NALAIYA THIRAN - IBM PROJECT REPORT

(19CS406T- Professional Readiness for Innovation, Employability and Entrepreneurship)

ON

CRUDE OIL PRICE PREDICTION

Submitted by

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in partial fulfillment for the award of the degree of

BACHELOR OF ENGINEERING

IN

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VELAMMAL ENGINEERING COLLEGE, CHENNAI 600 066

(An Autonomous Institution, Affiliated to Anna University, Chennai)

2022-2023

VELAMMAL ENGINEERING COLLEGE
CHENNAI-66

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BONAFIDE CERTIFICATE

Certified that this NALAIYA THIRAN – IBM PROJECT REPORT "CRUDE OIL PRICE PREDICTION" is the Bonafide work of "SRIDARAN U S (113219031146) , PRIYADHARSHAN R (113219031113) , RAGUL K (113219031116) and ABIMANYU N (113219031002)" carried out in "PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY AND ENTREPRENEURSHIP (NALAIYA THIRAN-IBM PROJECT)" during the Academic Year 2022-2023.

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CONTENTS

CHAPTER 1

INTRODUCTION

Crude oil has an essential role in the world, as this is one of the major products worldwide and thus includes global measurements. The origin of crude oil prediction errors involves composite supply-demand structures. Crude oil volatility has a critical effect on economic factors which includes economic increase of the country, unemployment, exchange rate that moreover depends on crude oil export and import. In current days machine learning techniques can be implemented in various applications. Machine learning gives powerful computational tools and algorithms that are capable of learning itself and predict data with long short-term memory.

1.1 PROJECT OVERVIEW

Crude oil is the world's most leading fuel. The main advantages of crude oil are it has high density, it is easily available. Oil is used in almost all the industries. Oil is a Constant Power Source. Oil energy is very reliable when compared to other sources such as solar and wind energy. Some machine learning models fit the data set efficiently depending upon the type of data points provided. The main aim of this project is to find the different models that efficiently fit the data points and predict the price of fuel with the help of machine learning models. This project works on comparing the different supervised learning models and brings a conclusion based on the efficiency. We have used 3 supervised learning models namely, Random Forest Regression, Linear Regression and Decision Tree Regression to know which gives the best in terms of accuracy and performance. These algorithms give a numeric value as output. So we can compare the output of these models with the actual models.

To predict the values of petroleum likepetroleum and Diesel within the future, we've decided to use the Machine Learning algorithms and apply ensemble learning. Ensemble learning is a technique where we use different algorithms or single algorithms many times. In this way we cancompare different algorithms and find the best one for our problem statement.

This paper contains LSTM based recurrent neural networks for the matter of crude oil price prediction. Recurrent neural networks (RNN) identifies to be the most powerful and impact models for processing time-series based sequential data. LSTM variants can be used for other task as well other than prediction such as speech, handwriting and polyphonic modeling. The hyper parameters of variants were assessed using random search and using variance framework.

1.2 PURPOSE

Oil demand is in elastic; therefore the rise in price is good news for producers because they will see an increase in their revenue. Oil importers, however, will experience increased costs of purchasing oil. Because oil is the largest traded commodity, the effects are quite significant. A rising oil price can even shift economic/political power from oil importers to oil exporters. The crude oil price movements are subject to diverse influencing factors.

This Guided Project mainly focuses on applying Neural Networks to predict the Crude Oil Price. This decision helps us to buy crude oil at the proper time. Time series analysis is the best option for this kind of prediction because we are using the previous history of crude oil prices to predict future crude oil. So we would be implementing RNN (Recurrent Neural Network) with LSTM (Long Short Term Memory) to achieve the task.

CHAPTER 2

LITERATURE SURVEY

2.1 EXISTING PROBLEM

Survey 1: "Multi-Scale Volatility and External Event Analysis of Crude Oil Price Prediction".

Crude oil price fluctuations and analyze the impacts of external events, this paper first employs the CEEMD method to decompose the crude oil historical prices into different components and extracts a market fluctuation, a shock from extreme events, and a long-term trend. And we find that when determining the crude oil prices, the shock from extreme events has become the most important factor. Then we combine the ICSS test with the Chow test to get the structural breaks and analyze extreme event impacts. Finally, considering the interaction between external event impacts and crude oil prices, we establish the models based on VAR, SVM, and structural breaks to predict the crude oil prices, finding that the CEEMD- VAR-SVM model with structural breaks performs best compared to other models we established.

Survey 2:
"**Google Index-Driven Oil Price Value-at-Risk Forecasting: A Decomposition Ensemble Approach**"

The oil price is in fluctuations not only by the fundamentals of supply and demand but also by unpredictable political conflicts, climate emergencies, and investor intentions, which cause enormous short term fluctuations in the oil price. The proposition of the Google index-driven decomposition ensemble model to forecast crude oil price risk uses big data technology and a time series decomposition method. First, by constructing an index of investor attention for the market and emergencies combined with a bi variate empirical mode decomposition, we analyze the impact of investor attention on oil price fluctuations. Second, we establish a

vector auto regression model, and the impulse responses define the impact of emergencies on the crude oil price. Finally, with the help of machine learning and historical simulation methods, the risk of crude oil price shocks from unexpected events is predicted. Empirical research demonstrates that concerns related to the oil market and emergencies that appear in Google search data are closely related to changes in oil prices. Based on the Google index, our model's prediction of crude oil prices is more accurate than other models, and the prediction of value-at-risk is closer to the theoretical value than the historical simulation with the ARMA forecasts method.

Survey 3:

"Effects of Covid-19 on Crude Oil Price and Future Forecast Using a Model Application and Machine Learning"

Oil Price has been a benchmark governing the trade of oil and gas globally. It is fixed by producing countries or countries in a consortium through organizations such as Organization of the Petroleum Exporting Countries (OPEC) or a particular mix of crude oil such as the West Texas Intermediate (WTI) or Brent. The spot price and future prices of crude oil is basically determined by demand and supply however, some external factors can have great influence on oil price. This research work will be emphasizing on the direct and indirect effects of the COVID-19 pandemic as an external factor other than demand and supply on the benchmarks of oil pricing between 2000 and 2020. Having analyzed the various oil price fluctuation which have caused by several factors over the years, this research went further to identify those significant factors, weigh them and input them into a model that will generate simulated oil prices of past, present and future benchmarks with relation to demand, supply, production cost and other external factors. This model was also validated using machine learning algorithms and real data of previous yearly average oil price noting the reasons for each spot price. Significant recommendations were

made on the use of this model for fixing oil price benchmarks as variables to each benchmark are numerous.

Survey 4:

"Crude oil prices and volatility prediction by a hybrid model based on kernel extreme learning machine".

In view of the important position of crude oil in the national economy and its contribution to various economic sectors, crude oil price and volatility prediction have become an increasingly hot issue that is concerned by practitioners and researchers. In this paper, a new hybrid forecasting model based on variation al mode decomposition (VMD) and kernel extreme learning machine (KELM) is proposed to forecast the daily prices and 7-day volatility of Brent and WTI crude oil. The KELM has the advantage of less time consuming and lower parameter sensitivity, thus showing fine prediction ability. The effectiveness of VMDKELM model is verified by a comparative study with other hybrid models and their single models. Except various commonly used evaluation criteria, a recently-developed multi- scale composite complexity synchronization (MCCS) statistic is also utilized to evaluate the synchrony degree between the predictive and the actual values. The empirical results verify that 1) KELM model holds better performance than ELM and BP in crude oil and volatility forecasting; 2) VMD-based model outperforms the EEMD-based model; 3) The developed VMD-KELM model exhibits great superiority compared with other popular models not only for crude oil price, but also for volatility prediction.

