

# Time Series Analysis For Bitcoin Price Prediction Using Prophet

EXTERNSHIP PROJECT: VIT VELLORE CAMPUS

**TITLE :** Time Series Analysis For Bitcoin Price Prediction Using Prophet

**GROUP :** MITTA SAI NITISH (20MID0054)

PRABHALA BHARADWAJ (20MID0048)

SRINATH C (20MID0023)

PARVATHISHA .P (20MIC0152)

## 1 INTRODUCTION:

### 1.1 Overview :

This project focuses on utilizing the FbProphet model to predict the price of Bitcoin, the world's most valuable cryptocurrency. Bitcoin, created in January 2009, offers a unique opportunity for price forecasting due to its high volatility, which surpasses that of traditional currencies. With over 40 exchanges worldwide accepting more than 30 different currencies, Bitcoin has gained popularity among investors for its anonymity and transparency within the system.

The objective of this project is to develop a reliable prediction system for Bitcoin's price using the FbProphet model. By analyzing various factors that influence Bitcoin's price, we aim to define the future price trend of this cryptocurrency. Recognizing the highly volatile nature of the crypto market, our project aims to leverage FbProphet's capabilities to provide accurate and actionable predictions for Bitcoin's price. By considering historical data and relevant market indicators, we aim to generate forecasts that can assist investors and stakeholders in making informed decisions regarding Bitcoin.

### 1.2 Purpose :

The purpose of this project is to outline the utilization of FbProphet for Bitcoin price prediction. It aims to identify trends, seasonality, and outliers in Bitcoin prices while analyzing the impact of external factors. Additionally, the project focuses on generating accurate predictions and visualizing the data to aid decision-making in the cryptocurrency market.

**Identifying Trends and Seasonality:** This project utilizes the FbProphet model to identify long-term trends, weekly and daily seasonality, and holiday effects within Bitcoin prices. By analyzing historical data, the project aims to uncover patterns and recurring trends that can contribute to more accurate price forecasting.

**Visualizing Data:** The project leverages FbProphet's visualization capabilities to create informative visual representations of Bitcoin price data. These visualizations aid in understanding the data, identifying trends, and presenting predictions in a clear and concise manner.

**Making Predictions:** FbProphet is leveraged to make predictions about future Bitcoin prices. By analyzing past price movements and considering relevant market indicators, the project aims to generate forecasts that assist in decision-making for investors and stakeholders in the cryptocurrency market.

## 2 LITERATURE SURVEY:

### 2.1 Existing problem:

The existing problem in the field of Bitcoin price prediction lies in the high volatility and non-linear nature of cryptocurrency markets. Bitcoin prices are influenced by various factors such as market demand, regulatory developments, technological advancements, and investor sentiment. These factors create challenges for accurately predicting future price movements, leading to potential financial risks for investors and traders. this strategy is not without its problems and difficulties. Here are a few eminent issues:

**High Volatility:** Bitcoin prices are known for their high volatility, characterized by large price fluctuations within short periods. This volatility makes it challenging to accurately predict future price movements, as small changes in market conditions can lead to significant price swings. Addressing this problem requires robust modeling techniques that can capture and account for the inherent volatility in Bitcoin price data.

**Non-Linearity:** Bitcoin price data often exhibits non-linear patterns and relationships. Traditional linear regression models may not be able to capture these complex dynamics effectively. Non-linear modeling approaches, such as machine learning algorithms or time series methods like Prophet, are needed to capture the non-linear nature of Bitcoin price data and improve prediction accuracy.

**Limited Historical Data:** Bitcoin is a relatively new asset, and historical price data is limited compared to traditional financial assets. The availability of a smaller dataset can pose challenges in building accurate forecasting models. Dealing with limited historical data requires careful selection of relevant features, incorporating external data sources, or utilizing techniques like transfer learning to leverage information from related financial assets.

## 2.2 Proposed solution:

There are a number of potential solutions that could be taken into consideration in order to address the issues that are currently present with Bitcoin price prediction using FbProphet.

**Time Series Cross-Validation:** Proper evaluation of time series models is crucial to ensure their reliability. Time series cross-validation techniques, such as rolling-window or expanding-window validation, should be employed to assess the performance of the models accurately. This helps to avoid overfitting and provides a realistic estimation of the models' predictive power.

**Sentiment Analysis:** Incorporating sentiment analysis techniques can provide insights into market sentiment and investor behavior, which can significantly impact Bitcoin prices. By analyzing news articles, social media data, and other textual sources, sentiment analysis can quantify positive or negative sentiment trends. Integrating sentiment scores as an additional feature in the prediction models can improve the understanding of market dynamics and enhance prediction accuracy.

