

Bitcoin Price Predictor – Project Report

Project Details

- **Project Title:** Bitcoin Price Predictor
- **Class:** TY IT 02
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1. Introduction

Bitcoin is one of the most well-known cryptocurrencies, with highly volatile price fluctuations. Predicting Bitcoin prices is a significant use case in financial technology (fintech), as it can guide investors and traders in decision-making. This project aims to create a web-based application that leverages machine learning to predict Bitcoin prices based on historical data.

The application is built using Python and integrates machine learning models with an interactive web interface developed using Streamlit. The model uses technical indicators like moving averages and daily returns to predict future prices, including the next day and up to 30 days ahead.

2. Objective

- To build a machine learning model that can predict Bitcoin prices using historical data.
- To use essential financial indicators to enhance model accuracy.
- To design an interactive dashboard that allows users to:
 - Select a date range for analysis.
 - Visualize historical data.
 - Get predictions for the next day and the following 30 days.
- To display model performance using metrics like Mean Squared Error (MSE) and R^2 score.

3. Technology Stack

Component	Tool/Library
Programming Language	Python
Data Source	Yahoo Finance (yfinance)
Machine Learning	scikit-learn
Data Handling	pandas, numpy
Visualization	Plotly
Web Interface	Streamlit

4. Project Structure

```
Bitcoin-Price-Predictor--main/
├── app.py                    # Streamlit UI code
├── utils/
│   ├── data_handler.py      # Data fetching and
│   │                       preprocessing
│   └── model.py             # Model training and prediction
├── logic
└── requirements.txt         # Required Python libraries
```

5. Data Collection and Preprocessing

Data Source

The historical data is collected using the [yfinance](#) API. It fetches real-time Bitcoin price data using the ticker symbol [BTC-USD](#).

Features Extracted:

- **Close:** Closing price of Bitcoin

- **MA7:** 7-day Moving Average [YouTube+7Lifewire+7Lifewire+7](#)
- **MA30:** 30-day Moving Average
- **Daily_Return:** Percentage change from the previous day

Preprocessing Steps

1. Fetch data within the selected date range.
2. Create technical indicators (MA7, MA30, Daily Return).
3. Handle missing values by dropping rows with NaNs (mainly due to moving average and shifting operations).
4. Create a feature matrix **X** and a target vector **y** using historical trends.

6. Model Building

Model Used:

- **Linear Regression:** A simple regression model used to establish the relationship between the dependent variable (Bitcoin Price) and independent variables (technical indicators).

• Features Used

- Previous Day's Closing Price
- 7-day Moving Average (MA7)
- 30-day Moving Average (MA30)
- Daily Return

Data Splitting:

- 80% Training Data
- 20% Testing Data (time-based split, not randomized)

Training:

- Fit a linear regression model using the training dataset.

Predictions:

- Generate predictions for the test dataset.
- Predict next day's price using the most recent data.
- Predict 30-day prices recursively.

Metrics:

- **R² Score**: Measures how well future samples are likely to be predicted by the model. Score obtained: 0.9951
- **Mean Squared Error (MSE)**: Average squared difference between predicted and actual values. MSE obtained: 178431.78

7. Streamlit Dashboard

Features:

- **Sidebar Controls**: Date picker for selecting start and end dates.
- **Data Display**: Raw data preview with candlestick chart using Plotly.
- **Model Training & Prediction**: Trains model and displays: [Reddit+1Canva+1](#)

- Next Day Prediction
 - R^2 Score
 - MSE [WIRED](#)
- **Graphs:**
 - Actual vs Predicted Prices
 - 30-Day Future Prediction
 - **Feature Description:** Educates users on the indicators used in prediction.

8.Evaluation Metrics

In any machine learning project, evaluating the model's performance is essential to ensure that the predictions are accurate and reliable. In this Bitcoin Price Predictor project, two primary evaluation metrics were used to assess the performance of the linear regression model:

1. R^2 Score (Coefficient of Determination)

The R^2 score is a statistical measure that explains how well the regression model captures the variation in the actual data. It ranges from 0 to 1, where:

- A score close to 1 indicates that the model is highly accurate and explains a large portion of the variability in the data.
- A score closer to 0 means the model fails to explain the variability and is not reliable.