Survey 5:

"An Explainable Machine Learning Framework for Forecasting Crude OilPrice during the COVID-19 Pandemic ".

Financial institutions, investors, central banks and relevant corporations need an efficient and reliable forecasting approach for determining the future of crude oil price in an effort to reach optimal decisions under market volatility. This paper

presents an innovative research framework for precisely predicting crude oil price movements and interpreting the predictions. First, it compares six advanced machine learning (ML) models, including two state-of-the-art methods: extreme gradient boosting (XGB) and the light gradient boosting machine (LGBM). Second, it selects novel data, including user search big data, digital currencies and data on the COVID-19 epidemic. The empirical results suggest that LGBM outperforms other alternative ML models. Finally, it proposes an interpretable framework for facilitating decision making to interpret the prediction results of complex ML models and for verifying the importance of various features affecting crude oil price. The results of this paper provide practical guidance for participants in the crude oil market.

Survey 6:

"OIL PRICE PREDICTION USING MACHINE LEARNING MODEL".

Machine Learning allows programming applications to be more precise in predicting outcomes without having to explicitly customize it to try to do it. Oil plays an important part in the energy consumption of the world. The sharp rise in oil prices is shaking financial stocks globally. Because of non-linear factors, old statistical models are not suitable for accurately makes us to mandate as a commitment to give a simple consent to the subsequent representation of oil price data and its related Index .

2.2 REFERENCES

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2.3 PROBLEM STATEMENT DEFINITION

Oil demand is inelastic, therefore the rise in price is good news for producers because they will see an increase in their revenue. Oil importers, however, will experience increased costsof purchasing oil. Because oil is the largest traded commodity, the effects are quite significant.

A rising oil price can even shift economic/political power from oil importers to oil exporters. The crude oil price movements are subject to diverse influencing factors.

Crude oil prices react to many variables, including supply and demand prospects and the perceived risk of market disruptions. Economic growth can drive up the demand for crude oil, while slowdowns tend to lower demand and prices. Crude oil prices react to many variables, including supply and demand prospects and the perceived risk of market disruptions. Economic growth can drive up the demand for crude oil, while slowdowns tend to lower demand prices.High oil prices can drive job creation and investment as it becomes economically viable for oil companies to exploit higher-cost shale oil deposits. However, high oil prices also hit businesses and consumers with higher transportation and manufacturing costs.

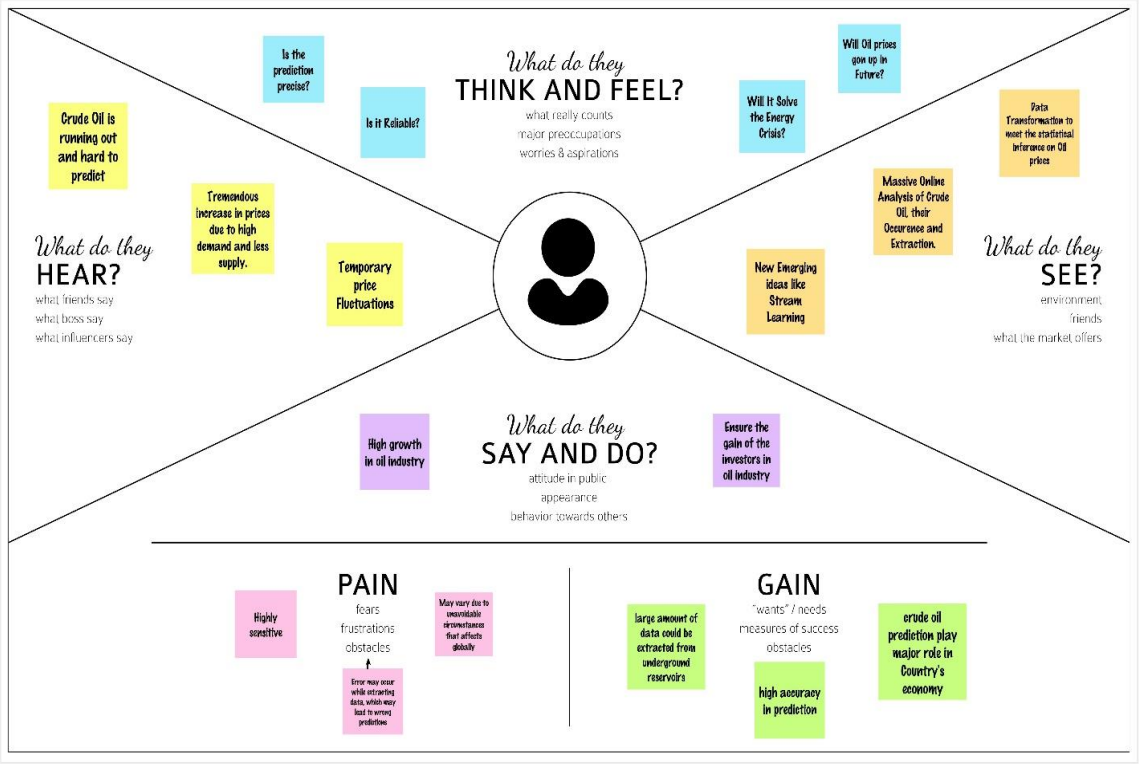
Factors That Influence Pricing Of Oil And Gas

- Demand Supply
- Speculation, Demand for Oil.
- Temporary Price Fluctuations.
- Investing in Oil and Gas Drilling.

