CRUDE OIL PRICE PREDICTION

IBM–DOCUMENTATION

UNDER THE GUIDANCE OF

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TEAM ID : PNT2022TMID38914

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ANNA UNIVERSITY :: 2019-2023

1. INTRODUCTION

1.1 Project Overview

Crude oil is the world's most leading fuel. The main advantages of crude oil are it has high density, it is easily available. Oil is used in almost all the industries. Oil is a Constant Power Source. Oil energy is very reliable when compared to other sources such as solar and wind energy. Some machine learning models fit the data set efficiently depending upon the type of data points provided. The main aim of this project is to find the different models that efficiently fit the data points and predict the price of fuel with the help of machine learning models. This project works on comparing the different supervised learning models and brings a conclusion based on the efficiency. We have used 3 supervised learning models namely, Random Forest Regression, Linear Regression and Decision Tree Regression to know which gives the best in terms of accuracy and performance. These algorithms give a numeric value as output. So, we can compare the output of these models with the actual models. Now-a-days the oil price has been increasing in leaps and bounds due to certain reasons like inflation throughout the world. Hence these are derived or extracted from petroleum. The sources of crude oil for India come from neighboring countries such as Dubai and Saudi-Arabia. To predict the values of petroleum like 6 petroleum and Diesel within the future, we've decided to use the Machine Learning algorithms and apply ensemble learning. Ensemble learning is a technique where we use different algorithms or single algorithms many times. In this way we can compare different algorithms and find the best one for our problem statement. Crude oil has an essential role in the world, as this is one of the major products worldwide and thus includes global measurements. The origin of crude oil prediction errors involves composite supply-demand structures. Crude oil volatility has a critical effect on economic factors which includes economic increase of the country, unemployment, exchange rate that moreover depends on crude oil export and import. In current days machine learning techniques can be implemented in various applications. Machine learning gives powerful computational tools and algorithms that are capable of learning itself and predict data with long short-term memory. This paper contains LSTM based recurrent neural networks for the matter of crude oil price prediction. Recurrent neural networks (RNN) identify to be the most powerful and impact models for processing time-series based sequential data. LSTM variants can be used for other task as well other than prediction such as speech, handwriting and polyphonic modeling. The hyper parameters of variants were assessed using random search and using variance framework.

1.2 Purpose

Oil demand is inelastic, therefore the rise in price is good news for producers because they will see an increase in their revenue. Oil importers, however, will experience increased costs of purchasing oil. Because oil is the largest traded commodity, the effects are quite significant. A rising oil price can even shift economic/political power from oil importers to oil exporters. The crude oil price movements are subject to diverse influencing factors.This Guided Project mainly focuses on applying Neural Networks to predict the Crude Oil Price. This

decision helps us to buy crude oil at the proper time. Time series analysis is the best option for this kind of prediction because we are using the previous history of crude oil prices to predict future crude oil. So, we would be implementing RNN (Recurrent Neural Network) with LSTM (Long Short-Term Memory) to achieve the task.
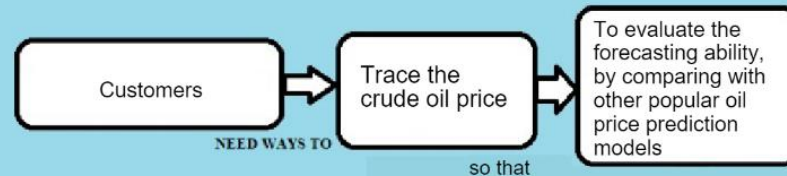
2.Literature Survey

s.no	Topic	Author name	Methodology	References
1	Do We Really Know That Oil Caused the Great Stagflation?	Barsky RB, Kilian L (2001)	This paper argues that major oil price increases were not nearly as essential a part of the causal mechanism that generated the stagflation of the 1970s as is often thought.	https://doi.org/10.1086/654439
2	Forecasting the WTI crude oil price by a hybrid-refined method.	Chai J, Xing LM, Zhou XY, Zhang ZG, Li JX (2018)	A new combination approach is put forward for the oil price forecast.We consider the change points, regime-switching, time-varying determinants of oil price.The novel proposed method outperforms some competing models and the benchmark.	https://doi.org/10.1016/j.eneco.2018.02.004
3	Evolutionary Neural Network model for West Texas Intermediate crude oil price prediction	Chiroma H, Abdulkareem S, Herawan T (2015)	We propose an approach for the prediction of the WTI crude oil price. The values predicted by the proposed method and actual once are statistically equal. The proposed method indicated performance improvement over existing results.	https://doi.org/10.1016/j.apenergy.2014.12.045

