BITCOIN PRICE PREDICTION

A TECHNICAL REPORT

submitted by

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under the guidance of

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BONAFIDE CERTIFICATE

This is to certify that the report entitled **“Bitcoin Price Prediction”** submitted by **K Majidh(AM.EN.U4EAC21035), Chethan Siva Kumar(AM.EN.U4EAC21023), Yeswanth(AM.EN.U4EAC21039), Bojja Nikhil Reddy(AM.EN.U4EAC21021), D Dinesh(AM.EN.U4EAC21024),** as part of the 19ECE495/ 19EAC495 PROJECT PHASE I is a bonafide record of the work carried out by her under my guidance and supervision at Amrita School of Engineering, Amritapuri.

Signature of Supervisor:
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DECLARATION

We, **K Majidh(AM.EN.U4EAC21035), Chethan Siva Kumar(AM.EN.U4EAC21023), Yeswanth(AM.EN.U4EAC21039), Bojja Nikhil Reddy(AM.EN.U4EAC21021), D Dinesh(AM.EN.U4EAC21024),** hereby declare that this technical report entitled **"Bitcoin Price Prediction",** is the record of the original work done by us under the guidance of **Dr.Manazhy Rashmi , M.Rages Rajan,** designation, Department of ECE, Amrita School of Engineering, Amritapuri. To the best of my knowledge this work has not formed the basis for the award of any degree/diploma/ associateship/fellowship/or a similar award to any candidate in any University.

Place: **Signature of the Students**
Date:

Acknowledgement

We extend our heartfelt gratitude to everyone who played a pivotal role in the successful completion of our project. Firstly, we would like to express our sincere appreciation to Dr.Rashmi, our project supervisor, whose guidance and expertise proved invaluable throughout the entire process. Their constructive feedback and insightful suggestions significantly contributed to the improvement of our work.

Our thanks also go to Mr. Ragesh for providing us with the necessary tools and spaces essential for conducting this study. The supportive and collaborative atmosphere fostered by our peers and colleagues greatly facilitated our project's progress.

Last but not least, we want to acknowledge the contributions of all team members. The commitment and collaboration within our group were instrumental in overcoming challenges and ensuring the timely completion of the project. It is through the combined efforts and dedication of everyone involved that this project became a reality. Without their collective support, this achievement would not have been possible.

Regards.

Group 10

S5-EAC

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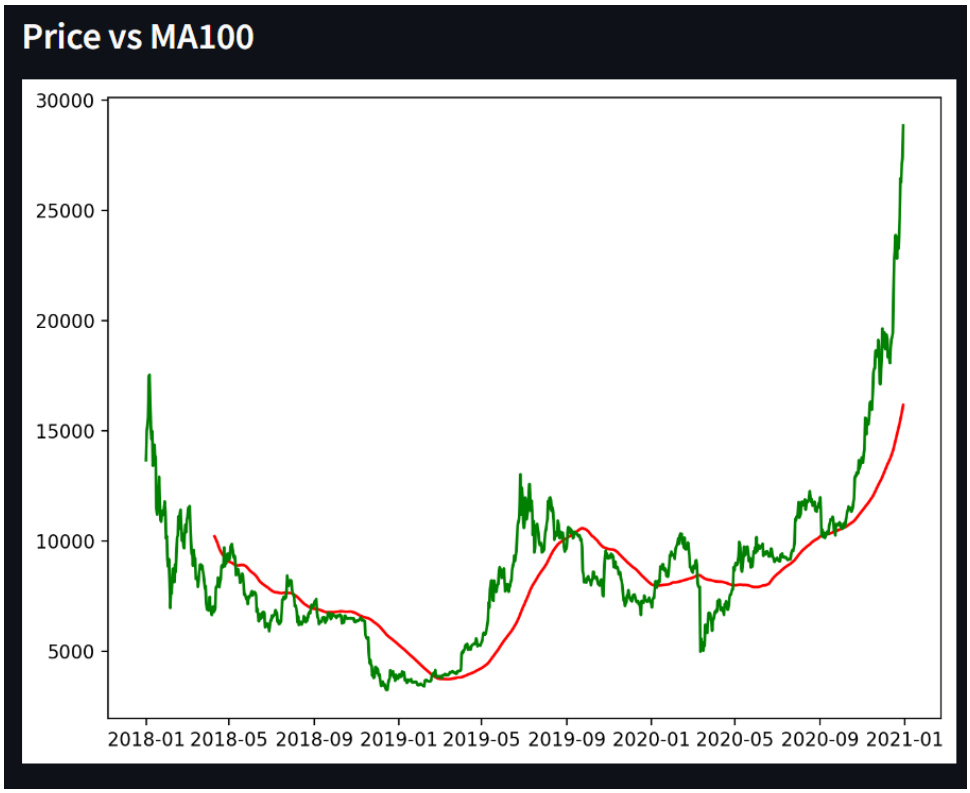

