

# A New Approach for Crude Oil Price Prediction based on FBprophet

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**Abstract** - The volatility of crude oil market and its chain effects to the global economy augmented the interest and fear of individuals, public and private sectors. Earlier statistical and econometric methods used for prediction, offer good results when dealing with linear data. However, crude oil price series deals with high non linearity and irregular events. The continuous usage of statistical and econometric methods for crude oil price prediction might demonstrate demotions to the crude oil price prediction performance. Time series forecasting through combination of historical quantitative data with qualitative data from experts view and news is a remedy proposed to predict this.

A time series is a set of observations taken at specific time usually at equal intervals. ex-month, year, decade, etc.. It is used to predict the future value based on the previous observations. FBprophet is a procedure for forecasting time series data based on additive model where non linear trends are fit with yearly, weekly and daily seasonality plus holiday effects. It works best with time series forecasting that have strong seasonal effect and several seasons of historical data. It is robust to missing data and shifts in the trend and typically handles outliers well

**Key Words:** Crude oil, Prediction Model, Time series forecasting ,FBprophet, machine learning.

## 1.INTRODUCTION

The paper is based on the design and application of Crude Oil Price Prediction using FBprophet model. Crude oil is a natural fossil fuel found in geological formations beneath the earth's surface in fluid form. It has mostly been extracted by oil drilling, which comes after the numerous studies of structural geology, sedimentary basin analysis, and reservoir characterization. Crude oil is among the most important energy resources on earth. So far, it remains the world's leading fuel, with nearly 1/3rd of global energy consumption all over.

Crude oil prices are determined by different factors and it has a big impact on the global environment and even economy. Although crude oil prices were firm n

steady in early 2014, they fell sharply since mid 2014. In January 2016, the U.S. refiner acquisition cost for crude oil imports, as a proxy for world oil price, is only \$28.81 per barrel on an average, and the West Texas Intermediate (WTI) crude oil spot price, as the benchmark oil price in Northern America, is only \$31.68 per barrel on average. The prices have considerably dropped by more than 70 percent since June 2014.

The world's environment is badly affected by the oil price falling. With the drop of crude oil prices, the fuel bills are also lowered. As a result, consumers are very likely to use even more oil and hence they increase the carbon emission. In addition, there are less incentives to develop renewable and clean sources of energy. On the other hand, sustained low oil prices might result in considerable drop in global oil and gas exploration and exploitation activities.

Fluctuating oil prices also play an important role in the world economy all over. The frequent fall in oil prices would result in the modest boost to global economic activity, but the owners of oil sectors generally suffer income losses. Recent researches from the World Bank shows that for each 30% decline in oil prices, the global GDP (Gross Domestic Product) would be increased by 0.5%. At the same time, the drop of oil prices would also reduce the cost of living, and hence the inflation rate would also fall.

There is no doubt that crude oil price forecasts are very much useful to various industries, governments organisations as well as individuals. Thus, forecasting crude oil prices have also been the subject of research by both academia and industries. Many methods and approaches have also been developed for predicting crude oil prices. However, due to the higher volatility of oil prices, it remains one of the most challenging prediction problems.

In recent years, forecasting techniques have been used frequently in many applications in geosciences. Time series forecasting provides powerful computational tools and powerful algorithms that can learn from past experiences and make predictions on data. In this paper, we are proposing a novel approach for crude oil price prediction based

on Time series forecasting. The main advantage of our FBprophet approach is that this prediction model can also capture the changing pattern of crude oil prices since the model is continuously updated whenever new oil price data are made available, with very small constant overhead.

Prophet is a procedure for forecasting time series data based on an additive model where non-linear trends are fit with monthly, weekly, and daily seasonality, plus holiday effects. It works best with time series data that have strong seasonal effects and several seasons of historical data. FBProphet is robust to missing data and shifts in the trend, and typically handles outliers well.

Importance of time series analysis:-

(i) Business forecasting:- the past defines what is going to happen in future

(ii) Understanding past behaviour analyses when did the sales went up and in which month sales went down.

(iii) planning future operation

(iv) It can also evaluate current accomplishments.

Components of time-series:-

-Trend:- trend is nothing but the movement of higher and lower value over a long period of time.

Uptrend-When price goes higher.

Downtrend-When price goes lower

Horizontal/Stationery trend-constant

In trend for some amount of time selling may be high or again after it may go down but this is not a pattern, it happens for sometimes and then it disappears.

Seasonality:- It is a repeating pattern within a fixed period of time.

ex- icecream sales will go comparatively higher in summer than in winter.

Irregularity:- We can say that it is unsystematic. It is also called as residual, basically it happens for short duration.

