

CRUDE OIL PRICE PREDICTION

IBM-Project-1180-1658377317

Crude oil price prediction

**NALAIYA THIRAN PROJECT BASED LEARNING ON
PROFESSIONAL READLINESS FOR INNOVATION,
EMPLOYNMENT AND ENTREPRENEURSHIP**

A PROJECT REPORT

**Abinesh M(710019104001)
Harish S(710019104011
Navinraj P G(710019104025)
Nawin S(710019104026)**

**BACHELOR OF ENGINEERING
IN
COMPUTER SCIENCE AND ENGINEERING**

**ANNA UNIVERSITY REGIONAL CAMPUS COIMBATORE
COIMBATORE – 641 046**

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1.INTRODUCTION

1.1 Project Overview

Category: Artificial Intelligence

Team ID : PNT2022TMID42234

Skills Required:

Python,RNN,IBM Cloud,IBM Watson Studio,Deep Learning,Python-Flask,LSTM

Project Description:

Crude oil is a yellow-black naturally occurring liquid found in geological formations beneath the Earth's surface, it can be separated into various kinds of consumer fuels through the process of fractional distillation. Crude oil is amongst the most important energy resources on earth right now. So far, it remains the world's leading fuel, with nearly one-third of global energy consumption. Petroleum products are also made of refined crude oil. Encouraging usage of fossil fuels is getting highly unpopular as they're irrefutably responsible for global warming, and other severe impacts on ecosystems. A conscious effort to phase-out fossil fuels is being made throughout the world to act upon the climate crisis.

Current estimates suggest that the world usage of Petroleum ranges up to 95 million barrels per day. Crude oil price prediction has a scope larger than we can think of, the forecasting used is relevant for big and small industries along with the government benefitting from the predicted prices, but due to the evaporative nature of oil, it becomes very challenging to achieve accuracy. In the current scenario where technology is taking over our lives and efforts are being made to minimize human labour the Artificial Neural Network Technique has become one of the most effective methods used for prediction of any data. In this paper, we propose a technique which can be used to forecast the oil prices using the Artificial Neural Network (Sigmoid Function with the Learning Algorithm). Prices of the crude oil and the economy have a strong correlation along with the economic and political factors affecting the crude oil price

1.2 Purpose

Crude oil price fluctuations have a far reaching impact on global economies and thus price forecasting can assist in **minimising the risks associated with volatility in oil**

prices. Price forecasts are very important to various stakeholders: governments, public and private enterprises, policymakers, and investors.

According to economic theory, the price of crude oil should be easily predictable from the equilibrium between demand and supply, wherein demand forecasts are usually made from GDP, exchange rates and domestic prices, and supply is predicted from past production data and reserve data. Predicting demand for oil is usually straightforward, however supply is heavily affected by political activity such as cartelisation by OPEC to regulate prices, technological advances leading to the extraction of higher amounts of oil, and wars and other conflicts which can affect supply unpredictably.

Models incorporating economic parameters such as supply and demand and their determinants are known as structural models. Even though structural models are found to be the most logical ways of modelling the prices of industrial products, the price of crude oil is affected by many other factors. One of these factors is that the price of crude oil is determined in the futures market which enables the purchase of a predefined amount of oil at a particular price in the future. Additionally, only 1% of the crude oil traded in futures contracts results in the actual purchase of a physical commodity; its chief purpose is to make money out of price fluctuations in crude oil. Hence the price of crude oil behaves more like a financial asset and therefore is more representative of the expectations of traders rather than just predictions based on economic theories of supply and demand.

2.LITERATURE SURVEY

2.1 Existing problem

The price of oil fluctuates according to three main factors: **current supply, future supply, and expected global demand.** Members of OPEC control 40% of the world's oil.

Most analysts expect oil prices to remain around \$100 per barrel for the remainder of 2022 and 2023. They cite that the oil market has not fully priced in a recession, which tends to **drop oil prices by around 40%**

High inflation

As a result, these will be passed down to the consumers, increasing the overall prices of

goods and services, and causing inflation. In fact, Bloomberg predicts that a “10% rise in oil prices could add a 0.4 percentage points” to Philippine inflation.

Forecasting is notoriously difficult, and nobody guessed how high stock prices would be today. But the most interesting miss was that the group was way too low on oil prices. Should we be surprised? Oil prices are hard to forecast because **they are highly sensitive to shocks in both global demand and supply.**

Environmental protection is indeed one of the main issues of concern in the oil and gas industry. Poor management in the exploration and production process will cause financial losses to the company and damage the environment. This industry is full of strict controls and regulations.

2.2. References

Shobhit Nigam. "Chapter 84 Single Multiplicative Neuron Model in Reinforcement Learning" , Springer Science and Business Media LLC, 2019.

"Harmony Search and Nature Inspired Optimization Algorithms" , Springer Science and BusinessMedia LLC, 2019.

Shuang Gao, Yalin Lei. "A new approach for crude oil price prediction based on stream learning" , Geoscience Frontiers, 2017.

Xin Wang, Ji Wu, Chao Liu, Senzhang Wang, Wensheng Niu. "A Hybrid Model Based on Singular Spectrum Analysis and Support Vector Machines Regression for Failure Time Series Prediction" Quality and Reliability Engineering International, 2016.

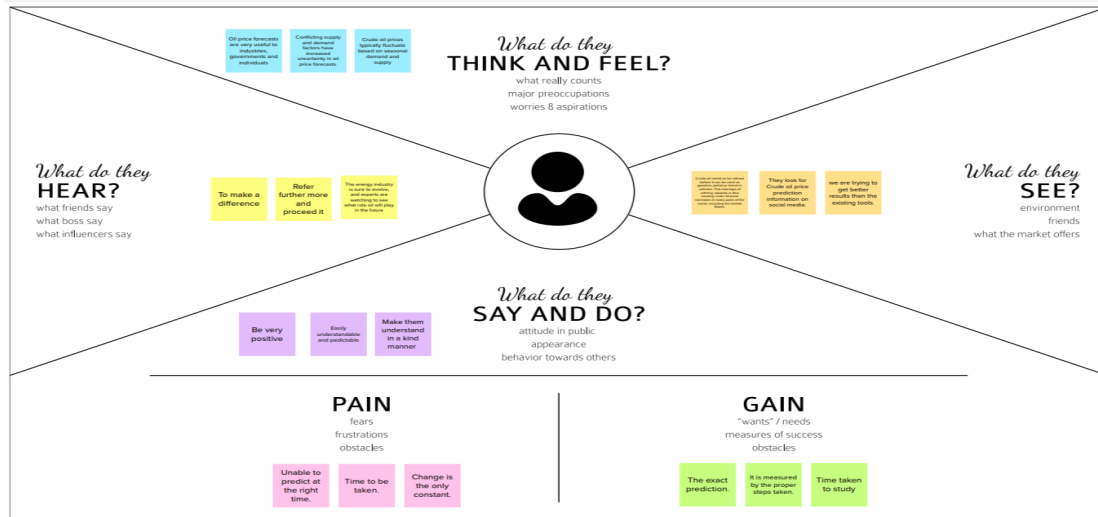
2.3. Problem Statement Definition

Crude oil is amongst the most important resources in today's world. The evaporative nature of crude oil, its price prediction becomes extremely difficult and it is hard to precise with the same. Prediction of future crude oil price is considered a significant challenge due to the extremely complex and dynamic nature of the market and stakeholders perception.