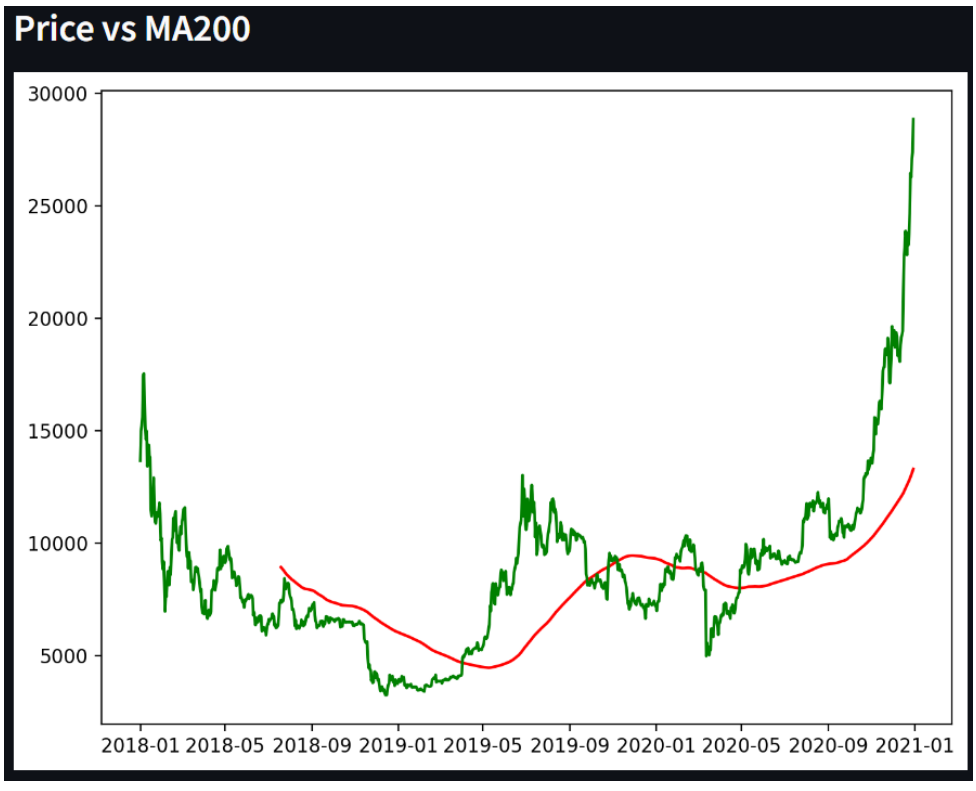

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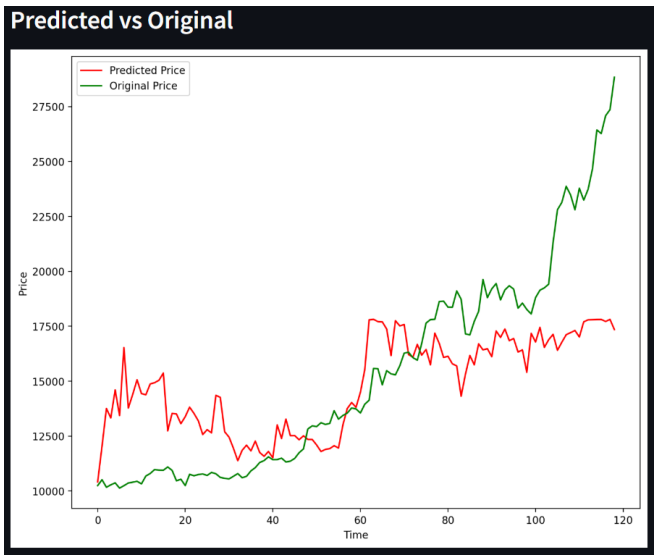