CHAPTER 3
IDEATION & PROPOSED SOLUTION

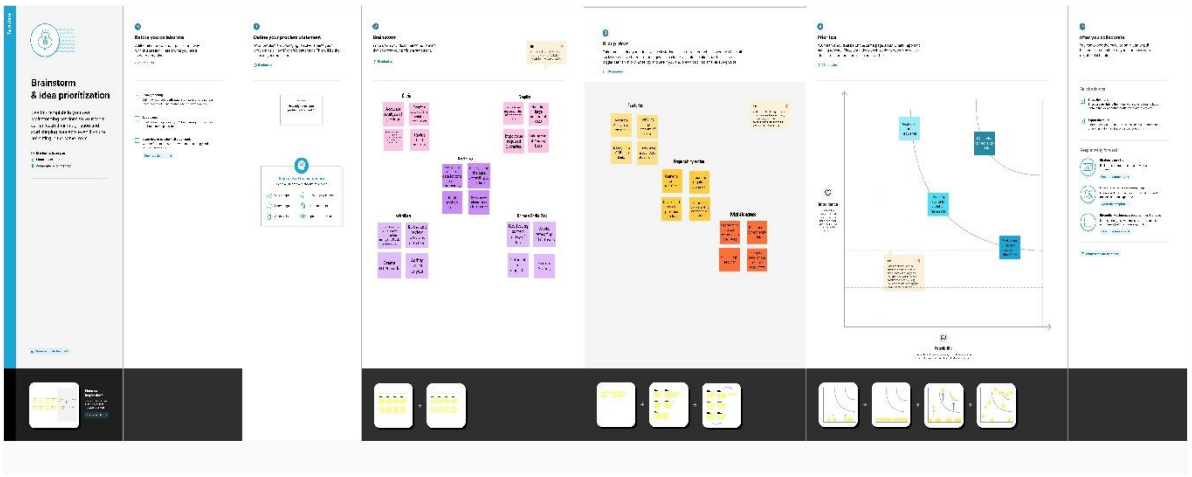
3.1. EMPATHY MAP CANVAS

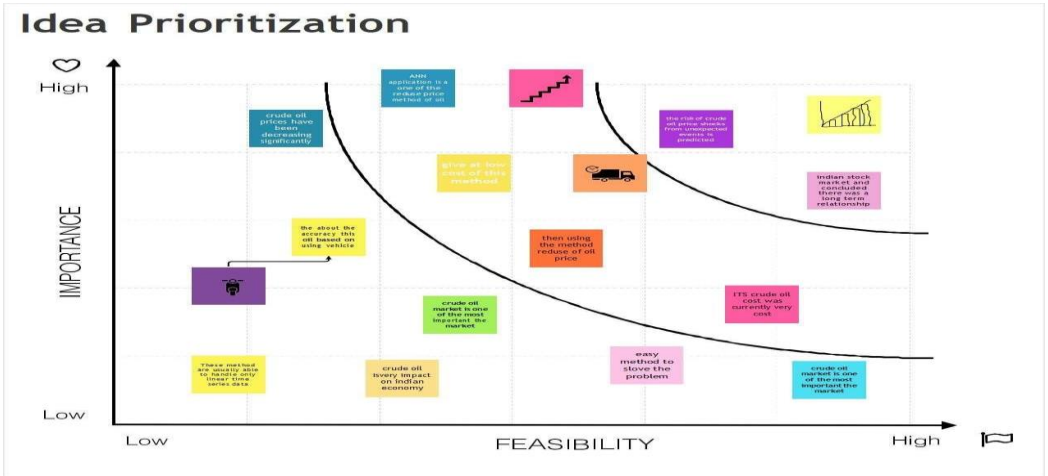
It's easy to jump straight into value proposition design. That is the core of your business and where the revenue or exchange of value will come from. However, trying to provide value to a misunderstood customer is very risky business. Do you have your blinkers on? Try using this canvas before you design your value proposition to make sure your offer nails exactly what your customer wants, needs, or may pleasantly surprise them! Keep asking yourself "why would they care?". What problem are you solving? What opportunity are you creating? In this empathy map what customer think and feels. this map shows the pain and gain of the customer and what do their hear about the problem. this is the easy way to understand the problem statement



3.2. IDEATION & BRAINSTORMING

Brainstorming is a method of generating ideas and sharing knowledge to solve a particular commercial or technical problem, in which participants are encouraged to think without interruption. Brainstorming is a group activity where each participant shares their ideas as soon as they come to mind





3.3. PROPOSED SOLUTION

Prediction of future crude oil price considered a significant challenge to the extremely complex,and dynamic nature of the market and stakeholders perception. Generate Revenue by Selling our application.The crude oil price movements are subject to diverse influencing factors. Includes on applying neural networks to predict the crude oil price .we are using the previous history of crude oil prices to predict future crude oil. So, we would implement and improve to accuracy model.

Our aim is to build an application of heart diseases prediction system using Flask and deployed on Heroku. A csv file is given as input . After the successful completion of operation the result is predicted and displayed.

3.4. PROBLEM SOLUTION FIT

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. After having identified the target customer segment, it's time to **investigate their needs**. One of the cheapest, fastest and most informative things to do at this stage is to meet with customers through **customer discovery interviews** (more about customer discovery interviews here and here) until we keep hearing the same things from customers.

Meeting with a customer is an invaluable source of insights, much more valuable than a survey. Besides, as entrepreneurs, our job is to meet and pitch to customers all the time, we'd be better off to start earlier rather than later.

Project Title: Crude Oil Prediction

Team ID: PNT2022TMID23337

Project Design Phase-I - Solution Fit Template

1. CUSTOMER SEGMENT(S) CS

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. Given the important role price of the crude oil plays, it becomes extremely important to predict future oil prices. The ability to forecast the changes in oil prices allows economic participants such as firms to adapt to future market changes and provides decision-makers with accurate information which they can use to select the optimal decision for them.

6. CUSTOMER CONSTRAINTS CC

The changes in crude oil prices are often great indicators of changes in the overall economy and global markets. Forecasting the price of oil accurately is difficult across various time periods as there is a multitude of factors that can affect the prices of oil. It is difficult to point out which factors have the dominant effect on the oil price. Of all the factors, supply and demand changes have always been the fundamental factors affecting the long-term trend of oil prices.

5. AVAILABLE SOLUTIONS AS

Crude oil price forecasting can assist in minimizing the risks associated with volatility in oil prices. One method to predict the price is Time Series Analysis which is an insightful way to look at how a certain commodity changes over time. In time series models, it is assumed that the current price of crude oil reflects the effects of all influencing factors and that price forecasting can be done based on the behaviour of past crude oil prices.

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

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

As price forecasts are very important to various stakeholders like governments, public and private enterprises, policymakers, and investors, we need to build a prediction model using time series analysis method.

9. PROBLEM ROOT CAUSE RC

Since demand for crude oil is soaring day by day, various factors affect the oil price. They include technological factors, financial factors, and supply-demand factors. In such cases, the prediction of oil prices becomes complex.

7. BEHAVIOUR BE

Auto-Regressive Integrated Moving Average (ARIMA) model is one of the more popular and widely used statistical methods for time-series forecasting. It predicts future moves by examining the difference between the values in the series as opposed to actual values. The values predicted by this model are more accurate when compared with the values obtained from manual prediction.

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

Identify strong TR & EM

3. TRIGGERS TR

The triggers include the factors that affect the price prediction.They are:

1. Technological factor
2. Financial factor
3. Supply-demand factor.

10. YOUR SOLUTION SL

Our solution involves applying Neural Networks to predict the Crude Oil Price. Time series analysis uses the previous history of crude oil prices to predict future prices. RNN(Recurrent Neural Network) with LSTM(Long Short Term Memory) is used to achieve the task.

8. CHANNELS OF BEHAVIOUR

Stakeholders can use this model to analyze future prices of crude oil and take prudent decisions. CH

Identify strong TR & EM

4. EMOTIONS: BEFORE / AFTER

Before: confusion, anxiety

After: confidence

EM

CHAPTER 4

REQUIREMENT ANALYSIS

A functional requirement defines a system or its component. A nonfunctional requirement defines the quality attribute of a software system. It specifies "What should the software system do?" It places constraints on "How should the software system fulfill the functional requirements?"

4.1 FUNCTIONAL REQUIREMENT

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Application	User Direct Open With Google Play Store App User Can Download The Crude Oil Price
FR-2	User Products Available	User Using The Application There Are So Many Products In Crude Oil Price App User Update The Energy And Oil Price Instant The Application
FR-3	User Additional Features	User Can Read Latest News And View Oil Price Charts User View Major Energy Quotes User Can Using A Multiple Color Themes
FR-4	User Exceptions	User Can Exchange Rates And Currancy Converter

4.2 NON-FUNCTIONAL REQUIREMENT

Non-functional Requirements:

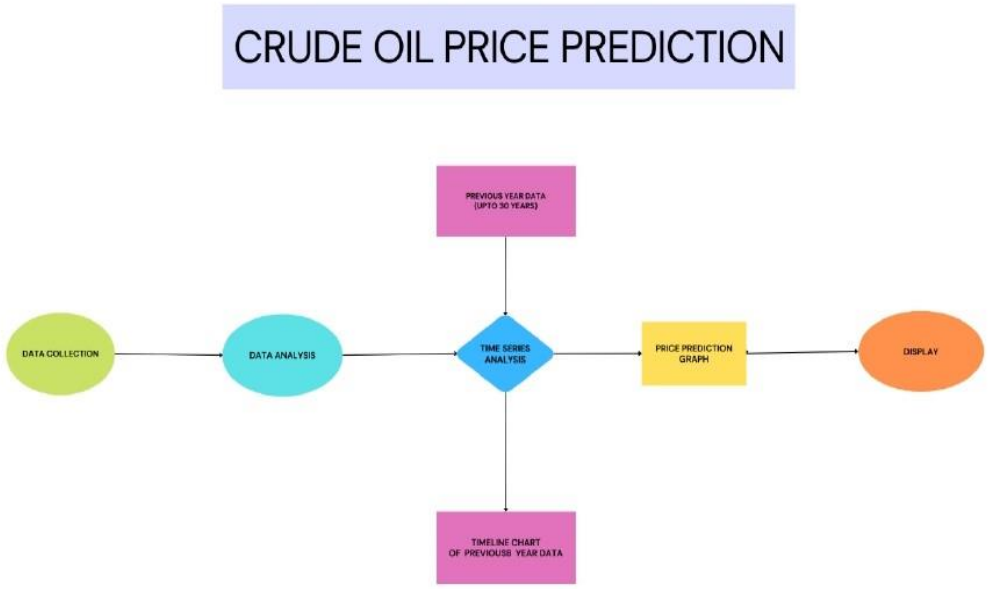
Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Used to improve to the Accuracy of crude oil price prediction
NFR-2	**Security**	In the rising oil price can even shift economical/political power from oil importers to oil exporters communications will be secured
NFR-3	**Reliability**	Reliability of the pointing towards high –risk components
NFR-4	**Performance**	Performance of the this project is to improve to the accuracy of crude oil price prediction
NFR-5	**Availability**	The Availability Solution is More Benefit for and the Importers and exporters in the crude oil price prediction.
NFR-6	**Scalability**	The scalability are 90%-95%

CHAPTER 5
PROJECT DESIGN

5.1. DATA FLOW DIAGRAM

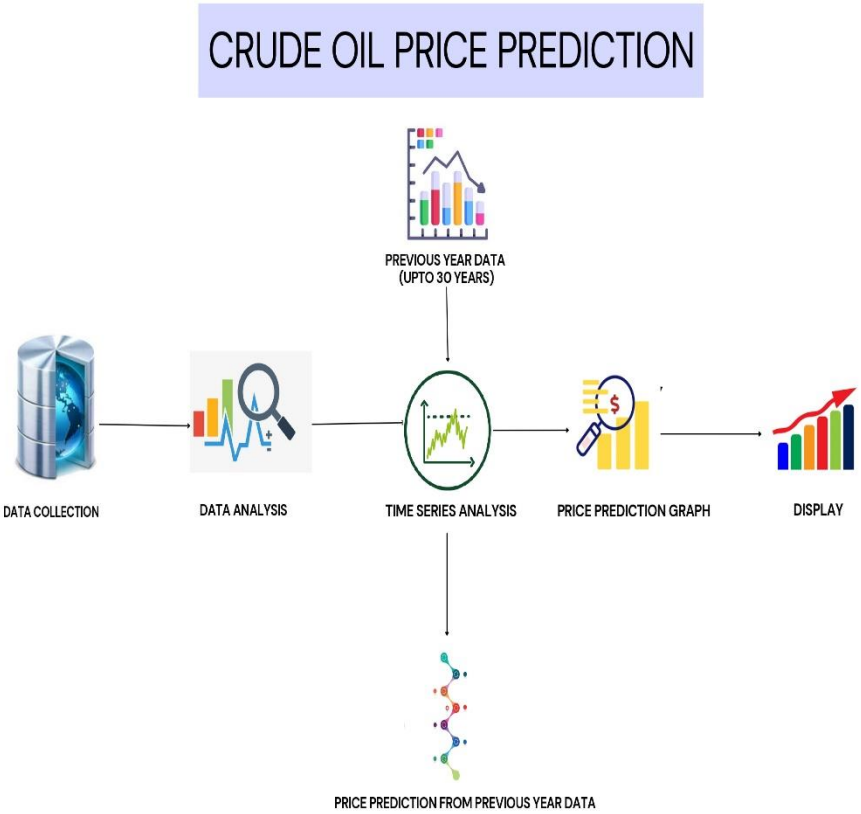
A data flow diagram (DFD) is **a graphical or visual** representation using a standardized set of symbols and notations to describe abusiness's operations through data movement**.**



In this flow diagram we are showing that the crude oil price prediction.

5.2. SOLUTION AND TECHNICAL ARCHITECTURE

A solution architecture (SA) is an architectural description of a specificatio solution. SA combine guidance from different enterprise architecture viewpoints (business, information and technical), as well as from the enterprise solution architecture (ESA)


CRUDE OIL PRICE PREDICTION
PREVIOUS YEAR DATA
(UPTO 30 YEARS)
DATA COLLECTION
DATA ANALYSIS
TIME SERIES ANALYSIS
PRICE PREDICTION GRAPH
DISPLAY
PRICE PREDICTION FROM PREVIOUS YEAR DATA

5.3. User Stories

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)	Application	USN-1	As a User Direct Open With Google Play Store App User Can Download The Crude Oil Price	I can access own decisions.	High	Sprint-1
	Available Products	USN-2	As a User Using The Application There Are So Many Products In Crude Oil Price App User Update The Energy And Oil Price Instant The application	I can receive the data once click then confirm	High	Sprint-1
	Additional Features	USN-3	As a User Can Read Latest News And View Oil Price Charts User View Major Energy Quotes User Can Using A Multiple Color Themes	I can view then read the price prediction.	High	Sprint-2
	Expectations	USN-4	User Can Exchange Rates And Currency Converter	I can expect	Medium	Sprint-1
	Login	USN-5	As a user, login directly then no email,username ,password.		High	Sprint-1
Customer (Web user)			As a user I can view the crude oil price	I can view the price directly	High	Sprint-1
Customer Care Executive			As a user I executive the given price history	I can accept the terms	medium	Sprint-1

CHAPTER 6
PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

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

Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a User Direct Open With Google Play Store App User Can Download The Crude Oil Price	2	High	Team leader, Team member 1
Sprint-1		USN-2	As a User Using The Application There Are So Many Products In Crude Oil Price App User Update The Energy And Oil Price Instant The application	1	High	Team leader, Team member1, Member2, member 3
Sprint-2		USN-3	As a User Can Read Latest News And View Oil Price Charts User View Major Energy Quotes User Can Using A Multiple Color Themes	2	Low	Team leader, Team member2, member 3
Sprint-1		USN-4	User Can Exchange Rates And Currency Converter	2	Medium	Team leader, Team member 1, member 3
Sprint-1	Login	USN-5	As a user, login directly then no email,username ,password.	1	High	Team leader, Team member1, member 2

6.2 SPRINT

DELIVERY&SCHEDULE

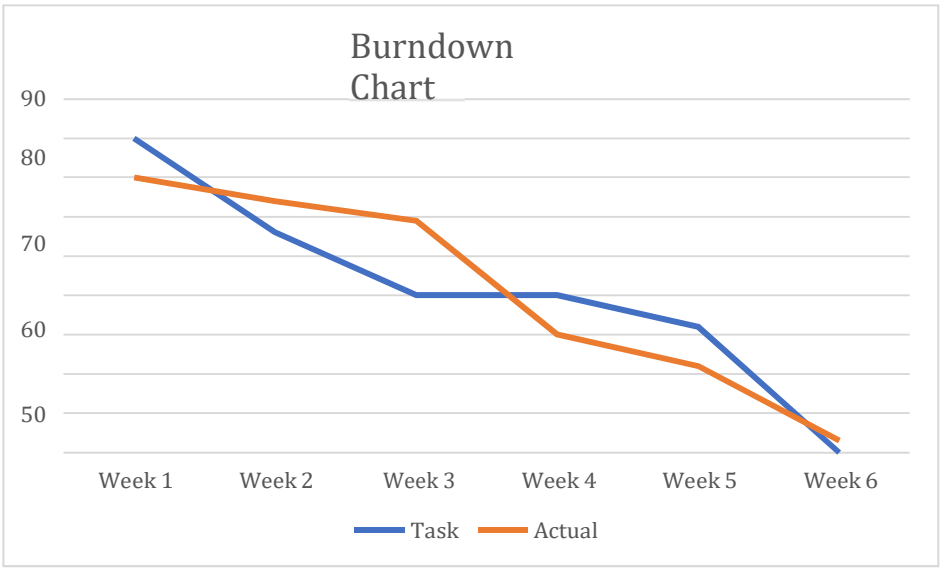
TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring the, technical papers, research publications etc.	28 SEPTEMBER 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	11 OCTOBER 2022
Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	18 OCTOBER 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	23 OCTOBER 2022
Problem Solution Fit	Prepare problem - solution fit document.	15 OCTOBER 2022
Solution Architecture	Prepare solution architecture document.	10 OCTOBER 2022

Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to exit).	9 OCTOBER 2022.
Functional Requirement	Prepare the functional requirement document.	20 OCTOBER 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for review.	23 OCTOBER 2022
Technology Architecture	Prepare the technology architecture diagram.	26 OCTOBER 2022
Prepare Milestone & Activity List	Prepare the milestones & activity list of the project.	26 OCTOBER 2022
Project Development - Delivery of Sprint-1, 2, 3 & 4	Develop & submit the developed code by testing it.	12 NOVEMBER 2022.

6.3 REPORT FROM JIRA

A Burn down chart **shows the amount of work that has been completed in an epic or sprint, and the total work remaining**. Burn down charts are used to predict your team's likelihood of completing their work in the time available.

Burn down chart:



CHAPTER 7
CODING & SOLUTIONING

7.1 FEATURE 1

```
<!DOCTYPE html >
<head>
  <title>Predict the Price</title>
  <style>
    body {
  height: 100%;
  margin: 0;
  background-image: url("crudeoil.jpg");
  height: 100%;
  background-position: center center;
  background-repeat: no-repeat;
  background-size: cover;
  background-attachment: fixed;
}
.btn {
  /*position: absolute;*/
  top: 50%;
  left: 50%;
  /*transform: translate(-50%, -50%);
  -ms-transform: translate(-50%, -50%);*/
  background-color: #f1f1f1;
  color: black;
  font-size: 16px;
  /* padding: 16px 50px; */
  border: none;
  cursor: pointer;
  border-radius: 5px;
  text-align: center;
}

.btn:hover {
  background-color: black;
  color: white;
}
.demo{
  align: center;
  padding-top: 200px;
  padding-left: 500px;
}
.demo1{
```

```
  color: white;
  font-size: 50px;
}
.demo2{
  padding-left: 100px;
}
.demo3{
  color: white;
}
p{
  font-size: 20px;
}
.animate-charcter
{
   text-transform: uppercase;
  background-image: linear-gradient(
    -225deg,
    #f0eef8 0%,
    #44107a 29%,
    #1391ff 67%,
    #fff800 100%
  );
  background-size: auto auto;
  background-clip: border-box;
  background-size: 200% auto;
  color: #fff;
  background-clip: text;
  text-fill-color: transparent;
  -webkit-background-clip: text;
  -webkit-text-fill-color: transparent;
  animation: textclip 2s linear infinite;
  display: inline-block;
      font-size: 50px;
}

@keyframes textclip {
  to {
    background-position: 200% center;
  }
}
.neon {
  color: rgb(255, 255, 255);
  text-shadow: 2px 2px 4px #000000;
}

  </style>
</head>
```

```
<body>
 <div class="demo" >
  <div class="container">
    <div class="row">
      <div class="col-md-12 text-center">
        <h3 class="animate-charcter"> Crude Price Prediction</h3>
      </div>
    </div>
  </div>

    <form action="{{ url_for('getprediction')}}"method="POST">
    <div class="demo2">
          <input type="text"  name="end" placeholder="YYYY-MM-DD" required="required" />
       <button class="btn"type="submit" class="btn btn-primary btn-block btn-large">Get
Prediction</button>
      </div>
    </form>

   <br>
   <br>
   <div class="container">
    <h1 class="neon">The predicted value: {{ output }} </h1>
  </div>

 </div>


</body>
</html
```

CHAPTER 8

TESTING

8.1 TEST CASES

A test case is nothing but **a series of step executed on a product, using a predefined set of input data, expected to produce a pre-defined set of outputs, in a given environment**. It describes “how” to implement those test cases. Test case specifications are useful as it enlists the specification details of the items. The purpose of testing is to discover errors . Testing is the process of trying to discover every conceivable fault or weakness in a work product . It provide a way to check the functionality of component , sub assemblies , assemblies and/or a finished product.

It is the process of exercising software with the intent of ensuring that the software system meets its requirement and user expectation and does not fail in an unacceptable manner. There are various types of testing. Each test type addressing a specific testing requirement. The testing report are submitted in github.

Test case Template

Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result
LoginPage_TC_OO1	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account button	Registration	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup displayed or not	https:///register.html/	Login/Signup popup should display
LoginPage_TC_OO2	UI	Login page	Verify the UI elements in Login/Signup popup	Receving Verification mail/Login	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Last password? Recovery password link	https://index.html/	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery password link

5	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation	BUG ID	Executed By
6	Registration	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup displayed or not	https:///register.html/	Login/Signup popup should display	Working as expected	Pass	Steps are very clear to follow	Yes	1177	
7	Receving Verification mail/Login	1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Singup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Last password? Recovery password link	https://index.html/	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery password link	Working as expected	Pass	Steps are very clear to follow	No	1177	

5	Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result
8	LoginPage_TC_003	Functional	Enquiry	Verify user is able to log into application with Valid credentials	Enter The Range Of Day	1.Enter the range of date	Date:11/07/2007 to 17/07/2007	Uesr can move on next step	working
9	LoginPage_TC_004	Functional	Visualazie	Verify user is able to log into application can move visulization	Visualize The Trend	1.Enter and move on.	visualize .	user can be visualize very quickly	Working
10	LoginPage_TC_004	Functional	End point page	In user can be view the results	See The Results	can be viewed the price.	Price Results can Visualized	See The correct Price	Working

5	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Commnets	TC for Automation	BUG ID	Executed By
8	ıter The Range Of Day	1.Enter the range of date	Date:11/07/2007 to 17/07/2007	Uesr can move on next step	working as expected	pass	Steps are very clear to follow	No	1177	
9	Visualize The Trend	1.Enter and move on.	visualize .	user can be visualize very quickly	Working as expected	pass	Steps are very clear to follow	yes	1177	
10	See The Results	can be viewed the price.	Price Results can Visualized	See The correct Price	Working as expected	pass	Steps are very clear to follow	yes	1177	

8.2. USER ACCEPTANCE TESTING

User acceptance testing is a critical phase of any project and requires significant participant by the end user. It also ensure that the system meets the functional requirement.

1. Purpose of Document

   The purpose of this document is to briefly explain the test coverage and open issues of the [Crude Oil] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

   This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	3	2	19
Duplicate	1	0	2	0	3
External	2	2	0	1	5
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	1	0	0	1
Won’t Fix	1	5	0	0	6

Totals	25	14	10	23	72

1. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	1	1	5
Client Application	51	0	1	50
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

CHAPTER 9
RESULTS

9.1 PERFORMANCE METRICS

Project team shall fill the following information in model performance testing template.