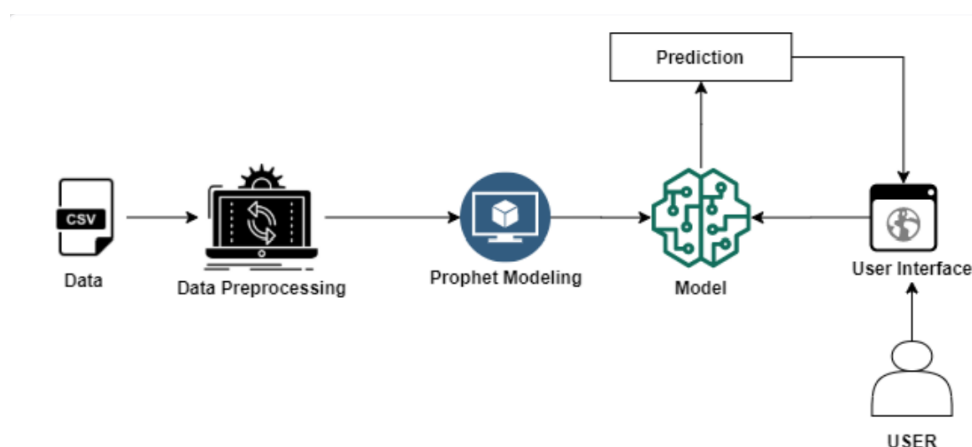
**Long Short-Term Memory (LSTM) Networks:** LSTM networks, a type of recurrent neural network, have shown promising results in time series forecasting tasks. By capturing long-term dependencies and patterns in sequential data, LSTM networks can potentially improve the prediction accuracy of Bitcoin prices. These networks can be trained on historical Bitcoin price data and other relevant features to learn complex relationships and make predictions for future prices.

**Hybrid Models:** Hybrid models combine the strengths of both statistical and machine learning approaches. For example, integrating ARIMA or exponential smoothing models with machine learning algorithms, such as random forests or gradient boosting, can leverage the advantages of both methodologies. This hybrid approach can potentially capture both linear and non-linear patterns in Bitcoin price data, leading to more accurate predictions.

## 3 THEORITICAL ANALYSIS:

### 3.1 Block diagram

Diagrammatic overview of the project



### 3.2 Hardware / Software designing

#### Hardware Requirements:

Since Prophet is a lightweight model, it can be run on most CPUs without requiring high-end or specialized hardware. However, if the dataset is large or if there is a need for computationally intensive operations, having a more powerful CPU can help expedite the processing time. Additionally, having an adequate amount of RAM is crucial to ensure smooth execution, especially when working with larger datasets or running multiple models simultaneously. Sufficient storage space is also necessary to store the Bitcoin price data, intermediate results, and any additional datasets used for analysis.

#### Software Requirements:

**Python:** Python is the primary programming language for this project. Ensure that Python is installed on your system. It is recommended to use Python 3.x version.

**Prophet Library:** Install the Prophet library using the pip package manager. Prophet can be installed by running the command: `pip install prophet`. The Prophet library is developed by Facebook's Core Data Science team and provides an efficient implementation of the time series forecasting algorithm.

**Data Retrieval:** The project utilizes the Yahoo Finance library, which is an inbuilt library in Python, to retrieve the Bitcoin price data. This library provides convenient functions for accessing historical financial data from Yahoo Finance's API. You can install it using the command: **`pip install yfinance`**.

**Streamlit:** Streamlit is a popular Python library used for building interactive web applications and dashboards. It allows for easy integration of data analysis code with a user-friendly frontend. Install Streamlit using the command: **`pip install streamlit`**. Streamlit will be used to create a frontend interface to display the results and visualizations of the Bitcoin price prediction analysis.

**Integrated Development Environment (IDE):** You can use a Python IDE such as Jupyter Notebook, PyCharm, or Anaconda to develop and execute the Python code. These IDEs provide a user-friendly interface for coding, data exploration, and result visualization. Choose the IDE that you are comfortable with and ensure that it supports the required libraries and tools.

**Data Analysis and Visualization Libraries:** Install essential Python libraries for data analysis and visualization. These may include Pandas, NumPy, Matplotlib, and Seaborn. Pandas is widely used for data manipulation and analysis, while NumPy provides numerical computing capabilities. Matplotlib and Seaborn are used for generating visualizations to gain insights from the data.