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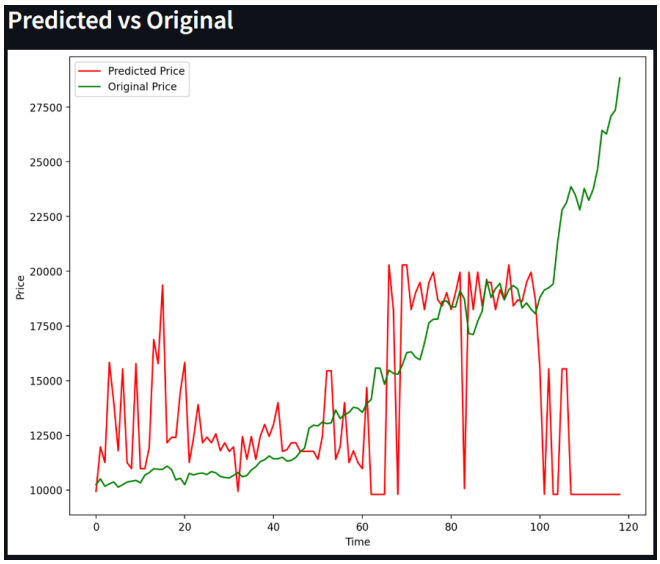

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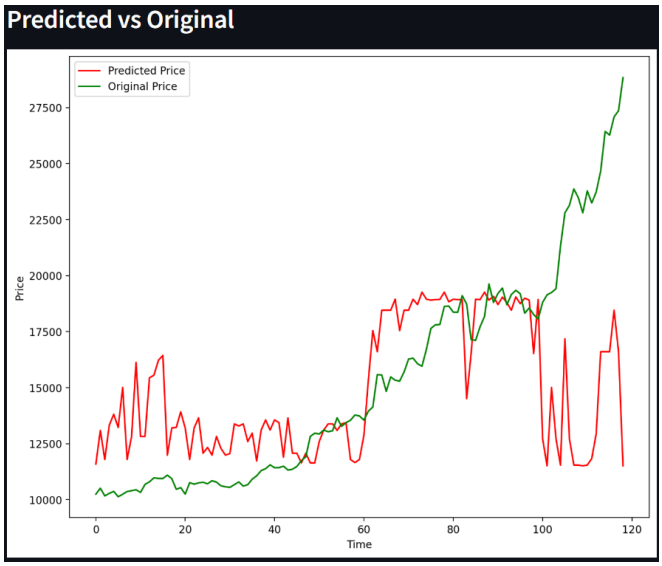

Abstract

This project explores using machine learning to predict Bitcoin prices using historical data from Yahoo Finance. The goal is to build a model that helps understand how Bitcoin prices move, assisting in making smarter investment decisions in the cryptocurrency market.

Here's how we approach it:

- Data Collection and Preparation: We gather and clean historical Bitcoin price data, making sure it's ready for analysis.
- Creating Features: We use a technique that looks at past Bitcoin price patterns to predict future prices.
- Building the Model: Initially, we use a simple method called Linear Regression to predict future Bitcoin prices based on the patterns we found.
- Checking the Model: We test how well our model predicts prices using a method that considers how data changes over time.
- What We Found: Our model shows potential in estimating Bitcoin price movements. Visual comparisons of predicted versus actual prices illustrate how well it understands market trends.

Our findings suggest that using machine learning can help predict Bitcoin prices, giving insights into the cryptocurrency market. To improve, we plan to try more advanced methods, explore different data features, and test more ways to measure our model's accuracy.

This project aims to help understand Bitcoin's market behaviour and lays the groundwork for using machine learning to forecast prices, offering opportunities for better investment strategies.

