CRUDE OIL PRICE PREDICTION

NALAIYA THIRAN PROJECT BASED LEARNING

On

PROFESSIONAL READINESS FOR INNOVATION, EMPLOYABILITY, AND ENTREPRENEURSHIP

A PROJECT REPORT

TEAM ID: PNT2022TMID46996

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BACHELOR OF ENGINEERING

IN

COMPUTER SCIENCE ENGINEERING

UNIVERSITY COLLEGE OF ENGINEERING - PATTUKKOTTAI

(A Constituent College of Anna University, Chennai)

PATTUKKOTTAI – 614701

NOVEMBER 2022

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PROJECT NAME	Crude oil price prediction

INTRODUCTION:

1.1 PROJECT OVERVIEW:

- Oil demand is inelastic, therefore the rise in price is good news for producers because they will see an increase in their revenue. Oil importers, however, will experience increased costs of purchasing oil. Because oil is the largest traded commodity, the effects are quite significant. A rising oil price can even shift economic/political power from oil importers to oil exporters. The crude oil price movements are subject to diverse influencing factors.
- This Guided Project mainly focuses on applying Neural Networks to predict the Crude Oil Price. This decision helps us to buy crude oil at the proper time. Time series analysis is the best option for this kind of prediction because we are using the previous history of crude oil prices to predict future crude oil. So we would be implementing RNN (Recurrent Neural Network) with LSTM (Long Short Term Memory) to achieve the task.

1.2 PURPOSE:

- Crude oil price prediction is a challenging task in oil producing countries. It has fluctuations such as demand, supply, cost, etc., its prices is among the most complex and tough to model because

fluctuation of price in crude oil are highly irregular, nonlinear and varies dynamically with high uncertainty.

- In order to overcome all the above mentioned obstacles and problems we are here to provide a user friendly application with high benefits.
- In modern predictions the predictors only used historical data but by using algorithms and user interface this crude oil price predictions are made user friendly.
- Due to fluctuations it is very difficult for the users to predict the prices and thereby they don't have correct resources to gather information hence by using this interface the process has been made easier to the users.

2.LITERATURE SURVEY:

2.1 Application of Traditional and Statistical Econometric Models:

Academic academics are starting to use the usual statistical and econometric approaches among the many and various forecasting models that have been created to anticipate the price of "black gold." Amano offers the first study on oil market forecasts (1987). To forecast the oil market, the author employed a small-scale econometric model. Huntington (1994) used an advanced econometric model to forecast the price of oil in the 1980s. Gulen (1998) used co-integration analysis in a different study to forecast the price of WTI crude oil. To predict the price of oil, Barone-adesi et al. (1998) proposed a semi-parametric approach based on the filtered historical simulation technique. Morana (2001) used a semi-parametric technique based on the GARCH features of the volatility of oil prices, which were studied by Barone-adesi et al (1998) suggested a semi-parametric approach based on the filtered historical simulation technique to forecast oil price. Based on the

GARCH properties of the oil price volatility, Morana (2001) employed a semi-parametric approach investigated by Barone-adesi et al. (1998) to short-term forecast of Brent crude oil price. In another work, Tang and Hammoudeh (2002) utilized a nonlinear regression to predict OPEC basket price. Using OECD petroleum inventory levels and relative stock inventories, Ye et al. (2002, 2005) adopted a simple linear regression model for short-term monthly prediction of WTI crude oil spot price. In a related study, Ye et al. (2006) included nonlinear variables such as low- and high- inventory variables to the linear forecasting model suggested by Ye et al. (2002, 2005) to predict short-run WTI crude oil prices. Zamani (2004) used an econometrics forecasting model to anticipate the short-term quarterly WTI crude oil spot price using OECD stocks, non-OECD demand, and OPEC supply. Using error correction models, Lanza et al. (2005) looked at the pricing of products and crude oil. Sadorsky (2006) used GARCH, TGARCH, AR, and BIGARCH statistical models, among others, to forecast daily volatility in petroleum futures price returns. To predict oil demand, supply, and prices, Dees et al. (2007) created a linear model of the global oil market with a primary focus on OPEC behaviour. Murat and Tokat (2009) looked into the connection between futures and spot crude oil prices and used the random walk model to test if futures prices might predict changes in spot prices.