Who does the problem affect?	Consumers, stakeholders
What are the boundaries of the problem?	Continuously capturing the unstable pattern of the crude oil prices.
What is the issue?	Crude-oil prices have always been volatile affecting the performance of the economy.
When does the issue occurs?	It occurs when the crude oil is influenced by many factors such as supply-and-demand gap, labour costs, amount of remaining resources, as well as stakeholders' perception.
Where is the issue occurring?	As India consumes around 2.2 million barrels of oil per day, the production is only about 0.8 million barrels per day . Therefore, 70% of its total oil consumption has to be imported. There occurs the issue.
Why is it important that we fix the problem?	As India ranks among the top 10 largest oil-consuming countries in the world. It is definitely mandatory to fix this problem.

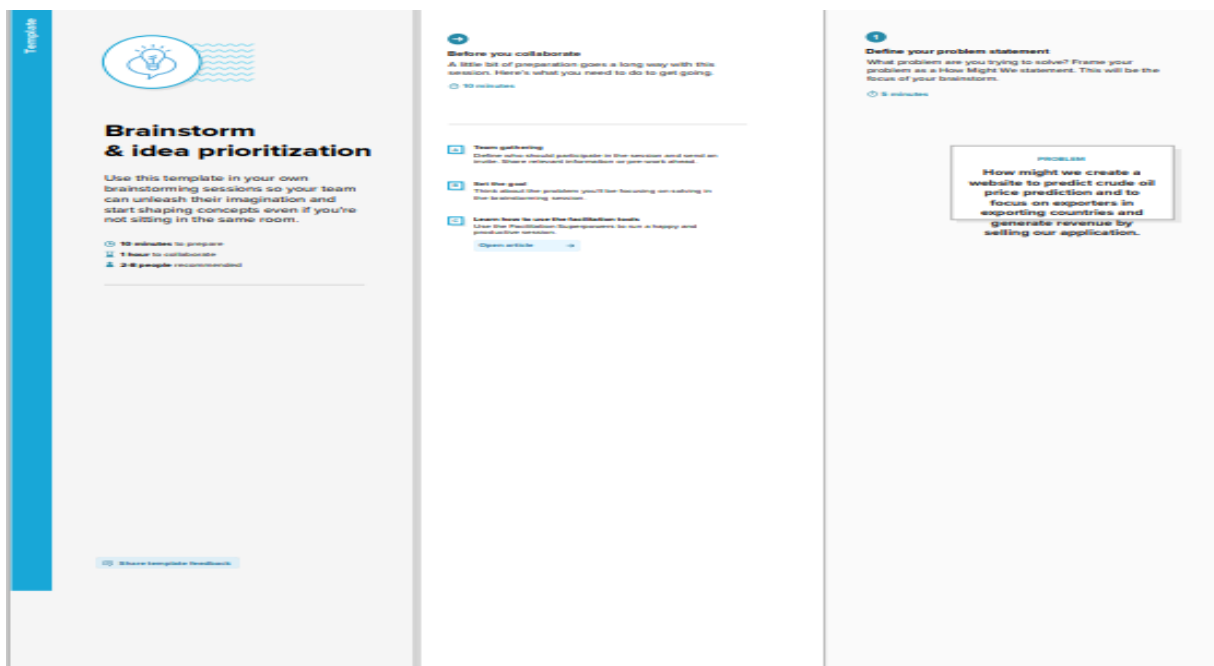
3.IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas



3.2 Idea on & Brainstorming

Step-1: Team Gathering, Collaboration and Select the Problem Statement .



Step-2 : Brainstorm,Idea Listing and Grouping

Brainstorm

Write down any ideas that come to mind that address your problem statement.

10 minutes

PARALLEL 1B

<p>The supply of natural gas in the United States is abundant. It is abundant because the price for crude oil around the world.</p>	<p>Proper assessment of the importance of the crude oil should be given to the people from the aspects.</p>
---	---

We have to develop a forecasting model to predict the oil prices.

Continuously capturing the volatile pattern of the crude oil prices.

Temporary price fluctuations should be noted.

Should try to develop various approaches to predict the crude oil prices.
esp. oil prices esp.

ABSTRACT

Adulteration of crude oil should be prevented.

Hydro-attenuating
artificially manufactured
antibumping powder
systems and additives
for ceramics.

- Updating the model whenever new oil price data are available to capture the changing pattern of oil prices.

Try to reduce competition, keep prices profitable for

we have
increased
crude
product

smaller, and
gradually a
spot accumu-
lates in the
thoracic re-
gion, gradually
becoming
brown.

10
1
1
1

100
1000
10000
100000
1000000
10000000

NATIONAL PO

Find any new application to measure trade oil and discover the global market demands.

Can the limit be
set that crude
oil. So that we
can easily
predict the
crude oil price

Increased use
effort to provide
variable oil price
variations, that
the long-term

We will find important results that mean that efforts made at present are unlikely to be enough to avoid a rise in sea level between 1.8 and 5.9 metres by the year 2100.

This issue is about the alternative scenarios in the middle: reducing the demand on

What
the
past
predicted
not

Should
I be
in the
line
of
the
line

We have no structure almost everywhere and the structure is the same everywhere.

We can use more programming methods to predict results at price points.

Reduce the factors that affect the crude oil demand

Proposing a new approach for prime products

The price of oil is a key determinant of the profitability of the oil industry. The price of oil is determined by the supply and demand for oil.

Calculus
partial
of vol
can c
future

[illegible]

The supply network
describes should be
direct and flexible
to distribute the
price to customer
around the world

The price of the oil is governed by the supply and demand.

Reduce the factors that affect the crude oil demand

Try to reduce competition and keep prices at profitable levels.

increases that reflect its greater efforts to produce smaller and price variations from the beginning.

We should find the pattern for predicting the oil prices.

Should try to develop custom app/website to provide the mobile all prices, eg. all prices app

Find any more applications to measure crude oil and structure the global market demands.

Step-3: Idea Prioritization

4

Prioritize

Your team should all be on the same page about what's important moving forward. Place your ideas on this grid to determine which ideas are important and which are feasible.

🕒 20 minutes



3.3 Proposed Solution

S.NO.	PARAMETER	DESCRIPTION
1.	Problem Statement (Problem to be solved)	The crude oil price has a huge impact on the world's economy. From the past few years, crude oil price fluctuates more than any other commodities prices. As the crude oil price depends on several external factors and there is high volatility predicting crude oil prices is very challenging.
2.	Idea/Solution Description	Continuously capturing the unstable pattern of the crude oil prices using new application.
3.	Novelty/Uniqueness	It is easy for the optimization algorithms to optimize the parameters to get the output. This helps the proposed model to illustrate lowest errors and better forecasting accuracy when compared to other models.
4.	Social Impact/Customer Satisfaction	<ul style="list-style-type: none">• Crude oil prices are heavily influenced by non-market forces, including the Organization of the Petroleum Exporting Countries (OPEC) , which effectively acts as a multinational oil cartel.• The reason why movements in oil price often surprise analysts is because there are hundreds of variables, each of them moving simultaneously in unpredictable ways.
5.	Business Model	Crude oil price prediction helps for the supply of crude oil is determined by the ability of oil companies to extract reserves from the ground and distribute them around the world.
6.	Scalability of the Solution	The volatility is continuously monitored for the price prediction of crude oil.