Chapter 01

INTRODUCTION

1.1 Background

The cryptocurrency market, with Bitcoin at its forefront, has emerged as a captivating and highly volatile investment landscape. Bitcoin's value fluctuations have drawn considerable attention from investors and analysts seeking to capitalize on market trends. The inherent unpredictability of cryptocurrency prices has fueled the exploration of advanced tools, with machine learning algorithms standing out as a promising avenue. This project delves into the application of three prominent algorithms—Support Vector Machine (SVM), XG Boost, and K-Nearest Neighbors (KNN)—to predict Bitcoin prices.

Cryptocurrencies, by their nature, lack intrinsic value and are heavily influenced by market sentiment, regulatory developments, and technological advancements. Consequently, accurately forecasting their price movements is crucial for making informed investment decisions. The utilization of machine learning techniques represents a forward-looking approach, leveraging historical data patterns to uncover trends and potential future scenarios.

1.2 Objective

The primary objective of this project is to rigorously evaluate the efficacy of three distinct machine learning models—SVM, XG Boost, and KNN—in predicting Bitcoin prices. The objective encompasses a comprehensive exploration of the challenges inherent in forecasting cryptocurrency values. By assessing the performance of each model, the project aims to provide valuable insights into their strengths, weaknesses, and applicability within the dynamic cryptocurrency market.

The challenges associated with predicting cryptocurrency prices are multifaceted. Factors such as market sentiment, regulatory shifts, and technological developments contribute to the complexity of the forecasting task. The objective is to systematically address these challenges through the application of advanced machine learning algorithms, providing a

nuanced understanding of their predictive capabilities in the cryptocurrency domain.

1.3 Scope

The project focuses on historical Bitcoin price data sourced from Yahoo Finance, providing a rich dataset for analysis. Seven key indicators, including open, high, low, close, adjusted close, volume, and Moving Average, are utilized for feature extraction. The selection of these indicators ensures a comprehensive representation of Bitcoin market dynamics, capturing both short-term fluctuations and long-term trends.

The scope extends to the implementation of three diverse machine learning models—SVM, XG Boost, and KNN. The report will delve into the intricacies of each model, highlighting their respective strengths and limitations. By presenting a thorough analysis of methodologies and results, the scope encompasses providing stakeholders, including investors and analysts, with valuable insights into the applicability and performance of machine learning in predicting Bitcoin prices.

Chapter 02

Literature Survey

2.1 Predicting Bitcoin Prices Using Machine Learning

In a study by Dimitriadou and Gregoriou, the authors explored the application of machine learning techniques for predicting Bitcoin prices. Their research focused on utilizing historical data and advanced algorithms to discern patterns and trends in the cryptocurrency market. The study laid the groundwork for understanding the complexities involved in forecasting Bitcoin prices and highlighted the significance of machine learning models in capturing non-linear patterns.

2.2 Bitcoin Price Prediction Using Machine Learning

Another relevant work by V. M et al. delved into Bitcoin price prediction using machine learning approaches. The authors emphasized the importance of accurate predictions in the volatile cryptocurrency market and proposed a methodology that incorporated various features for

enhancing prediction accuracy. The study provided insights into the challenges faced in predicting Bitcoin prices and demonstrated the potential of machine learning models in addressing these challenges.

Chapter 03
Methodology

3.1 Data Collection

The foundation of this project lies in the extraction of historical Bitcoin price data from Yahoo Finance. The dataset encompasses essential attributes such as open, high, low, close, adjusted close, and volume. This historical perspective enables a thorough temporal analysis, allowing the identification of trends and patterns within the Bitcoin market dynamics. By capturing data over various time periods, the dataset serves as a valuable resource for training and testing machine learning models.

3.2 Feature Extraction

Feature extraction is a crucial step in constructing a robust predictive model. Seven key indicators have been strategically selected to comprehensively represent Bitcoin market activity. These indicators include open, high, low, and volume, providing a snapshot of the cryptocurrency's trading behavior. Additionally, the inclusion of the Moving Average enhances the analytical depth, offering insights into both short-term fluctuations and long-term trends. The incorporation of these features is aimed at capturing the diverse facets of Bitcoin price movements, contributing to a holistic representation for model training.

