IBM-Project-47385-1660798812

PROJECT DOCUMENTATION REPORT

CRUDE-OIL PRICE PREDICTION

TECHNOLOGY: ARTIFICIAL INTELLIGENCE
Team ID: PNT2022TMID46457

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Team Size: 4

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1 INTRODUCTION:

1.1 PROJECT OVERVIEW:

This document is provided as a report for the project **Crude Oil Price Prediction.**

Crude oil is amongst the most important resources in today's world, it is the chief fuel and its cost has a direct effect on the global habitat, our economy and oil exploration, exploitation and other activities. Prediction of oil prices has become the need of the hour, it is a boon to many large and small industries, individuals, the government. The evaporative nature of crude oil, its price prediction becomes extremely difficult and it is hard to be precise with the same. Several different factors that affect crude oil prices.

1.2 PURPOSE:

The purpose of this document is to provide a clear-cut view of the project undertaken and produce a neat and greater understanding of the project.

2 LITERATURE SURVEY:

2.1 EXISTING PROBLEM:

One of the most significant commodities in the world, crude oil is responsible for one-third of the world's energy use. It serves as the foundation for the majority of the items we use on a daily basis, ranging from plastics to transportation fuels. Since changes in the price of crude oil have a significant impact on national economies around the world, price forecasting can help reduce the risks brought on by oil price volatility. For a variety of stakeholders, including governments, public and private organisations, policymakers, and investors, price projections are crucial.

2.2 REFERENCES:

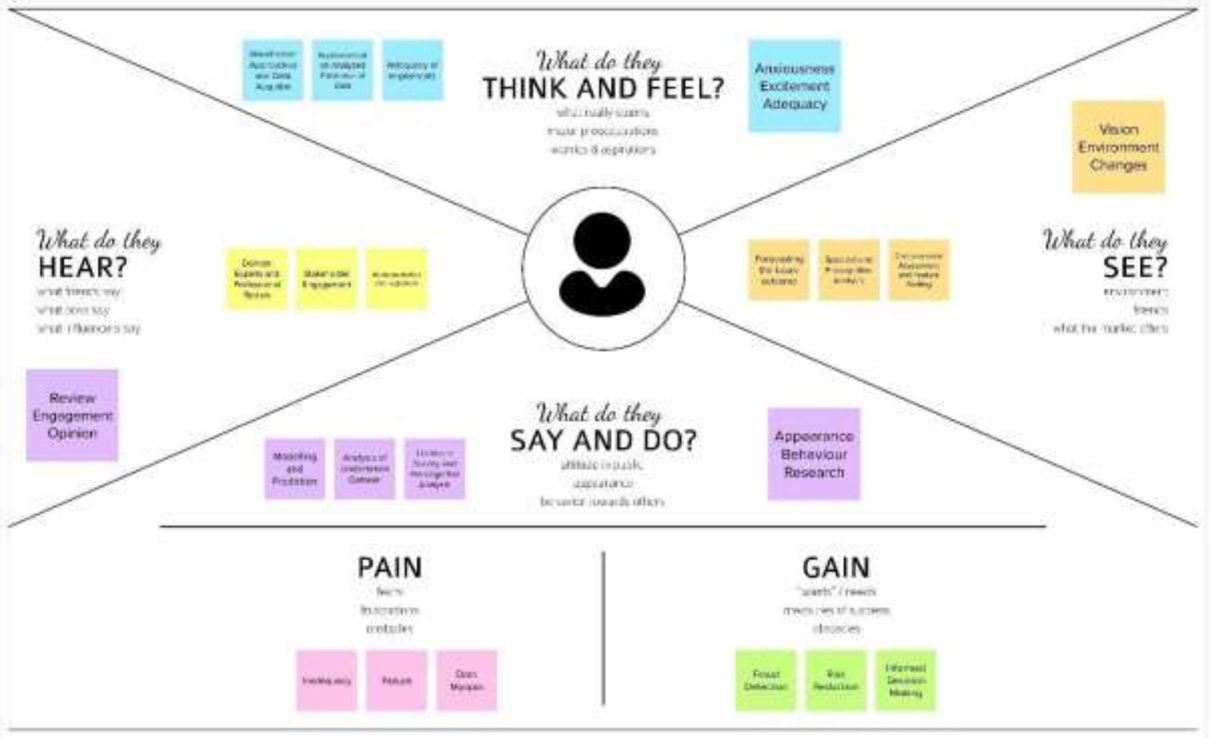
https://drive.google.com/drive/folders/1yq9UqoGpyAQFKR6ARNFwpVMofYtOHdCm?usp=sharing

2.3 PROBELM STATEMENT DEFINITION:

It is required to forecast CRUDE OIL PRICE in international market. The input and output should also be shown as charts and/or dashboards in various formats (like day, week, work-week, month, quarter, year, etc.). The models should be built with comprehensive explanation of data (using EDA), trend analysis, assumptions, data cleaning and validation, data augmentation (if required). Performance of various models need to be clearly evaluated and best model needs to be recommended based on some robust evaluation criteria e.g., AIC (Akaike information criterion), Accuracy, RMSE, MSE etc.

3 IDEATION & PROPOSED SOLUTION:

3.1 EMPATHY MAPS:



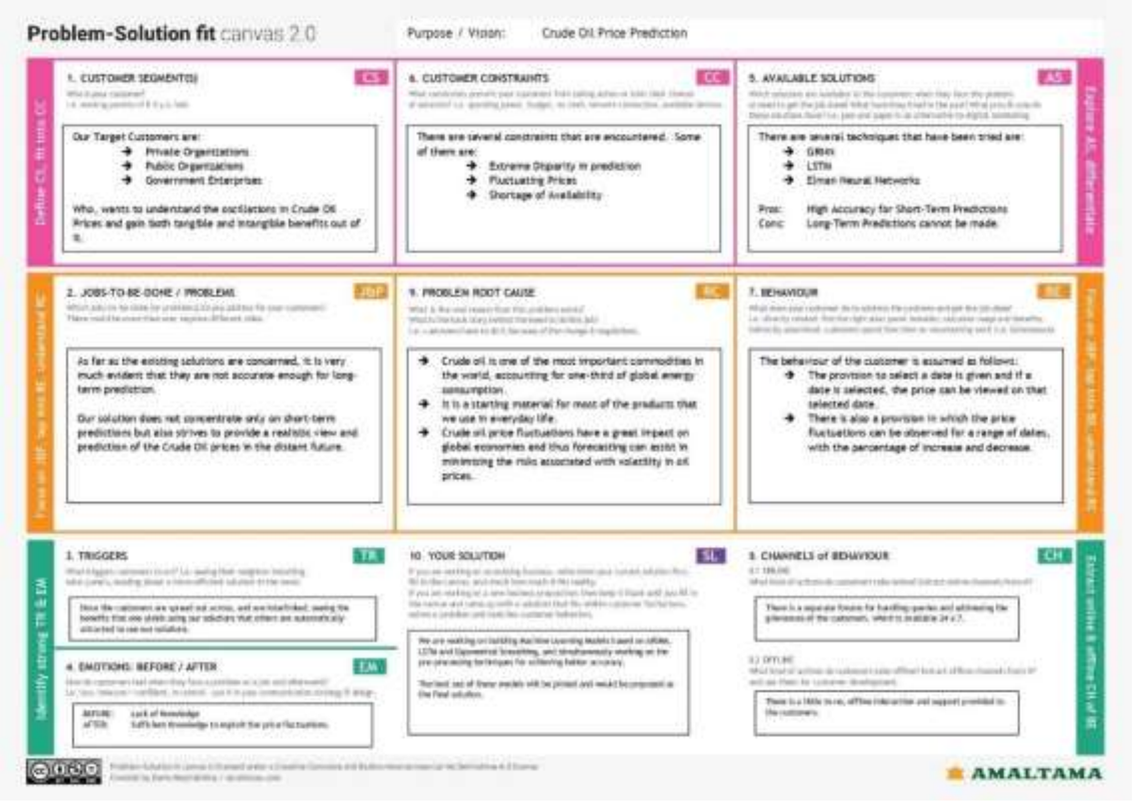
3.2 IDEATION AND BRAINSTORMING:

3.3 PROPOSED SOLUTION:

S. No.	Parameter	Description
1	Problem Statement (Problem to be Solved)	The existing patrimony model of oil price prediction is not capable enough to deliver the accurate predicted prices as expected. Few factors can be described as the conjectural buying and selling , geopolitical, OPEC output, increased demand from important role in the prediction of the oil prices. Now problem arising with the current ANN and CNN models that are used as prediction model's are that they can't provide accurate results when the data is too big.
2	Idea / Solution description	1) LSTM clears about keeping the previous data and prediction which might be encouraging and more accurate. The possible results are comparatively inspiring. 2) The LSTM model will be updated whenever new oil price data are available, and provided to model, so the model continuously evolves over time, and can capture the changing pattern of oil prices.
3	Novelty / Uniqueness	1) Price forecasting can assist in minimising the risks associated with volatility in oil prices. 2) Price forecasts are very important to various stakeholders: governments, public and private enterprises, policymakers, and investors.
4	Social Impact / Customer Satisfaction	1) Brand activation 2) Innovative and schemes 3) Instant reward schemes 4) Personalized consumer purchase exchanges 5) Capability building of sales personnel.

5	Business Model (Revenue Model)	1) The price of crude oil should be easily predictable from the equilibrium between demand and supply. 2) 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. 3) price of crude oil are changeable based from time to time.
6	Scalability of the Solution	1) hydrodynamic conditions in oilfield operations is suggested. 2) Modern refineries typically use a high number of sensors that generate an enormous amount of data. 3) Sustainable Solution for Crude Oil using Concentrated Solar Power Technology.

3.4 PROBLEM SOLUTION FIT:



Problem-Solution fit canvas 2.0

Purpose / Vision: Crude Oil Price Prediction

Define CS, fit into CC

1. CUSTOMER SEGMENT(S) CS

Our Target Customers are:
- Private Organizations
- Public Organizations
- Government Enterprises

Who, wants to understand the oscillations in Crude Oil Prices and gain both tangible and intangible benefits out of it.

6. CUSTOMER CONSTRAINTS CC

There are several constraints that are encountered. Some of them are:
- Extreme Disparity in prediction
- Fluctuating Prices
- Shortage of Availability

5. AVAILABLE SOLUTIONS AS

There are several techniques that have been tried are:
- GRNN
- LSTM
- Elman Neural Networks

Pros: High Accuracy for Short-Term Predictions
Cons: Long-Term Predictions cannot be made.

Explore AS, differentiate

2. JOBS-TO-BE-DONE / PROBLEMS J&P

As far as the existing solutions are concerned, it is very much evident that they are not accurate enough for long-term prediction.

Our solution does not concentrate only on short-term predictions but also strives to provide a realistic view and prediction of the Crude Oil prices in the distant future.

9. PROBLEM ROOT CAUSE RC

- Crude oil is one of the most important commodities in the world, accounting for one-third of global energy consumption.
- It is a starting material for most of the products that we use in everyday life.
- Crude oil price fluctuations have a great impact on global economies and thus forecasting can assist in minimizing the risks associated with volatility in oil prices.

7. BEHAVIOUR BE

The behaviour of the customer is assumed as follows:
- The provision to select a date is given and if a date is selected, the price can be viewed on that selected date.
- There is also a provision in which the price fluctuations can be observed for a range of dates, with the percentage of increase and decrease.

Identify strong TR & EM

3. TRIGGERS TR

Once the customers are spread out across, and are benefited, seeing the benefits that one yields using our solutions that others are automatically attracted to use our solution.

4. EMOTIONS: BEFORE / AFTER EM

BEFORE: Lack of knowledge
AFTER: Sufficient knowledge to exploit the price fluctuations.

10. YOUR SOLUTION SL

We are working on building Machine Learning Models based on ARIMA, LSTM and Exponential Smoothing, and simultaneously working on the pre-processing techniques for achieving better accuracy.

The best set of these models will be picked and would be proposed as the final solution.

8. CHANNELS of BEHAVIOUR CH

8.1 ONLINE

There is a separate forum for handling queries and addressing the grievances of the customers, which is available 24 x 7.

8.2 OFFLINE

There is a little to no, offline interaction and support provided to the customers.

Extract online & offline CH of BE

AMALTAMA

4 REQUIREMENT ANALYSIS:

4.1 FUNCTIONAL REQUIREMENT:

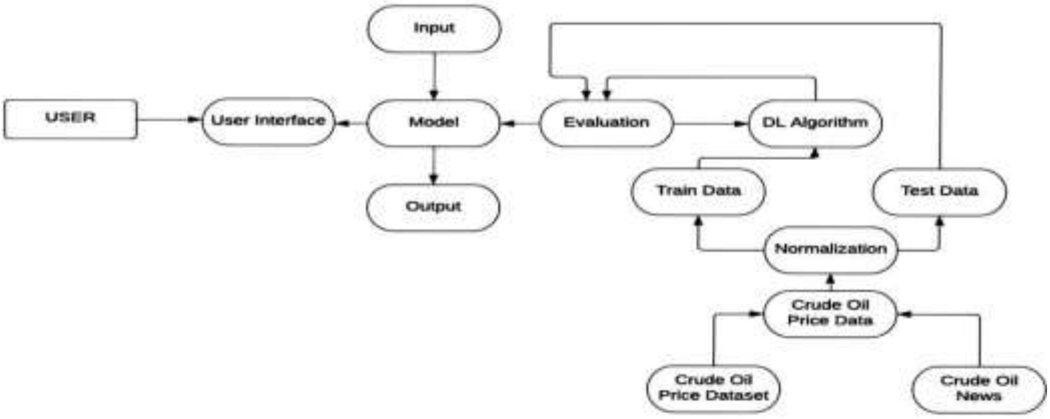
FRNO.	FUNCTIONAL REQUIREMENT	SUB REQUIREMENT
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Enquiry	Enter the date or range of dates
FR-4	User Visualization	Visualize the trend Enquire the prices Analyse the results
FR-5	User Endowment	See the results Gain Knowledge
FR-6	User Utilization	Use it in your idea Close the portal

4.2 NON-FUNCTIONAL REQUIREMENT:

FRNO.	NON-FUNCTIONAL REQUIREMENT	DESCRIPTION
FR-1	**Usability**	The application interface is easy to use and implement.
FR-2	**Security**	The credentials are secured and the result is encrypted.
FR-3	**Reliability**	The accuracy and reliability quotient is quoted to be high.
FR-4	**Performance**	The performance is uninterrupted and undeterred
FR-5	**Availability**	The data is freely available and the trend can be manually analysed
FR-6	**Scalability**	The predictions are scalable and reliable.