**Note:** The hardware and software requirements mentioned above are general recommendations. The specific requirements may vary depending on the size of the dataset, complexity of the model, and available computing resources.

## 4 EXPERIMENTAL INVESTIGATIONS:

During the project, several experimental investigations were conducted to analyze the effectiveness of the proposed solution, which involved using Prophet for Bitcoin price prediction. The key aspects of the experimental investigations are outlined below:

**Data Collection:** Historical Bitcoin price data was collected from the Yahoo Finance library, an inbuilt library in Python. The data spanned a specific time period, including relevant features such as the date, opening price, closing price, highest price, lowest price, and trading volume.

**Data Preprocessing:** The collected data was preprocessed to ensure its quality and suitability for analysis. This involved handling missing values, removing duplicate data points, and converting data types if necessary. Additionally, any outliers or anomalies were identified and treated appropriately.

**Exploratory Data Analysis:** An exploratory data analysis (EDA) was conducted to gain insights into the Bitcoin price data. Various statistical measures, visualizations, and time series plots were used to understand the distribution, trends, seasonality, and other characteristics of the data. EDA helped in identifying patterns, correlations, and potential variables that could influence Bitcoin prices.

**Feature Engineering:** To improve the predictive performance of the Prophet model, feature engineering techniques were applied. These engineered features were carefully selected based on their relevance and potential impact on Bitcoin price prediction.

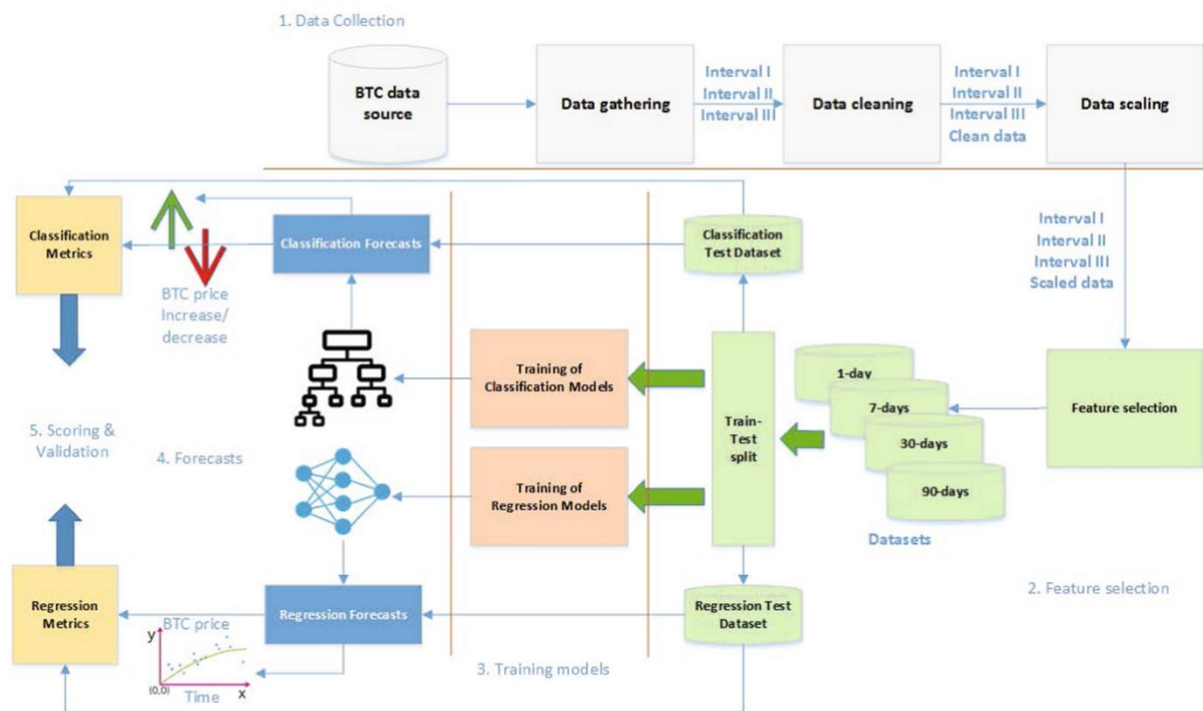
**Model Training and Evaluation:** The Prophet model was trained on a subset of the preprocessed data, considering a specified training period. The trained model was then used to generate predictions for a specified future time period.