Cyclic Pattern:- It is basically up and down movements. They don't have a fixed pattern. They keep on repeating anytime and are much harder to predict

We have used the data type called list to store

the predicted value of crude oil. Python offers a range of compound data types that are also referred to as sequences. List is one of the frequently used and very versatile data type used in Python.

Lists are used to store multiple elements inside a single variable. Lists are one of four built-in data types in Python which is used to store collections of data. In Python programming, a list is usually created by placing all the items inside the square brackets [] and all the elements are separated by commas. List can have any number of elements and also they may be of different types (integer, float, string etc...). A list can also have different lists as an item inside it.

We have used a data set which contains seven columns out of which there are only five input parameters that are useful for our model which are :-

- Date
- Open price
- Close price
- High price
- Low price

Where open price is the price of crude oil at the start of the day,

close price is the price of crude oil at the end of the day,

high price is the highest price of crude oil at any point of time on that day,

low price is the lowest price of crude oil at any point of time on that day.

Our aim is to apply the FBprophet model which is the Time series forecasting for the prediction of the close price of crude oil. The dataset which we are using has four main input parameters that are open, close, high, low for the prediction of the crude oil price.

Advantages:-

Accurate and fast.

FBProphet is used in many applications across Facebook for producing reliable forecasts for planning and goal setting. Studies found it to perform better than any other approach in the majority of cases.

Fully automatic.

Get a reasonable forecast on messy data with zero manual effort. FBProphet is robust to outliers, missing data, and dramatic changes in your time series.

Tunable forecasts.

The FBProphet procedure includes many possibilities for users to tweak and adjust forecasts. You can use human-interpretable parameters to improve the forecast by adding domain knowledge.

It uses an additive model where non-linear trends are fit with monthly, weekly and daily seasonality and permits holidays to be modelled and included or excluded.

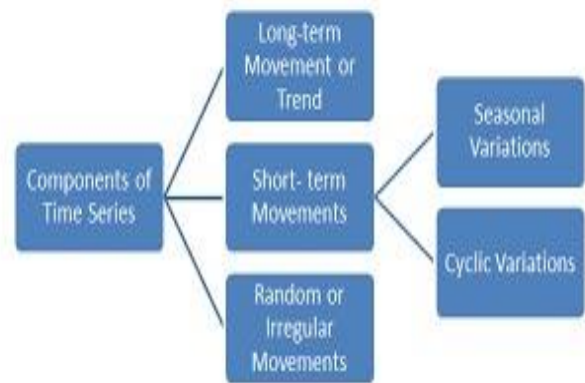
### 1.1. Hardware Requirements

- Processor:
  - Minimum 1 GHz
  - Recommended 2GHz or more
- Ethernet connection (LAN) OR a wireless adapter (Wi-Fi)
- Hard Drive:
  - Minimum 32 GB
  - Recommended 64 GB or more
- Memory (RAM):
  - Minimum 1 GB
  - Recommended 4 GB or above

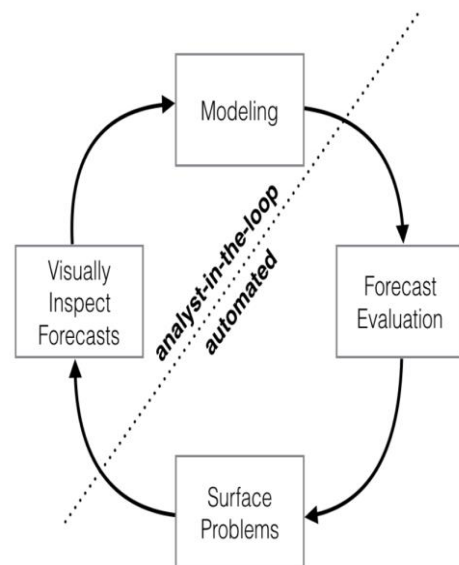
### 1.2 Software Requirements

- Windows: 7 or newer
- Jupyter Notebook
- Python
- Supported Browsers
  - Firefox
  - Chrome