5 PROJECT DESIGN

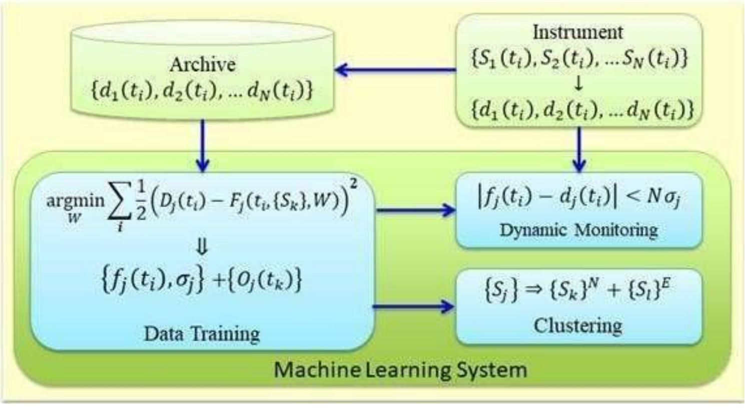
5.1 DATA FLOW DIAGRAM:



5.2 SOLUTION AND TECHNICAL ARCHITECTURE:

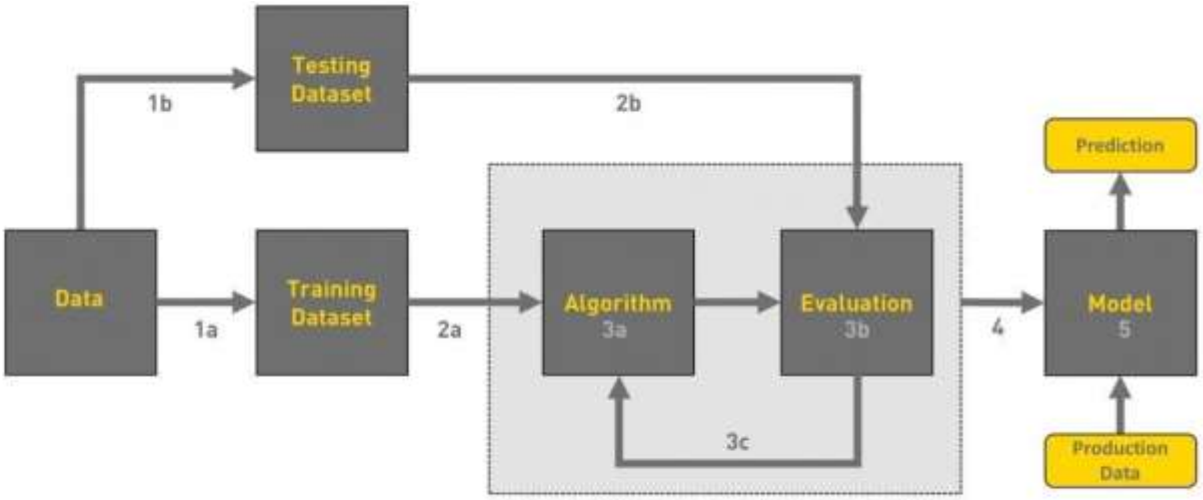
Context View

This view gives a high level representation of the system, the different user types and interactions with external entities. It describes the boundaries of the solution.


Archive
$\{d_1(t_i), d_2(t_i), \ldots d_N(t_i)\}$
Instrument
$\{S_1(t_i), S_2(t_i), \ldots S_N(t_i)\}$
$\downarrow$
$\{d_1(t_i), d_2(t_i), \ldots d_N(t_i)\}$
$\underset{W}{\operatorname{argmin}} \sum_i \frac{1}{2}\left(D_j(t_i) - F_j(t_i, \{S_k\}, W)\right)^2$
$\Downarrow$
$\{f_j(t_i), \sigma_j\} + \{O_j(t_k)\}$
Data Training
$|f_j(t_i) - d_j(t_i)| < N\sigma_j$
Dynamic Monitoring
$\{S_j\} \Rightarrow \{S_k\}^N + \{S_l\}^E$
Clustering
Machine Learning System

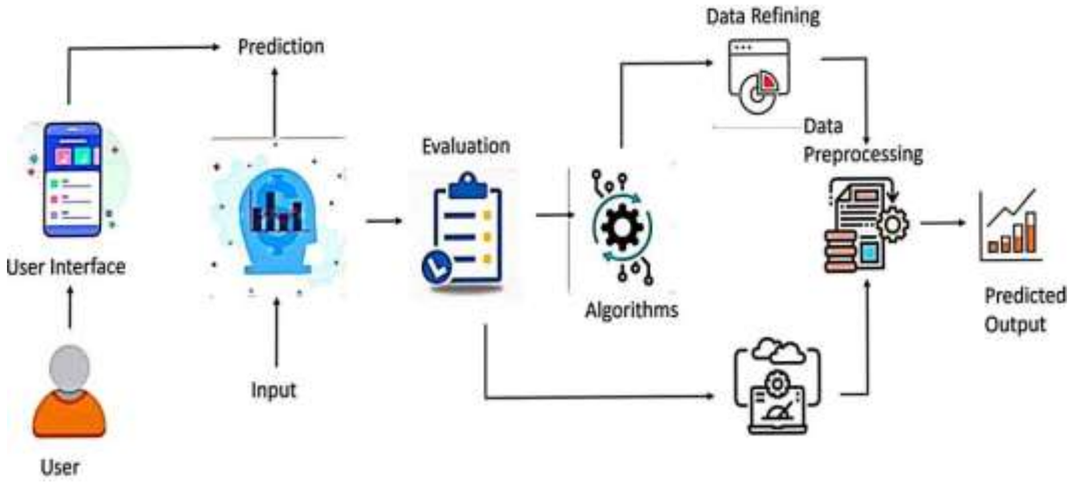
Project View

This section shows how key functionality relevant to the solution architecture maps to releases and milestones.



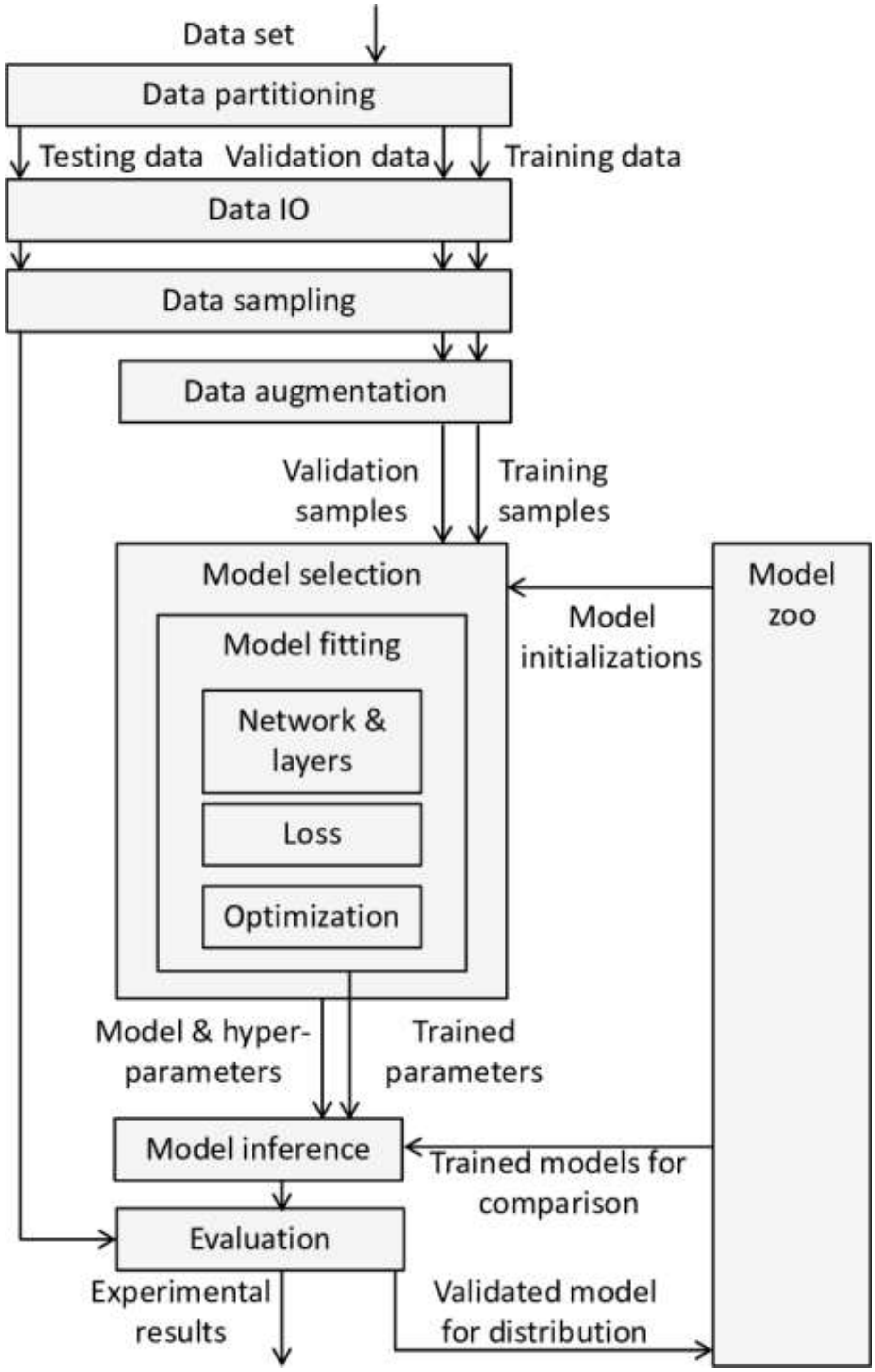
Functional View

This section describes the key functional areas of the project. The goal is to provide context around the architecture – all software performs some functionality and the definition of this functional scope is a very important factor to define the architecture.



Process View

The intent of the process view is to show how the various processing steps within the system fit together to implement the overall functional requirements. This is necessary if the system relies on workflow processes, forked or parallel processing mechanisms. The following processes are significant:



Non-Functional View

This section describes architecturally significant changes that enable the solution to achieve the agreed non-functional requirements (NFRs). Each change is mapped to the corresponding NFR category, which is based on the ISO/IEC 25010-2011 product quality model.

NFRs are documented and maintained in the Non-Functional Requirements Definition and will not be repeated here. In case of duplication, the Non-Functional Requirements Definition takes precedence.

Performance Easy tracking of records and updating can be done. All the requirements relating to performance characteristics of the system are specified in the section below. There are two types of requirements.

1. Static Requirements:

These requirements do not impose any constraints on the execution characteristics of the system. They are:

A) Number of Terminals: The software makes use of an underlying database that will reside at the same system, while the front end will be available to the administrative computer.

B) Number of Users: The number of users can be administrator only, but this software can be extended to applications for almost all staff members of the organization.

2. Dynamic Requirements:

These specify constraints on the execution characteristics of the system. They typically include response time and throughout of the system. Since these factors are not applicable to the proposed software, it will suffice if the response tine is high and the transactions are carried out precisely and quickly. Reliability: The software will not be able to connect to the database in the event of the server being down due to a hardware or software failure.

3. Availability:

The software will be available only to administrator of the organization and the product as well as customer details will be recorded by him. He can add customers, update and delete them as well as add new products and manage them.

4. **Security:**

The security requirements deal with the primary security. The software should be handled only by the administrator and authorized users. Only the administrator has right to create new accounts and generating inventory. Only authorized users can access the system with username and password of administrator

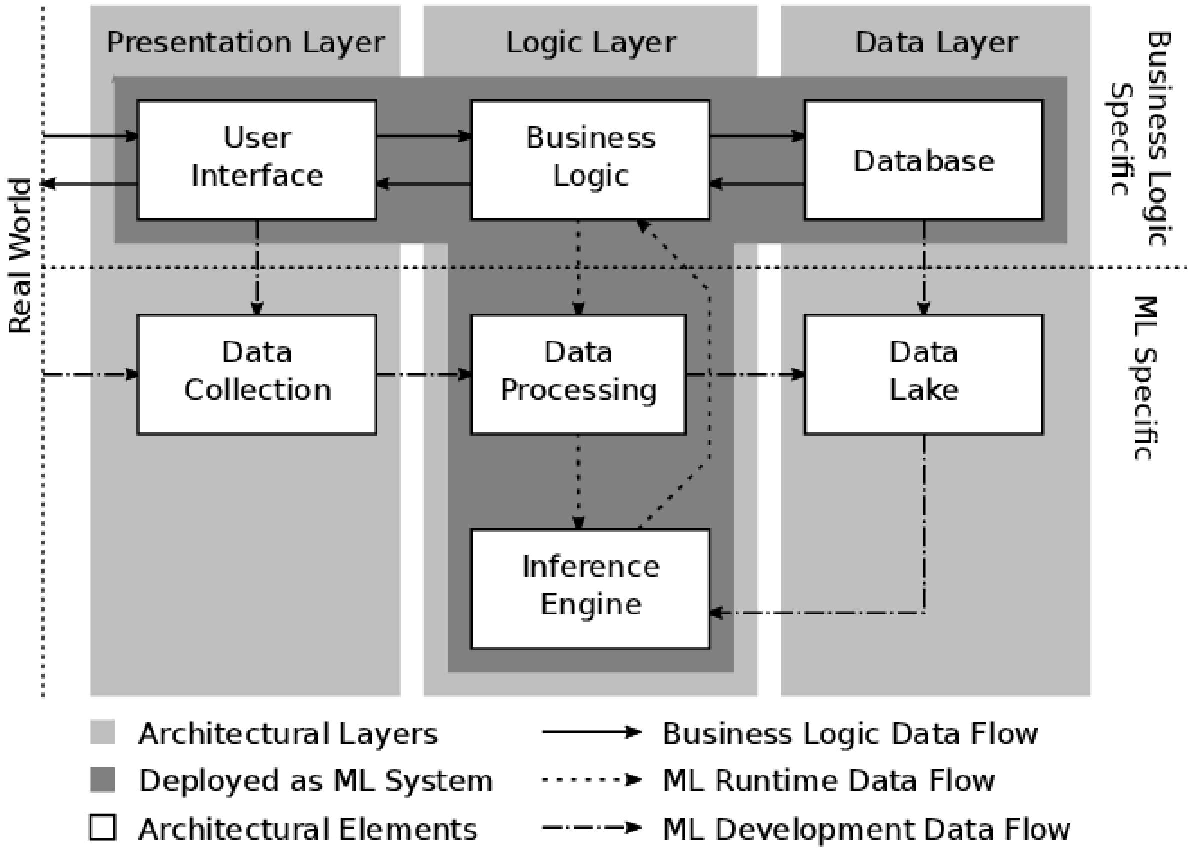
5. **Maintainability:**

Backups for database are available.