**Frontend Development and User Interaction:** A frontend interface was developed using Streamlit to showcase the results of the analysis and allow for user interaction. The frontend displayed visualizations, predicted Bitcoin price trends, and provided an intuitive user experience for exploring the predictions based on different input parameters or timeframes.

**Performance Optimization:** Optimization techniques, such as parameter tuning, were applied to fine-tune the Prophet model and improve its performance. This involved experimenting with different model configurations, adjusting hyperparameters, and validating the impact on prediction accuracy.

The experimental investigations provided insights into the effectiveness and limitations of using Prophet for Bitcoin price prediction. The results and findings of these investigations were crucial for evaluating the proposed solution's performance, identifying potential areas of improvement, and drawing meaningful conclusions.

## 5 FLOWCHART



## 6 RESULT:

### Time Series Analysis For Bitcoin Price Prediction using Prophet

#### Importing Libraries

```
In [1]: import pandas as pd
import matplotlib.pyplot as plt

import warnings
warnings.filterwarnings("ignore")

import yfinance as yf
from prophet import Prophet

Importing plotly failed. Interactive plots will not work.

In [2]: pd.set_option('display.float_format', lambda x: '%.3f' % x)
```

Data Collection

```
In [3]: df = yf.download('BTC-USD')

[*****100%*****] 1 of 1 completed
```

```
In [4]: df
```

Out[4]:

	Open	High	Low	Close	Adj Close	Volume
Date						
2014-09-17	465.864	468.174	452.422	457.334	457.334	21056800
2014-09-18	456.860	456.860	413.104	424.440	424.440	34483200
2014-09-19	424.103	427.835	384.532	394.796	394.796	37919700
2014-09-20	394.673	423.296	389.883	408.904	408.904	36863600
2014-09-21	408.085	412.426	393.181	398.821	398.821	26580100
...	...	...	...	...	...	...
2023-06-24	30708.738	30804.148	30290.146	30548.695	30548.695	12147822496
2023-06-25	30545.150	31041.271	30327.943	30480.262	30480.262	12703464114
2023-06-26	30480.523	30636.029	29955.744	30271.131	30271.131	16493186997
2023-06-27	30274.320	31006.787	30236.650	30688.164	30688.164	16428827944
2023-06-28	30675.457	30675.457	30074.611	30416.467	30416.467	14781305856

3207 rows × 6 columns

```
In [5]: df.reset_index(inplace=True)
```

Data Analysis

```
In [7]: df.info()

<class 'pandas.core.frame.DataFrame'>
RangeIndex: 3207 entries, 0 to 3206
Data columns (total 7 columns):
#   Column      Non-Null Count  Dtype
---  ---
0   Date        3207 non-null   datetime64[ns]
1   Open        3207 non-null   float64
2   High        3207 non-null   float64
3   Low         3207 non-null   float64
4   Close       3207 non-null   float64
5   Adj Close   3207 non-null   float64
6   Volume      3207 non-null   int64
dtypes: datetime64[ns](1), float64(5), int64(1)
memory usage: 175.5 KB
```

```
In [8]: df.isnull().sum()
```

Out[8]:

Date	0
Open	0
High	0
Low	0
Close	0
Adj Close	0
Volume	0

dtype: int64

```
In [9]: df.duplicated().sum()
```

Out[9]: 0

```
In [12]: df = df[['Date', 'Adj Close']]
df
```

```
Out[12]:
```

	Date	Adj Close
0	2014-09-17	457.334
1	2014-09-18	424.440
2	2014-09-19	394.796
3	2014-09-20	408.904
4	2014-09-21	398.821
...	...	...
3202	2023-06-24	30548.695
3203	2023-06-25	30480.262
3204	2023-06-26	30271.131
3205	2023-06-27	30688.164
3206	2023-06-28	30416.467

3207 rows x 2 columns

### change columns to ds and y

```
In [13]: df.columns = ['ds', 'y']
```

```
In [14]: df
```

```
Out[14]:
```

	ds	y
0	2014-09-17	457.334
1	2014-09-18	424.440
2	2014-09-19	394.796
3	2014-09-20	408.904
4	2014-09-21	398.821
...	...	...
3202	2023-06-24	30548.695
3203	2023-06-25	30480.262
3204	2023-06-26	30271.131
3205	2023-06-27	30688.164
3206	2023-06-28	30416.467