| 4 | Forecasting crude-oil market volatility: further evidence with jumps | Charles A, Darné O (2017) | We analyze volatility models and their forecasting abilities with the presence of jumps for Brent and WTI crude oil markets.We compare several GARCH-type models estimated from raw and filtered returns.We also use GAS and MSM models estimated from raw returns. | https://doi.org/10.1016/j.eneco.2017.09.002 |
| 5 | Explaining crude oil prices using fundamental measures. | Coleman L (2012) | Article introduces new variables to the study of oil prices. New variables are terrorist incidents and military activity, and oil futures market size. Shocks prove important, affecting prices by $6–18 per barrel for several months. OPEC market influence rises with OECD import dependence. | https://doi.org/10.1016/j.enpol.2011.10.012 |

2.3 PROBLEM STATEMENT

Crude Oil Price Prediction

Customers **NEED WAYS TO** Trace the crude oil price **so that** To evaluate the forecasting ability, by comparing with other popular oil price prediction models

PROBLEM-STATEMENT

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas
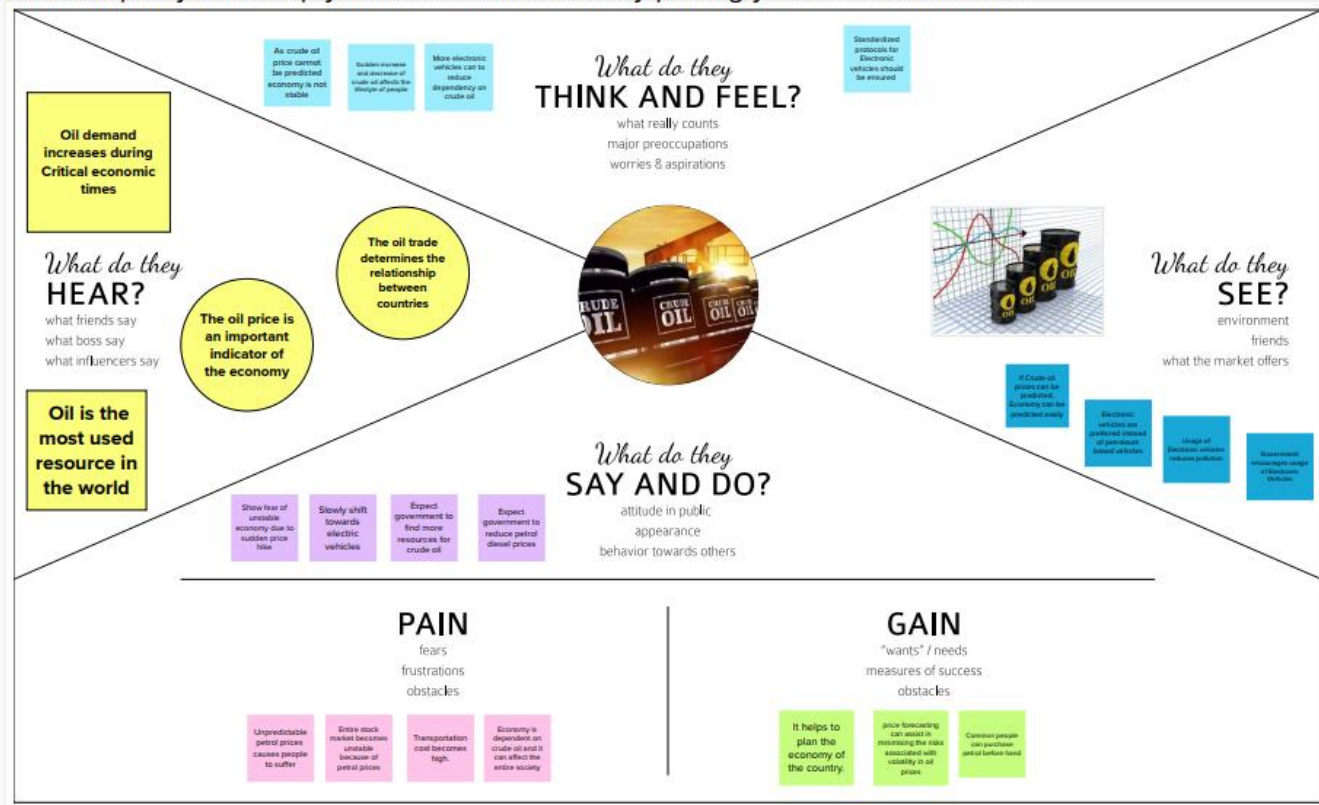
3.2 Ideation & Brainstorming

Arun siva ranjith

Deep learning can be used for analysis.	History of prices can be used for references.	The integration of AI and machine learning will be useful.