6. **Portability:**

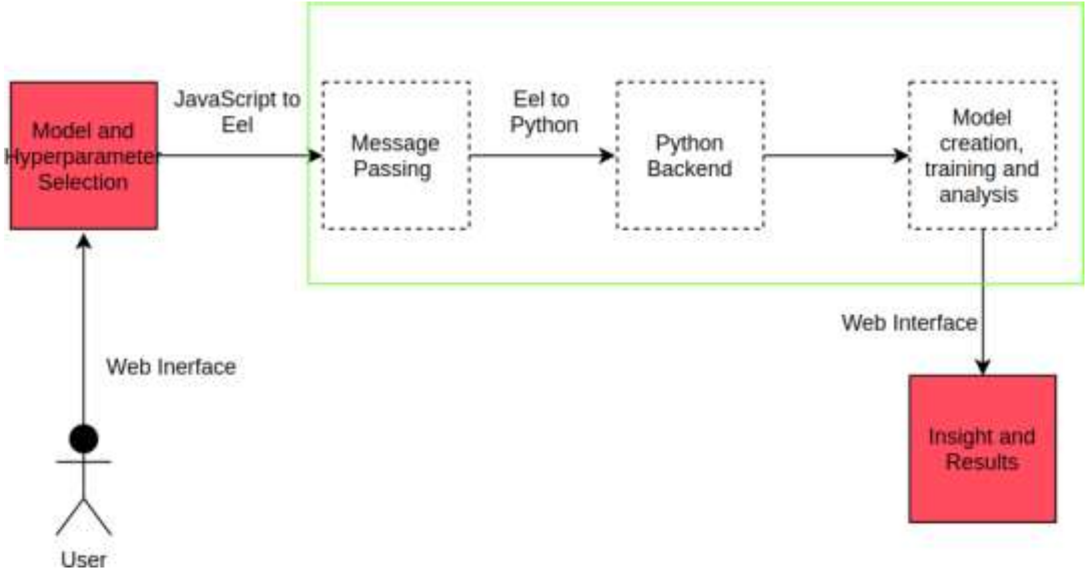
The Software is a web-based application and is built in Python and Nosql so it is platform independent and is independent of operating system.

Logical View



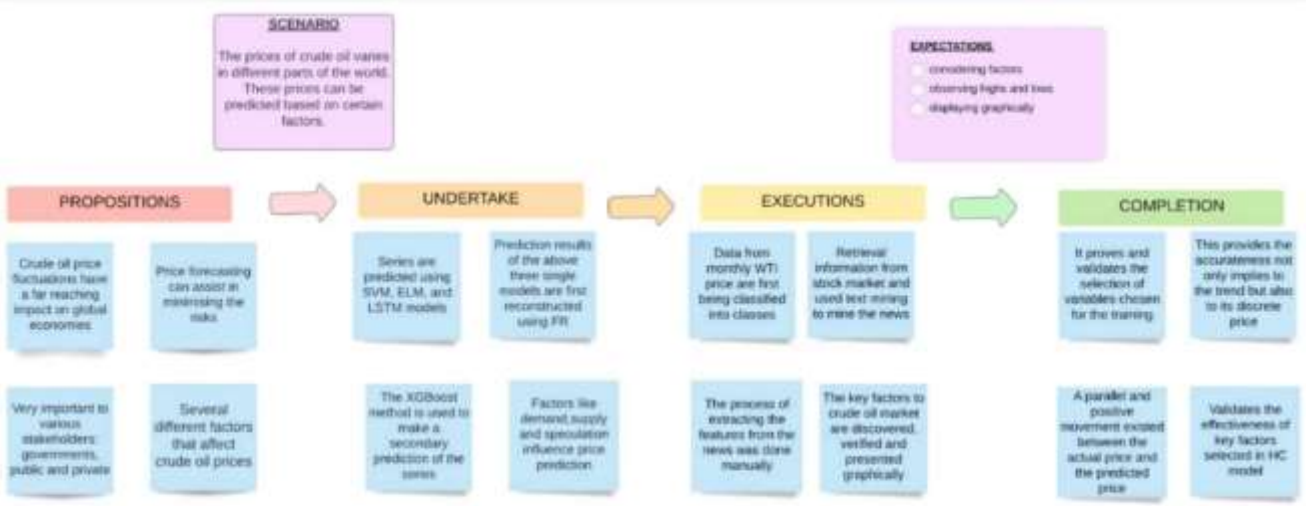
1 Interface View

This section describes the interfaces that will be required to the external system integration touch points



Design View

This section describes and explains any lower-level design concepts arising from the solution if required.



SCENARIO

The prices of crude oil varies in different parts of the world. These prices can be predicted based on certain factors.

EXPECTATIONS

○ considering factors
○ observing highs and lows
○ displaying graphically

PROPOSITIONS

Crude oil price fluctuations have a far reaching impact on global economies

Price forecasting can assist in minimising the risks

Very important to various stakeholders: governments, public and private

Several different factors that affect crude oil prices

UNDERTAKE

Series are predicted using SVM, ELM, and LSTM models

Prediction results of the above three single models are first reconstructed using FR

The XGBoost method is used to make a secondary prediction of the series

Factors like demand,supply and speculation influence price prediction

EXECUTIONS

Data from monthly WTI price are first being classified into classes

Retrieval information from stock market and used text mining to mine the news

The process of extracting the features from the news was done manually

The key factors to crude oil market are discovered, verified and presented graphically

COMPLETION

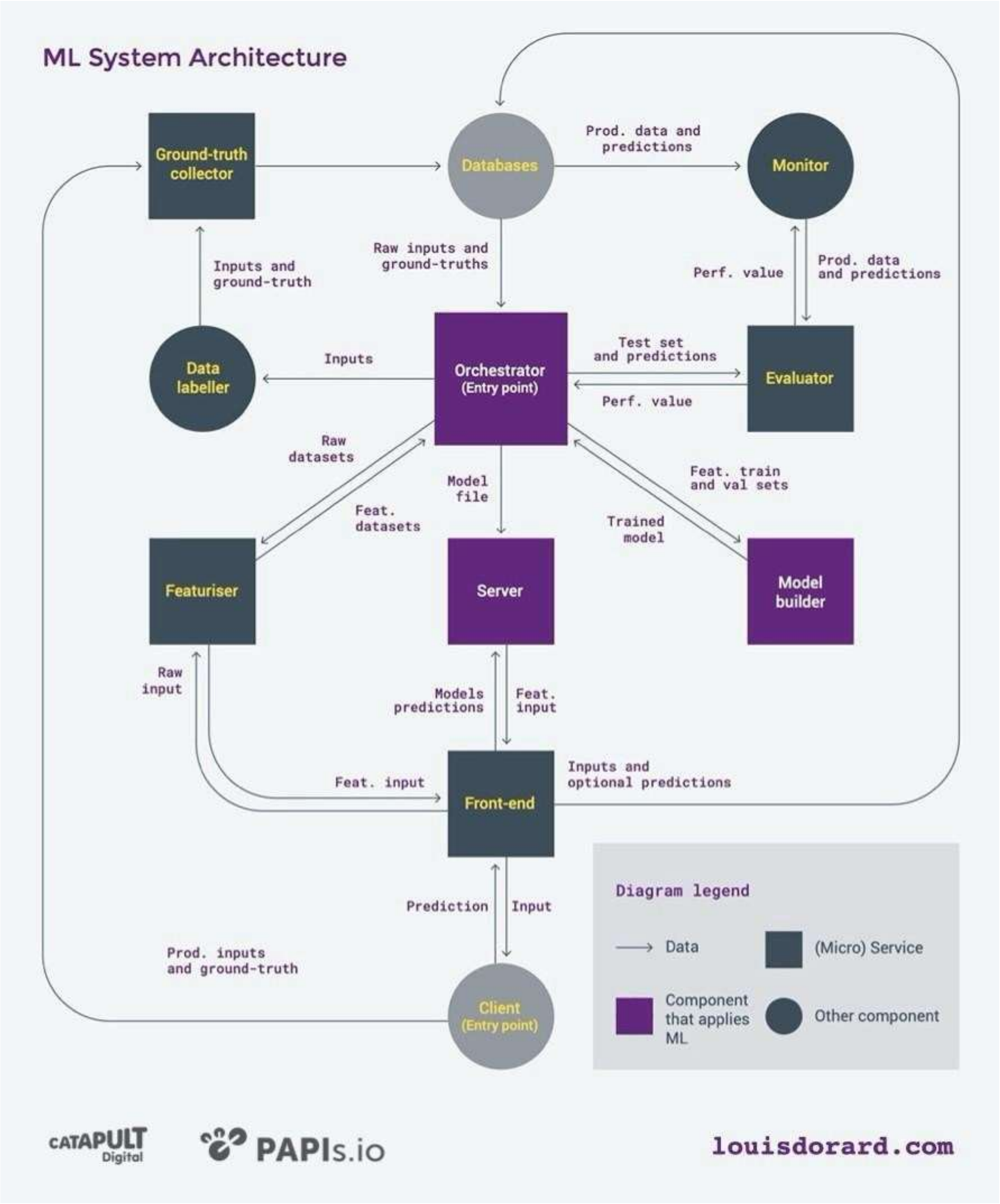
It proves and validates the selection of variables chosen for the training

This provides the accurateness not only implies to the trend but also to its discrete price

A parallel and positive movement existed between the actual price and the predicted price

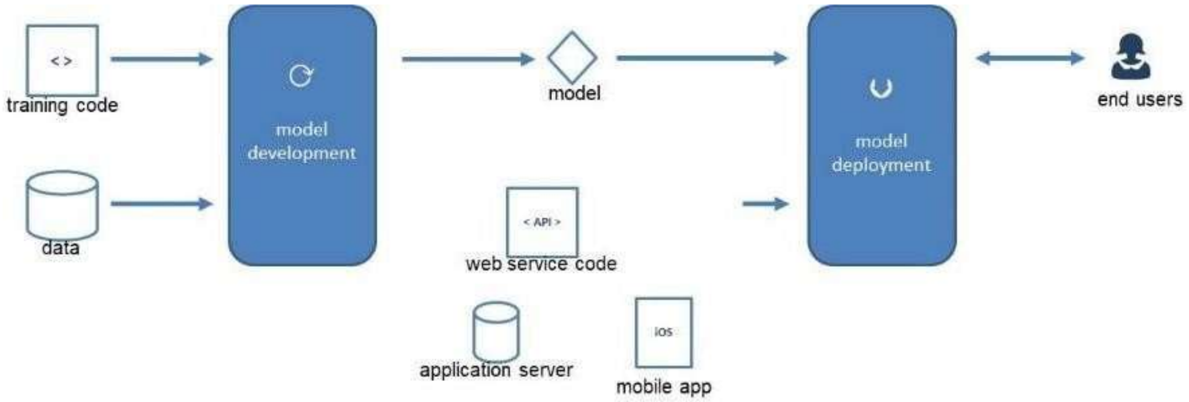
Validates the effectiveness of key factors selected in HC model

Physical View



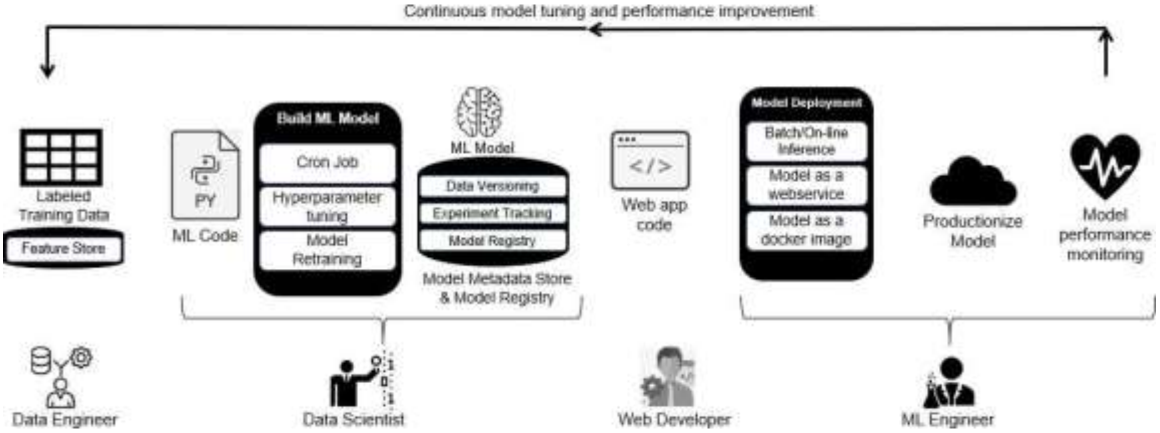
Deployment View

This section describes how code will be deployed in test environments and key considerations for the more complex Production go-live deployment.



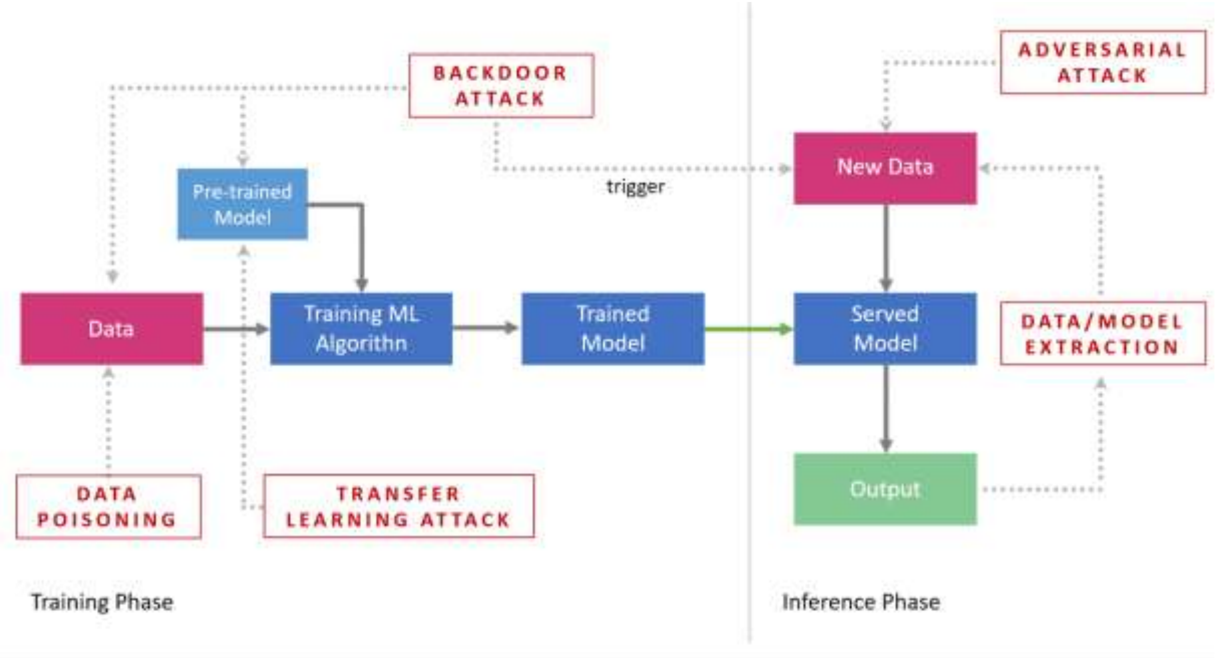
Operational View

This section describes how the architecture will support operational processes and activities.