<table>
<tr><th>S.No.</th><th>Parameter</th><th>Values</th><th>Screenshot</th></tr>
<tr><td>1.</td><td>Metrics</td><td>Regression Model:
MAE - , MSE - , RMSE - ,
R2 score

Classification Model:
Confusion Matrix - , Accuracy Score- & Classification Report -</td><td>
<table>
<tr><th></th><th>RMSE</th><th>MAE</th><th>R2-SCORE</th></tr>
<tr><td>1</td><td>12.08626473</td><td>0.5738016561</td><td>7.6429788</td></tr>
<tr><td>2</td><td>9.147314047</td><td>0.9047892679</td><td>5.03809031</td></tr>
<tr><td>3</td><td>1.452734461</td><td>0.99798563</td><td>0.8729176886</td></tr>
</table>
RMSE for different models used in our project
Linear Regression : 19.3533662859143
Decision Tree Regression : 9.14731404717267
Random Forest Regression : 1.45273446145987
R2 Score for different models used in our project :
Linear Regression : 0.57380165610804
Decision Tree Regression : 0.90478926790260
Random Forest Regression : 0.997598562970117

Calculate RMSE performance metrics

Accuracy : 29.347830443269938
</td></tr>
<tr><td>2.</td><td>Tune the Model</td><td>Hyper parameter Tuning -
Validation Method -</td><td>Hyper parameter tuning

In the case of over fitting, some inclusion of regularization and further hyper parameter tuning for the training process must be considered. A good model should be based on a compromise between capturing the essential patterns in the data without</td></tr>
</table>

CHAPTER 10
ADVANTAGE

- The advantage of this model is high performance and accuracy rate.
- It is very flexible and high rates of success are achieved
- The application when implemented using random forests has moreaccuracy rate when compare to other algorithm. In this system, we achieve around 98%.

DISADVANTAGE

- Time consuming (at the moment)
- Lack of automation
- UI isn’t responsive, making it difficult to use in portable devices

CHAPTER 11

CONCLUSION

The main purpose of this paper is to develop a time series collection of regular observations on oil price datasets. Used to predict future value based on historical data. Non- linear trends are fitted using annual, weekly, and daily data. This white paper integrates machine learning models such as FB Prophet a to analyze, classify, and predict time series data.Historical data is presented using variables analyzed and calculated during the algorithm execution module, and each algorithm makes a series of oil price predictions using this setof values.

CHAPTER 12

FUTURE SCOPE

The project's future potential is enormous. The project can be implemented with the real-time functionalities that are necessary. Because it is quite versatile in terms of expansion, the project can be upgraded in the near future as and when the need arises. The complete prediction value can be increased in a much better, accurate, and error-free mannerwith the proposed approach. The project can be enhanced withreal time data.

CHAPTER 13

APPENDIX

PYTHON

Python is a computer programming language often used to **build websites and software, automate tasks, and conduct data analysis**. Python is a general purpose language, meaning it can be used to create a variety of different programsand isn't specialized for any specific problems.

SOURCECODE

LOGIN

```
index:<!DOCTYPE html >
<head>
  <title>Predict the Price</title>
  <style>
    body {
  height: 100%;
  margin: 0;
  background-image: url("crudeoil.jpg");
  height: 100%;
  background-position: center center;
  background-repeat: no-repeat;
  background-size: cover;
  background-attachment: fixed;
}
.btn {
  /*position: absolute;*/
  top: 50%;
  left: 50%;
  /*transform: translate(-50%, -50%);
  -ms-transform: translate(-50%, -50%);*/
  background-color: #f1f1f1;
  color: black;
  font-size: 16px;
  /* padding: 16px 50px; */
  border: none;
  cursor: pointer;
  border-radius: 5px;
```

```
  text-align: center;
}

.btn:hover {
  background-color: black;
  color: white;
}
.demo{
  align: center;
  padding-top: 200px;
  padding-left: 500px;
}
.demo1{
  color: white;
  font-size: 50px;
}
.demo2{
  padding-left: 100px;
}
.demo3{
  color: white;
}
p{
  font-size: 20px;
}
.animate-charcter
{
   text-transform: uppercase;
  background-image: linear-gradient(
    -225deg,
    #f0eef8 0%,
    #44107a 29%,
    #1391ff 67%,
    #fff800 100%
  );
  background-size: auto auto;
  background-clip: border-box;
  background-size: 200% auto;
  color: #fff;
  background-clip: text;
  text-fill-color: transparent;
  -webkit-background-clip: text;
  -webkit-text-fill-color: transparent;
  animation: textclip 2s linear infinite;
  display: inline-block;
      font-size: 50px;
}
```

```
@keyframes textclip {
  to {
    background-position: 200% center;
  }
}
.neon {
  color: rgb(255, 255, 255);
  text-shadow: 2px 2px 4px #000000;
}

  </style>
</head>

<body>
 <div class="demo" >
  <div class="container">
    <div class="row">
      <div class="col-md-12 text-center">
        <h3 class="animate-charcter"> Crude Price Prediction</h3>
      </div>
    </div>
  </div>

    <form action="{{ url_for('getprediction')}}"method="POST">
    <div class="demo2">
          <input type="text"  name="end" placeholder="YYYY-MM-DD" required="required" />
       <button class="btn"type="submit" class="btn btn-primary btn-block btn-large">Get
Prediction</button>
      </div>
    </form>

   <br>
   <br>
   <div class="container">
    <h1 class="neon">The predicted value: {{ output }} </h1>
  </div>

 </div>


</body>
</html>
```