Vishnu rangan

Price prediction can be done by analysing the data from different time period.	prices can be roughly predicted based on current economic situations .	Can be predicted based on Trade policy between two countries

Yugendran

Can be predicted using the Price history of raw material.	AI can be very effective in prediction.	Samplings and records are usefull for prediction.

Vignesh

Crude oil price is based on current state affairs.	Crude oil prices may decrease on use of electric vehicles.	Clear information should be gather to implement the model.

mathematical analysis

|		
History of prices can be used for references.	Price prediction can be done by analysing the data from different time period.	prices can be roughly predicted based on current economic situations .

usage of other resources

Crude oil prices may decrease on use of electric vehicles.

machine learning based analysis

Deep learning can be used for analysis.	The integration of AI and machine learning will be useful.	AI can be very effective in prediction.

prediction based on economic situations

Crude oil price is based on current state affairs.	prices can be roughly predicted based on current economic situations .	Can be predicted based on Trade policy between two countries
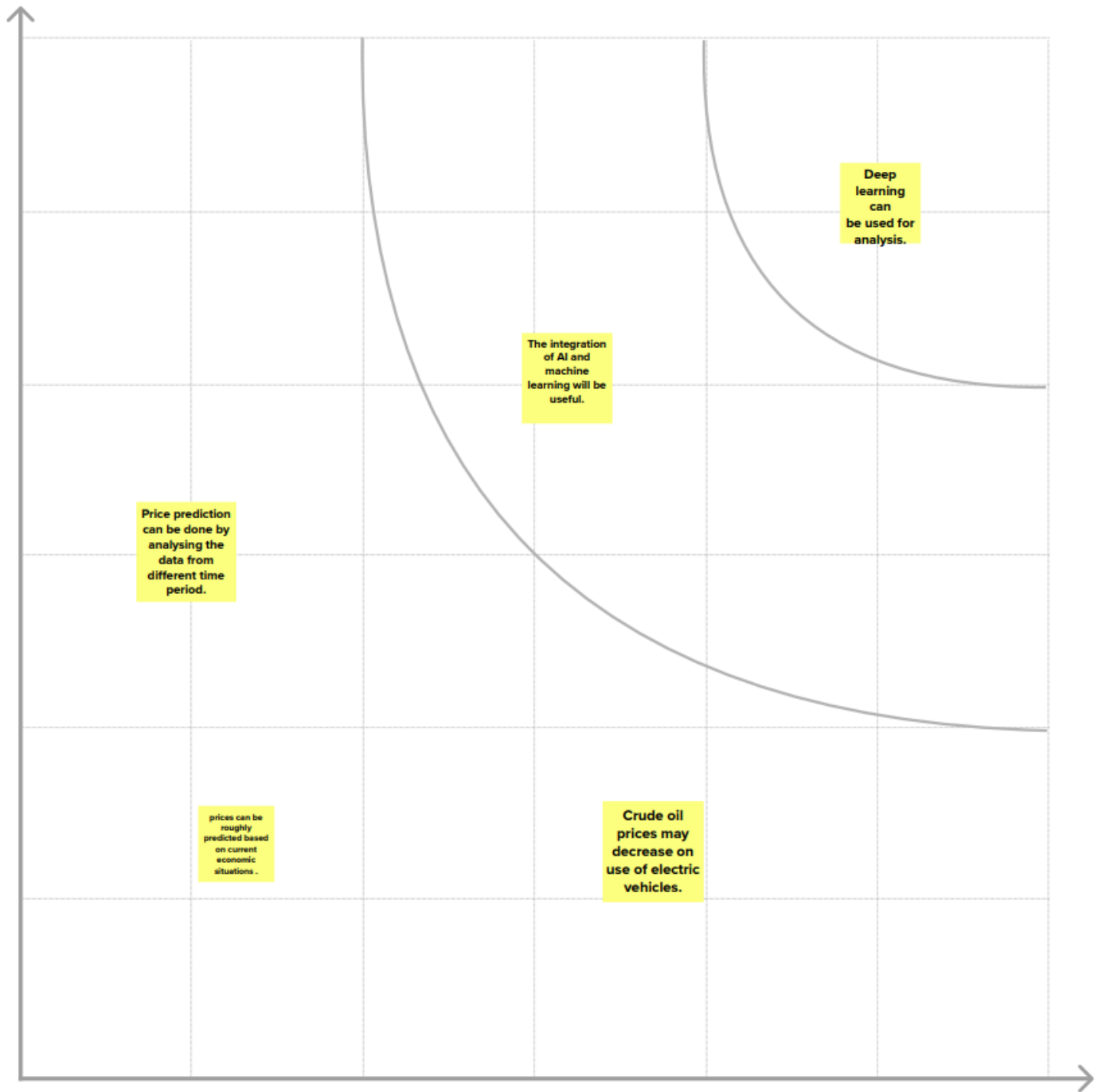
3.3 Proposed Solution