3.4 Problem Solution fit

Problem-Solution Fit canvas
 Purpose / Vision
 Version:

Define CS, fit into CL	1. CUSTOMER SEGMENT(S) CS Common People Transportation Industrial Residential Commercial	6. CUSTOMER LIMITATIONS CL <small>EG. BUDGET, DEVICES</small> Cost Non-renewable	5. AVAILABLE SOLUTIONS AS <small>PLUSES & MINUSES</small> The supply/demand balance should be known well, because it determines the price for crude oil around the world. Reduce taxes on petroleum products.	Explore AS, differentiate
	2. PROBLEMS / PAINS + ITS FREQUENCY PR The problem is the volatile nature of the crude oil.	9. PROBLEM ROOT / CAUSE RC The volatility of oil prices is inherently tied to the low responsiveness or inelasticity of both supply and demand to price changes in the short run.	7. BEHAVIOR + ITS INTENSITY BE Promote the use of electrical vehicles among the vehicle and also by giving some rebate on buying. By using a public vehicle instead of a private vehicle.	
Identify strong TR & EM	3. TRIGGERS TO ACT TR Levels of consumption	10. YOUR SOLUTION SL Updating the model whenever new oil price data are available to capture the changing pattern of oil prices.	8. CHANNELS of BEHAVIOR CH ONLINE Can use mobile applications or websites for predicting the values. OFFLINE We should find the pattern for predicting the oil prices.	Extract online & offline CH of BE
	4. EMOTIONS <small>BEFORE / AFTER</small> EM Before: Facing difficulties while recognizing the price like frustration, blocking (can't afford it). After: Made a smart purchase.			

Problem-Solution fit canvas is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License. Designed by Daria Nepriakhina / ideahackers.nl - we tailor ideas to customer behaviour and increase solution adoption probability.

4.REQUIREMENT ANALYSIS

4.1 Functional requirement

Following are the functional requirements of the proposed solution

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form.
FR-2	User Confirmation	Confirmation via SMS.
FR-3	Fetching input data	Give the model the input data.
FR-4	Generating Results	Prediction of Oil Prices.

4.2. Non-Functional requirements

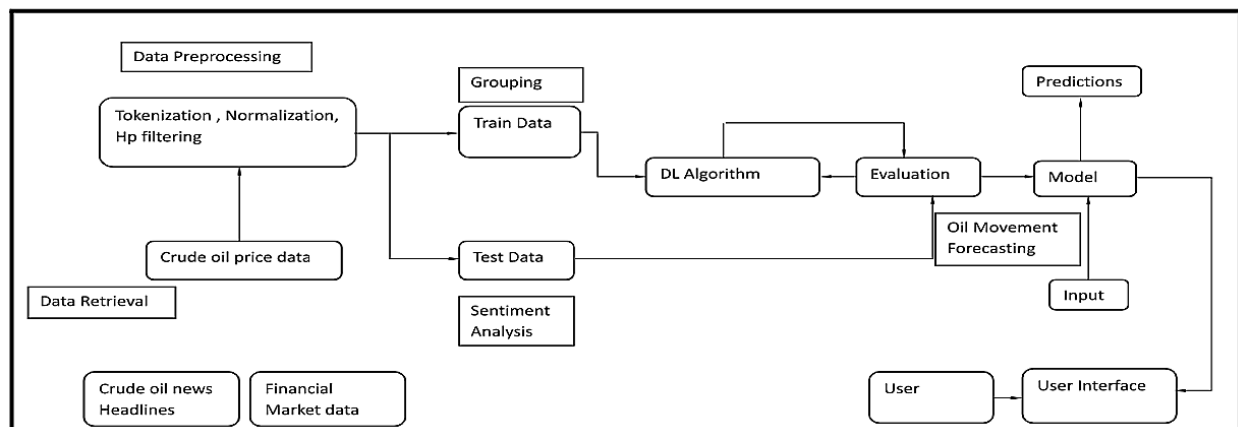
Following are the non-functional requirements of the proposed solution

NFR No.	Non-Functional Requirement	Description
NFR-1	Usability	user interfaces are easy to use.
NFR-2	Security	Sensitive data is protected.
NFR-3	Reliability	Because there is very little variance from the prediction, the testing is highly dependable.
NFR-4	Performance	Using LSTM networks gives highly performance.
NFR-5	Availability	The system tested with 4 datasets and the system operating properly.
NFR-6	Scalability	LSTM network model works efficiently for large number of users.

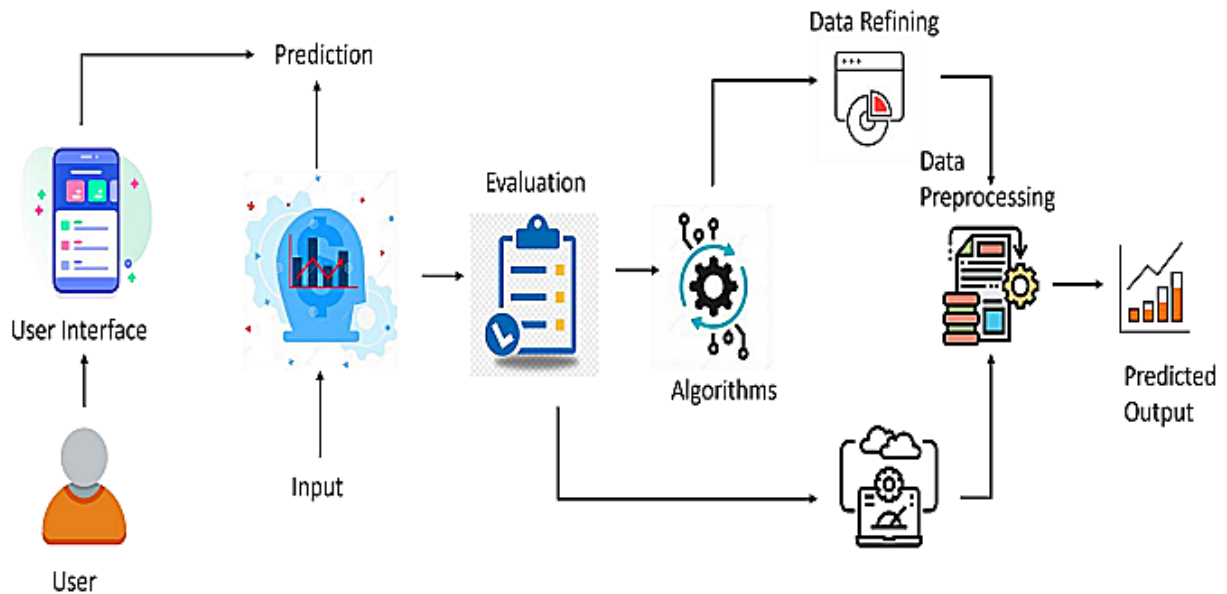
5. PROJECT DESIGN

5.1 Data Flow Diagram

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



5.2 Solution & Technical Architecture



5.3 User Stories

Use the below template to list all the user stories for the product.