However, more recent research have used GARCH and several models from the GARCH family to forecast oil prices. For instance, the GARCH model was employed by Narayan and Narayan (2007) and Agnolucci (2009) to forecast spot and futures crude oil prices. In a related study, Mohamad and Su (2010) investigated the crude oil price predicting outcomes of various GARCH-type models. CGARCH, FIGARCH, and IGARCH models were suggested by Kang et al. (2009) to predict the volatility of crude oil markets.

Wei et al. (2010) enhanced the work of Kang et al. (2009) towards the same goal by using linear and nonlinear GARCH-class models. As a result of the application of linear techniques, a sizable difference between the projected and real price of oil has been demonstrated. The most often utilised exogenous variables in these models for predicting oil prices are inventories, supply, and demand. The fact that supply and demand are relatively inelastic to price changes and that inventory adjustments can take time to materialise account for a considerable share of the difference between actual and predicted prices, especially in the near run (Hamilton, 2008). However, traditional statistical and economic techniques frequently only detect linear processes in data. data time series. (Weigend and Gershenfeld, 1994). However, the oil prices behavior is characterized by a high nonlinearity and irregularity. Therefore, the mentioned models are not the appropriate choice to forecast the oil price.

2.2 REFERENCES:

1. Yang, C.; Lv, F.; Fang, L.; Shang, X. The pricing efficiency of crude oil futures in the Shanghai International Exchange. Financ Res.Lett. 2020, 36, 101329. [CrossRef]

2. Murat, A.; Tokat, E. Forecasting oil price movements with crack spread futures. Energy Econ. 2009, 31, 85–90. [CrossRef]

3. Yu, L.; Zhao, Y.; Tang, L. Ensemble forecasting for complex time series using sparse representation and neural networks. J.Forecast. 2017, 36, 122–138. [CrossRef]

4. Hou, A.; Suardi, S. A nonparametric GARCH model of crude oil price return volatility. Energy Econ. 2012, 34, 618–626. [CrossRef]

5. Lanza, A.; Manera, M.; Giovannini, M. Modeling and forecasting cointegrated relationships among heavy oil and product prices.Energy Econ. 2005, 27, 831–848. [CrossRef]

6. Jammazi, R.; Aloui, C. Crude oil price forecasting: Experimental evidence from wavelet decomposition and neural network modeling. Energy Econ. 2012, 34, 828–841. [CrossRef]

7. Xie, W.; Yu, L.; Xu, S.; Wang, S. A new method for crude oil price forecasting based on support vector machines. In International Conference on Computational Science; Springer: Berlin/Heidelberg, Germany, 2006; pp. 444–451.

8. Hinton, G.E.; Salakhutdinov, R.R. Reducing the dimensionality of data with neural networks. Science 2006, 313, 504–507. [CrossRef] [PubMed]

9. Lecun, Y.; Bengio, Y.; Hinton, G. Deep learning. Nature 2015, 521, 436–444. [CrossRef] [PubMed]

10. Sutskever, I.; Hinton, G.E.; Taylor, G.W. The recurrent temporal restricted boltzmann machine. Adv. Neural Inf. Process. Syst. 2008, 21, 1601–1608.

2.3 Artificial Neural Network (ANN):

2.3.1 Definition and Neuron Model Evolution

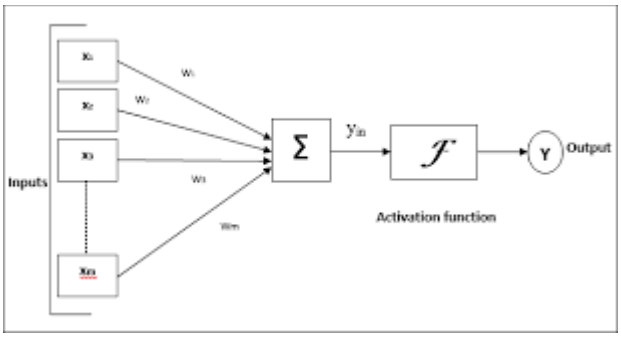
2.3.1.1 Definition

ANN is an input-output mathematical model that mimics how the human brain functions by adopting the same strategy for learning new things. An equivalence between a biological and an artificial neuron.