Project Design Phase-I

Proposed SolutionTemplate

Team ID	PNT2022TMID37179
Project Name	Crude Oil Price Prediction
Maximum marks	4 Marks

Proposed Solution:

S.no	Parameter	Description
1	Problem Statement (Problem to be solved)	Crude oil is the world's leading fuel, and its prices have a big impact on the global environment, economy as well as oil exploration and exploitation activities. Oil price forecasts are very useful to industries, governments and individuals.
2	Idea / Solution description	The application to approach the prediction model can capture the changing pattern of oil prices since the model is continuously updated whenever new oil price data are available, with very small constant overhead.
3	Novelty / Uniqueness	Article introduces new variables to the study of oil prices. New variables are terrorist incidents and military activity, and oil futures market size. Shocks prove important, affecting prices by $6–18 per barrel for several months. OPEC market influence rises with OECD import dependence.

4	Social Impact/ Customer Satisfaction	It can help decision makers – either firms, private investors, or individuals – when choosing to buy or sell the crude oil crude oil is one of the most profitable trading commodities for traders.
5	Business Model (Revenue Model)	Using the proposed model, major crude oil price movement is analyzed and modeled. The performance of the proposed model is evaluated using the price data in the WTI crude oil markets. The empirical results show that the proposed model achieves the improved forecasting accuracy.
6	Scalability of the Solution	This solution will be scalable to different types of prediction models

3.4 Problem Solution fit

Project title: Crude Oil Price Prediction | **problem solution fit** | **Team ID:PNT2022TMID37179**

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1. CUSTOMER SEGMENT(S) — CS

Who is your customer?
i.e. working parents of 0-5 y.o. kids

Crude oil prediction mainly based on companies and industries for business and also to the government.

6. CUSTOMER CONSTRAINTS — CC

What constraints prevent your customers from taking action or limit their choices of solutions? i.e. spending power, budget, no cash, network connection, available devices.

The price of crude oil typically accounts for anywhere from two-thirds to three-quarters of the cost of domestic fuel oil. The problem is that crude oil is traded in global markets, which means it is subject to a range of constantly changing market forces.

5. AVAILABLE SOLUTIONS — AS

Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? i.e. pen and paper is an alternative to digital notetaking

In crude oil trading, a 'buy and hold' is probably the best and most widely used trading strategy. Traders analyze demand and supply factors and take calculated positions. If their prediction comes true, traders close their position to book profits way before expiry.

Define CS, fit into CC | *Explore AS, differentiate*

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2. JOBS-TO-BE-DONE / PROBLEMS — J&P

Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.

Crude oil is the world's leading fuel, and its prices have a big impact on the global environment, economy as well as oil exploration and exploitation activities, As it is not an easy job to predict crude oil, we must provide desired information for customers.

9. PROBLEM ROOT CAUSE — RC

What is the real reason that this problem exists?
What is the back story behind the need to do this job?
i.e. customers have to do it because of the change in regulations.

As price of crude oil is varying day by day, this affecting the oil price.

Demand and supply also changing day by day, this also affect price of oil crude oil prediction.