## 2. DIAGRAMS



**Fig -1:** Block Diagram



**Fig -2:** Forecasting at scale

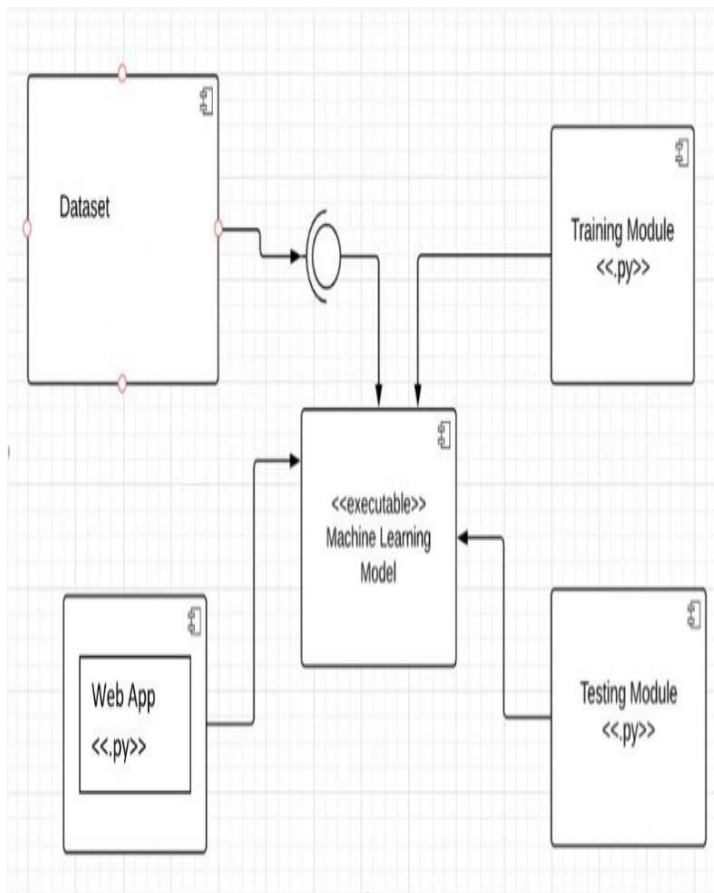


Fig -3: Component Diagram

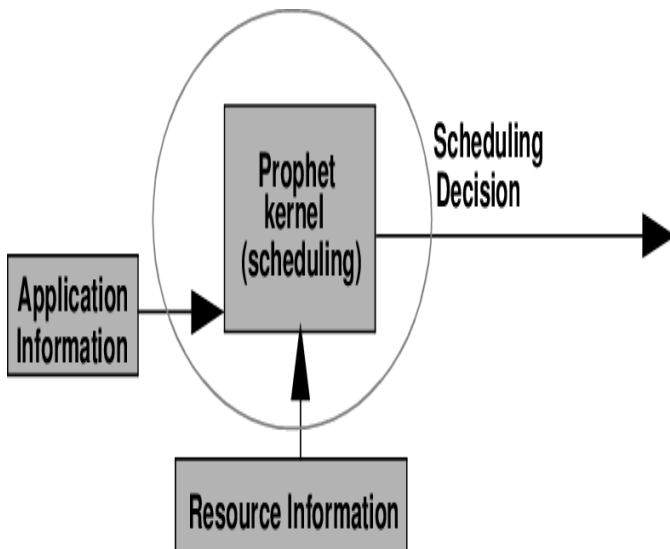


Fig -4: System Architecture diagram

### 3. APPLICATIONS

- It can be used by both individuals and organizations to see the fluctuations in crude

oil price and its future price.

- Since India is mainly an oil importing country so crude oil price prediction models is of great importance if we talk with respect of India as it may be used to save country's million dollars.
- Not only from the economic point of view but even for students this model can be of great use to enhance their knowledge about price prediction using machine learning as we have tried not to make things complex and tedious and can be understood by even those who have basic knowledge of machine learning and its related technologies.

### 4. FUTURE SCOPE

- As a major raw material of industries and social activities crude oil price has been widely concerned by numerous industry practioners, researchers and policy makers. The prediction of crude oil price has already become a hot issue all over the world introducing turbulence into both oil importing and exporting countries.
- An accurate prediction for crude oil price would help people to prepare suitable responses against the disturbances resulted from fluctuations of crude oil price in advance. Therefore an accurate prediction is pivotal for stable and rapid economic development.
- Looking in longer term, we don't see much scope for significantly higher prices as there is growing demand for petroleum products from emerging markets but the demand in developed countries is declining as environmental standard get tougher and electric vehicles are in much demand.
- Also demand in emerging markets would probably taper off as clean technologies become cheaper. Nevertheless, for the next 4-5 decades crude oil is going to exist with a major share in energy market.

### 5. CONCLUSIONS

Crude oil is one of the most important non renewable natural resource. Crude oil is used in various fields in different forms. Petrol and diesel are also made from refining crude oil, and they are the main source for transportation, industrial power, Petro – chemical industries etc. These fuels

are imported in large quantity and it will be profitable to buy them at low cost so as to increase the profit and deliver the product at lower cost to the consumers. Therefore our application will predict the price of crude oil by the use of Time series forecasting approach that is FBprophet so as to get more accurate result.

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