2.3.1.2 Neuron Model Evolution:

a)McCulloch & Pitts (1943) neuron model:

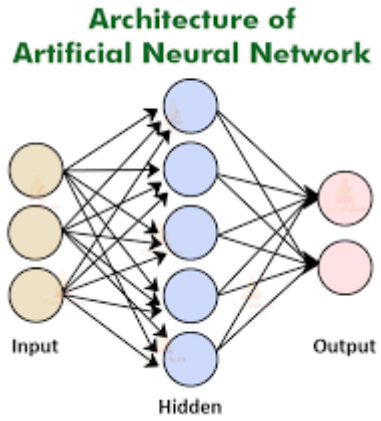
- ✓ McCulloch & Pitts (1943) neuron model McCulloch and Pitts (1943) proposed the first artificial neuron also called formal neuron. Mathematically, the McCulloch written.
- ✓ Where 1 2 x , x , ..., n x represent the McCulloch- Pitts neuron inputs that are exclusively binary values (zeros or ones), 1 2 , ,..., w w wn are the connections‟ weights received by the neuron. f is the sign function, λ is the threshold and y is the output of McCulloch -Pitts neuron defined as:



b) Multilayer perceptron model:

- ✓ Without hidden layers, perceptron neural networks assume just binary input-output values and only two layers, which explains why the model can only handle linearly separable functions. The delta rule was developed by Windrow and Hoff in 1960 and consists of changing the weights of the connections to minimise the discrepancy between the desired and actual output value. As a result, in place of 0 and 1, the output value can take any value. In their book, Minsky and Papert (1969), emphasised the value of including one or more hidden layers to identify the intricate features contained in the inputs. Traditionally, the multilayer perceptron net was trained using Rumelhart et alback propagation learning technique (explained in more depth in the following section) (1986).The multilayer perceptron is composed

of a layer of input units, one or more hidden layers and an output layer.



- ✓ In this network system, the information propagates in a single direction „„forward"": the input units pass the information to the neurons in the first hidden layer, the outputs from the first hidden layer are subsequently.
- ✓ passed to the next layer, and so forth. Thus, the network output (for example, with one hidden layer) is:
- ✓ Where: i x are the input variables of the network; I is the number of input variables; J is the total number of nodes in the hidden layer; K is the number of neurons in the output layer; g and h are, respectively, the transfer/activation function of the first and the second layer; w1 is the weights matrix of the hidden layer; w2 is the weights matrix of the output layer; 1 b and 2 b are the bias vectors of the hidden layer and of the output layer, respectively. To note, at least one transfer function (see the next section for more description of transfer function) of the hidden layer must be nonlinear (Hornik et al., 1989).

2.4.PROBLEM STATEMENT DEFINITION:

PROBLEM:

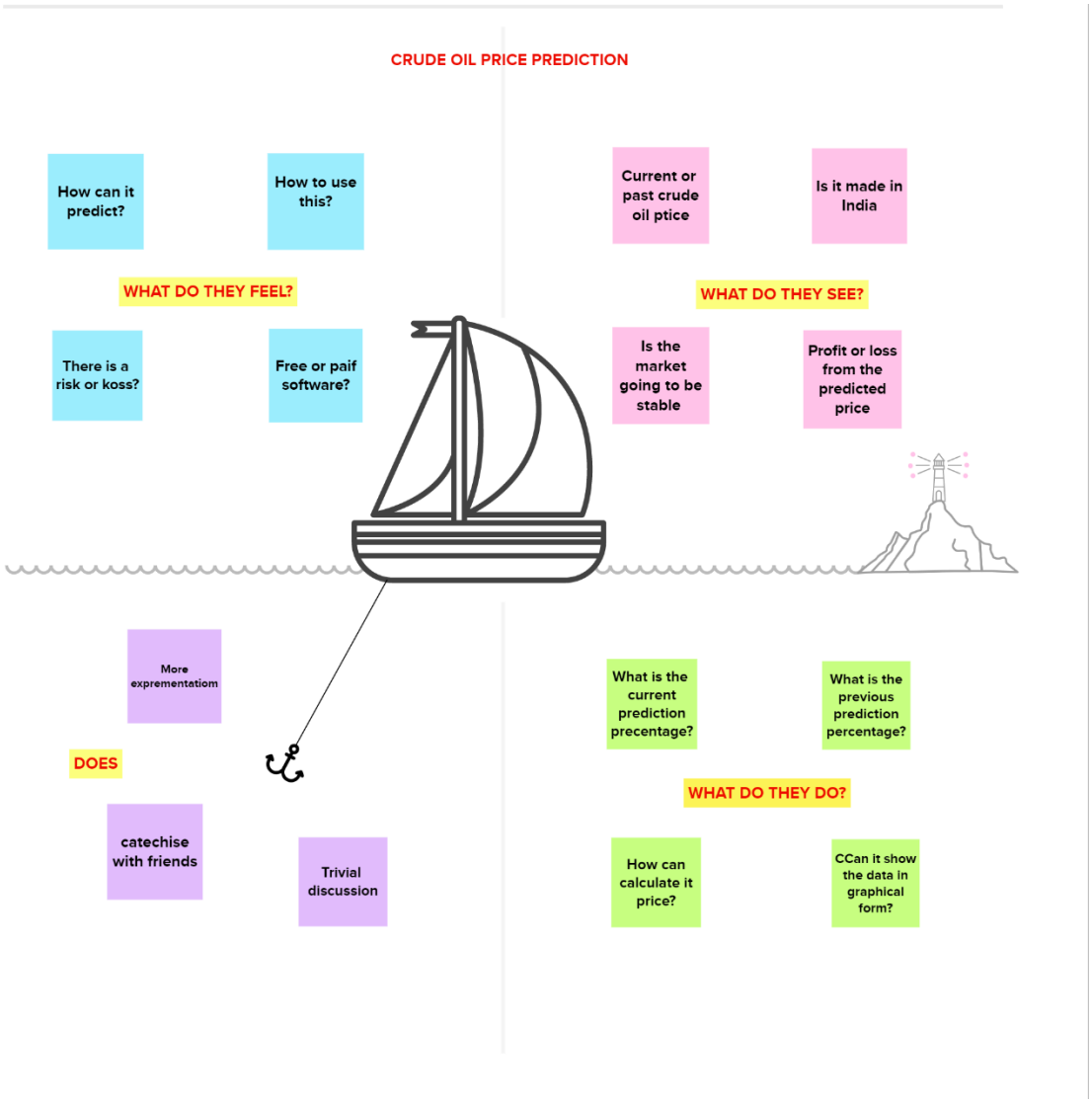
- ✓ Crude oil price fluctuations have a far reaching impact on global economies.
- ✓ These fluctuations make a major impact on stake holders and the investors.
- ✓ Cause of fluctuation of prices, demand and supply.

SOULTION:

- ✓ In this project we mainly focus on neural networks to predict the crude oil prices.
- ✓ We are using the previous history of crude oil prices as the input data to the training model.
- ✓ Here data preprocessing, training and testing is done using ANN.
- ✓ We use RNN and LSTM algorithm, were the output of one hidden layer act as input of another hidden layer. To evaluate the complex problems into a simpler way.
- ✓ The LSTM algorithm is well adapted to categorize, analyze and predict time series of uncertain.

3.IDEATION & PROPOSED SOLUTION:

3.1 EMPATHY MAP CANVAS:



3.2 IDEATION AND BRAINSTROMING:

STEP1：Team Gathering, Collaboration and Select the Problem Statement

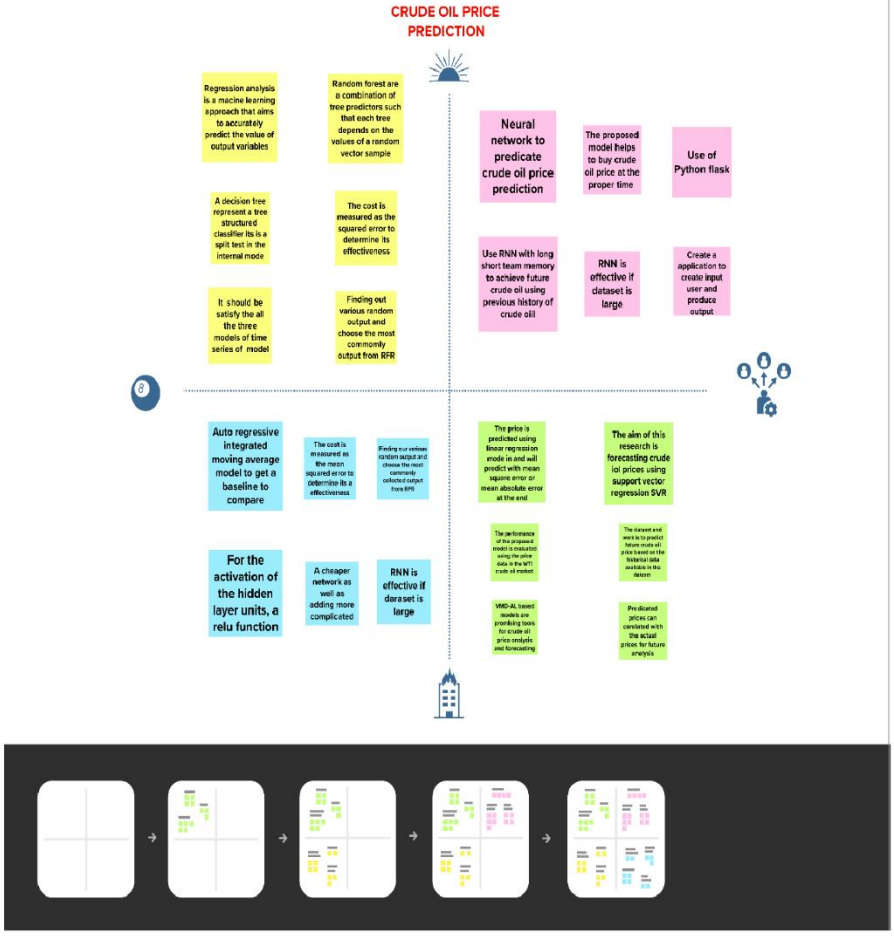
Step-2:Brainstorm, Idea Listing and Grouping

1

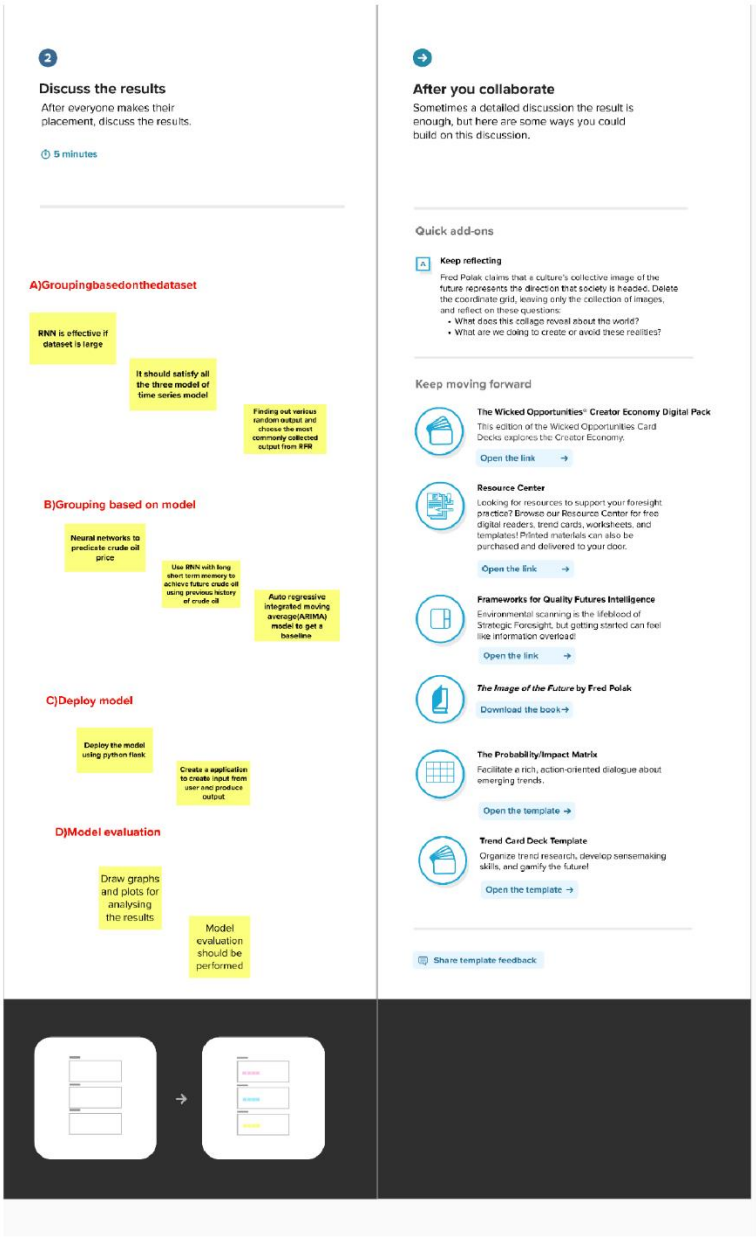
Add your image of the future on your placement