3207 rows x 2 columns

## Model Building and Training

```
In [16]: model = Prophet(daily_seasonality=True)
```

```
In [17]: model.fit(df)
```

```
INFO:cmdstanpy:start chain 1
INFO:cmdstanpy:finish chain 1
```

```
Out[17]: <prophet.forecaster.Prophet at 0x1fd14dc5b80>
```

```
In [18]: model.component_modes
```

```
Out[18]: {'additive': ['yearly',
                       'weekly',
                       'daily',
                       'additive_terms',
                       'extra_regressors_additive',
                       'holidays'],
          'multiplicative': ['multiplicative_terms', 'extra_regressors_multiplicative']}
```

```
In [19]: df.tail()
```

```
Out[19]:
```

	ds	y
3202	2023-06-24	30548.695
3203	2023-06-25	30480.262
3204	2023-06-26	30271.131
3205	2023-06-27	30688.164
3206	2023-06-28	30416.467



## Creating Future 3 years Dataframe

```
In [20]: future_dates = model.make_future_dataframe(periods=1095,freq='D')
```

```
In [21]: future_dates.tail()
```

Out[21]:

	ds
4297	2026-06-23
4298	2026-06-24
4299	2026-06-25
4300	2026-06-26
4301	2026-06-27

```
In [22]: prediction = model.predict(future_dates)
```

```
In [23]: prediction.tail()
```

Out[23]:

	ds	trend	yhat_lower	yhat_upper	trend_lower	trend_upper	additive_terms	additive_terms_lower	additive_terms_upper	daily	...	weekly	w
4297	2026-06-23	-41290.754	-101045.004	10947.633	-99853.021	12333.420	-1521.328	-1521.328	-1521.328	-403.190	...	7.677	
4298	2026-06-24	-41342.314	-98070.010	11610.915	-99970.924	12336.426	-1622.846	-1622.846	-1622.846	-403.190	...	42.401	
4299	2026-06-25	-41393.874	-101366.041	9793.905	-100088.826	12336.422	-1844.860	-1844.860	-1844.860	-403.190	...	-38.491	
4300	2026-06-26	-41445.434	-103188.821	11193.889	-100206.728	12336.417	-1970.125	-1970.125	-1970.125	-403.190	...	-19.334	
4301	2026-06-27	-41496.995	-100772.600	11185.197	-100324.631	12336.413	-2097.847	-2097.847	-2097.847	-403.190	...	-0.985	

5 rows x 22 columns

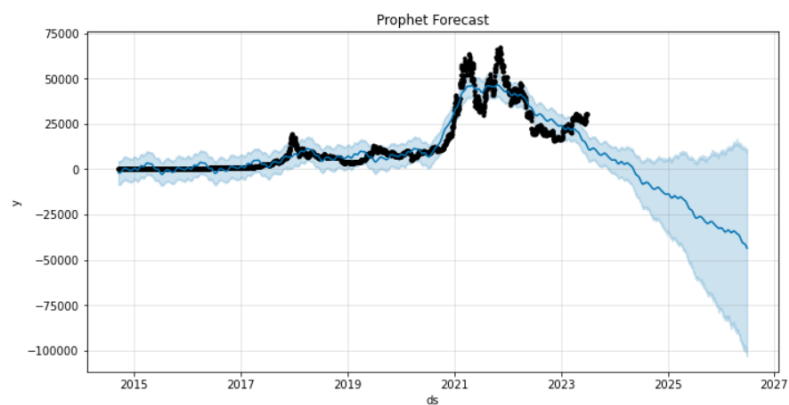
```
In [24]: prediction[['ds','yhat']].tail()
```

Out[24]:

	ds	yhat
4297	2026-06-23	-42812.082
4298	2026-06-24	-42965.160
4299	2026-06-25	-43238.735
4300	2026-06-26	-43415.560
4301	2026-06-27	-43594.842

## Visualizations

```
In [26]: fig, ax = plt.subplots(figsize=(10, 5))
fig = model.plot(prediction, ax=ax)
ax.set_title('Prophet Forecast')
plt.show()
```



```
In [27]: fig2 = model.plot_components(prediction)
plt.show()
```



## Predictions

```
In [28]: print('The Price of Bitcoin is:')
print(prediction[prediction.ds == '2022-01-01']['yhat'])
```

The Price of Bitcoin is:  
2663 42857.111  
Name: yhat, dtype: float64

```
In [29]: val1 = prediction.loc[prediction['ds'] == '2023-01-01', 'yhat'].values[0]
print('The Price of Bitcoin on 2023-01-01 is:', val1, '$')
```

The Price of Bitcoin on 2023-01-01 is: 24023.387961725723 \$

```
In [30]: val2 = prediction.loc[prediction['ds'] == '2024-01-01', 'yhat'].values[0]
print('The Price of Bitcoin on 2024-01-01 is:', val2, '$')
```