In this project, the model achieved a high R^2 score, which suggests that the model effectively understands the trends in Bitcoin prices and produces trustworthy predictions.

2. Mean Squared Error (MSE)

Mean Squared Error is used to measure the average squared difference between the actual prices and the predicted prices. It provides a clear understanding of how far off the predictions are from real values.

- A smaller MSE value indicates that the predictions are very close to the actual prices.
- A larger MSE means the model is making larger errors in its predictions.

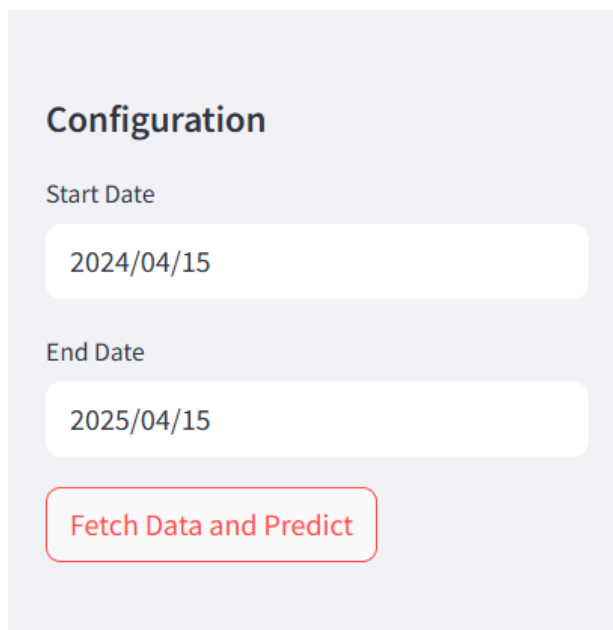
In this case, the MSE value is relatively low when considering the scale of Bitcoin prices, which shows that the model performs well in minimizing prediction errors.

3. Next Day Prediction

The model also provides a next-day price prediction based on the latest available data. This is a practical application of the trained model, giving users a forecast for the immediate future. The predicted price serves as a helpful tool for short-term investment insights.

Working Model

GitHub Repo: <https://github.com/PratikModi22/Bitcoin-Price-Predictor.git>



The image shows a web interface for configuring the Bitcoin Price Predictor. It has a light blue background. At the top, the word "Configuration" is written in bold black text. Below it, there are two input fields. The first is labeled "Start Date" and contains the text "2024/04/15". The second is labeled "End Date" and contains the text "2025/04/15". At the bottom of the configuration area, there is a red button with the text "Fetch Data and Predict" in white.



Bitcoin Price Predictor

This application predicts Bitcoin prices using linear regression based on historical data. Select a date range to analyze and predict future prices.

Historical Bitcoin Data

Date	Open	High	Low	Close	Volume	Dividends	Stock Splits	MA7	MA30	Daily_Return
2025-04-11 00:00:00+00:00	79625.0469	84247.4766	78936.3203	83404.8359	41656778779	0	0	80404.5	83400.6701	0.0475
2025-04-12 00:00:00+00:00	83404.5156	85856.1875	82769.375	85287.1094	24258059104	0	0	80659.1161	83541.3503	0.0226
2025-04-13 00:00:00+00:00	85279.4688	86015.1875	83027.0078	83684.9766	28796984817	0	0	81440.615	83531.8794	-0.0188
2025-04-14 00:00:00+00:00	83694.5234	85785	83690.6406	84542.3906	34090769777	0	0	82198.7656	83538.5221	0.0102
2025-04-15 00:00:00+00:00	84561.3438	85955.7031	84366.1719	85567.8047	29246199808	0	0	83526.7444	83638.126	0.0121