User Type	Functional Requirement (Epic)	User Story Number	User Story/ Task	Acceptance criteria	Priority	Release
Customer (Mobile User)	Registration	USN-1	As a user,I can register for the application by entering my email, password,and confirming my password.	I can access my account/ Displays Line graph / Bar graph.	High	Sprint-1
		USN-2	As a user,I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user,I can register for the application through Facebook	I can register & accessthe my Account	Low	Sprint-2
		USN-4	As a user,I can register for the application through Gmail	I can register through already logged in gmail account.	Medium	Sprint-1
	Login	USN-5	As a user,I can log into the application by entering email & password	After registration,I can log in by only email & password.	High	Sprint-1
	Line\Bar graph		After entering the inputs,the model will display predictions in Line\Bar Gragh Format.	I can get the expected prediction in various formats.	High	Sprint-3
Customer (Web user)	Login	USN-1	As the web user,I can login simply by using Gmail or Facebook account.	Already created gmail can be used for Login.	Medium	Sprint-2
Customer Care Executive	Support		The Customer care service will provide solutions for any FAQ and also provide ChatBot.	I can solve the problems arised by Support.	Low	Sprint-3

Administrator	News		Admin will give the recent news of Oil Prices.	Provide the recent oil prices.	High	Sprint-4
	Notification		Admin will notify when the oil prices changes.	Notification by Gmail.	High	Sprint-4
	Access Control		Admin can control the access of users.	Access permission for Users.	High	Sprint-4
	Database		Admin can store the details of users.	Stores User details.	High	Sprint-4

6.PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Use the below template to create product backlog and sprint schedule:

Sprint	FunctionalRequirement(Epic)	UserStoryNumber	UserStory/Task	StoryPoints	Priority	TeamMembers
Sprint-1	DataCollection	USN-1	DownloadCrudeOilPriceDataset	2	Medium	Nawin S
Sprint-1	DataPreprocessing	USN-2	ImportingTheDatasetintoWorkspace	1	Low	Abinesh M
Sprint-1		USN-3	HandlingMissingData	3	Medium	Harish S
Sprint-1		USN-4	FeatureScaling	3	Low	Navinraj PG
Sprint-1		USN-5	DataVisualization	3	Medium	Harish S
Sprint-1		USN-6	SplittingDataintoTrain andTest	4	High	Harish S
Sprint-1		USN-7	CreatingADatasetwith SlidingWindows	4	High	Harish S
Sprint-2	ModelBuilding	USN-8	ImportingTheModelBuildingLibraries	1	Medium	Nawin S
Sprint-2		USN-9	InitializingTheModel	1	Medium	Navinraj PG
Sprint-2		USN-10	AddingLSTMLayers	2	High	Harish s
Sprint-2		USN-11	AddingOutputLayers	3	Medium	Abinesh M
Sprint-2		USN-12	ConfigureTheLearningProcess	4	High	Navinraj PG

Sprint	FunctionalRequirement(Epic)	UserStoryNumber	UserStory/Task	StoryPoints	Priority	TeamMembers
Sprint-2		USN-13	TrainTheModel	2	Medium	Harish S
Sprint-2		USN-14	ModelEvaluation	1	Medium	Navinraj PG
Sprint-2		USN-15	SaveTheModel	2	Medium	Nawin S
Sprint-2		USN-16	TestTheModel	3	High	Harish S
Sprint-3	ApplicationBuilding	USN-17	CreateAnHTMLFile	4	Medium	Nawin S
Sprint-3		USN-18	BuildPythonCode	4	High	Harish S
Sprint-3		USN-19	RunTheAppinLocalBrowser	4	Medium	Abinеш M
Sprint-3		USN-20	ShowcasingPredictionOn UI	4	High	Navinraj PG
Sprint-4	TrainTheModelOnIBM	USN-21	RegisterForIBMCloud	4	Medium	Harish S
Sprint-4		USN-22	TrainTheMLModelOnIBM	8	High	Harish S
Sprint-4		USN-23	IntegrateFlaskwithScoringEndPoint	8	High	Harish S

6.2. Sprint Delivery Schedule

ProjectTracker,Velocity &Burndown Chart:

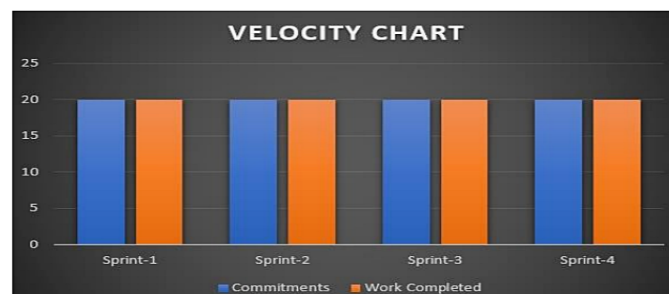
Sprint	Total StoryPoints	Duration	SprintStartDate	SprintEndDate(Planned)	Story PointsCompleted (as onPlannedEndDate)	SprintReleaseDate(Actual)
Sprint-1	20	6Days	24Oct2022	29Oct2022	20	29Oct2022
Sprint-2	20	6Days	31Oct2022	05Nov2022	20	03Nov2022
Sprint-3	20	6Days	07Nov2022	12Nov2022	20	10Nov2022
Sprint-4	20	6Days	14Nov2022	19Nov2022	20	17Nov2022

6.3. Reports from JIRA

Velocity:

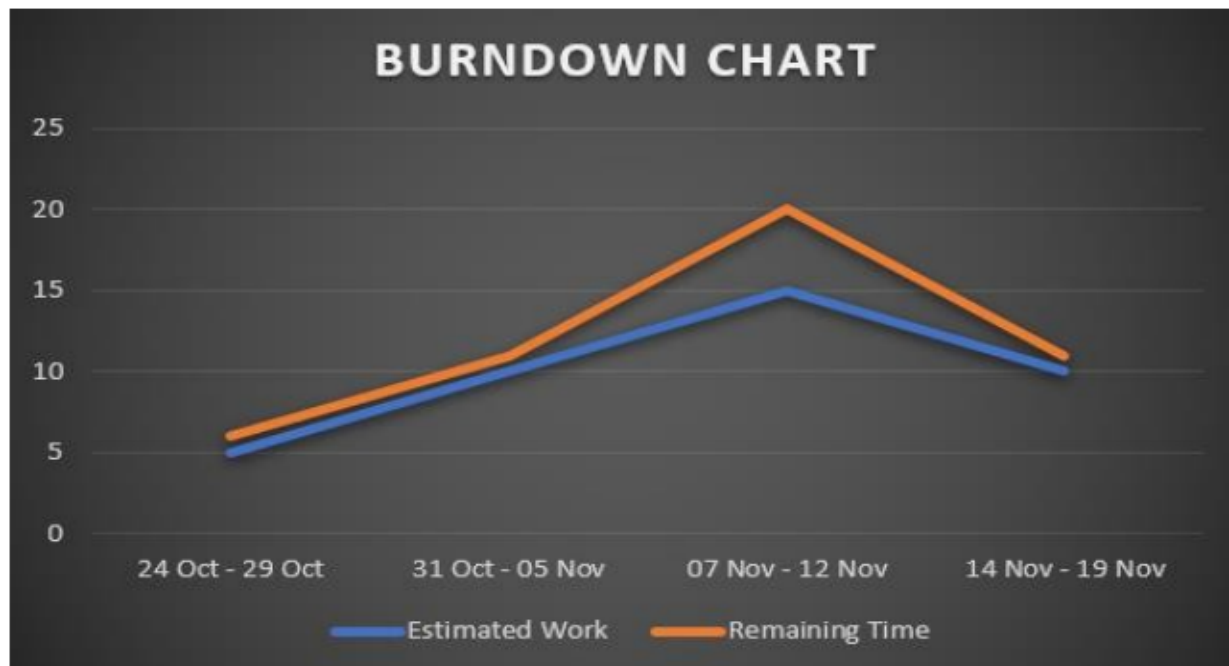
Imagine we have 10-daysprint duration,and the velocity of the team is 20 (points per sprint). Let's calculate the team's average velocity(AV)periteration unit(story points per day).