BUILD CODE

```
{
  "cells": [
```

```
   {
    "cell_type": "code",
    "execution_count": null,
    "metadata": {
     "colab": {
      "base_uri": "https://localhost:8080/"
     },
     "id": "BjwDXa8t5IKe",
     "outputId": "0b549c78-4b5d-4920-a4ba-2c7682fe91ce"
    },
    "outputs": [
     {
      "output_type": "stream",
      "name": "stdout",
      "text": [
       "Drive already mounted at /content/drive; to attempt to forcibly remount, call
drive.mount(\"/content/drive\", force_remount=True).\n"
      ]
     }
    ],
    "source": [
     "from google.colab import drive\n",
     "drive.mount('/content/drive')"
    ]
   },
   {
    "cell_type": "code",
    "execution_count": null,
    "metadata": {
     "colab": {
      "base_uri": "https://localhost:8080/"
     },
     "id": "aXbu-tDy_jjc",
     "outputId": "58142efb-0a97-4777-d706-f75dc66da470"
    },
    "outputs": [
     {
      "output_type": "stream",
      "name": "stdout",
      "text": [
       "/content/drive/MyDrive/Colab Notebooks/Data\n"
      ]
     }
    ],
    "source": [
     "cd/content/drive/MyDrive/Colab Notebooks/Data"
    ]
   },
```

```
  {
   "cell_type": "code",
   "execution_count": null,
   "metadata": {
    "colab": {
     "base_uri": "https://localhost:8080/"
    },
    "id": "4g_0GCF1Cm7W",
    "outputId": "76c98075-bd88-4f08-b047-59baf9c6def8"
   },
   "outputs": [
    {
     "output_type": "stream",
     "name": "stdout",
     "text": [
      "Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/\n",
      "Requirement already satisfied: pandas in /usr/local/lib/python3.7/dist-packages (1.3.5)\n",
      "Requirement already satisfied: python-dateutil>=2.7.3 in /usr/local/lib/python3.7/dist-packages (from pandas) (2.8.2)\n",
      "Requirement already satisfied: pytz>=2017.3 in /usr/local/lib/python3.7/dist-packages (from pandas) (2022.6)\n",
      "Requirement already satisfied: numpy>=1.17.3 in /usr/local/lib/python3.7/dist-packages (from pandas) (1.21.6)\n",
      "Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-packages (from python-dateutil>=2.7.3->pandas) (1.15.0)\n",
      "Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/\n",
      "Requirement already satisfied: pandas-datareader in /usr/local/lib/python3.7/dist-packages (0.10.0)\n",
      "Requirement already satisfied: lxml in /usr/local/lib/python3.7/dist-packages (from pandas-datareader) (4.9.1)\n",
      "Requirement already satisfied: pandas>=0.23 in /usr/local/lib/python3.7/dist-packages (from pandas-datareader) (1.3.5)\n",
      "Requirement already satisfied: requests>=2.19.0 in /usr/local/lib/python3.7/dist-packages (from pandas-datareader) (2.23.0)\n",
      "Requirement already satisfied: numpy>=1.17.3 in /usr/local/lib/python3.7/dist-packages (from pandas>=0.23->pandas-datareader) (1.21.6)\n",
      "Requirement already satisfied: python-dateutil>=2.7.3 in /usr/local/lib/python3.7/dist-packages (from pandas>=0.23->pandas-datareader) (2.8.2)\n",
      "Requirement already satisfied: pytz>=2017.3 in /usr/local/lib/python3.7/dist-packages (from pandas>=0.23->pandas-datareader) (2022.6)\n",
      "Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/dist-packages (from python-dateutil>=2.7.3->pandas>=0.23->pandas-datareader) (1.15.0)\n",
      "Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests>=2.19.0->pandas-datareader) (2.10)\n",
      "Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/lib/python3.7/dist-packages (from requests>=2.19.0->pandas-datareader) (1.24.3)\n",
```

```
          "Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests>=2.19.0->pandas-datareader) (3.0.4)\n",
          "Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests>=2.19.0->pandas-datareader) (2022.9.24)\n"
         ]
        }
       ],
       "source": [
        "! pip install --upgrade pandas\n",
        "! pip install --upgrade pandas-datareader"
       ]
      },
      {
       "cell_type": "code",
       "execution_count": null,
       "metadata": {
        "colab": {
         "base_uri": "https://localhost:8080/"
        },
        "id": "RB_qw93x5mfY",
        "outputId": "73d8b807-c4ac-41a0-a15f-49b6e4863620"
       },
       "outputs": [
        {
         "output_type": "stream",
         "name": "stdout",
         "text": [
          "Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/\n",
          "Requirement already satisfied: pyngrok in /usr/local/lib/python3.7/dist-packages (5.1.0)\n",
          "Requirement already satisfied: PyYAML in /usr/local/lib/python3.7/dist-packages (from pyngrok) (6.0)\n",
          "Looking in indexes: https://pypi.org/simple, https://us-python.pkg.dev/colab-wheels/public/simple/\n",
          "Requirement already satisfied: flask_ngrok in /usr/local/lib/python3.7/dist-packages (0.0.25)\n",
          "Requirement already satisfied: requests in /usr/local/lib/python3.7/dist-packages (from flask_ngrok) (2.23.0)\n",
          "Requirement already satisfied: Flask>=0.8 in /usr/local/lib/python3.7/dist-packages (from flask_ngrok) (1.1.4)\n",
          "Requirement already satisfied: Werkzeug<2.0,>=0.15 in /usr/local/lib/python3.7/dist-packages (from Flask>=0.8->flask_ngrok) (1.0.1)\n",
          "Requirement already satisfied: click<8.0,>=5.1 in /usr/local/lib/python3.7/dist-packages (from Flask>=0.8->flask_ngrok) (7.1.2)\n",
          "Requirement already satisfied: itsdangerous<2.0,>=0.24 in /usr/local/lib/python3.7/dist-packages (from Flask>=0.8->flask_ngrok) (1.1.0)\n",
          "Requirement already satisfied: Jinja2<3.0,>=2.10.1 in /usr/local/lib/python3.7/dist-packages (from Flask>=0.8->flask_ngrok) (2.11.3)\n",
          "Requirement already satisfied: MarkupSafe>=0.23 in /usr/local/lib/python3.7/dist-packages
```

