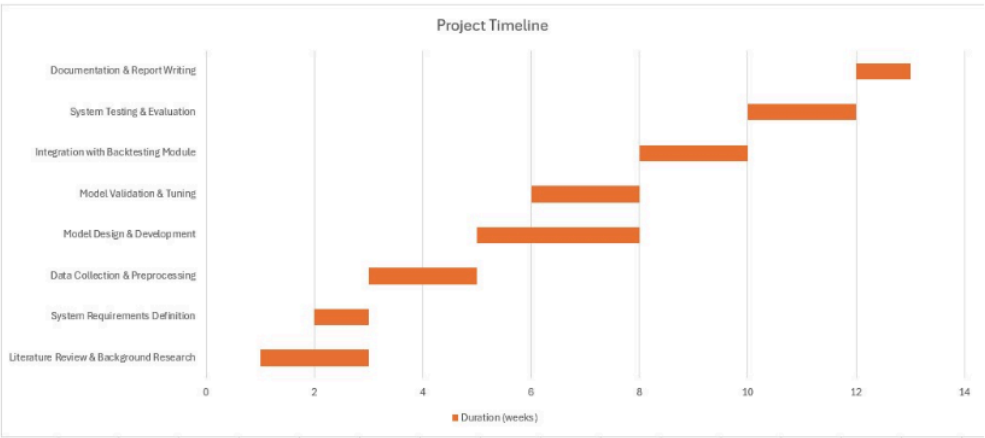
Weeks 10-11 – Performance Evaluation

The system will undergo testing and performance evaluation. At this time the focus will be on both prediction accuracy and trading outcomes.

Week 12 – Final Reporting

The final week will involve documentation and analysis for the preparation of the final report. Results and findings will be documented as well as areas for future improvement.

Gantt Chart



References

- [1] C. &. Brown, "Why is Crypto So Volatile? Understanding Market Movements," Caleb & Brown, 20 July 2025. [Online]. Available: <https://calebandbrown.com/blog/crypto-volatility/#:~:text=Supply%20and%20Demand%20Dynamics,of%20many%20different%20digital%20assets>. [Accessed 6th October 2025].
- [2] S. Singh, "How AI Detects Hidden Patterns in Big Data," ITcart, 21st January 2025. [Online]. Available: <https://itcart.io/blogs/how-ai-detects-hidden-patterns-in-big-data/>. [Accessed 6th October 2025].
- [3] M. K. a. A. Mihoub, Long Short-Term Memory Networks: A Comprehensive Survey, 5 September 2025. [Online]. Available: <https://www.mdpi.com/2673-2688/6/9/215>. [Accessed 7th October 2025].
- [4] "Why are there so many cryptocurrencies and why do we need them?," Coinbase, [Online]. Available: <https://www.coinbase.com/en-gb/learn/crypto-basics/why-are-there-so-many-cryptocurrencies-and-why-do-we-need-them>. [Accessed 22 October 2025].
- [5] eToro, "Cryptocurrency and Blockchain: same, same but different," eToro, 3rd November 2019. [Online]. Available: https://www.etoro.com/news-and-analysis/etoro-updates/cryptocurrency-and-blockchain-same-same-but-different/?utm_source=38638&utm_campaign=CAMP21462548382|AG167839784834|Devicec|KW|MT|Target|Targetid|sa-1518303916724|Creative730792712062&utm_serial=CAMP21. [Accessed 22nd October 2025].

- [6] T. I. Team, "Cryptocurrency Explained With Pros and Cons for Investment," The Investopedia Team, 28th August 2025. [Online]. Available: <https://www.investopedia.com/terms/c/cryptocurrency.asp>. [Accessed 22nd October 2025].
- [7] M. Legge, "What Determines the Price of Crypto?," Kionly, 8th October 2025. [Online]. Available: <https://koinly.io/blog/what-determines-the-price-of-crypto/>. [Accessed 11th October 2025].
- [8] S. R. A. R. N. L. F. S. a. S. W. L. Wajeeha Badar, "Enhanced Interpretable Forecasting of Cryptocurrency Prices Using Autoencoder Features and a Hybrid CNN-LSTM Model," 7th June 2025. [Online]. Available: <https://www.mdpi.com/2227-7390/13/12/1908#B4-mathematics-13-01908>. [Accessed 11th October 2025].
- [9] J. L. Huisu Jang, "An Empirical Study on Modeling and Prediction of Bitcoin Prices With Bayesian Neural Networks Based on Blockchain Information," IEEE, 2018. [Online]. Available: <https://ieeexplore.ieee.org/document/8125674>. [Accessed 12th October 2025].
- [10] J. R. S. C. Sean McNally, "Predicting the Price of Bitcoin Using Machine Learning," IEEE, 2018. [Online]. Available: <https://ieeexplore.ieee.org/document/8374483>. [Accessed 12th October 2025].

Project Proposal - Sophie Meyrick-Vernon

GRADEMARK REPORT

FINAL GRADE

GENERAL COMMENTS

67 /100

PROJECT PROPOSAL – ACCA6020 INDEPENDENT PROJECT

Student Sophie Meyrick-Vernon
Mark 67

Intro / A&O (400 words)		
Project title; Identification of a specific problem to be investigated; Well-defined aims and SMART objectives; Explaining why this project is worth doing; Discussion of what the project needs to do in order to be a success; Description any deliverables that will be produced at the end of the project	20	16
A terse introduction that does give context and background to the subject and field. Maybe a little more		

Background to the Project / Literature Review (400 words)		
Description of how the work to be done by in the project relates to the work identified in the literature review; Discussion of any ethical issues raised by the project Identifying what has already been done within the field; Topic familiarity; Brief literature review using appropriate sources – 6-8 journal papers and book chapters rather than just websites; Selection of relevant models & concepts A well narrated background to the proposed project. A little more detailed discussion around current state of cryptocurrency and its prediction would have been beneficial, but reasonable research question though, maybe a little more thought to this would have refined it. Some more explanation to back testing would have been advantageous too, as this feeds into the aim. Whilst the aim and obkectives have been reasonably thought out, a little more refinement would be required for SMART objectives here. A little repetition could have been avoided. Reasonable sources for references, more	20	13

credible academic sources would have been beneficial.		
Project Design (500 words)		
Clear statement of which development methods are to be used and why they are appropriate; Clear statement of which tools are to be used and why they are appropriate; Clear description of how data collected will be analysed More discussion detailing the methodology would have been desirable. Good discussion around implementation and frameworks to be used however no mention of hardware. Some mention of metrics, A better discussion and understanding of evaluation here would have been advantageous. More detailed discussion of the data to be used and the data for the final evaluation would have been desirable here too. A clearer definition of evaluation would have resulted in clearer direction. Reasonably considered timeline here.	30	17

Resources / Planning (200 words)		
List of any deliverables; Clear diagram showing both timing and resource use; Completed ethics form; Limited and relevant appendices Clear and considered Gantt chart given to back up consideration of timeline. Some detail given to the ethics form but not fully completed.	15	8
Document Presentation		
Correct spelling, grammar and punctuation; Flow of narrative/fluency; Coherence; Word processed ; Correct use of referencing with bibliography; Strict word limit Well laid out document, sectioned well and referenced in the correct manner.	15	13

TOTAL	100	67

PAGE 1
PAGE 2
PAGE 3
PAGE 4
PAGE 5
PAGE 6
PAGE 7
PAGE 8
PAGE 9
PAGE 10
PAGE 11