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



BurndownChart:

A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burndown charts can be applied to any project containing measurable progress over time.



7. CODING & SOLUTIONING

7.1. Feature 1

Flask python code:

```
from flask import Flask, render_template, url_for, flash, request, redirect
import pandas as pd
from sklearn.preprocessing import MinMaxScaler
import requests

app = Flask(__name__)
app.config['SECRET_KEY'] = "a5d6n3j4k5l6k7mn342nw3"
```

NOTE: you must manually set API_KEY below using information retrieved from your IBM Cloud account.

```
API_KEY = "sxLK1YM6C8nEyr4stvWlZ-3sPJew6qlCz-JHgsVUuf34"
```

```
token_response = requests.post('https://iam.cloud.ibm.com/identity/token',  
data={"apikey":  
API_KEY, "grant_type": 'urn:ibm:params:oauth:grant-type:apikey'})  
mltoken = token_response.json()["access_token"]
```

```
header = {'Content-Type': 'application/json', 'Authorization': 'Bearer ' + mltoken}
```

```
file = "dataset\\Crude Oil Prices Daily.xlsx"  
df = pd.read_excel(file)  
df["Closing Value"].fillna(df["Closing Value"].mean(), inplace=True)  
x = df["Closing Value"].values.reshape(-1,1)
```

```
# normalising  
scaler = MinMaxScaler(feature_range=(0,1))  
x = scaler.fit_transform(x)
```

```
@app.route("/") #home route
```

```
def home():
```

```
    # dataset = [
```

```
    # ('1',1),
```

```
    # ('2',2),
```

```
    # ('3',3),
```

```
    # ('4',4),
```

```
    # ('5',5)
```

```
    # ]
```

```
    # labels = [row[0] for row in dataset]
```

```
    # values = [row[1] for row in dataset]
```

```
    labels, values = getCrudeOilData(100)
```

```
    curr = getCrudeOilPriceCloud([values[-3],values[-2],values[-1]])
```

```
        return render_template("main_page.html", labels=labels, values=values,  
current_price=curr)
```

```
@app.route("/predict", methods=["GET","POST"])
```

```
def predictPage():
```

```

if request.method == "POST":
    day1 = request.form['day-1']
    day2 = request.form['day-2']
    day3 = request.form['day-3']
    if not day1 or not day2 or not day3:
        flash('Enter all the past 3 days value')
    else:
        day1, day2, day3 = float(day1), float(day2), float(day3)
        # price = getCurrentCrudeOilPrice([day1, day2, day3])
        price = getCrudeOilPriceCloud([day1, day2, day3])
        return render_template('prediction.html', price=price)
return render_template('prediction.html')
pass

```

```

def getCrudeOilData(n = 100):
    labels = list(df["Date"].astype(str))
    df["Closing Value"].fillna(df['Closing Value'].mean(), inplace=True)
    values = list(df["Closing Value"])
    return labels[len(labels)-n:], values[len(values)-n:] # returning only the last n data

```

```

def getCrudeOilPriceCloud(prices=[]):
    data = [[prices]]

```

```

    payload_scoring = {"input_data": [{"fields": ["day-1","day-2","day-3"], "values": data}]}

```

```

    response_scoring = requests.post('https://us-
south.ml.cloud.ibm.com/ml/v4/deployments/8f848e93-fea8-40c6-a991-
43c14c6329e5/predictions?version=2022-11-16', json=payload_scoring,
    headers={'Authorization': 'Bearer ' + mltoken})
    response = response_scoring.json()['predictions'][0]["values"]
    res = scaler.inverse_transform(response)
    return round(res[0][0],4)

```

```

if __name__ == '__main__':
    app.run(debug=True)

```

HTML Code:

```
<!DOCTYPE html>
<html lang="en">
<head>
  <meta name="viewport" content="width=device-width, initial-scale=1.0">
  <title>Home page</title>
  <link rel="stylesheet" href="style.css">
</head>
<body>

  <div class="main">
    <div class="navbar">
      <div class="icon">
        <h2 class="logo">CRUDE OIL</h2>
      </div>

      <div class="menu">
        <ul>
          <li><a href="#">HOME</a></li>
          <li><a href="#">ABOUT</a></li>
          <li><a href="#">SERVICE</a></li>
          <li><a href="#">CONTACT</a></li>
        </ul>
      </div>

      <div class="search">
        <input class="srch" type="search" name="" placeholder="Type To text">
        <a href="#"> <button class="btn">Search</button></a>
      </div>

    </div>
    <div class="content">
      <h1>Crude Oil<br><span>Price Prediction</span><br></h1>
      <p class="par"> Crude oil means a mixture of hydrocarbons that exists in liquid
phase in<br>
      natural underground reservoirs and remains liquid <br>at atmospheric pressure
```

after passing through
surface separating facilities.</p>

<button class="cn">JOIN US</button>

<div class="form">

<h2>Login Here</h2>

<input type="email" name="email" placeholder="Enter Email Here">

<input type="password" name="" placeholder="Enter Password Here">

<button class="btnn">Login</button>

<p class="link">Don't have an account

Sign up here</p>

<p class="liw">Log in with</p>

<div class="icons">

<ion-icon name="logo-facebook"></ion-icon>

<ion-icon name="logo-google"></ion-icon>

</div>

</div>

</div>

</div>

</div>

</div>

<script src="https://unpkg.com/ionicons@5.4.0/dist/ionicons.js"></script>

</body>

</html>

<!DOCTYPE html>

<html>

<head>

<title>Registration Form</title>

<link rel="stylesheet"

href="register.css" type="text/css">

</head>

<body>

```
<div class="main">
  <div class="register">
    <h2>Register Here</h2>
    <form id="register" method="post">
      <label>First Name : </label>
      <br>
      <input type="text" name="fname"
id="name" placeholder="Enter Your First Name">
      <br><br>
      <label>Last Name : </label>
      <br>
      <input type="text" name="lname"
id="name" placeholder="Enter Your last Name">
      <br><br>
      <label>Your Age : </label>
      <br>
      <input type="number" name="age"
id="name" placeholder="How Old Are You">
      <br><br>
      <label>Email : </label>
      <br>
      <input type="email" name="email"
id="name" placeholder="Enter Your Valid Email">
      <br><br>
      <label>Gender : </label>
      <br>
      &nbsp; &nbsp; &nbsp; &nbsp;
      <input type="radio" name="gender"
id="male">
      &nbsp;
      <span id="male">Male</span>
      &nbsp; &nbsp; &nbsp; &nbsp;
      <input type="radio" name="gender"
id="female">
      &nbsp;
      <span id="female">Female</span>
      <br><br>
```

```
        <input type="submit" value="Submit"
        name="submit" id="submit">
    </form>
</div>
</div>
</body>
</html>
```