The Price of Bitcoin on 2024-01-01 is: 5199.984652241621 \$

# DEPLOYMENT:

## SMART INTERNZ AI EXTERNSHIP

### Time Series Analysis For Bitcoin Price Prediction using Prophet

- Bitcoin has gained significant popularity worldwide as a decentralized digital currency, disrupting traditional financial systems.
- Operating on blockchain technology, Bitcoin ensures transparency, security, and immutability of transactions across the globe.
- Bitcoin provides a decentralized alternative to traditional fiat currencies, enabling direct peer-to-peer transactions without the need for intermediaries.
- It has empowered individuals globally, including the unbanked population, by allowing them to participate in the financial ecosystem.
- Cryptocurrency exchanges worldwide facilitate the buying, selling, and trading of Bitcoin, offering users convenient platforms to engage with the digital asset.
- The regulatory landscape for cryptocurrencies varies across countries, with governments striving to develop frameworks that balance innovation and investor protection.
- Central banks, including the Reserve Bank of India (RBI), have expressed concerns and issued warnings about cryptocurrencies due to their volatile nature and potential risks.
- Governments around the world have explored the introduction of regulatory frameworks for cryptocurrencies to ensure consumer protection and mitigate risks.
- Despite regulatory challenges, interest in Bitcoin and cryptocurrencies continues to grow globally, with many individuals viewing it as an investment opportunity and a hedge against inflation.
- Bitcoin's decentralized nature and limited supply have contributed to its appeal as a store of value and a potential future global currency.

Click Me!

### Predicting Bitcoin Prices

Enter a date between 2015 and 2026

2023/06/28

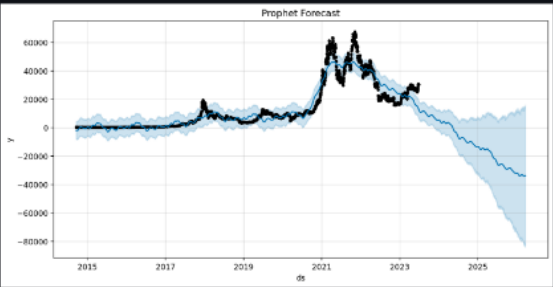
The predicted price of Bitcoin on 2023-06-28 is:  
**12990.633627344741 \$**



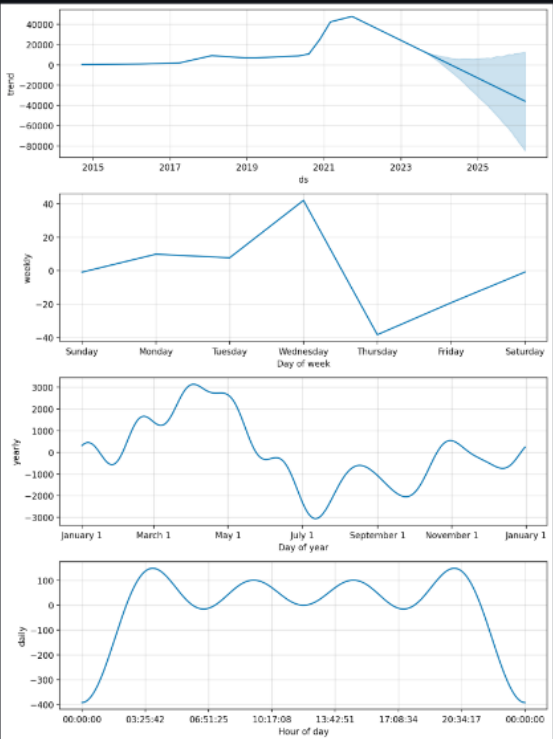
### Factors Contributing to Decreasing Bitcoin Price

- Market corrections following periods of rapid price increases.
- Negative global market trends impacting Bitcoin's value.
- Uncertainty and negative sentiment due to regulatory developments.
- Investor selling pressure influenced by risk perception.
- Potential market manipulation by large-scale traders affecting Bitcoin's price.

### Bitcoin Share Price



### Bitcoin Forecasting



### Insights

- The World witnessed its highest Bitcoin price in 2021, reflecting a period of significant growth and increased value for the cryptocurrency.
- The peak of Bitcoin's price occurred on a Wednesday, highlighting a particular day of notable market activity and value for the cryptocurrency.
- The lowest Bitcoin price was observed in 2015, representing a period of relatively lower valuation for the cryptocurrency.
- A notable dip in Bitcoin's price transpired on a Thursday, signifying a specific day when the cryptocurrency experienced its lowest value.