7. BEHAVIOUR — BE

What does your customer do to address the problem and get the job done? i.e. directly related: find the right solar panel installer, calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (i.e. Greenpeace)

prediction model can capture the changing pattern of oil prices since the model is continuously updated whenever new oil price data are available, with very small constant overhead. To evaluate the forecasting ability, we compare it with other popular oil price prediction models.

Focus on J&P, tap into BE, understand RC | *Focus on J&P, tap into BE, understand RC*

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3. TRIGGERS — TR

What triggers customers to act? i.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.

The price of oil fluctuates according to three main factors: current supply, future supply, and expected global demand.

4. EMOTIONS: BEFORE / AFTER — EM

Before: frustration, insecurity

After: Trust, profit

10. YOUR SOLUTION — SL

If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality.
If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.

The analysis of crude oil during every period of time is the best option to predict the price

it needs necessary importance to calculate the prediction

8. CHANNELS of BEHAVIOUR — CH

8.1 ONLINE
What kind of actions do customers take online? Extract online channels from #7
Expecting discount
Trustworthy customers
Go by customers

8.2 OFFLINE
What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development.
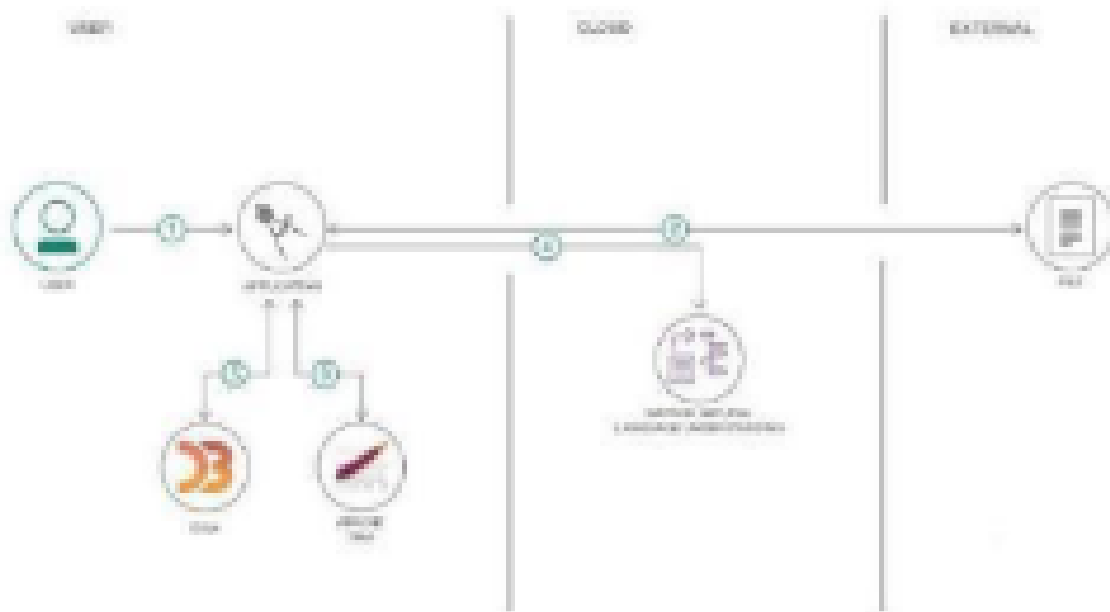Risk
Trustworthy customers

