# Project Report: Timeseries Bitcoin Price prediction using prophet ML Model

## Project Overview:

The Bitcoin Price Prediction project uses time-series forecasting and uses Facebook's Prophet for the prediction of Bitcoin prices. The YahooFinance API feeds actual data on Bitcoin prices and historical prices, and it constructs a model that better projects future price. This project makes it easier for investors, traders, and financial analysts to make appropriate decisions by providing the possible future price prediction by utilizing time-series techniques from the building of the model. The model, in the prediction, can be made available in the web application through Flask, where users can take it as they need real-time predictions.


***Project Team:***

**- Aaditya Pandey - Team Leader**

**- Samarth Kasalkar**

**- Bhuvaneshwari Pawar**

**- Kajal Halandar**


# Milestone 1: Project Initialization and Planning Phase

## Activity 1: Define the problem

**Problem statement**: With the situation around Bitcoin being highly volatile, predicting prices is very challenging. Additionally, external factors can influence cryptocurrency markets, creating additional strain. This project aims at the development of a time-series forecasting model using Prophet to provide future trends of prices of Bitcoins. This will help all the stakeholders make informed investment decisions as well as trading related to it..

**Activity 2: Project Proposal (Proposed Solution)**

**Proposed Solution**: The "Bitcoin Price Prediction with Prophet and YahooFinance" project makes a forecast based on historical data for the prices of Bitcoins in the near future. This solution will be accurate in its predictions by making use of the Prophet library, which is quite resilient against missing data and seasonal trends. This solution will take the open, close, high, and low price points from the dataset available in YahooFinance to train the model on these points to predict future prices.

## Activity 3: Schematic Preliminary Planning of the First Project

Objectives: Use Prophet's time-series forecasting feature to predict Bitcoin closing prices more accurately.
Design a web application that provides actionable insights for investors and financial analysts.

Scope: Make predictions of Bitcoin closing prices at a later date by using historical closing price data.

Interested Parties:Investors, traders, financial analysts, and cryptocurrency enthusiasts.

Timeline: Scheduled over 5 days: data collection, model training, and deployment.
Resources:

The access to YahooFinance API for Bitcoin price data, Prophet library for forecasting, and Flask for the web application's deployment.

## Milestone 2: Data Collection and Preprocessing Phase

## Activity 1: Data Collection Plan

Data Source: Historical price data of Bitcoins is acquired from YahooFinance that gives real-time and historical data about the fluctuations in Bitcoin's prices.

### Activity 2: Data Quality Assurance

Data Completeness: Check if the historical data contains all the necessary fields such as date, open, high, low, close, and volume.

Handling Missing Values: Prophet is built to handle missing values but will be cross-checked for accuracy.

### Activity 3: Data Exploration and Preprocessing

Exploratory and Pre-processing Strategy

Exploratory Data Analysis (EDA): Analyze Bitcoin price trends, identifying key price movements and market conditions.

Preprocessing workflow: Convert date-time data to a suitable format for Prophet, ensure that time intervals are uniform, and drop any extra columns.

## Milestone 3: Model Development Phase

### Activity 1: Feature Selection

**Key Feature Identification**:

- **Primary Feature**: The closing price of Bitcoin will be the central feature for price forecasting.
- **Secondary Features**: Open, high, low, and volume data could add additional predictive value.

### Activity 2: Model Selection

**Model Selection**:

- Prophet is selected as the primary model for forecasting due to its efficiency in handling time-series data, including daily seasonality and trend changes.

### Activity 3: Initial Model Training, Validation, and Evaluation

- **Model Training Approach**: The Prophet model will be trained on historical data collected from YahooFinance.
- **Evaluation Metrics**:

**- MAE (Mean Absolute Error)**: To assess prediction accuracy.

## Milestone 4: Model Optimization and Tuning Phase

### Activity 1: Hyperparameter Tuning

Optimization techniques like **Grid Search** will be applied to adjust key Prophet parameters:

- **Seasonality Mode**: Whether to use 'additive' or 'multiplicative' seasonality, depending on the data trend.
- **Changepoint Detection**: Adjust the flexibility of changepoints to capture sharp shifts in Bitcoin prices.

### Activity 2: Performance Metrics Comparison

**Comparison Report**: Compare performance before and after optimization using MAE and RMSE to ensure better prediction accuracy.

### Activity 3: Final Model Selection

Prophet will be the chosen model due to its capability to handle time-series trends and seasonal patterns in Bitcoin prices effectively.

## Milestone 5: Documentation and Project Files Submission

- Full project documentation, including the methodology, model details, and code explanations, will be provided.
- The Flask application will allow users to input specific dates to generate predicted Bitcoin prices.

## Milestone 6: Project Demonstration

A recorded video will showcase:

- **Project Summary**: Overview of the Bitcoin price prediction methodology and implementation.
- **Live Demo**: A walkthrough of the Flask application, displaying how users can interact with the prediction model and see price forecasts.
- **Key Insights and Recommendations**: Insight into the model's performance and future recommendations for improving the accuracy of predictions.

# Conclusion:

The **Bitcoin Price Prediction Using Prophet** project demonstrates the power of time-series forecasting in financial markets. With a user-friendly web application, this solution offers valuable insights to traders and investors looking to make data-driven decisions. The model's scalability ensures it can adapt to evolving market trends and handle real-world financial forecasting.