3.3 Model Implementation

The core of the project involves the implementation of three distinct machine learning models: Support Vector Machine (SVM) with the Radial Basis Function (RBF) kernel, XG Boost, and K-Nearest Neighbors (KNN). Each model is selected for its unique strengths, contributing to a comprehensive and diverse analysis.

- SVM with RBF Kernel: SVM is chosen for its classification and regression capabilities, making it a robust choice for discerning intricate patterns in cryptocurrency market data. The RBF kernel is employed to enhance adaptability to non-linear trends, allowing the model to capture complex relationships within the data.

- XG Boost: This powerful gradient boosting algorithm is implemented to sequentially improve the model's ability to capture complex patterns and dependencies in historical data. XG Boost's capability to handle non-linear relationships and its efficiency in enhancing prediction accuracy make it a valuable addition to the project.
- K-Nearest Neighbors (KNN): Leveraging the proximity-based approach, KNN is utilized to predict future Bitcoin values by considering the closeness of data points. This contributes to a context-aware model, allowing for effective cryptocurrency price forecasting.

3.4 Evaluation Metrices

The performance of each model is assessed using the Root Mean Squared Error (RMSE) as the evaluation metric. RMSE quantifies the difference between predicted and actual values, providing a measure of the prediction accuracy. A lower RMSE indicates a better-performing model, demonstrating its effectiveness in predicting Bitcoin prices. This standardized metric facilitates a comparative analysis of the three models, allowing for an informed evaluation of their respective strengths and weaknesses in capturing the dynamic nature of cryptocurrency price movements.

In summary, the methodology encompasses a meticulous process of data collection, feature extraction, model implementation, and performance evaluation. The selection of diverse models and comprehensive features aims to provide a nuanced understanding of the complex patterns inherent in Bitcoin price data, contributing to the development of accurate and reliable prediction models.

Chapter 04

Machine Learning Models

The success of predicting Bitcoin prices relies heavily on the selection and implementation of appropriate machine learning models. In this project, three distinct models—Support Vector Machine (SVM), XG Boost, and K-Nearest Neighbours (KNN)—have been employed, each bringing unique capabilities to the task of forecasting cryptocurrency values.

4.1 Support Vector Machine (SVM):

Support Vector Machine is a versatile machine learning algorithm that demonstrates exceptional performance in both classification and regression tasks. In the context of predicting historical Bitcoin price patterns, SVM proves to be a robust choice. The SVM model is specifically equipped to discern intricate patterns within cryptocurrency market data, providing valuable insights into the underlying dynamics that influence price movements.

The utilization of the Radial Basis Function (RBF) kernel further enhances the adaptability of SVM to non-linear trends. Cryptocurrency markets are known for their inherent complexity and non-linear behaviour, and the RBF kernel allows the SVM model to navigate these complexities effectively. By augmenting the data with non-linear features derived from existing ones, the SVM model can identify patterns in a higher-dimensional space, offering a more nuanced understanding of the relationships within the Bitcoin price data.

4.2 XG Boost:

XG Boost, an advanced gradient boosting algorithm, plays a pivotal role in enhancing prediction accuracy for Bitcoin prices. Its sequential learning approach allows the model to iteratively improve its understanding of complex patterns and dependencies present in historical data. This makes XG Boost particularly well-suited for capturing the dynamic nature of cryptocurrency prices, which are influenced by a myriad of factors ranging from market sentiment to macroeconomic trends.

The power of XG Boost lies in its ability to handle non-linear relationships efficiently. By combining the predictions of multiple weak learners, or decision trees, XG Boost constructs a robust and accurate predictive model. This makes it a valuable asset in the toolkit for forecasting Bitcoin prices, where subtle and evolving patterns often define market trends.

4.3 K-Nearest Neighbours (KNN):

K-Nearest Neighbours (KNN) is employed as a proximity-based algorithm in this project, leveraging historical patterns to predict future Bitcoin values. Unlike some other models, KNN takes into account the closeness of data points, introducing a context-aware approach to cryptocurrency price forecasting.

KNN operates on the principle that data points with similar features are likely to have similar outcomes. In the context of predicting Bitcoin prices, this means considering the influence of neighbouring data points. By identifying and incorporating the patterns of nearby instances, KNN contributes to a more localized and adaptive predictive model.