Identify strong TR & EM | *Extract online & offline CH of BE*

★ AMALTAMA

4. PROJECT DESIGN

4.1 Data Flow Diagrams

crude oil price prediction

4.2 Solution & Technical Architecture

Solution Architecture:
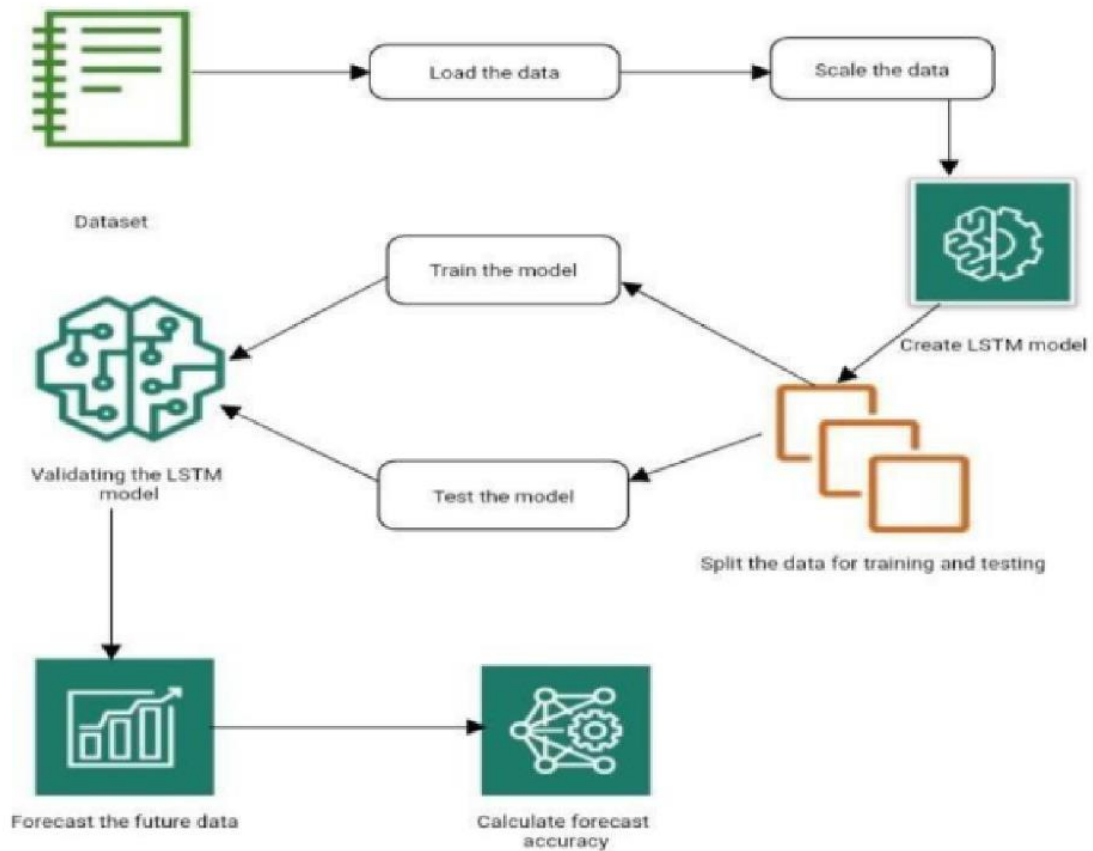
5.Project Planning & Scheduling

5.1 Sprint Delivery Schedule

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points)

Date	18 October 2022
Team ID	PNT2022TMID37179
Project Name	Crude Oil Price Prediction
Maximum Marks	8 Marks

Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	10	High	ARUN SHIVA RANJITH.S
Sprint-1		USN-2	As a user, I will receive confirmation email once I have registered for the application	10	High	VISHNU RANGAN.K
Sprint-1	Login	USN-3	As a user, I can log into the application by entering email & password.	15	High	YUGENDRAN
Sprint-2	Input Necessary Details	USN-4	As a user, I can give Input Details to Predict Likeliness of crude oil	15	High	VIGNESH
Sprint-2	Data Pre-processing	USN-5	Transform raw data into suitable format for prediction.	15	High	ARUN SHIVA RANJITH.S
Sprint-3	Prediction of Crude Oil Price	USN-6	As a user, I can predict Crude oil using machine learning model.	20	High	VISHNU RANGAN.K
Sprint-3		USN-7	As a user, I can get accurate prediction of crude oil	5	Medium	YUGENDRAN

Sprint-4	Review	USN-8	As a user, I can give feedback of the application.	20	High	VIGNESH

Project Tracker, Velocity & Burndown Chart: (4 Marks)

$$AV = \frac{sprint\ duration}{velocity} = \frac{20}{10} = 2$$

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022		
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022		
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022		

Velocity:

Imagine we have a 10-day sprint duration, and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity (AV) per iteration unit (story points per day)

Burndown Chart:

October / November 2022

10/23 – 10/29	10/30 – 11/05	11/06 – 11/12	11/13 – 11/17

Virtual

Planned

Team ID: PNT2022TMID00041
Crude oil price prediction

10/23
1. Creation of webpage
2. User Registration
3. Login

10/30
1. Required information for prediction given as input from user.
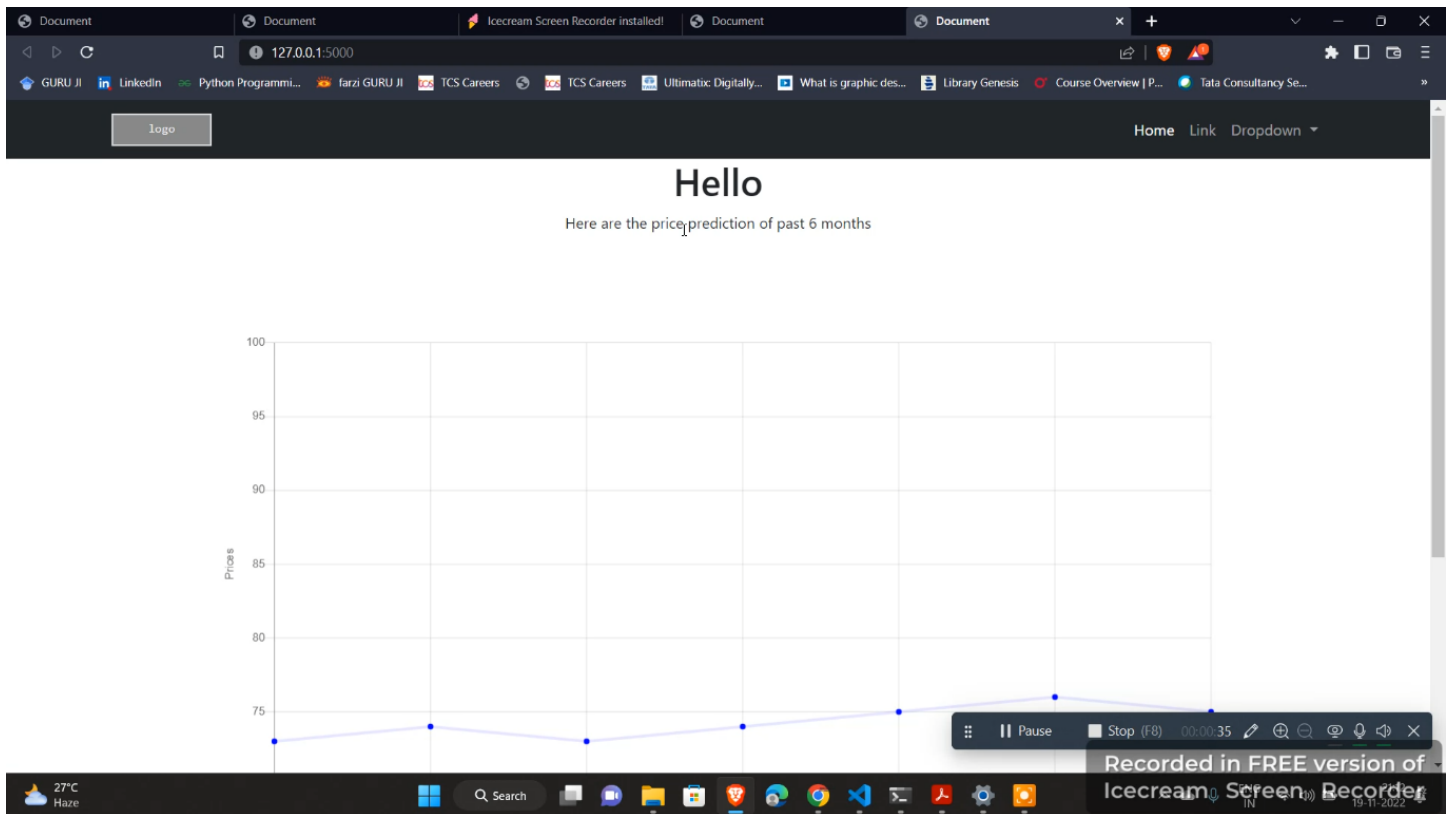2. Data Pre-processing

11/06
1. Creating respective diagrams for price prediction of oil
2. Predicted output is shown

11/13
Forecasting and Regular updation

6. Results

6.1 PERFOMANCE MATRIECES

7.CONCLUSION

The developed algorithm will predict the price of crude oil, By single click.

8. GitHub & Project Demo Link

GitHub :

[IBM-EPBL/IBM-Project-14602-1659587766: Crude Oil Price Prediction (github.com)](github.com)

Project Demo Link

Demo link

https://youtu.be/CtoMp2p1Vj8