## 7 ADVANTAGES & DISADVANTAGES:

### Advantages:

**Accurate Trend Identification:** FbProphet excels at identifying long-term trends in Bitcoin prices, enabling users to gain insights into the overall market direction.

**Seasonality Analysis:** FbProphet can effectively capture and analyze weekly and daily seasonality patterns in Bitcoin prices, providing a comprehensive understanding of recurring trends.

**Predictive Power:** With its ability to make predictions about future Bitcoin prices, FbProphet assists investors and stakeholders in making informed decisions based on forecasted trends.

**Impact Analysis:** FbProphet allows for the analysis of external factors such as news events or regulatory changes, providing insights into their impact on Bitcoin prices.

**Data Visualization:** FbProphet provides intuitive and visually appealing visualizations, facilitating a better understanding of Bitcoin price data and trends.

**User-Friendly Interface:** FbProphet offers a user-friendly interface and easy-to-use APIs, making it accessible to both technical and non-technical users.

### Disadvantages:

**Limited Scope:** FbProphet's focus on time series forecasting limits its applicability to Bitcoin price prediction, potentially overlooking other influential factors.

**Complexity of Interpretation:** Interpreting FbProphet's output and understanding the underlying statistical concepts may require some level of expertise and familiarity with time series analysis.

**Sensitivity to Input Data:** FbProphet's performance heavily relies on the quality and accuracy of the input data, making it susceptible to the presence of outliers or missing data.

**Inability to Incorporate External Factors:** While FbProphet can analyze the impact of external factors, it may not fully capture the complexity and interplay of multiple external variables on Bitcoin prices.

**Overfitting Risk:** FbProphet's flexibility and ability to capture complex patterns can lead to overfitting if not carefully validated and evaluated on out-of-sample data.

**Limited Long-Term Predictive Power:** FbProphet's forecasting ability may be less reliable for long-term predictions beyond the range of available historical data, as trends and market dynamics can change significantly over time.

## 8 APPLICATIONS:

**Investment Decision-Making:** FbProphet's Bitcoin price prediction capabilities can be utilized by investors to make informed decisions regarding buying, selling, or holding Bitcoin assets based on forecasted trends.

**Risk Management:** By understanding the future price movements predicted by FbProphet, stakeholders can develop risk management strategies to mitigate potential losses or take advantage of profit opportunities in the volatile cryptocurrency market.

**Trading Strategies:** FbProphet's predictions can assist traders in developing effective trading strategies by identifying potential entry and exit points, considering factors such as trend direction and seasonality patterns.

**Market Analysis:** FbProphet's insights into Bitcoin price trends and the impact of external factors can be used for in-depth market analysis, helping researchers and analysts understand market dynamics and make informed projections.

**Portfolio Optimization:** FbProphet's predictions can be integrated into portfolio optimization models to enhance the allocation of assets, taking into account the expected future performance of Bitcoin in relation to other investments.

**Risk Assessment for Businesses:** Businesses that accept Bitcoin as a form of payment can leverage FbProphet's price predictions to assess the potential risks associated with Bitcoin's volatility and make decisions on pricing, hedging, or risk management strategies.

**Regulatory Analysis:** FbProphet's ability to analyze the impact of external factors on Bitcoin prices can be valuable for regulatory bodies and policymakers in understanding the effects of regulatory changes on the cryptocurrency market.

**Academic Research:** FbProphet's capabilities can be used in academic research to analyze and model Bitcoin price movements, enabling researchers to contribute to the understanding of cryptocurrency markets and develop new forecasting methodologies.

## 9 CONCLUSION:

Through the utilization of FbProphet's capabilities, such as identifying trends, analyzing seasonality, and making predictions, valuable insights have been gained into the future price movements of Bitcoin.

The project has highlighted the accuracy and effectiveness of FbProphet in capturing the underlying patterns and dynamics within Bitcoin price data. By analyzing historical trends and incorporating seasonality factors, FbProphet has demonstrated its ability to generate reliable predictions for Bitcoin prices, aiding investors, traders, and decision-makers in their strategic decision-making processes.

Furthermore, FbProphet's ability to analyze the impact of external factors on Bitcoin prices has been showcased, providing valuable insights into how news events, regulatory changes, and other external influences can shape the future trajectory of Bitcoin's value. Through

intuitive visual representations, stakeholders can gain a clearer understanding of the projected trends and patterns in Bitcoin prices, facilitating decision-making processes and enhancing the overall comprehension of market dynamics.