CSS Code:

```
*{
    margin: 0;
    padding: 0;
}
body{
    background:url(cr.jpg);
    background-position: center;
    background-size: cover;
}
div.main{
    width: 400px;
    margin: 100px auto 0px auto ;
}
h2{
    text-align: center;
    padding: 20px;
    font-family: Arial;
}
div.register{
    background-color: rgba(0, 0, 0, 0.5);
    width: 100%;
    font-size: 20px;
    border-radius: 10px;
    border: 1px solid rgba(255, 255, 255, 0.3);
    box-shadow: 2px 2px 15px
    rgba(0,0,0,0.3);
    color:#ff7200
```

```
}
form#register{
  margin: 40px;
}
label{
  font-family: Arial;
  font-size: 18px;
}
input#name{
  width: 300px;
  border: 1px solid #ff7200;
  border-radius: 3px;
  outline: 0;
  padding: 7px;
  background-color: #000;
  box-shadow: inset 1px 1px 5px
    rgba(0, 0, 0, 0.3);
}
input#submit{
  width: 240px;
  height: 40px;
  background: #ff7200;
  border: none;
  margin-top: 30px;
  font-family: Arial;
  font-size: 18px;
  font-weight: bold;
  border-radius: 10px;
  cursor: pointer;
  color: #fff;
  transition: 0.4s ease;
  margin-bottom: 20px;
}
label,h2{
  text-shadow: 1px 1px 5px rgba(0, 0, 0, 0.3);
}
span{
```



```
    color: #000;  
    text-shadow: 1px 1px 5px rgba(0, 0, 0, 0.3);  
}
```

```
*{  
    margin: 0;  
    padding: 0;  
}
```

```
.main{  
    width: 100%;  
    background:url(cr.jpg);  
    background-position: center;  
    background-size: cover;  
    height: 100vh;  
}
```

```
.navbar{  
    width: 1200px;  
    height: 75px;  
    margin: auto;  
}
```

```
.icon{  
    width: 200px;  
    float: left;  
    height: 70px;  
}
```

```
.logo{  
    color: #ff7200;  
    font-size: 35px;  
    font-family: Arial;  
    padding-left: 20px;  
    float: left;  
    padding-top: 10px;  
    margin-top: 5px;  
}
```

```
.menu{  
    width: 400px;
```

```
float: left;
height: 70px;
}
ul{
float: left;
display: flex;
justify-content: center;
align-items: center;
}
ul li{
list-style: none;
margin-left: 62px;
margin-top: 27px;
font-size: 14px;
}
ul li a{
text-decoration: none;
color: #fff;
font-family: Arial;
font-weight: bold;
transition: 0.4s ease-in-out;
}
ul li a:hover{
color: #ff7200;
}
.search{
width: 330px;
float: left;
margin-left: 270px;
}
.srch{
font-family: 'Times New Roman';
width: 200px;
height: 40px;
background: transparent;
border: 1px solid #ff7200;
margin-top: 13px;
```

```
    color: #fff;
    border-right: none;
    font-size: 16px;
    float: left;
    padding: 10px;
    border-bottom-left-radius: 5px;
    border-top-left-radius: 5px;
}
.btn{
    width: 100px;
    height: 40px;
    background: #ff7200;
    border: 2px solid #ff7200;
    margin-top: 13px;
    color: #fff;
    font-size: 15px;
    border-bottom-right-radius: 5px;
    border-bottom-right-radius: 5px;
    transition: 0.2s ease;
    cursor: pointer;
}
.btn:hover{
    color: #000;
}
.btn:focus{
    outline: none;
}
.srch:focus{
    outline: none;
}
.content{
    width: 1200px;
    height: auto;
    margin: auto;
    color: #fff;
    position: relative;
}
```

```
.content .par{
  padding-left: 20px;
  padding-bottom: 25px;
  font-family: Arial;
  letter-spacing: 1.2px;
  line-height: 30px;
}
.content h1{
  font-family: 'Times New Roman';
  font-size: 50px;
  padding-left: 20px;
  margin-top: 9%;
  letter-spacing: 2px;
}
.content .cn{
  width: 160px;
  height: 40px;
  background: #ff7200;
  border: none;
  margin-bottom: 10px;
  margin-left: 20px;
  font-size: 18px;
  border-radius: 10px;
  cursor: pointer;
  transition: .4s ease;
}
.content .cn a{
  text-decoration: none;
  color: #000;
  transition: .3s ease;
}
.cn:hover{
  background-color: #fff;
}
.content span{
  color: #ff7200;
  font-size: 65px
```

```
}  
.form{  
  width: 250px;  
  height: 380px;  
  background: linear-gradient(to top, rgba(0,0,0,0.8)50%,rgba(0,0,0,0.8)50%);  
  position: absolute;  
  top: -20px;  
  left: 870px;  
  transform: translate(0%,-5%);  
  border-radius: 10px;  
  padding: 25px;  
}  
.form h2{  
  width: 220px;  
  font-family: sans-serif;  
  text-align: center;  
  color: #ff7200;  
  font-size: 22px;  
  background-color: #fff;  
  border-radius: 10px;  
  margin: 2px;  
  padding: 8px;  
}  
.form input{  
  width: 240px;  
  height: 35px;  
  background: transparent;  
  border-bottom: 1px solid #ff7200;  
  border-top: none;  
  border-right: none;  
  border-left: none;  
  color: #fff;  
  font-size: 15px;  
  letter-spacing: 1px;  
  margin-top: 30px;  
  font-family: sans-serif;  
}
```

```
.form input:focus{
    outline: none;
}
::placeholder{
    color: #fff;
    font-family: Arial;
}
.btnn{
    width: 240px;
    height: 40px;
    background: #ff7200;
    border: none;
    margin-top: 30px;
    font-size: 18px;
    border-radius: 10px;
    cursor: pointer;
    color: #fff;
    transition: 0.4s ease;
}
.btnn:hover{
    background: #fff;
    color: #ff7200;
}
.btnn a{
    text-decoration: none;
    color: #000;
    font-weight: bold;
}
.form .link{
    font-family: Arial, Helvetica, sans-serif;
    font-size: 17px;
    padding-top: 20px;
    text-align: center;
}
.form .link a{
    text-decoration: none;
    color: #ff7200;
```

```

}
.liw{
    padding-top: 15px;
    padding-bottom: 10px;
    text-align: center;
}
.icons a{
    text-decoration: none;
    color: #fff;
}
.icons ion-icon{
    color: #fff;
    font-size: 40px;
    padding-left: 60px;
    padding-top: 5px;
    transition: 0.3s ease;
}
.icons ion-icon:hover{
    color: #ff7200;
}
@media screen and (max-width:1200px) {
    /Normal Screen/

    .navbar{
        width: 100%;
        height: 100px;
    }
    ul{
        margin-left: 30px;
    }
    ul li{
        margin-left: 60px;
    }
    ul li a{
        font-size: 1.6vw;
    }
    .search{