Bitcoin Price History



Next Day Prediction

\$86,377.37

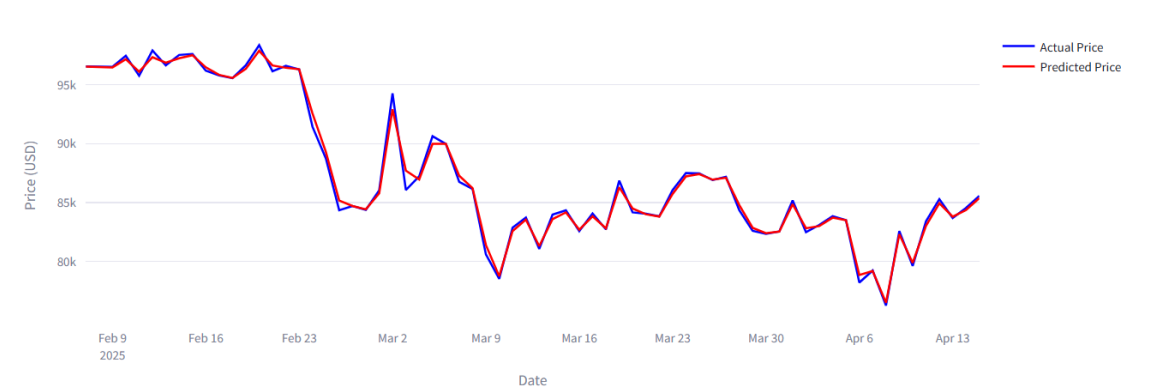
Model R² Score

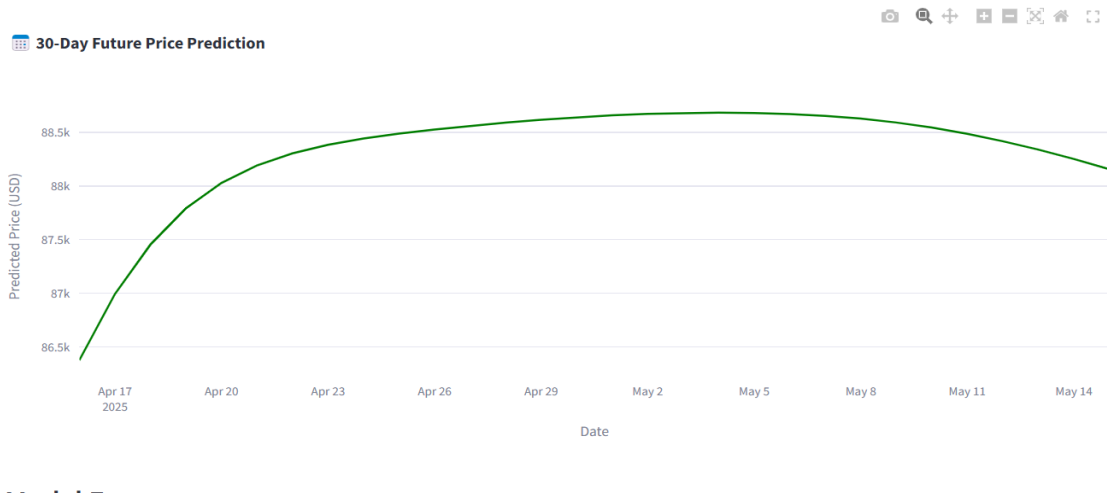
0.9951

Mean Squared Error

178168.59

Actual vs Predicted Prices





Conclusion

The Bitcoin Price Predictor project successfully demonstrates the application of linear regression in forecasting cryptocurrency prices. The evaluation metrics used— R^2 Score and MSE confirm the accuracy and reliability of the model.

With a strong R^2 value and a reasonable MSE, the model proves to be effective in capturing market trends and providing insightful predictions. The 30-day future prediction, along with daily forecasts, offers practical utility for users interested in understanding price movements.

This project showcases how data-driven tools can empower users with predictive insights into volatile markets like cryptocurrency, and it serves as a solid foundation for further enhancements using more complex models in the future.