(from Jinja2<3.0,>=2.10.1->Flask>=0.8->flask_ngrok) (2.0.1)\n",
"Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/dist-packages (from requests->flask_ngrok) (2022.9.24)\n",
"Requirement already satisfied: idna<3,>=2.5 in /usr/local/lib/python3.7/dist-packages (from requests->flask_ngrok) (2.10)\n",
"Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/local/lib/python3.7/dist-packages (from requests->flask_ngrok) (1.24.3)\n",
"Requirement already satisfied: chardet<4,>=3.0.2 in /usr/local/lib/python3.7/dist-packages (from requests->flask_ngrok) (3.0.4)\n"
]
}
],
"source": [
"!pip install pyngrok\n",
"!pip install flask_ngrok"
]
},
{
"cell_type": "code",
"execution_count": null,
"metadata": {
"id": "Pm0pD8-H5miK"
},
"outputs": [],
"source": []
},
{
"cell_type": "code",
"execution_count": null,
"metadata": {
"colab": {
"base_uri": "https://localhost:8080/"
},
"id": "3twKZsV65mkw",
"outputId": "9fa55695-40d4-41bf-cb9a-8bf00b32d29c"
},
"outputs": [
{
"output_type": "stream",
"name": "stdout",
"text": [
"deb https://ngrok-agent.s3.amazonaws.com buster main\n",
"Hit:1 http://archive.ubuntu.com/ubuntu bionic InRelease\n",
"Hit:2 http://archive.ubuntu.com/ubuntu bionic-updates InRelease\n",
"Hit:3 https://cloud.r-project.org/bin/linux/ubuntu bionic-cran40/ InRelease\n",
"Hit:4 http://archive.ubuntu.com/ubuntu bionic-backports InRelease\n",
"Hit:5 http://security.ubuntu.com/ubuntu bionic-security InRelease\n",
"Ign:6 https://developer.download.nvidia.com/compute/machine-

```
learning/repos/ubuntu1804/x86_64  InRelease\n",
          "Hit:7 https://developer.download.nvidia.com/compute/cuda/repos/ubuntu1804/x86_64
InRelease\n",
          "Hit:8 https://developer.download.nvidia.com/compute/machine-
learning/repos/ubuntu1804/x86_64  Release\n",
          "Hit:9 http://ppa.launchpad.net/c2d4u.team/c2d4u4.0+/ubuntu bionic InRelease\n",
          "Hit:10 https://ngrok-agent.s3.amazonaws.com buster InRelease\n",
          "Hit:11 http://ppa.launchpad.net/cran/libgit2/ubuntu bionic InRelease\n",
          "Hit:12 http://ppa.launchpad.net/deadsnakes/ppa/ubuntu bionic InRelease\n",
          "Hit:13 http://ppa.launchpad.net/graphics-drivers/ppa/ubuntu bionic InRelease\n",
          "Reading package lists... Done\n",
          "Building dependency tree       \n",
          "Reading state information... Done\n",
          "9 packages can be upgraded. Run 'apt list --upgradable' to see them.\n",
          "Reading package lists... Done\n",
          "Building dependency tree       \n",
          "Reading state information... Done\n",
          "ngrok is already the newest version (3.1.0).\n",
          "The following package was automatically installed and is no longer required:\n",
          "  libnvidia-common-460\n",
          "Use 'sudo apt autoremove' to remove it.\n",
          "0 upgraded, 0 newly installed, 0 to remove and 9 not upgraded.\n"
        ]
       }
      ],
      "source": [
        "!curl -s https://ngrok-agent.s3.amazonaws.com/ngrok.asc | sudo tee
/etc/apt/trusted.gpg.d/ngrok.asc >/dev/null && echo \"deb https://ngrok-agent.s3.amazonaws.com buster
main\" | sudo tee /etc/apt/sources.list.d/ngrok.list && sudo apt update && sudo apt install ngrok"
      ]
    },
    {
      "cell_type": "code",
      "execution_count": null,
      "metadata": {
        "colab": {
          "base_uri": "https://localhost:8080/"
        },
        "id": "qWCp5hQ25mnk",
        "outputId": "8883a5e1-e90a-4cb9-a3c4-cba9b6ce6521"
      },
      "outputs": [
        {
          "output_type": "stream",
          "name": "stdout",
          "text": [
            "Authtoken saved to configuration file: /root/.config/ngrok/ngrok.yml\n"
          ]
```

```
      }
     ],
     "source": [
      "!ngrok authtoken 2Hyeje5WYpT6WQ1Wt7fxr0VX7Sv_6oJBJyeCBZkWKGFvUaP8w"
     ]
    },
    {
     "cell_type": "code",
     "execution_count": null,
     "metadata": {
      "id": "_OnQ7OVu5mp5"
     },
     "outputs": [],
     "source": [
      "from sklearn.preprocessing import MinMaxScaler\n",
      "import pandas\n",
      "from dateutil import parser\n",
      "import datetime\n",
      "import pandas_datareader as web\n",
      "import numpy as np\n",
      "import pickle\n",
      "from flask import Flask\n",
      "from flask import request, render_template\n",
      "from pyngrok import ngrok\n",
      "from flask_ngrok import run_with_ngrok\n",
      "import datetime\n",
      "from dateutil import parser"
     ]
    },
    {
     "cell_type": "code",
     "execution_count": null,
     "metadata": {
      "colab": {
       "base_uri": "https://localhost:8080/"
      },
      "id": "xwwqqpmW5msz",
      "outputId": "66cd2612-aa51-4cad-c510-4afa7aaba8b7"
     },
     "outputs": [
      {
       "output_type": "stream",
       "name": "stdout",
       "text": [
        " * Serving Flask app \"__main__\" (lazy loading)\n",
        " * Environment: production\n",
        "\u001b[31m   WARNING: This is a development server. Do not use it in a production deployment.\u001b[0m\n",
```

```
        "\u001b[2m   Use a production WSGI server instead.\u001b[0m\n",
        " * Debug mode: off\n"
       ]
      },
      {
       "output_type": "stream",
       "name": "stderr",
       "text": [
        "INFO:werkzeug: * Running on http://127.0.0.1:5000/ (Press CTRL+C to quit)\n"
       ]
      },
      {
       "output_type": "stream",
       "name": "stdout",
       "text": [
        " * Running on http://c9d9-34-73-152-155.ngrok.io\n",
        " * Traffic stats available on http://127.0.0.1:4040\n"
       ]
      },
      {
       "output_type": "stream",
       "name": "stderr",
       "text": [
        "INFO:werkzeug:127.0.0.1 - - [24/Nov/2022 08:57:01] \"\u001b[37mGET /
HTTP/1.1\u001b[0m\" 200 -\n",
        "INFO:werkzeug:127.0.0.1 - - [24/Nov/2022 08:57:02] \"\u001b[33mGET /favicon.ico
HTTP/1.1\u001b[0m\" 404 -\n",
        "INFO:werkzeug:127.0.0.1 - - [24/Nov/2022 08:57:03] \"\u001b[37mGET /
HTTP/1.1\u001b[0m\" 200 -\n"
       ]
      }
     ],
     "source": [
      "app = Flask(__name__)\n",
      "\n",
      "run_with_ngrok(app)\n",
      "\n",
      "\n",
      "@app.route('/')\n",
      "def home():\n",
      "    return render_template('index.html')\n",
      "\n",
      "@app.route('/getprediction',methods=['POST'])\n",
      "def getprediction():    \n",
      "    model = pickle.load(open('model_saved.pkl', 'rb'))\n",
      "    end = datetime.datetime.strptime( request.form['end'],'%Y-%m-%d')\n",
      "    start = datetime.datetime(2001, 1, 1)\n",
      "    apple_quote = web.DataReader('CL=F', \"yahoo\",start, end)\n",
```

```
    "    \n",
    "    #Get the quote\n",
    "    #Create a new dataframe\n",
    "    new_df = apple_quote.filter(['Close'])\n",
    "    #Get the last 1000 days closing price values and convert the dataframe to an array\n",
    "    last_1000_days = new_df[-1000:].values\n",
    "    scaler = MinMaxScaler().fit(last_1000_days)\n",
    "    #Scale the data to be values between 0 to 1\n",
    "    last_1000_days_scaled = scaler.transform(last_1000_days)\n",
    "    #Create an empty list\n",
    "    X_test= []\n",
    "    #Append the past 1000 days\n",
    "    X_test.append(last_1000_days_scaled)\n",
    "    #Convert the X_test data set to a numpy array\n",
    "    X_test = np.array(X_test)\n",
    "    #Reshape the data\n",
    "    X_test = np.reshape(X_test, (X_test.shape[0], X_test.shape[1], 1))\n",
    "    pred_price = model.predict(X_test)\n",
    "    #undo the scaling\n",
    "    pred_price = scaler.inverse_transform(pred_price)\n",
    "\n",
    "\n",
    "    return render_template('index.html', output='Predicted Price is :{}'.format(pred_price))\n",
    "  \n",
    "\n",
    "\n",
    "app.run()"
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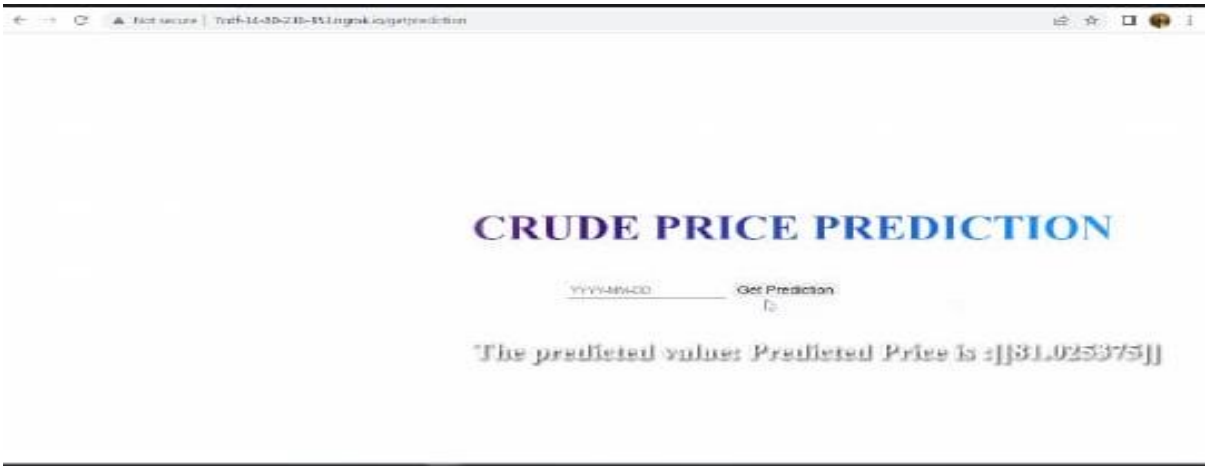
SCREENSHOT



LINKS

PROJECT REPOSITORY LINK:

https://github.com/IBM-EPBL/IBM-Project-25018-1659952393

PROJECT DEMO LINK:

https://drive.google.com/file/d/1S6-84blf1MFoOY86wRpSfN-Pb_sWN71v/view?usp=sharing