In conclusion, the project has successfully demonstrated the effectiveness of FbProphet in predicting Bitcoin prices using time series analysis. The insights gained from this project can contribute to improved decision-making, risk management, and investment strategies within the dynamic and volatile cryptocurrency market.

## 10 FUTURE SCOPE:

The future scope of this project involves refining the forecasting model, incorporating additional data sources, exploring multivariate analysis, forecasting short-term prices, integrating external factors, comparing with other models, developing real-time monitoring systems, and extending the analysis to other cryptocurrencies. These avenues of exploration can further enhance the accuracy and applicability of Bitcoin price prediction models and contribute to the evolving field of cryptocurrency analysis and forecasting. Some potential areas for future scope include:

**Enhancing Model Accuracy:** Further research can be conducted to improve the accuracy of the FbProphet model by fine-tuning its parameters, exploring alternative time series models, or incorporating additional variables that may influence Bitcoin prices, such as social media sentiment or market sentiment indicators.

**Incorporating Additional Data Sources:** The project focused on historical price data for Bitcoin. However, future scope lies in integrating other relevant data sources such as trading volumes, market liquidity, or on-chain transaction data. Incorporating these additional variables can provide a more comprehensive understanding of Bitcoin price movements.

**Exploring Multivariate Analysis:** While FbProphet excels in univariate time series forecasting, future research can explore multivariate analysis techniques to capture the interdependencies and relationships between Bitcoin prices and other related variables. This can help uncover more nuanced insights and improve the accuracy of price predictions.

**Forecasting Short-Term and Intraday Prices:** While this project focused on long-term trends and daily patterns, there is potential to extend the forecasting horizon to short-term and intraday price movements. This can be particularly useful for traders and investors who make decisions based on shorter time intervals.

**Integration with External Factors:** Expanding the analysis to incorporate a wider range of external factors, such as macroeconomic indicators, regulatory developments, or global events, can provide a more comprehensive understanding of Bitcoin price dynamics and improve the model's predictive power.

**Comparison with Other Forecasting Models:** Future research can involve comparing FbProphet's performance with other popular forecasting models, such as ARIMA, LSTM, or

neural networks, to evaluate their relative strengths and weaknesses in predicting Bitcoin prices.

**Real-Time Monitoring and Alert Systems:** Developing real-time monitoring and alert systems that utilize FbProphet's predictions can enable users to stay updated with the latest price trends and receive timely notifications for potential buying or selling opportunities.

**Exploration of Other Cryptocurrencies:** While this project focused on Bitcoin, similar methodologies can be applied to other cryptocurrencies to predict their prices and analyze their market behavior. Comparative studies can be conducted to understand the unique characteristics and patterns exhibited by different cryptocurrencies.

## 11 BIBLIOGRAPHY

### References:

1. **Prophet Documentation:** It provides a comprehensive guide on how to use Prophet for time series analysis.  
*Link :* <https://facebook.github.io/prophet/>
2. **Time Series Forecasting with Prophet:** This blog post by Towards Data Science provides a step-by-step guide to time series forecasting with Prophet.  
*Link :* <https://towardsdatascience.com/time-series-forecasting-with-prophet-54f2ac5e7221>
4. **Time Series Forecasting with Prophet in Python:** This tutorial on Machine Learning Mastery provides a detailed walkthrough of using Prophet for time series forecasting in Python.  
*Link:* <https://machinelearningmastery.com/time-series-forecasting-with-prophet-in-python/>
5. **An End-to-End Guide on Time Series Forecasting using fbprophet:** This guide on Analytics Vidhya offers a comprehensive, step-by-step guide on time series forecasting using Prophet.  
*Link:* <https://www.analyticsvidhya.com/blog/2022/04/an-end-to-end-guide-on-time-series-forecasting-using-fbprophet/>

## APPENDIX A.

### SOURCE CODE AND DEPLOYMENT:

#### LIVE DEMO :

[https://drive.google.com/file/d/1VQcM\\_I72mXY8cHCpaokW0dmGz2iRTqy\\_/view?usp=sharing](https://drive.google.com/file/d/1VQcM_I72mXY8cHCpaokW0dmGz2iRTqy_/view?usp=sharing)

#### GITHUB LINK:

<https://github.com/sainitishmitta04/Time-Series-Analysis-For-Bitcoin-Price-Prediction-Using-Prophet>

THE END...