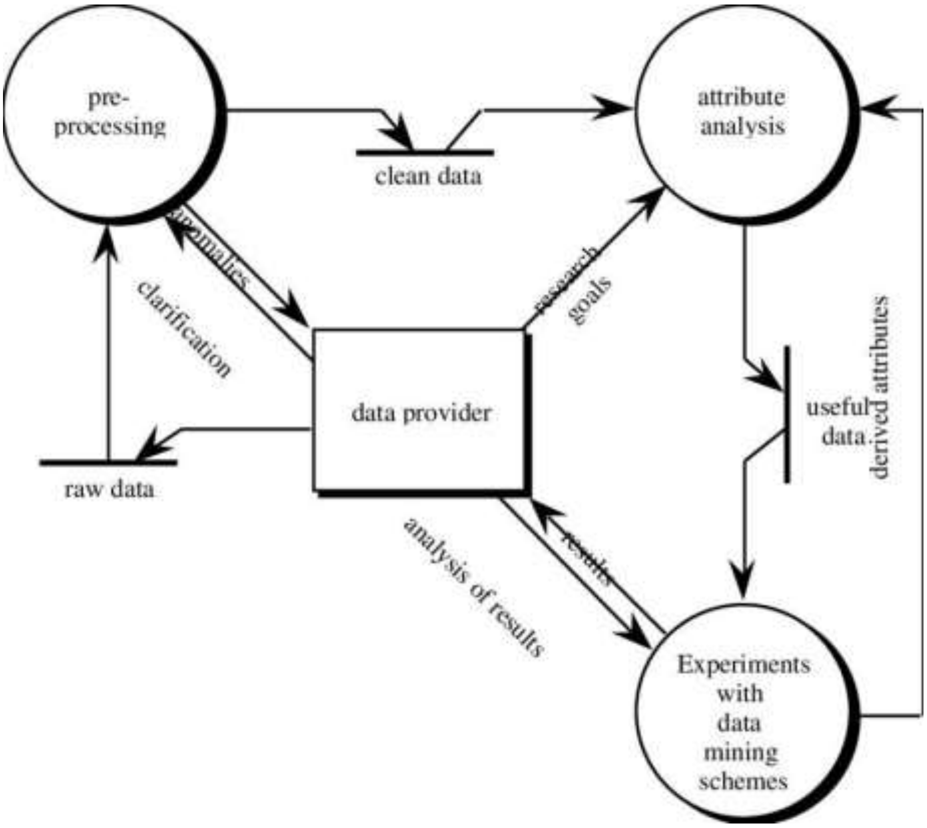
Security View

This section describes how the architecture addresses the different security aspects.



Data View

This section describes the important data model changes required to fulfil the requirements and the associated data flows.



5.3 USER STORIES:

USER TYPE	FUNCTIONAL REQUIREMENT	USER STORY	USER STORY / TASK	ACCEPTANCE CRITERIA	PRIORITY	RELEASE
Customer	Registration	1	Register for the Application through different vendors.	I can access my account / dashboard	High	Sprint-3
	Confirmation	2	Receiving Confirmation Mail	I can receive confirmation email & click confirm	High	Sprint-4
	Login	3	Log in into the application	Access to the account	High	Sprint-2
	Enquiry	4	Enter the range of dates	Plausible Range	High	Sprint-1
	Visualize	5	Visualize the Trend	Accuracy Check	High	Sprint-3
	Endowment	6	See the result	Prediction Check	High	Sprint-1
	Utilization	7	Log Out	Confirmation and Session Closure	High	Sprint-2
Administrator	Authority	1	Verify the imbalances	Session Dryness	High	Sprint-3

6 PROJECT PLANNING AND SCHEDULING:

6.1 SPRINT PLANNING AND ESTIMATION:

SPRINT	FUNCTIONAL REQUIREMENT	USER STORY	USER STORY / TASK	STORY POINTS	PRIORITY	MEMBERS
1	Registration	1	Register for the Application	2	High	2
2	Confirmation	2	Receiving Confirmation Mail	1	Medium	2
2	Login	3	Log in into the application	2	High	2
3	Enquiry	4	Enter the range of dates	2	Medium	2
4	Visualize	5	Visualize the Trend	2	High	2
3	Endowment	6	See the result	2	High	2
4	Utilization	7	Log Out	1	Medium	2

6.2 SPRINT DELIVERY SCHEDULE:

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed	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	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

1. ***CODING & SOLUTIONING (Explain the features added in the project along with code)***
   1. *A LSTM Price forecasting machine learning model*
   2. *A User Interface for forecasting based on the past 10 days price*

2. ***TESTING***
   1. *Test Cases*
   2. *User Acceptance Testing*

3. ***RESULTS***
   1. *Performance Metrics – RMSE – 2.78*

7.coding and solution

```
LOGIN.html

&lt;!DOCTYPE html&gt;
&lt;html lan=&quot;en&quot; and dir=&quot;Itr&quot;&gt;
    &lt;head&gt;
        &lt;meta charset=&quot;utf-8&quot;&gt;
        &lt;title&gt;login form&lt;/title&gt;
        &lt;link rel=&quot;stylesheet&quot; href=&quot;style.css&quot;&gt;
         &lt;script src =&quot;login.js&quot;&gt;&lt;/script&gt;
    &lt;/head&gt;
    &lt;body&gt;
        &lt;form class=&quot;box&quot; action=&quot;login.html&quot;
method=&quot;POST&quot;&gt;
            &lt;h1&gt;CRUDE OIL PRICE PREDICTION&lt;/h1&gt;
            &lt;h2&gt;
                 LOGIN
            &lt;/h2&gt;
            &lt;input type=&quot;text&quot; name=&quot;&quot; placeholder=&quot;Enter
Username&quot;
id=&quot;username&quot;&gt;
            &lt;input type=&quot;password&quot; name=&quot;&quot; placeholder=&quot;Enter
Password&quot;
id=&quot;password&quot;&gt;
            &lt;input type=&quot;submit&quot; name=&quot;&quot;
value=&quot;Login&quot;  onclick=&quot;validate()&quot;&gt;
            &lt;h3&gt;&lt;a href=&quot;register.html&quot;&gt; New User ? Register
&lt;/a&gt;&lt;/h3&gt;
        &lt;/form&gt;
    &lt;/body&gt;
&lt;/html&gt;

LOGIN.JS
function validate()
{
    var username=document.getElementById(&quot;username&quot;).Value;
    var password=document.getElementById(&quot;password&quot;).Value;
    if(username==&quot;ibm&quot;&amp;&amp;password==&quot;ibm123&quot;)
    {
        alert(&quot;login succesfully&quot;);
        return true;
    }
    else
    {
        document.getElementById(&quot;username&quot;).disabled=true;
        document.getElementById(&quot;password&quot;).disabled=true;
        return false;
    }

}

{
    document.getElementByI
d(&quot;email&quot;).value=&quot;&quot;;
    document.getElementById(&quot;pwd1&quot;).value=&quot;&quot;;
}
```

predict.html

```
<!DOCTYPE html>
<head>
```

```
    <title>Crude Oil Price Prediction </title>
    <link href='https://fonts.googleapis.com/css?family=Roboto' rel='stylesheet'>
    <link rel="stylesheet" href="{{ url_for('static', filename='css/predict.css') }}">
</head>
<body style="text-align:center;background-color: lightsteelblue;">
    <h1 style="color: white;font-size: 50px;font-family: roboto;">
    Crude Oil Price Prediction </h1>
    <h1 style="color: white;font-size: 50px;font-family: roboto;">
        Enter the Oil price for 10 days </h1>
        <form action="/predict" method="POST" enctype = "multipart/form-data">
            <div style="color:green;font-size:50px;font-family:roboto;">
                {{prediction}}
            </div>
        <input type="text" name="val" style="border-radius: 18px;padding: 20px;width: 
300px;height: 15px;text-align: center; align:center;" >
         <br> <br> <br>
        <input type="submit"/ style="border-radius: 9px;;padding: 10px;width: 150px;
        height: 40px;text-align: center;background: #003d66;color: white;">
        </form>
        <br>
        <form action="/predict" method="GET" enctype = "multipart/form-data">
        <input type="submit"/ value="Reset" style="border-radius: 9px;;padding: 
10px;width: 150px;
        height: 40px;text-align: center;background: #003d66;color: white;">
        </form>
</body>
```

REGISTER.CSS

```
body{
    margin: 0;
    padding: 0;
    font-family: sans-serif;
    background: url(ppp.jpg);
    background-size: cover;
}
.box{
    width: 300px;
    padding: 30px;
    position: absolute;
    top: 50%;
    left: 50%;
    transform: translate(-50%,-50%);
    background: rgb(14, 14, 14);
    text-align: center;
}
.box h1
{
    color: rgb(253, 249, 251);
    text-transform: uppercase;
    font-weight: 700;
}
```

```
.box h2
{
    color: rgb(253, 249, 251);
    text-transform: uppercase;
    font-weight: 700;
}

.box input[type="text"],.box input[type="password"] ,.box input[type="date"],.box
input[type="Number"],.box input[type="Email"]
{
    border: 0;
    background: white;
    display: block;
    margin: 28px auto;
    text-align: center;
    border: 3px solid #2af003;
    padding: 14px 10px;
    width: 220px;
    outline: none;
    color: #fff6ff(18, 18, 179);
    border-radius: 24px;
    transition: 0.25px;
}
.box input[type="text"]:focus,.box input[type="password"]:focus{
    width: 270px;
    border-color: rgb(238, 26, 203);

}
.box input[type="submit"]{
    border: 0;
    background: none;
    display: block;
    margin: 28px auto;
    text-align: center;
    border: 3px solid rgb(211, 15, 152);
    padding: 14px 10px;
    width: 220px;
    outline: none;
    color: rgb(73, 31, 224);
    border-radius: 24px;
    transition: 0.25px;
    cursor: pointer;


}
.box input[type="submit"]:hover{
    background: rgb(100, 182, 53);
}
h3{
    color: wheat;
}
```

REGISTER.HTML

```
<!DOCTYPE html>
<html lan="en" and dir="Itr">
    <head>
        <meta charset="utf-8">
        <title>login form</title>
        <link rel="stylesheet" href="register.css">
         <script src ="login.js"></script>
    </head>
    <body>
        <form class="box" action="login.html" method="POST">
            <h1>CRUDE OIL PRICE PREDICTION</h1>
            <h2>
                 Register
            </h2>
            <input type="text" name="" placeholder="Enter Username" id="username">
            <input type="email" name="" placeholder="Enter Your Email Id" id="Email">
            <input type="number" name="" placeholder="Enter Your Number" id="Number">
            <input type="password" name="" placeholder="Enter Password" id="password">
            <input type="submit" name="" value="Register"  onclick="validate()">
            <h3><a href="login.html"> Login </a></h3>
        </form>

    </body>
</html>
```

STYLE.CSS

```
body{
    margin: 0;
    padding: 0;
    font-family: sans-serif;
    background: url(p2.jpg);
    background-size: cover;
}
.box{
    width: 300px;
    padding: 30px;
    position: absolute;
    top: 50%;
    left: 50%;
    transform: translate(-50%,-50%);
    background: rgb(14, 14, 14);
    text-align: center;
}
.box h1
{
    color: rgb(253, 249, 251);
    text-transform: uppercase;
    font-weight: 700;
}
.box h2
{
    color: rgb(253, 249, 251);
    text-transform: uppercase;
    font-weight: 700;
}

.box input[type="text"],.box input[type="password"] ,.box input[type="date"],.box
input[type="Number"],.box input[type="Email"]
{
    border: 0;
    background: white;
    display: block;
    margin: 28px auto;
    text-align: center;
    border: 3px solid #2af003;
    padding: 14px 10px;
    width: 220px;
    outline: none;
    color: #fff6ff(18, 18, 179);
    border-radius: 24px;
    transition: 0.25px;
}
.box input[type="text"]:focus,.box input[type="password"]:focus{
    width: 270px;
    border-color: rgb(238, 26, 203);

}
.box input[type="submit"]{
    border: 0;
    background: none;
    display: block;
    margin: 28px auto;
    text-align: center;
    border: 3px solid rgb(211, 15, 152);
    padding: 14px 10px;
    width: 220px;
    outline: none;
    color: rgb(73, 31, 224);
    border-radius: 24px;
    transition: 0.25px;
    cursor: pointer;


}
.box input[type="submit"]:hover{
    background: rgb(100, 182, 53);
}
h3{
    color: wheat;
}
```

APP.PY

```
from flask import Flask,render_template,request,redirect
import numpy as np
import joblib
```

```
from keras.models import load_model

app = Flask(__name__)

@app.route('/',methods=["GET"])
def index():
    return render('login.html')

@app.route('/predict',methods=["POST","GET"])
def predict():
    if request.method == "POST":
        string = request.form['val']
        if(string ==""):
            return render_template('predict.html')
        string = string.split(',')
        x_input = [eval(i) for i in string]
        sc = joblib.load("scaler.save")
        x_input = sc.fit_transform(np.array(x_input).reshape(-1,1))
        x_input = np.array(x_input).reshape(1,-1)
        x_input = x_input.reshape(1,-1)
        x_input = x_input.reshape((1,10,1))
        model = load_model('model.h5')
        output = model.predict(x_input)
        val = sc.inverse_transform(output)
        return render_template('predict.html', prediction = "The predicted price is
{:.2f}".format(val[0][0]))
    if request.method == "GET":
        return render_template('predict.html')

if __name__=="__main__":
    model = load_model('model.h5')
    app.run(host='0.0.0.0', port=5000)
```

8. TESTING

8.1 TEST CASES

Sprint 1:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
```

In [2]:

```
data=pd.read_excel("/content/Crude Oil Prices Daily.xlsx")
```

In [3]:

```
data.isnull().any()
```

Out[3]:

```
Date             False
Closing Value     True
dtype: bool
```

In [4]:

```
data.isnull().sum()
```

Out[4]:

```
Date             0
Closing Value    7
dtype: int64
```

In [5]:

```
data.dropna(axis=0,inplace=True)
```

In [6]:

```
data.isnull().sum()
```

Out[6]:

```
Date             0
Closing Value    0
dtype: int64
```

In [7]:

```
data_oil=data.reset_index()['Closing Value']
data_oil
```

Out[7]:

```
0       25.56
1       26.00
2       26.53
3       25.85
4       25.87
        ...
8211    73.89
8212    74.19
8213    73.05
8214    73.78
8215    73.93
Name: Closing Value, Length: 8216, dtype: float64
```

In [8]:

```
from sklearn.preprocessing import MinMaxScaler
scaler=MinMaxScaler(feature_range=(0,1))
data_oil=scaler.fit_transform(np.array(data_oil).reshape(-1,1))
```

In [9]:

```
data_oil
```

Out[9]:

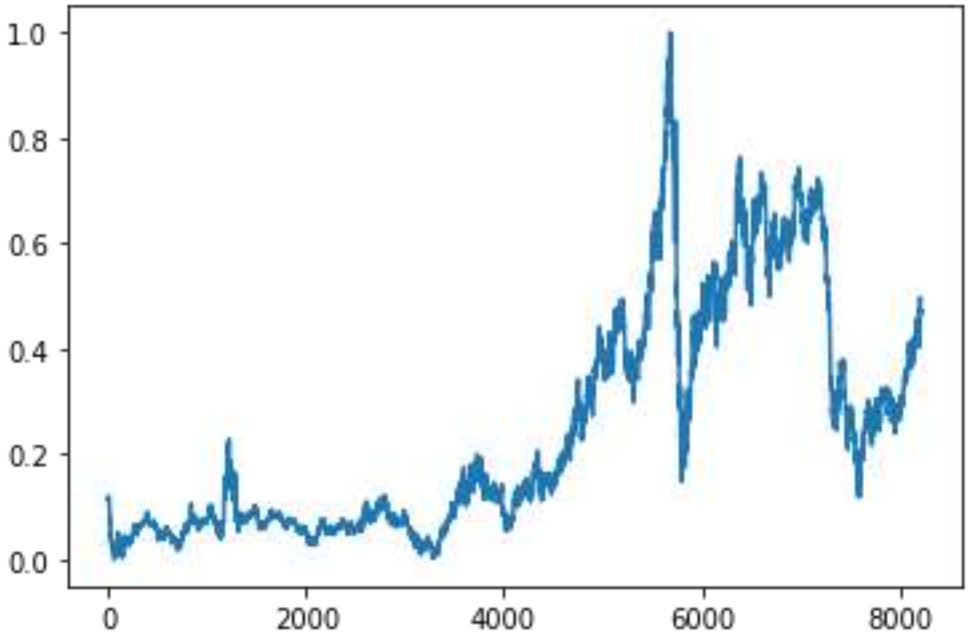
```
array([[0.11335703],
       [0.11661484],
       [0.12053902],
       ...,
       [0.46497853],
       [0.47038353],
       [0.47149415]])
```

In [10]:

```
plt.plot(data_oil)
```

Out[10]:

```
[]
```



In [11]:

```
training_size=int(len(data_oil)*0.65)
test_size=len(data_oil)-training_size
train_data,test_data=data_oil[0:training_size,:],data_oil[training_size:len(data_oi
l),:1]
```

In [12]:

```
training_size,test_size
```

Out[12]:

```
(5340, 2876)
```

In [13]:

```
train_data.shape
```

Out[13]:

```
(5340, 1)
```

In [14]:

```
def create_dataset(dataset,time_step=1):
  dataX,dataY=[],[]
  for i in range(len(dataset)-time_step-1):
    a=dataset[i:(i+time_step),0]
    dataX.append(a)
    dataY.append(dataset[i+time_step,0])
  return np.array(dataX),np.array(dataY)
```

In [15]:

```
time_step=10
x_train,y_train=create_dataset(train_data,time_step)
x_test,y_test=create_dataset(test_data,time_step)
```

In [16]:

```
print(x_train.shape),print(y_train.shape)
(5329, 10)
(5329,)
```

Out[16]:

```
(None, None)
```

In [17]:

```
print(x_test.shape),print(y_test.shape)
(2865, 10)
```

```
(2865,)
```

Out[17]:

```
(None, None)
```

In [18]:

```
x_train
```

```
array([[0.11335703, 0.11661484, 0.12053902, ..., 0.10980305, 0.1089886
        0.11054346],
       [0.11661484, 0.12053902, 0.11550422, ..., 0.1089886 , 0.11054346,
        0.10165852],
       [0.12053902, 0.11550422, 0.1156523 , ..., 0.11054346, 0.10165852,
        0.09906708],
       ...,
       [0.36731823, 0.35176958, 0.36080261, ..., 0.36391234, 0.37042796,
        0.37042796],
       [0.35176958, 0.36080261, 0.35354657, ..., 0.37042796, 0.37042796,
        0.37879461],
       [0.36080261, 0.35354657, 0.35295424, ..., 0.37042796, 0.37879461,
        0.37916482]])
```

In [19]:

```
x_train=x_train.reshape(x_train.shape[0],x_train.shape[1],1)
x_test=x_test.reshape(x_test.shape[0],x_test.shape[1],1)
```

Sprint 2:

crudeoil.html

```
<!DOCTYPE
html>
                <html>
                <head>
                <title>PRICE PREDICTION</title>
                </head>
                <body>
                <p>&nbsp;</p>
                <p>&nbsp;</p>
                <style>
                body {
                  background-image: url('CR.webp');
                  background-repeat: no-repeat;
                    background-attachment: fixed;
                  background-size: cover;
                }
                {
                      min-height: 70%;
                      }
                      body,form {
                      padding: 0;
                      margin: 0;
                      outline: none;
                      font-family: Roboto, Arial, sans-serif;
                      font-size: 14px;
                      color: #FFFFFF;
                      line-height: 22px;
                     }
```

```
     .myDiv {
  border: 5px outset  #000000;
  background-color: #2F4F4F;
  text-align: center;
  font-family: Roboto, Arial, sans-serif;
      font-size: 14px;
      color: #FFFFFF;
}

</style>
<h1 style="text-align:center"><span style="color:#ffffff"><strong><span style="font-family:Arial,Helvetica,sans-serif"><span style="font-size:36px">CRUDE OIL PRICE PREDICTION&nbsp;</span></span></strong></span></h1>
<p>&nbsp;</p>
<p>&nbsp;</p>
<p>&nbsp;</p>
<form style="text-align:center">
  <label for="ENTER PRICE">ENTER PRICE:</label>
  <input type="date" id="PRICE" name="PRICE">
  <input type="submit">
</form>
<p>&nbsp;</p>
<p>&nbsp;</p>
<div class="myDiv">
  <h2>PREDICTED PRICE:</h2>
  <p>{_____________}</P><br>

  </p>
</div>
</body>
</html>
```

DATA VISULAITATION:

```
{
  "nbformat": 4,
  "nbformat_minor": 0,
  "metadata": {
    "colab": {
      "provenance": []
    },
    "kernelspec": {
      "name": "python3",
      "display_name": "Python 3"
    },
    "language_info": {
      "name": "python"
    }
  },
  "cells": [
    {
      "cell_type": "code",
      "source": [
"import pandas as pd\n",
        "import numpy as np\n",
        "import matplotlib.pyplot as plt"
      ],
      "metadata": {
        "id": "GiRQ27X4JRcH"
      },
      "execution_count": 1,
      "outputs": []
    },
    {
      "cell_type": "code",
      "source": [
        "data=pd.read_excel(\"/content/Crude Oil Prices Daily.xlsx\")"
      ],
      "metadata": {
        "id": "dbaHUfMiJW8I"
      },
      "execution_count": 2,
      "outputs": []
    },
    {
      "cell_type": "code",
      "source": [
        "data.isnull().any()"
      ],
      "metadata": {
        "colab": {
          "base_uri": "https://localhost:8080/"
        },
        "id": "RAUyZB0-Jp0t",
        "outputId": "2cfb34ee-fdfa-4bf4-f8c3-3da341f3a2a9"
      },
      "execution_count": 3,
      "outputs": [
        {
          "output_type": "execute_result",
          "data": {
            "text/plain": [
              "Date             False\n",
              "Closing Value     True\n",
              "dtype: bool"
            ]
          },
          "metadata": {},
          "execution_count": 3
        }
      ]
    },
    {
      "cell_type": "code",
      "source": [
        "data.isnull().sum()"
      ],
      "metadata": {
        "colab": {
          "base_uri": "https://localhost:8080/"
        },
        "id": "yorF39lCJsyV",
        "outputId": "35237200-e540-4f63-b787-b5da37cd411a"
```

```
},
      "execution_count": 4,
      "outputs": [
        {
          "output_type": "execute_result",
          "data": {
            "text/plain": [
              "Date             0\n",
              "Closing Value    7\n",
              "dtype: int64"
            ]
          },
          "metadata": {},
          "execution_count": 4
        }
      ]
    },
    {
      "cell_type": "code",
      "source": [
        "data.dropna(axis=0,inplace=True)"
      ],
      "metadata": {
        "id": "g3FWuWVPJwms"
      },
      "execution_count": 5,
      "outputs": []
    },
    {
      "cell_type": "code",
      "source": [
        "data.isnull().sum()"
      ],
      "metadata": {
        "colab": {
          "base_uri": "https://localhost:8080/"
        },
        "id": "vIHbyOs4JzIf",
        "outputId": "dbf56470-e7ef-4760-974c-f79f484a6bdb"
      },
      "execution_count": 6,
      "outputs": [
        {
          "output_type": "execute_result",
          "data": {
            "text/plain": [
              "Date             0\n",
              "Closing Value    0\n",
              "dtype: int64"
            ]
          },
          "metadata": {},
          "execution_count": 6
        }
      ]
    },
    {
      "cell_type": "code",
      "source": [
        "data_oil=data.reset_index()['Closing Value']\n",
"data_oil"
      ],
      "metadata": {
        "colab": {
          "base_uri": "https://localhost:8080/"
        },
        "id": "IoxUNwrvJ2b6",
        "outputId": "568cb857-db42-4623-9bba-d73857809dc5"
      },
      "execution_count": 7,
      "outputs": [
        {
          "output_type": "execute_result",
          "data": {
            "text/plain": [
              "0        25.56\n",
              "1        26.00\n",
              "2        26.53\n",
              "3        25.85\n",
              "4        25.87\n",
              "         ...  \n",
              "8211     73.89\n",
              "8212     74.19\n",
              "8213     73.05\n",
              "8214     73.78\n",
              "8215     73.93\n",
              "Name: Closing Value, Length: 8216, dtype: float64"
            ]
          },
          "metadata": {},
          "execution_count": 7
        }
      ]
    },
    {
      "cell_type": "code",
      "source": [
        "from sklearn.preprocessing import MinMaxScaler\n",
        "scaler=MinMaxScaler(feature_range=(0,1))\n",
        "data_oil=scaler.fit_transform(np.array(data_oil).reshape(-1,1))"
      ],
      "metadata": {
        "id": "5m-DUFI9J_WN"
      },
      "execution_count": 8,
      "outputs": []
    },
    {
      "cell_type": "code",
      "source": [
        "data_oil"
      ],
      "metadata": {
        "colab": {
          "base_uri": "https://localhost:8080/"
        },
        "id": "fyMwOo1jKLqL",
        "outputId": "d4483e05-5472-46cc-eb13-14a4f0a4f37b"
      },
      "execution_count": 9,
"outputs": [
        {
          "output_type": "execute_result",
          "data": {
            "text/plain": [
              "array([[0.11335703],\n",
              "       [0.11661484],\n",
              "       [0.12053902],\n",
              "       ...,\n",
              "       [0.46497853],\n",
              "       [0.47038353],\n",
              "       [0.47149415]])"
            ]
          },
          "metadata": {},
          "execution_count": 9
        }
      ]
    },
    {
      "cell_type": "code",
      "source": [
        "plt.plot(data_oil)"
      ],
      "metadata": {
        "id": "GdNJartuKUfk",
        "outputId": "f635e36e-e38c-4768-ac5b-3ea693cc9c0a",
        "colab": {
          "base_uri": "https://localhost:8080/",
          "height": 282
        }
      },
      "execution_count": 10,
      "outputs": [
        {
          "output_type": "execute_result",
          "data": {
            "text/plain": [
              "[<matplotlib.lines.Line2D at 0x7f8b4c0ed150>]"
            ]
          },
          "metadata": {},
          "execution_count": 10
        },
        {
          "output_type": "display_data",
          "data": {
            "text/plain": [
              "<Figure size 432x288 with 1 Axes>"
            ],
            "image/png":
"iVBORw0KGgoAAAANSUhEUgAAAXQAAAD4CAYAAAD8Zh1EAAAABHNCSVQICAgIfAhkiAAAAAlwSFl
zAAALEgAACxIB0t1+/AAAADh0RVh0U29mdHdhcmUAbWF0cGxvdGxpYiB2ZXJzaW9uMy4yLjIsIGh
0dHA6Ly9tYXRwbG90bGliLm9yZy+WH4yJAAAgAElEQVR4nO2dd3gU1frHv282DUIIJQklARJ6lRa
KgHSRooId7OXKtXtt94d6sV1UbFdsV1GvyvXasKOgKEV6C70JBAgQakkJJSCD9/P7Ymd2Z2dndyWZ
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FnWEYxiJEB+vCycnJIiMjI1iXZxiGCUvWr19fIIIIRI0TsWNEHPyMhAdnZ2sC7PMAwTlhDRAXfH2OT
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Yxhw+XLYPeafPBXsYjB/xhw09DcAhxX6e1OYCEU0momVomws7Pz/fDpRmG8YV9+cWYNncnBr20Nh
```

```
DYfxIQBdFhRDvCyGyhBBZKSm6kasMwwSAc+VVwR4CYwL+EPTDAFoo9tOlNoZhQpRqrlRmSfwh6HM
A3Cx5u/QHUCiEOOqH8zIMYxJV1SzoVsRrci4i+gLAUADJRJQH4GkAMQAghHgPwDwAYwHkADgH4Da
zBsswjH/gGbo18SroQohJXo4LAPf6bUQMw5hOVXWwR8CYAUeKMkwEwiYXa8KCzjARCAu6NWFBZ5g
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C8IkQIh3AWACfEpHLuYUQ7wshsoQQWSkpKX66NMMwRlGG+SvXRHmCbg2MCPphAC0U++lSm5I7AMw
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vuLRSta9889Cy6M8Thq9vBVjQGSZCUM7Q5QLRcdHmSoD3QtTO2fYnK3Nx8O5r+d85OvNqv3Siiq
3fQ8YOJ+VYEFnmAhBKejyDD3axBn6scJS7JP83d2hNZ8cKyr1el7Lgr79SCEypsgzqNFjmP
fbsjDuXL1jN7KsKAzTISgNLkQzF8U/fOYU1hbNNLPG1NZpRZnIzb9tAbxqv1zZXZB/2XrMQDAmDe
WqY5H0sIoCzrDRAgqLxJJN810clE+LNx5GWo9W4yk9B3UVl2+UjbBlFXqm17KWNAZhrEaSu1MqhM
DwFw/dOWZSyuqVYFNALB2/ymH95ZbVaoNcfOA0A+GCZ/qKqUXdIK8CCzjARQnbuKZc
2c2fozu2C4jI89s0Wx/7rv+/GtTNXuXzGiEtiRVXNBJoFnWEYy/HZmoMubWYm5yKozy0nBgOANxb
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DRDDBjhOVuSA9CYDRGbq9T4yNMLJTKro0r4/qauGwpWthQWcYxlLM3XLUsZ3VqqFj20yTi56p47M
1+rVF/zq4jdvPaJFNLjG2KMRF21BWWY3WT8xDQXG5qt9dQ+RzspcLwzAW4bqZq3Dv5xsc++/c0Mu
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DATASET WITH SLIDING:

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FUTURE SCALING:

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              "2       26.53\n",
              "3       25.85\n",
              "4       25.87\n",
              "        ...  \n",
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              "8212    74.19\n",
              "8213    73.05\n",
              "8214    73.78\n",
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        "data_oil=scaler.fit_transform(np.array(data_oil).reshape(-1,1))"
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              "       [0.12053902],\n",
              "       ...,\n",
              "       [0.46497853],\n",
              "       [0.47038353],\n",
              "       [0.47149415]])"
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IMPORT LIBRARIES:

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      "metadata": {},
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{
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    "data_oil=data.reset_index()['Closing Value']\n",
    "data_oil"
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          "2       26.53\n",
          "3       25.85\n",
          "4       25.87\n",
          "         ...  \n",
          "8211    73.89\n",
          "8212    74.19\n",
          "8213    73.05\n",
          "8214    73.78\n",
          "8215    73.93\n",
          "Name: Closing Value, Length: 8216, dtype: float64"
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      "metadata": {},
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    "from sklearn.preprocessing import MinMaxScaler\n",
    "scaler=MinMaxScaler(feature_range=(0,1))\n",
    "data_oil=scaler.fit_transform(np.array(data_oil).reshape(-1,1))"
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              "       [0.46497853],\n",
              "       [0.47038353],\n",
              "       [0.47149415]])"
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}
```

IMPORTING DATASETS:

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        "import numpy as np\n",
        "import matplotlib.pyplot as plt"
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}
```

MODEL BUILDING:

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        "import numpy as np\n",
        "import matplotlib.pyplot as plt\n"
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```
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              "3       25.85\n",
              "4       25.87\n",
              "        ...  \n",
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              "8212    74.19\n",
              "8213    73.05\n",
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              "8215    73.93\n",
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        "data_oil=scaler.fit_transform(np.array(data_oil).reshape(-1,1))"
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              "       ...,\n",
              "       [0.46497853],\n",
              "       [0.47038353],\n",
              "       [0.47149415]])"
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        "  for i in range(len(dataset)-time_step-1):\n",
        "    a=dataset[i:(i+time_step),0]\n",
        "    dataX.append(a)\n",
        "    dataY.append(dataset[i+time_step,0])\n",
        "  return np.array(dataX),np.array(dataY)"
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        "from tensorflow.keras.layers import LSTM"
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\n",
            "                                                                 
\n",
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\n",
            "                                                                 
\n",
            " lstm_2 (LSTM)               (None, 50)                20200     
\n",
            "                                                                 
\n",
            " dense (Dense)               (None, 1)                 51        
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            "                                                                 
\n",

"=================================================================\n",
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"_________________________________________________________________\n"
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0.0017 - val_loss: 0.0011\n",
            "Epoch 2/3\n",
            "84/84 [==============================] - 1s 16ms/step - loss:
1.2375e-04 - val_loss: 7.8338e-04\n",
            "Epoch 3/3\n",
            "84/84 [==============================] - 1s 16ms/step - loss:
1.2058e-04 - val_loss: 7.5010e-04\n"
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        "train_predict=scaler.inverse_transform(train_data) \n",
        "test_predict=scaler.inverse_transform(test_data)\n",
        "### Calculate RMSE performance metrics\n",
        "import math \n",
        "from sklearn.metrics import mean_squared_error\n",
        "math.sqrt(mean_squared_error(train_data,train_predict))"
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```

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lstm_cell_1_layer_call_fn,
lstm_cell_1_layer_call_and_return_conditional_losses,
lstm_cell_2_layer_call_fn while saving (showing 5 of 6). These functions
will not be directly callable after loading.\n",
            "WARNING:absl:<keras.layers.recurrent.LSTMCell object at
0x7f2e2f939a10> has the same name 'LSTMCell' as a built-in Keras object.
Consider renaming <class 'keras.layers.recurrent.LSTMCell'> to avoid naming
conflicts when loading with `tf.keras.models.load_model`. If renaming is not
possible, pass the object in the `custom_objects` parameter of the load
function.\n",
            "WARNING:absl:<keras.layers.recurrent.LSTMCell object at
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Consider renaming <class 'keras.layers.recurrent.LSTMCell'> to avoid naming
conflicts when loading with `tf.keras.models.load_model`. If renaming is not
possible, pass the object in the `custom_objects` parameter of the load
function.\n",
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Consider renaming <class 'keras.layers.recurrent.LSTMCell'> to avoid naming
conflicts when loading with `tf.keras.models.load_model`. If renaming is not
possible, pass the object in the `custom_objects` parameter of the load
function.\n"
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        "trainpredictPlot[:, :]= np.nan\n",
        "trainpredictPlot[look_back:len(train_predict)+look_back, :] =
train_predict\n",
        "# shift test predictions for plotting\n",
        "testPredictplot = np.empty_like(data_oil)\n",
        "testPredictplot[:,: ] = np.nan\n",
        "testPredictplot[look_back:len(test_predict)+look_back, :] =
test_predict\n",
        "# plot baseline and predictions\n",
        "plt.plot(scaler.inverse_transform(data_oil))\n",
        "plt.show()"
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SPLITING DATA INTO TRAIN AND TEST:

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        "import numpy as np\n",
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      "metadata": {
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        "data_oil=data.reset_index()['Closing Value']\n",
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TAKING CARE OF MISSING DATA:

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        "import numpy as np\n",
        "import matplotlib.pyplot as plt"
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          "data_oil=data.reset_index()['Closing Value']\n",
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          "data": {
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              "1       26.00\n",
              "2       26.53\n",
              "3       25.85\n",
              "4       25.87\n",
              "        ...  \n",
              "8211    73.89\n",
              "8212    74.19\n",
              "8213    73.05\n",
              "8214    73.78\n",
              "8215    73.93\n",
              "Name: Closing Value, Length: 8216, dtype: float64"
            ]
          },
          "metadata": {},
          "execution_count": 9
        }
      ]
    }
  ]
}
```

DATA PREPROCESSING:

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      "execution_count": 1,
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      },
      "outputs": [],
      "source": [
        "import pandas as pd\n",
        "import numpy as np\n",
        "import matplotlib.pyplot as plt"
      ]
    },
    {
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      "execution_count": 2,
      "metadata": {
        "id": "dbaHUfMiJW8I"
      },
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      "source": [
        "data=pd.read_excel(\"/content/Crude Oil Prices Daily.xlsx\")"
      ]
    },
    {
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          "outputId": "9f1ec869-c35f-4764-8989-0d5d82646e18"
        },
        "outputs": [
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                "dtype: bool"
              ]
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            "execution_count": 3,
            "metadata": {},
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          }
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      },
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  "outputs": [
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        "source": [
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      },
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    },
    {
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              "2       26.53\n",
              "3       25.85\n",
              "4       25.87\n",
              "        ...  \n",
              "8211    73.89\n",
              "8212    74.19\n",
              "8213    73.05\n",
              "8214    73.78\n",
              "8215    73.93\n",
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        "data_oil=scaler.fit_transform(np.array(data_oil).reshape(-1,1))"
      ]
    },
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              "       ...,\n",
              "       [0.46497853],\n",
              "       [0.47038353],\n",
              "       [0.47149415]])"
            ]
          },
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        "training_size=int(len(data_oil)*0.65)\n",
        "test_size=len(data_oil)-training_size\n",

"train_data,test_data=data_oil[0:training_size,:],data_oil[training_size:len
(data_oil),:1]"
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        "def create_dataset(dataset,time_step=1):\n",
        "  dataX,dataY=[],[]\n",
        "  for i in range(len(dataset)-time_step-1):\n",
        "    a=dataset[i:(i+time_step),0]\n",
          "    dataX.append(a)\n",
          "    dataY.append(dataset[i+time_step,0])\n",
          "  return np.array(dataX),np.array(dataY)"
        ]
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          "x_train,y_train=create_dataset(train_data,time_step)\n",
          "x_test,y_test=create_dataset(test_data,time_step)"
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            "execution_count": 16,
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              "       [0.11661484, 0.12053902, 0.11550422, ..., 0.1089886 ,
0.11054346,\n",
              "        0.10165852],\n",
              "       [0.12053902, 0.11550422, 0.1156523 , ..., 0.11054346,
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              "        0.37916482]])"
            ]
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        "x_test=x_test.reshape(x_test.shape[0],x_test.shape[1],1)"
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SPRINT 3:

ADDING LSTM:

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        "import numpy as np\n",
        "import matplotlib.pyplot as plt"
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              "2        26.53\n",
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              "4        25.87\n",
              "         ...  \n",
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        "data_oil=scaler.fit_transform(np.array(data_oil).reshape(-1,1))"
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              "       [0.47149415]])"
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```

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"train_data,test_data=data_oil[0:training_size,:],data_oil[training_size:len
(data_oil),:1]"
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        "  dataX,dataY=[],[]\n",
        "  for i in range(len(dataset)-time_step-1):\n",
        "    a=dataset[i:(i+time_step),0]\n",
        "    dataX.append(a)\n",
        "    dataY.append(dataset[i+time_step,0])\n",
        "  return np.array(dataX),np.array(dataY)"
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        "time_step=10\n",
        "x_train,y_train=create_dataset(train_data,time_step)\n",
        "x_test,y_test=create_dataset(test_data,time_step)"
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        "print(x_train.shape),print(y_train.shape)"
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```

```
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              "        0.09906708],\n",
              "       ...,\n",
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              "       [0.35176958, 0.36080261, 0.35354657, ..., 0.37042796,
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              "        0.37879461],\n",
              "       [0.36080261, 0.35354657, 0.35295424, ..., 0.37042796,
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        "x_train=x_train.reshape(x_train.shape[0],x_train.shape[1],1)\n",
        "x_test=x_test.reshape(x_test.shape[0],x_test.shape[1],1)"
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        "from tensorflow.keras.models import Sequential\n",
        "from tensorflow.keras.layers import Dense\n",
        "from tensorflow.keras.layers import LSTM"
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        "model.add(LSTM(50,return_sequences=True))\n",
        "model.add(LSTM(50))"
      ],
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```