```

```
    margin-top: 3px;
    margin-left: 290px;
}
.srch{
    height: 40px;
    width: 190px;
    font-size: 14px;
}
.btn{
    height:40px;
    width: 80px;
}
.content{
    width: 100%;
}
.content h1, .content span{
    font-size: 4.5vw;
}
.content .par{
    width: 90%;
    font-size: 1.5vw;
}
.content .cn{
    width: 13%;
    height: 3.5vw;
    font-size: 1.8vw;
}
.content a{
    font-size: 1.6vw
}
}
```

```
@media screen and (max-width:1170px) {
  /Login-box/
  .main{
    padding-left: 20px;
    height: 180vh;
```



```

}
.form{
    margin-left: -30px;
    width: 250px;
    height: 370px;
    background: linear-gradient(to top, rgba(0,0,0,0.8)50%,rgba(0,0,0,0.8)50%);
    position: absolute;
    top: 420px;
    left: 50px;
    transform: translate(0%,-5%);
    border-radius: 10px;
    padding: 25px;
}
.form input{
    width: 240px;
    height: 35px;
    background: transparent;
    border-bottom: 1px solid #ff7200;
    border-top: none;
    border-right: none;
    border-left: none;
    color: #fff;
    font-size: 15px;
    letter-spacing: 1px;
    margin-top: 30px;
    font-family: sans-serif;
}
.btnn a{
    font-size: 16px;
}
.form .link a{
    font-size: 16px;
}
}

@media screen and (max-width: 830px){
    /For tablet/

```

```
.content{
  margin-top: 120px;
  width: 80%;
  margin-left: 40px;
}
.content h1, .content span{
  font-size: 6vw;
}
.content .par{
  width: 90%;
  font-size: 1.8vw;
}
.content .cn{
  width: 15%;
  height: 4.5vw;
  font-size: 2vw;
}
.content a{
  font-size: 2vw
}
.logo{
  margin-left: 240px;
  width: 100%;
  margin-top: 15px;
  font-size: 5vw;
}
.menu{
  width: 100%;
}
ul{
  margin-top: -5px;
  margin-left: 5px;
}
ul li{
  margin-left: 60px;
}
ul li a{
```

```
    font-size: 2vw;
}
.search{
    margin-top: -20px;
    margin-left: 60px;
}
.srch{
    height: 30px;
    width: 160px;
    font-size: 12px;
}
.btn{
    height:30px;
    width: 70px;
}
.main{
    padding-left: 20px;
    height: 180vh;
}
.form{
    margin-left: -30px;
    width: 250px;
    height: 370px;
    background: linear-gradient(to top, rgba(0,0,0,0.8)50%,rgba(0,0,0,0.8)50%);
    position: absolute;
    top: 430px;
    left: 50px;
    transform: translate(0%,-5%);
    border-radius: 10px;
    padding: 25px;
}
.form input{
    width: 240px;
    height: 35px;
    background: transparent;
    border-bottom: 1px solid #ff7200;
    border-top: none;
```

```

border-right: none;
border-left: none;
color: #fff;
font-size: 15px;
letter-spacing: 1px;
margin-top: 30px;
font-family: sans-serif;
}
.btnn a{
    font-size: 16px;
}
.form .link a{
    font-size: 16px;
}
}

@media screen and (max-width: 600px){
    /IPAD/
    .content{
        margin-top: 80px;
        margin-left: 20px;
    }
    .search{
        margin-top: -40px;
        margin-left: 42px;
    }
    .logo{
        margin-left: 180px;
        font-size: 4vw;
    }
    ul{
        margin-top: -25px;
        margin-left: -5px;
    }
    ul li {
        margin-left: 50px;
    }
}

```

```
ul li a{
  font-size: 2vw;
}
}

@media screen and (max-width: 450px){
  /mobile/
  .logo{
    margin-left: 140px;
    font-size: 4vw;
  }
  ul{
    margin-top: -25px;
  }
  ul li {
    margin-left: 42px;
  }
  ul li a{
    font-size: 2vw;
  }
  .search{
    margin-top: -40px;
    margin-left: 38px;
  }
}
```

9. RESULTS

9.1. Performance Metrics

The crude oil prices are taken out by implementing the performance of the proposed model. The proposed model is here used to predict the closing price of crude oil.