In summary, the combined use of SVM, XG Boost, and KNN offers a well-rounded and diverse approach to predicting Bitcoin prices. Each model brings its own set of strengths—SVM excels in discerning intricate patterns, XG Boost sequentially improves accuracy through gradient boosting, and KNN introduces a context-aware, proximity-based perspective. The integration of these models contributes to a comprehensive and robust framework for understanding and forecasting the dynamic nature of cryptocurrency markets.

Chapter 05

Results & Discussion

5.1 SVM:

The Support Vector Machine (SVM) model, incorporating the Radial Basis Function (RBF) kernel, demonstrates notable success in predicting Bitcoin prices. The Root Mean Squared Error (RMSE) of 3440.1560 signifies the model's efficacy in capturing non-linear trends within the cryptocurrency market. The SVM model's ability to navigate intricate patterns in Bitcoin price data positions it as a robust choice for investors and analysts seeking accurate predictions in this dynamic environment.

5.2 XG Boost:

XG Boost, a powerful gradient boosting algorithm, exhibits a respectable performance in enhancing prediction accuracy, albeit with a slightly higher error compared to SVM. The RMSE of 5831.6408 indicates the model's ability to sequentially improve its understanding of complex patterns and dependencies within historical Bitcoin data. Despite the higher error rate, XG Boost remains a valuable asset for its efficiency in capturing the evolving nature of cryptocurrency prices, providing insights that can inform strategic decision-making.

5.3 KNN:

K-Nearest Neighbours (KNN), employed as a proximity-based algorithm, achieves an RMSE of 4538.8518. This result emphasizes KNN's context-aware prediction capabilities, considering the influence of neighbouring data points on Bitcoin price movements. While KNN demonstrates effectiveness, its performance falls between SVM and XG Boost. The RMSE suggests that KNN captures the dynamic nature of the cryptocurrency market, offering a balance between accuracy and contextual sensitivity.

Chapter 06

Conclusion & Future Scope

In conclusion, the comparative analysis of SVM, XG Boost, and KNN models reveals the nuanced landscape of predicting Bitcoin prices through machine learning. The SVM model, leveraging the RBF kernel, emerges as the most accurate predictor among the three, showcasing its prowess in capturing non-linear patterns. XG Boost, while yielding a higher error rate, contributes valuable insights into the evolving complexities of cryptocurrency markets, demonstrating its importance in a diversified modelling approach.

The results underscore the inherent challenges of predicting cryptocurrency prices and emphasize the significance of employing a combination of models to achieve a comprehensive analysis. Each model brings unique strengths to the table—SVM excels in discerning intricate patterns, XG Boost sequentially refines accuracy, and KNN introduces a context-aware perspective.

While the SVM model stands out in terms of accuracy, the higher error rates of XG Boost and KNN suggest that there is room for improvement and fine-tuning of parameters. Ongoing research and optimization efforts can potentially enhance the predictive capabilities of these models, providing investors and analysts with even more reliable tools for navigating the unpredictable cryptocurrency market.

The Stream lit web application, incorporating moving averages and key indicators, offers a user-friendly interface for exploring Bitcoin price predictions. This interactive platform enhances accessibility, allowing stakeholders in the cryptocurrency space to make informed decisions based on the insights provided by the machine learning models.

Future Scope

1. Model Optimization: Fine-tune model parameters and explore hyperparameter tuning for XG Boost and KNN to enhance prediction accuracy.
2. Ensemble Methods: Investigate the effectiveness of ensemble methods for combining predictions from multiple models to create a more robust forecasting approach.
3. Feature Expansion: Explore the inclusion of additional features, such as sentiment analysis from news and social media, to capture external factors influencing cryptocurrency prices.
4. Real-time Prediction: Develop models capable of real-time prediction to adapt to rapidly changing cryptocurrency market conditions.5
5. Blockchain Integration: Investigate integrating blockchain technology for enhanced data transparency and security in collecting and storing cryptocurrency market data.
6. User Interface Enhancements: Improve the user interface of the Streamlit web application, making it more interactive and customizable for users.

Chapter 07

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