PROJECT.NPYL

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        "import pandas as pd # data processing, CSV file I/O (e.g.
pd.read_csv)\n",
        "import datetime\n",
        "from pylab import rcParams\n",
        "import matplotlib.pyplot as plt\n",
        "import warnings\n",
        "import itertools\n",
        "import statsmodels.api as sm\n",
        "from keras.models import Sequential\n",
        "from keras.layers import Dense\n",
        "from keras.layers import LSTM\n",
        "from keras.layers import Dropout\n",
        "from sklearn.metrics import mean_squared_error\n",
        "from keras.callbacks import ReduceLROnPlateau, EarlyStopping,
ModelCheckpoint\n",
        "from sklearn.metrics import mean_squared_error\n",
        "from sklearn.metrics import mean_absolute_error\n",
        "import seaborn as sns\n",
        "sns.set_context(\"paper\", font_scale=1.3)\n",
        "sns.set_style('white')\n",
        "import math\n",
        "from sklearn.preprocessing import MinMaxScaler\n",
        "# Input data files are available in the \"../input/\"
directory.\n",
        "# For example, running this (by clicking run or pressing
Shift+Enter) will list all files under the input directory\n",
        "warnings.filterwarnings(\"ignore\")\n",
        "plt.style.use('fivethirtyeight')\n",
        "import os\n",
        "for dirname, _, filenames in os.walk('/kaggle/input'):\n",
        "    for filename in filenames:\n",
        "        print(os.path.join(dirname, filename))"
      ]
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        "#Read csv file\n",
        "from google.colab import files\n",
        "uploaded = files.upload()"
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              "     <output id=\"result-2ced4f3e-b49c-4ad5-9829-
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executed in the\n",
              "      current browser session. Please rerun this cell to
enable.\n",
              "      </output>\n",
              "      <script>// Copyright 2017 Google LLC\n",
              "//\n",
              "// Licensed under the Apache License, Version 2.0 (the
\"License\");\n",
              "// you may not use this file except in compliance with the
License.\n",
              "// You may obtain a copy of the License at\n",
              "//\n",
              "//      http://www.apache.org/licenses/LICENSE-2.0\n",
              "//\n",
              "// Unless required by applicable law or agreed to in writing,
software\n",
              "// distributed under the License is distributed on an \"AS
IS\" BASIS,\n",
              "// WITHOUT WARRANTIES OR CONDITIONS OF ANY KIND, either
express or implied.\n",
              "// See the License for the specific language governing
permissions and\n",
              "// limitations under the License.\n",
              "\n",
              "/**\n",
              " * @fileoverview Helpers for google.colab Python module.\n",
              " */\n",
              "(function(scope) {\n",
              "function span(text, styleAttributes = {}) {\n",
              "  const element = document.createElement('span');\n",
"  element.textContent = text;\n",
              "  for (const key of Object.keys(styleAttributes)) {\n",
              "    element.style[key] = styleAttributes[key];\n",
              "  }\n",
              "  return element;\n",
              "}\n",
              "\n",
              "// Max number of bytes which will be uploaded at a time.\n",
              "const MAX_PAYLOAD_SIZE = 100 * 1024;\n",
              "\n",
              "function _uploadFiles(inputId, outputId) {\n",
              "  const steps = uploadFilesStep(inputId, outputId);\n",
              "  const outputElement =
document.getElementById(outputId);\n",
              "  // Cache steps on the outputElement to make it available
for the next call\n",
              "  // to uploadFilesContinue from Python.\n",
              "  outputElement.steps = steps;\n",
              "\n",
              "  return _uploadFilesContinue(outputId);\n",
              "}\n",
              "\n",
              "// This is roughly an async generator (not supported in the
browser yet),\n",
              "// where there are multiple asynchronous steps and the Python
side is going\n",
              "// to poll for completion of each step.\n",
              "// This uses a Promise to block the python side on completion
of each step,\n",
              "// then passes the result of the previous step as the input
to the next step.\n",
              "function _uploadFilesContinue(outputId) {\n",
              "  const outputElement =
document.getElementById(outputId);\n",
              "  const steps = outputElement.steps;\n",
              "\n",
              "  const next =
steps.next(outputElement.lastPromiseValue);\n",
              "  return Promise.resolve(next.value.promise).then((value) =>
{\n",
              "    // Cache the last promise value to make it available to
the next\n",
              "    // step of the generator.\n",
              "    outputElement.lastPromiseValue = value;\n",
              "    return next.value.response;\n",
              "  });\n",
              "}\n",
              "\n",
              "/**\n",
              " * Generator function which is called between each async step
of the upload\n",
              " * process.\n",
              " * @param {string} inputId Element ID of the input file
picker element.\n",
              " * @param {string} outputId Element ID of the output
display.\n",
              " * @return {!Iterable<!Object>} Iterable of next steps.\n",
              " */\n",
              "function* uploadFilesStep(inputId, outputId) {\n",
              "  const inputElement = document.getElementById(inputId);\n",
 "  inputElement.disabled = false;\n",
              "\n",
              "  const outputElement =
document.getElementById(outputId);\n",
              "  outputElement.innerHTML = '';\n",
              "\n",
              "  const pickedPromise = new Promise((resolve) => {\n",
              "    inputElement.addEventListener('change', (e) => {\n",
              "      resolve(e.target.files);\n",
              "    });\n",
              "  });\n",
              "\n",
              "  const cancel = document.createElement('button');\n",
              "  inputElement.parentElement.appendChild(cancel);\n",
              "  cancel.textContent = 'Cancel upload';\n",
              "  const cancelPromise = new Promise((resolve) => {\n",
              "    cancel.onclick = () => {\n",
              "      resolve(null);\n",
              "    };\n",
              "  });\n",
              "\n",
              "  // Wait for the user to pick the files.\n",
              "  const files = yield {\n",
              "    promise: Promise.race([pickedPromise,
cancelPromise]),\n",
              "    response: {\n",
              "      action: 'starting',\n",
              "    }\n",
              "  };\n",
              "\n",
              "  cancel.remove();\n",
              "\n",
              "  // Disable the input element since further picks are not
allowed.\n",
              "  inputElement.disabled = true;\n",
              "\n",
              "  if (!files) {\n",
              "    return {\n",
              "      response: {\n",
              "        action: 'complete',\n",
              "      }\n",
              "    };\n",
              "  }\n",
              "\n",
              "  for (const file of files) {\n",
              "    const li = document.createElement('li');\n",
              "    li.append(span(file.name, {fontWeight: 'bold'}));\n",
              "    li.append(span(\n",
              "        `(${file.type || 'n/a'}) - ${file.size} bytes, `
+\n",
              "        `last modified: ${\n",
              "            file.lastModifiedDate ?
file.lastModifiedDate.toLocaleDateString() :\n",
              "                                      'n/a'} - `));\n",
              "    const percent = span('0% done');\n",
              "    li.appendChild(percent);\n",
              "\n",
              "    outputElement.appendChild(li);\n",
              "\n",
              "    const fileDataPromise = new Promise((resolve) => {\n",
 "      const reader = new FileReader();\n",
              "      reader.onload = (e) => {\n",
              "        resolve(e.target.result);\n",
              "      };\n",
              "      reader.readAsArrayBuffer(file);\n",
              "    });\n",
              "    // Wait for the data to be ready.\n",
              "    let fileData = yield {\n",
              "      promise: fileDataPromise,\n",
              "      response: {\n",
              "        action: 'continue',\n",
              "      }\n",
              "    };\n",
              "\n",
              "    // Use a chunked sending to avoid message size limits.
See b/62115660.\n",
              "    let position = 0;\n",
              "    do {\n",
              "      const length = Math.min(fileData.byteLength - position,
MAX_PAYLOAD_SIZE);\n",
              "      const chunk = new Uint8Array(fileData, position,
length);\n",
              "      position += length;\n",
              "\n",
              "      const base64 = btoa(String.fromCharCode.apply(null,
chunk));\n",
              "      yield {\n",
              "        response: {\n",
              "          action: 'append',\n",
              "          file: file.name,\n",
              "          data: base64,\n",
              "        },\n",
              "      };\n",
              "\n",
              "      let percentDone = fileData.byteLength === 0 ?\n",
              "          100 :\n",
              "          Math.round((position / fileData.byteLength) *
100);\n",
              "      percent.textContent = `${percentDone}% done`;\n",
              "\n",
              "    } while (position < fileData.byteLength);\n",
              "  }\n",
              "\n",
              "  // All done.\n",
              "  yield {\n",
              "    response: {\n",
              "      action: 'complete',\n",
              "    }\n",
              "  };\n",
              "}\n",
              "\n",
              "scope.google = scope.google || {};\n",
              "scope.google.colab = scope.google.colab || {};\n",
              "scope.google.colab._files = {\n",
              "  _uploadFiles,\n",
              "  _uploadFilesContinue,\n",
              "};\n",
              "})(self);\n",
              "</script> "
            ]
```

```
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Daily.xlsx\n"
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      ]
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        "df = pd.read_excel(io.BytesIO(uploaded['Crude Oil Prices
Daily.xlsx']))\n",
        "df.head()\n",
        "df[:10]\n"
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              "1 1986-01-03          26.00\n",
              "2 1986-01-06          26.53\n",
              "3 1986-01-07          25.85\n",
              "4 1986-01-08          25.87\n",
              "5 1986-01-09          26.03\n",
              "6 1986-01-10          25.65\n",
              "7 1986-01-13          25.08\n",
              "8 1986-01-14          24.97\n",
              "9 1986-01-15          25.18"
            ],
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              "      <div>\n",
              "<style scoped>\n",
              "    .dataframe tbody tr th:only-of-type {\n",
              "        vertical-align: middle;\n",
              "    }\n",
              "\n",
              "    .dataframe tbody tr th {\n",
              "        vertical-align: top;\n",
              "
}\n",
           "\n",
           "    .dataframe thead th {\n",
           "        text-align: right;\n",
           "    }\n",
           "</style>\n",
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           "  <thead>\n",
           "    <tr style=\"text-align: right;\">\n",
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           "      <th>Date</th>\n",
           "      <th>Closing Value</th>\n",
           "    </tr>\n",
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           "    </tr>\n",
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           "      <th>8</th>\n",
           "      <td>1986-01-14</td>\n",
           "      <td>24.97</td>\n",
           "    </tr>\n",
           "
```

```
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              "      <td>25.18</td>\n",
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4defa2e543d3')\"\n",
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interactive table.\"\n",
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              "        \n",
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height=\"24px\"viewBox=\"0 0 24 24\"\n",
              "       width=\"24px\">\n",
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.94-2.06-.94 2.06-2.06.94zm-11 1L8.5 8.5l.94-2.06 2.06-.94-2.06-.94L8.5
2.5l-.94 2.06-2.06.94zm10 10l.94 2.06.94-2.06 2.06-.94-2.06-.94-.94-2.06-.94
2.06-2.06.94z\"/><path d=\"M17.41 7.96l-1.37-1.37c-.4-.4-.92-.59-1.43-.59-
.52 0-1.04.2-1.43.59L10.3 9.45l-7.72 7.72c-.78.78-.78 2.05 0 2.83L4
21.41c.39.39.9.59 1.41.59.51 0 1.02-.2 1.41-.59l7.78-7.78 2.81-2.81c.8-
.78.8-2.07 0-2.86zM5.41 20L4 18.59l7.72-7.72 1.47 1.35L5.41 20z\"/>\n",
              "  </svg>\n",
              "      </button>\n",
              "      \n",
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              "      flex-wrap:wrap;\n",
              "      gap: 12px;\n",
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              "      border: none;\n",
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              "    }\n",
              "\n",
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3px 1px rgba(60, 64, 67, 0.15);\n",
              "      fill: #174EA6;\n",
              "    }\n",
              "\n",
              "    [theme=dark] .colab-df-convert {\n",
              "      background-color: #3B4455;\n",
              "      fill: #D2E3FC;\n",
              "    }\n",
              "\n",
              "
```

```
[theme=dark] .colab-df-convert:hover {\n",
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              "      box-shadow: 0px 1px 3px 1px rgba(0, 0, 0, 0.15);\n",
              "      filter: drop-shadow(0px 1px 2px rgba(0, 0, 0,
0.3));\n",
              "      fill: #FFFFFF;\n",
              "    }\n",
              "  </style>\n",
              "\n",
              "      <script>\n",
              "        const buttonEl =\n",
              "          document.querySelector('#df-2367b016-b67f-445c-
8b15-4defa2e543d3 button.colab-df-convert');\n",
              "        buttonEl.style.display =\n",
              "          google.colab.kernel.accessAllowed ? 'block' :
'none';\n",
              "\n",
              "        async function convertToInteractive(key) {\n",
              "          const element = document.querySelector('#df-
2367b016-b67f-445c-8b15-4defa2e543d3');\n",
              "          const dataTable =\n",
              "            await
google.colab.kernel.invokeFunction('convertToInteractive',\n",
              "                                                     [key],
{});\n",
              "          if (!dataTable) return;\n",
              "\n",
              "          const docLinkHtml = 'Like what you see? Visit the '
+\n",
              "            '<a target=\"_blank\"
href=https://colab.research.google.com/notebooks/data_table.ipynb>data table
notebook</a>'\n",
              "            + ' to learn more about interactive tables.';\n",
              "          element.innerHTML = '';\n",
              "          dataTable['output_type'] = 'display_data';\n",
              "          await google.colab.output.renderOutput(dataTable,
element);\n",
              "          const docLink = document.createElement('div');\n",
              "          docLink.innerHTML = docLinkHtml;\n",
              "          element.appendChild(docLink);\n",
              "        }\n",
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        "df = df.sort_values('Date')\n",
        "df = df.groupby('Date')['Closing Value'].sum().reset_index()\n",
        "df.set_index('Date', inplace=True)\n",
        "df=df.loc[datetime.date(year=2000,month=1,day=1):]"
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              "2000-01-06          24.79\n",
              "2000-01-07          24.79\n",
              "2000-01-10          24.71"
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              "        vertical-align: middle;\n",
              "    }\n",
              "\n",
              "    .dataframe tbody tr th {\n",
              "        vertical-align: top;\n",
              "    }\n",
              "\n",
              "    .dataframe thead th {\n",
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              "    }\n",
              "</style>\n",
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              "      <th>Closing Value</th>\n",
              "    </tr>\n",
              "    <tr>\n",
              "      <th>Date</th>\n",
              "
    <th></th>\n",
              "    </tr>\n",
              "  </thead>\n",
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              "    </tr>\n",
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              "      <td>24.79</td>\n",
              "    </tr>\n",
              "    <tr>\n",
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              "      <td>24.79</td>\n",
              "    </tr>\n",
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interactive table.\"\n",
              "              style=\"display:none;\">\n",
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height=\"24px\"viewBox=\"0 0 24 24\"\n",
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2.5l-.94 2.06-2.06.94zm10 10l.94 2.06.94-2.06 2.06-.94-2.06-.94-.94-2.06-.94
2.06-2.06.94z\"/><path d=\"M17.41 7.96l-1.37-1.37c-.4-.4-.92-.59-1.43-.59-
.52 0-1.04.2-1.43.59L10.3 9.45l-7.72 7.72c-.78.78-.78 2.05 0 2.83L4
21.41c.39.39.9.59 1.41.59.51 0 1.02-.2 1.41-.59l7.78-7.78 2.81-2.81c.8-
.78.8-2.07 0-2.86zM5.41 20L4 18.59l7.72-7.72 1.47 1.35L5.41 20z\"/>\n",
              "  </svg>\n",
              "      </button>\n",
              "      \n",
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              "      border-radius: 50%;\n",
              "      cursor: pointer;\n",
              "
    display: none;\n",
              "      fill: #1967D2;\n",
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              "      padding: 0 0 0 0;\n",
              "      width: 32px;\n",
              "    }\n",
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3px 1px rgba(60, 64, 67, 0.15);\n",
              "      fill: #174EA6;\n",
              "    }\n",
              "\n",
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              "      fill: #D2E3FC;\n",
              "    }\n",
              "\n",
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              "      box-shadow: 0px 1px 3px 1px rgba(0, 0, 0, 0.15);\n",
              "      filter: drop-shadow(0px 1px 2px rgba(0, 0, 0,
0.3));\n",
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              "    }\n",
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              "\n",
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8adf-55ea4e83ce2e button.colab-df-convert');\n",
              "        buttonEl.style.display =\n",
              "          google.colab.kernel.accessAllowed ? 'block' :
'none';\n",
              "\n",
              "        async function convertToInteractive(key) {\n",
              "          const element = document.querySelector('#df-
6af25580-39d5-4204-8adf-55ea4e83ce2e');\n",
              "          const dataTable =\n",
              "            await
google.colab.kernel.invokeFunction('convertToInteractive',\n",
              "                                                     [key],
{});\n",
              "          if (!dataTable) return;\n",
              "\n",
              "          const docLinkHtml = 'Like what you see? Visit the '
+\n",
              "            '<a target=\"_blank\"
href=https://colab.research.google.com/notebooks/data_table.ipynb>data table
notebook</a>'\n",
              "            + ' to learn more about interactive tables.';\n",
              "          element.innerHTML = '';\n",
              "          dataTable['output_type'] = 'display_data';\n",
              "          await google.colab.output.renderOutput(dataTable,
element);\n",
              "          const docLink = document.createElement('div');\n",
              "          docLink.innerHTML = docLinkHtml;\n",
              "          element.appendChild(docLink);\n",
              "        }\n",
              "
```