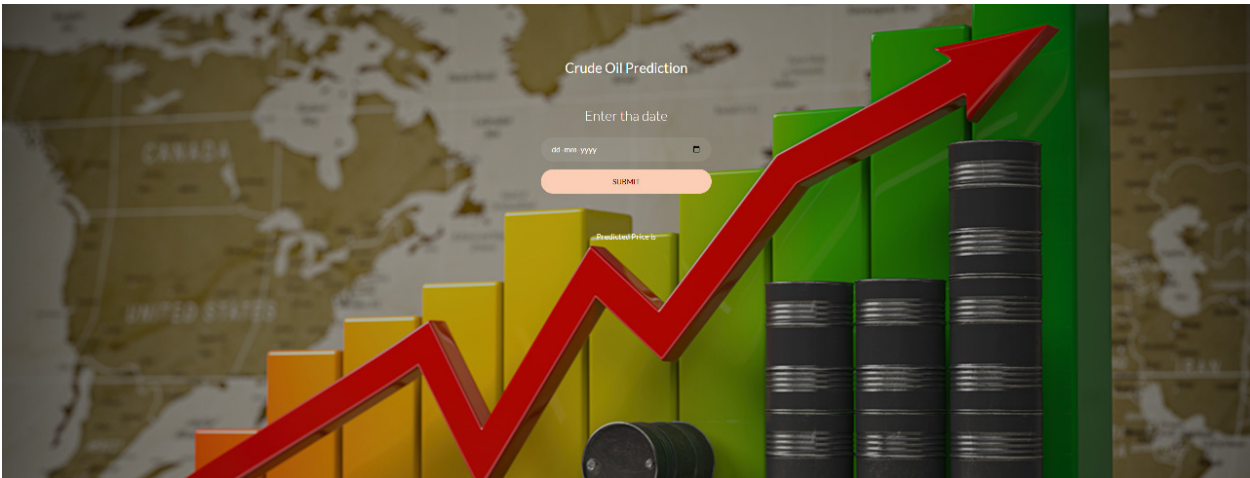
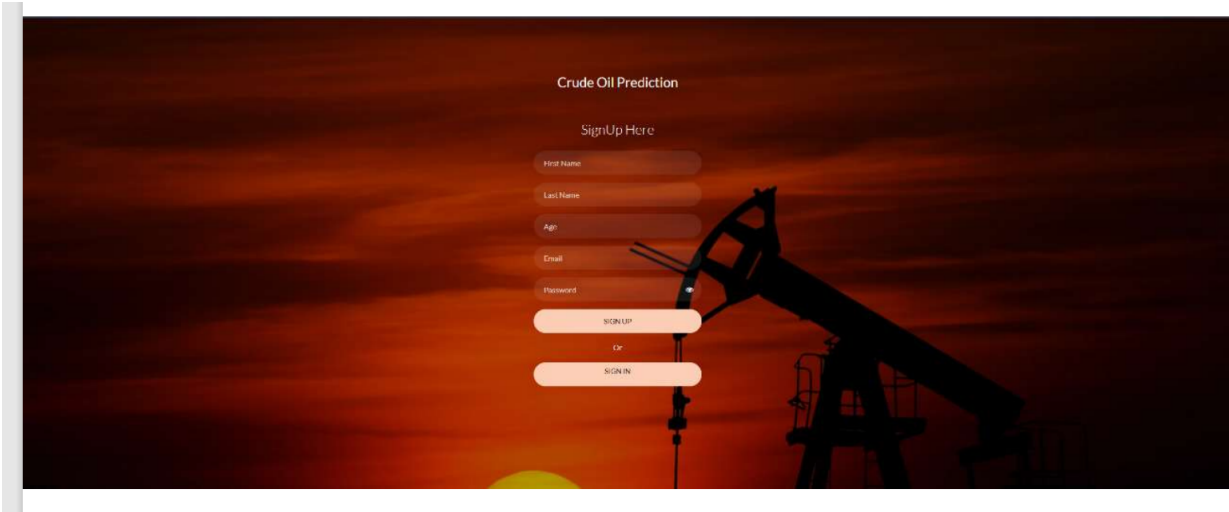
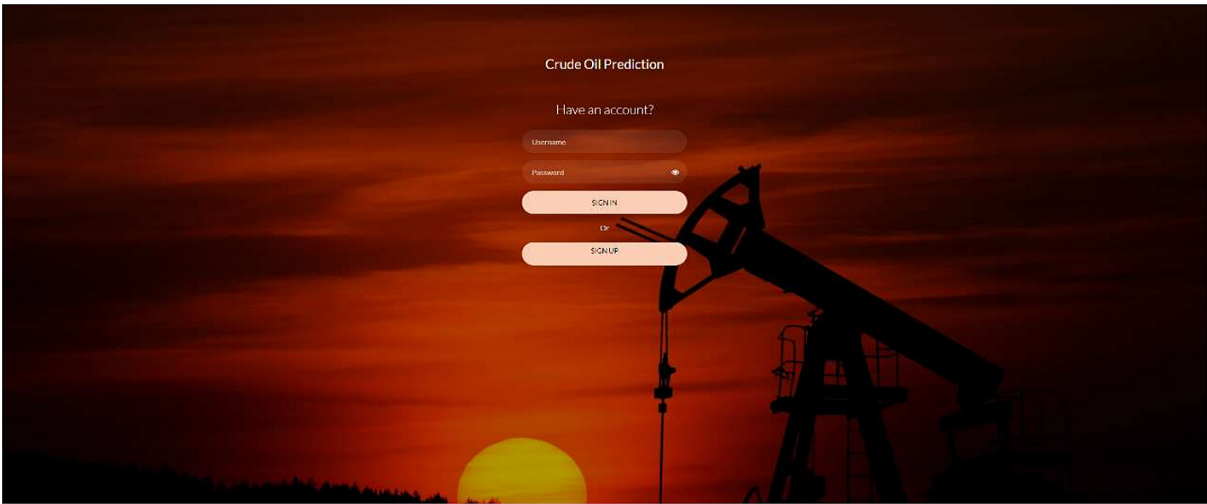
Front-End Only Users is a user management and membership plugin that allows for front-end user registration and login, and for admins to restrict access to portions of their websites to certain users. No need to give access to your WordPress dashboard .

Includes Gutenberg blocks for the following features: register, login, logout, user search, user list, edit account, forgot password and confirm forgot password!

FRONT END USER KEY FEATURES:

- Customizable membership fields for front-end user registration
- Pure CSS-styled front-end login form, user registration form and edit profile form
- Front-end users supports all input types for fields, allowing you to create a custom user profile
- Front-end user input-based redirects
- Front end user notifications: Fully customizable set of user emails. Create as many unique email messages as you want and then assign the message of your choice to specific actions.

OUTPUT:



10. ADVANTAGES & DISADVANTAGES

Advantages:

- a.** Crude oil price fluctuations have a far reaching impact on global economies and thus price forecasting can assist in minimising the risks associated with volatility in oil prices.
- b.** Price forecasts are very important to various stakeholders: governments, public and private enterprises, policymakers, and investors.
- c.** Quite a lot of plastics and other synthetic materials are derived from oil and higher prices ripple through the economy.
- d.** With high oil prices, then, comes increased interest and R&D into non-oil alternative feedstocks for these materials. This process has a lot of fringe benefits for the economy as a whole.

Disadvantages:

a. Demand

As with any commodity, one factor that dictates price is demand. The world demand is around 90 million barrels per day for crude oil. Many countries have fuel subsidies for their residents. This can be good or bad. It's especially bad when a company is forced to sell at a loss.

b. Supply

Supply has an effect on price. Supply is usually kept slightly below demand by about one million barrels per day.

c. Investing in Oil and Gas Drilling

Crude oil investing always comes with a certain amount of risk, however, it also comes with the potential for high returns on your investment.

d.Speculation

Speculation gets a lot of the blame for the high gas prices we all face. Experts disagree on how much speculation affects the price of gas and oil. But the trading of oil futures certainly has an effect.

11. CONCLUSION

An artificial neural network model is presented with the task of determining the most favourable lag in the crude oil price data. It is evident, the prediction is accurate till there is a massive and sudden change in the actual data, where it becomes challenging to predict the exact new price with the change, however, the proposed model has efficiently taken into consideration these patterns. Else ways, this also proves the theory that financial markets are unpredictable and change anytime because of known and unknown factors.

This work indicates that the ANN model is an effective tool for crude oil price prediction and can be efficiently used for short term price forecasting by determining the optimal lags. The proposed model is powerful and highly suggested because investors can use it not only to initiate trades but also as an effective tool to judge various strategies.

12. FUTURE SCOPE

This work is carried out on the closing price of crude oil; however, there are various other factors which also affect the crude oil prices like change in the prices and quantities (demand and supply), change in the economy and current affairs as shown by the media.

The main advantage of this research is in capturing the changing pattern of these prices. In the coming future, fundamental indicators and market trends have been planned to be incorporated into a model which will help the proposed model perform more efficiently.

13. APPENDIX

13.1 Source Code Github Link :

<https://github.com/IBM-EPBL/IBM-Project-1180-1658377317>
IBM-Project-1180-1658377317

13.2 Project Demo Video Link :

<https://youtu.be/5DzXu-Q1n1M>