```
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              "  </div>\n",
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        "    # gives some infos on columns types and numer of null 
values\n",
        "    tab_info = pd.DataFrame(df_initial.dtypes).T.rename(index={0: 
'column type'})\n",
        "    tab_info = 
tab_info.append(pd.DataFrame(df_initial.isnull().sum()).T.rename(index={0: 
'null values (nb)'}))\n",
        "    tab_info = 
tab_info.append(pd.DataFrame(df_initial.isnull().sum() / df_initial.shape[0] 
* 100).T.\n",
        "                               rename(index={0: 'null values 
(%)'}))\n",
        "    return tab_info"
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      },
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```

```
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              "      <div>\n",
              "<style scoped>\n",
              "    .dataframe tbody tr th:only-of-type {\n",
              "        vertical-align: middle;\n",
              "    }\n",
              "\n",
              "    .dataframe tbody tr th {\n",
              "        vertical-align: top;\n",
              "    }\n",
              "\n",
              "    .dataframe thead th {\n",
              "        text-align: right;\n",
              "    }\n",
              "</style>\n",
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              "    <tr style=\"text-align: right;\">\n",
              "      <th></th>\n",
              "      <th>Closing Value</th>\n",
              "    </tr>\n",
              "  </thead>\n",
              "  <tbody>\n",
              "    <tr>\n",
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              "      <td>float64</td>\n",
              "    </tr>\n",
              "    <tr>\n",
              "      <th>null values (nb)</th>\n",
              "      <td>0</td>\n",
              "    </tr>\n",
              "    <tr>\n",
              "      <th>null values (%)</th>\n",
              "      <td>0.0</td>\n",
              "    </tr>\n",
              "  </tbody>\n",
              "</table>\n",
              "</div>\n",
              "      <button class=\"colab-df-convert\"
onclick=\"convertToInteractive('df-4e32bf9f-80e7-48c2-a7c6-
abf9974fa83d')\"\n",
              "              title=\"Convert this dataframe to an
interactive table.\"\n",
              "              style=\"display:none;\">\n",
              "        \n",
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height=\"24px\"viewBox=\"0 0 24 24\"\n",
              "       width=\"24px\">\n",
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2.5l-.94 2.06-2.06.94zm10 10l.94 2.06.94-2.06 2.06-.94-2.06-.94-.94-2.06-.94
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21.41c.39.39.9.59 1.41.59.51 0 1.02-.2 1.41-.59l7.78-7.78 2.81-2.81c.8-
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google.colab.kernel.invokeFunction('convertToInteractive',\n",
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{});\n",
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W88orr+Dj4/PQGI4ePUpycjIajQYTExP69etHWFgYpqamzJ07F4Dly5cr258+fRqAmpoatm3bRn5
+Pjdv3mTQoEGsWrWKIUOGKNu6ubkREhJCeXk52dnZNDc34+3tTWhoKJ07d26zehRCtB1JnIQQT5S
KigqSkpJYtmyZMmN6bGwsGo2Gad0m4e/vz7Zt24iIiCAlJUWZcHnjxo1kZmayZMkSBg8ezKlTp9i
w0jXcxwAABCFJREFUYQOWlpYtzkh/9uxZ4uLiCAgIwMXFhbq6OgoKCqirq6N3795ER0cTFRVFWFi
YzuhYY2MjK1eu5MaNGwQFBdG9e3cOHz7MypUrSUtL05kyIjk5mSFDhhAdHU1JSQmJiYmoVCqCg4M
fbUUKIf4RSZyEEE+U2tpadu/eTa9evQD46aef+Oijj3rrbeYMmUKAFqtllWrVnH58mUcHR25evU
qhw8fJjIyUhlhcnNzo7Kykl27drWYOF28eJEBAwawawaNEipWz8+PHK63sjWo6OjjqXGbOzsykuLiY
lJYU+ffoAMHr0aGbNmkVycrJOUmRmZkZsbCydOnVizJgxNDY2snfvXUb1JgQoi3J4wi
EEE8UW1tbJWkC6N27NwCjRo1Syu6t//333wE4c+t+YMnTp1YuLEiTQ1NSl/o0eP5scff+TOnTt/ua+
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Li1u1LyFE+5IRJyHEE6Vr1646y3+fuBTI3N3+grKGhAYDr169z584d/Pz89H7W7du3sbW1/cv6ZcxaVUwRgEEZUcyuGBkZ4ezTOTJk0lPT2f58uXMnz8fe3t7ampqKCwsxNramnnn
Hi58vhNAfSZyEEB2ehYUFhoaG7Nq1S7nn6X7/P3m5n4+PDz4+PlRXV3O5WUb1JgQoi3J4wi
fk5MTa9aseWCdsbGxznJVVZXXOcnV1NQDW1tYPPSYhhH5I4iSE6PBGjx5Nc3MzN2/e5JlnnvlHn9G
tWzf8/PzIy8vjl19+AcDI6G4X2tjY+MD+O4XBpQfn09gYKByuS4vLw+VSkX//v3UZx
CiEdLEichRIfn4OCAn58nuSkpKoqalh5MiRWFlZUVR
UxLlz5wgMDARArVajUqnIzMykS5cuGBkZ4ezszOTJk0lPT2f58uXMnz8fe3t7ampqKCwsxNramnn
z5in7qK+vJzw8nGnTplFSUsKePXXuYOXOm3BguxGNKEichxH9CWFgYffr0ISMjg6SkSkJLp06YKjoyN
Tp05t8T1OTk4cPHiQ48ePU19fj1qtZunSpcyZMwcAlUrFunXr2LlzJ8uWLaOpqYnTp0+jUqlITEx
kx44dJCUlUVVVRffu3Xf2dtb5VR7AvHnz0Gg0RERE0NzczNSpU1mxYsUjrQshxD8nU64IIYSeuLm
58eabb/LSy/pOxQhRCvJ4wiEEEIIIVpJEichhBBCiFaSS3VCCCGEEK0kI05CCCGEEK0kiZMQQgg
hRCtJ4iSEEEII0UqSOAkhhBBCtJIkTkIIIYQQrSSJkxBCCCFEK/0fV9T0dUkr8PwAAAAASUVORK5
CYII=\n"
          },
          "metadata": {}
        }
      ]
    }
  ]
}
```

Sprint 4:

LOGIN.html

```
&lt;!DOCTYPE html&gt;
&lt;html lan=&quot;en&quot; and dir=&quot;Itr&quot;&gt;
    &lt;head&gt;
        &lt;meta charset=&quot;utf-8&quot;&gt;
        &lt;title&gt;login form&lt;/title&gt;
        &lt;link rel=&quot;stylesheet&quot; href=&quot;style.css&quot;&gt;
         &lt;script src =&quot;login.js&quot;&gt;&lt;/script&gt;
    &lt;/head&gt;
    &lt;body&gt;
        &lt;form class=&quot;box&quot; action=&quot;login.html&quot;
method=&quot;POST&quot;&gt;
            &lt;h1&gt;CRUDE OIL PRICE PREDICTION&lt;/h1&gt;
            &lt;h2&gt;
                 LOGIN
            &lt;/h2&gt;
            &lt;input type=&quot;text&quot; name=&quot;&quot; placeholder=&quot;Enter
Username&quot;
id=&quot;username&quot;&gt;
            &lt;input type=&quot;password&quot; name=&quot;&quot; placeholder=&quot;Enter
Password&quot;
id=&quot;password&quot;&gt;
            &lt;input type=&quot;submit&quot; name=&quot;&quot;
value=&quot;Login&quot;  onclick=&quot;validate()&quot;&gt;
            &lt;h3&gt;&lt;a href=&quot;register.html&quot;&gt; New User ? Register
&lt;/a&gt;&lt;/h3&gt;
```

```
        &lt;/form&gt;
    &lt;/body&gt;
&lt;/html&gt;

LOGIN.JS
function validate()
{
    var username=document.getElementById(&quot;username&quot;).Value;
    var password=document.getElementById(&quot;password&quot;).Value;
    if(username==&quot;ibm&quot;&amp;&amp;password==&quot;ibm123&quot;)
    {
        alert(&quot;login succesfully&quot;);
        return true;
    }
    else
    {
        document.getElementById(&quot;username&quot;).disabled=true;
        document.getElementById(&quot;password&quot;).disabled=true;
        return false;
    }

}

{
    document.getElementByI
d(&quot;email&quot;).value=&quot;&quot;;
    document.getElementById(&quot;pwd1&quot;).value=&quot;&quot;;
}
```

predict.html

```
<!DOCTYPE html>
<head>
    <title>Crude Oil Price Prediction </title>
    <link href='https://fonts.googleapis.com/css?family=Roboto' rel='stylesheet'>
    <link rel="stylesheet" href="{{ url_for('static', filename='css/predict.css') }}">
</head>
<body style="text-align:center;background-color: lightsteelblue;">
    <h1 style="color: white;font-size: 50px;font-family: roboto;">
    Crude Oil Price Prediction </h1>
    <h1 style="color: white;font-size: 50px;font-family: roboto;">
        Enter the Oil price for 10 days </h1>
        <form action="/predict" method="POST" enctype = "multipart/form-data">
            <div style="color:green;font-size:50px;font-family:roboto;">
                {{prediction}}
            </div>
        <input type="text" name="val" style="border-radius: 18px;padding: 20px;width:
300px;height: 15px;text-align: center; align:center;" >
         <br> <br> <br>
        <input type="submit"/ style="border-radius: 9px;;padding: 10px;width: 150px;
        height: 40px;text-align: center;background: #003d66;color: white;">
        </form>
        <br>
        <form action="/predict" method="GET" enctype = "multipart/form-data">
        <input type="submit"/ value="Reset" style="border-radius: 9px;;padding:
10px;width: 150px;
        height: 40px;text-align: center;background: #003d66;color: white;">
        </form>
```

```
</body>
```

REGISTER.CSS

```
body{
    margin: 0;
    padding: 0;
    font-family: sans-serif;
    background: url(ppp.jpg);
    background-size: cover;
}
.box{
    width: 300px;
    padding: 30px;
    position: absolute;
    top: 50%;
    left: 50%;
    transform: translate(-50%,-50%);
    background: rgb(14, 14, 14);
    text-align: center;
}
.box h1
{
    color: rgb(253, 249, 251);
    text-transform: uppercase;
    font-weight: 700;
}
.box h2
{
    color: rgb(253, 249, 251);
    text-transform: uppercase;
    font-weight: 700;
}

.box input[type="text"],.box input[type="password"] ,.box input[type="date"],.box
input[type="Number"],.box input[type="Email"]
{
    border: 0;
    background: white;
    display: block;
    margin: 28px auto;
    text-align: center;
    border: 3px solid #2af003;
    padding: 14px 10px;
    width: 220px;
    outline: none;
    color: #fff6ff(18, 18, 179);
    border-radius: 24px;
    transition: 0.25px;
}
.box input[type="text"]:focus,.box input[type="password"]:focus{
    width: 270px;
    border-color: rgb(238, 26, 203);

}
.box input[type="submit"]{
    border: 0;
    background: none;
    display: block;
    margin: 28px auto;
    text-align: center;
    border: 3px solid rgb(211, 15, 152);
    padding: 14px 10px;
    width: 220px;
    outline: none;
    color: rgb(73, 31, 224);
    border-radius: 24px;
    transition: 0.25px;
    cursor: pointer;


}
.box input[type="submit"]:hover{
    background: rgb(100, 182, 53);
}
h3{
    color: wheat;
}
```

REGISTER.HTML

```
<!DOCTYPE html>
<html lan="en" and dir="Itr">
    <head>
        <meta charset="utf-8">
        <title>login form</title>
        <link rel="stylesheet" href="register.css">
         <script src ="login.js"></script>
    </head>
    <body>
        <form class="box" action="login.html" method="POST">
            <h1>CRUDE OIL PRICE PREDICTION</h1>
            <h2>
                 Register
            </h2>
            <input type="text" name="" placeholder="Enter Username" id="username">
            <input type="email" name="" placeholder="Enter Your Email Id" id="Email">
            <input type="number" name="" placeholder="Enter Your Number" id="Number">
            <input type="password" name="" placeholder="Enter Password" id="password">
            <input type="submit" name="" value="Register"  onclick="validate()">
            <h3><a href="login.html"> Login </a></h3>
        </form>

    </body>
</html>
```

STYLE.CSS

```
body{
    margin: 0;
    padding: 0;
    font-family: sans-serif;
    background: url(p2.jpg);
    background-size: cover;
}
.box{
    width: 300px;
    padding: 30px;
    position: absolute;
    top: 50%;
    left: 50%;
    transform: translate(-50%,-50%);
    background: rgb(14, 14, 14);
    text-align: center;
}
.box h1
{
    color: rgb(253, 249, 251);
    text-transform: uppercase;
    font-weight: 700;
}
.box h2
{
    color: rgb(253, 249, 251);
    text-transform: uppercase;
    font-weight: 700;
}

.box input[type="text"],.box input[type="password"] ,.box input[type="date"],.box
input[type="Number"],.box input[type="Email"]
{
    border: 0;
    background: white;
    display: block;
    margin: 28px auto;
    text-align: center;
    border: 3px solid #2af003;
    padding: 14px 10px;
    width: 220px;
    outline: none;
    color: #fff6ff(18, 18, 179);
    border-radius: 24px;
    transition: 0.25px;
}
.box input[type="text"]:focus,.box input[type="password"]:focus{
    width: 270px;
    border-color: rgb(238, 26, 203);

}
```

```
.box input[type="submit"]{
    border: 0;
    background: none;
    display: block;
    margin: 28px auto;
    text-align: center;
    border: 3px solid rgb(211, 15, 152);
    padding: 14px 10px;
    width: 220px;
    outline: none;
    color: rgb(73, 31, 224);
    border-radius: 24px;
    transition: 0.25px;
    cursor: pointer;


}
.box input[type="submit"]:hover{
    background: rgb(100, 182, 53);
}
h3{
    color: wheat;
}
```

APP.PY

```
from flask import Flask,render_template,request,redirect
import numpy as np
import joblib
from keras.models import load_model

app = Flask(__name__)

@app.route('/',methods=["GET"])
def index():
    return render('login.html')

@app.route('/predict',methods=["POST","GET"])
def predict():
    if request.method == "POST":
        string = request.form['val']
        if(string ==""):
            return render_template('predict.html')
        string = string.split(',')
        x_input = [eval(i) for i in string]
        sc = joblib.load("scaler.save")
        x_input = sc.fit_transform(np.array(x_input).reshape(-1,1))
        x_input = np.array(x_input).reshape(1,-1)
        x_input = x_input.reshape(1,-1)
        x_input = x_input.reshape((1,10,1))
        model = load_model('model.h5')
        output = model.predict(x_input)
        val = sc.inverse_transform(output)
        return render_template('predict.html', prediction = "The predicted price is
{:.2f}".format(val[0][0]))
    if request.method == "GET":
        return render_template('predict.html')

if __name__=="__main__":
    model = load_model('model.h5')
    app.run(host='0.0.0.0', port=5000)
```

14. ADVANTAGES & DISADVANTAGES

- The model is able to forecasting the price accurately based on the past 10 days data.
- But whenever the commodity is affected by external factors which are caused naturally then the predictions are bad.
- This cannot be predicted by machine learning model

10.CONCLUSION:

Therefore the ml was deployed as a web app and the user interface is handy for stakeholders who do not have much knowledge in programming. The predicted value is displayed in the user interface.

11.FUTURE SCOPE

The machine learning model can be improved by converting it from univariate to multi variate model for better understanding the price value. This can result in a great boost in the prediction .

GitHub link:

GitHub: https://github.com/IBM-EPBL/IBM-Project-47385-1660798812

Demo Link: https://youtu.be/RE-tcRPhQgs