Use the "Images" feature on the left-hand tool menu to search and add your image of the Future. When you think about what the future looks like, what do you see?

5 minutes



Step-3: Idea Prioritization



4.SOLUTION ARCHITECTURE:

Solution architecture is a complex process – with many sub-processes – that bridges that gap between business problem and technology solutions. Its goals are to:

- ✓ Find the best tech solution to solve existing business problems.
- ✓ Describe the structure, characteristics, behavior, and other aspect of the software to project stakeholders.
- ✓ Define features, development phases, and solution requirements.
- ✓ Provide specifications according to which the solution is defined, managed, and delivered.

4.1 EXAMPLE – SOLUTION ARCHITECTURE DIAGRAM:

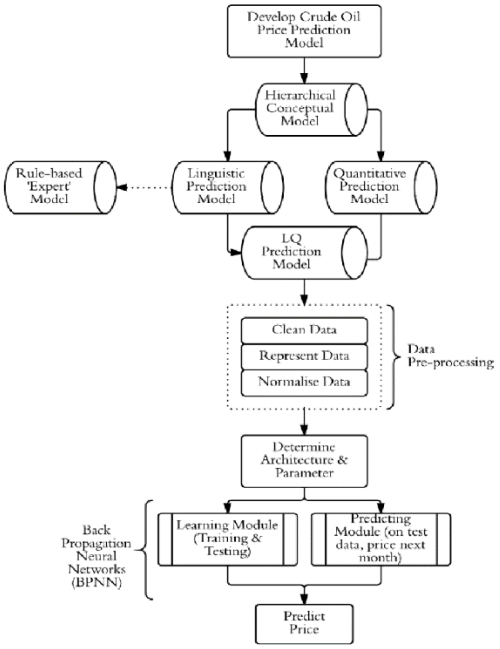


Figure 1: Architecture and data flow of the voice patient diary sample application

5.PROPOSED SOLUTION:

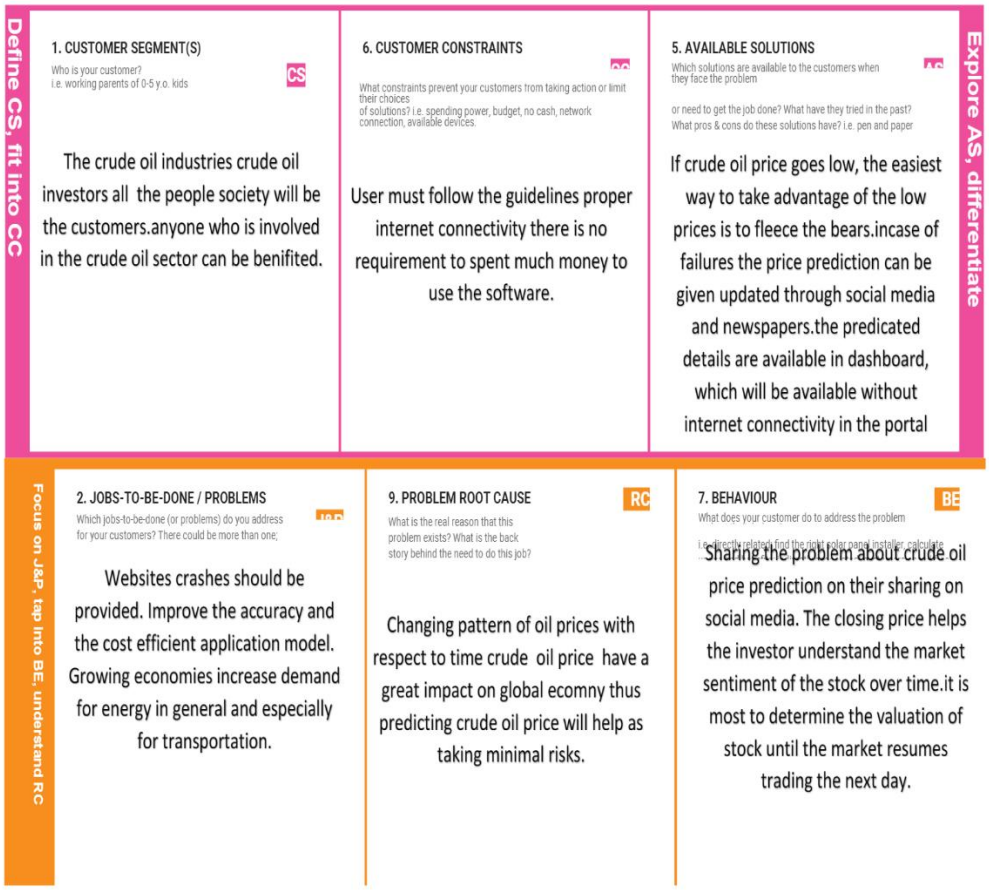
Proposed Solution Template:

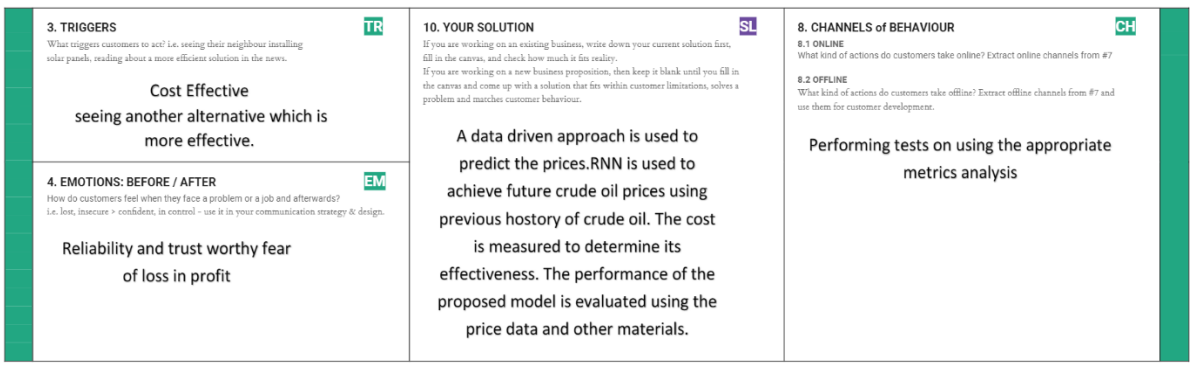
Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Crude oil is the world's leading fuel, and its prices have a big impact on the global environment and its forecasts are very useful to government, industry is individuals. The continuous usage of statistical and econometric techniques including AI for crude oil price prediction might demonstrate demotions to the prediction performance.
2.	Idea / Solution description	On predicating the price of the crude oil, it will be very helpful for the daily vehicle users and it has to reduction in the price of the public transportation so that the usage of the individuals vehicles can be reduced in accordance to that the fuel usage amount is reduced.
3.	Novelty / Uniqueness	• Crude oil price fluctuations have a far reaching impact on global economies and thus price forecasting can assist in minimising the risks associated with volatility in oil prices. • Prices forecasts are very important to various stakeholders, governments, public and private enterprises, policymakers, and investors.
4.	Social Impact / Customer Satisfaction	• It is used to predict the future price snd use the oil according to the prices. • This prices has direct effects on several goods and products and its fluctuations affect the stock market. • Oil prices are not only driven by economic variables, but they are also affected by key events.
5.	Business Model (Revenue Model)	We can focus on exporters in exporting countries, generate revenue by selling our application.
6.	Scalability of the Solution	• PCA, MDS and LLE methods are used to reduce the dimension of the data • Improve the accuracy of RNN&LSTM

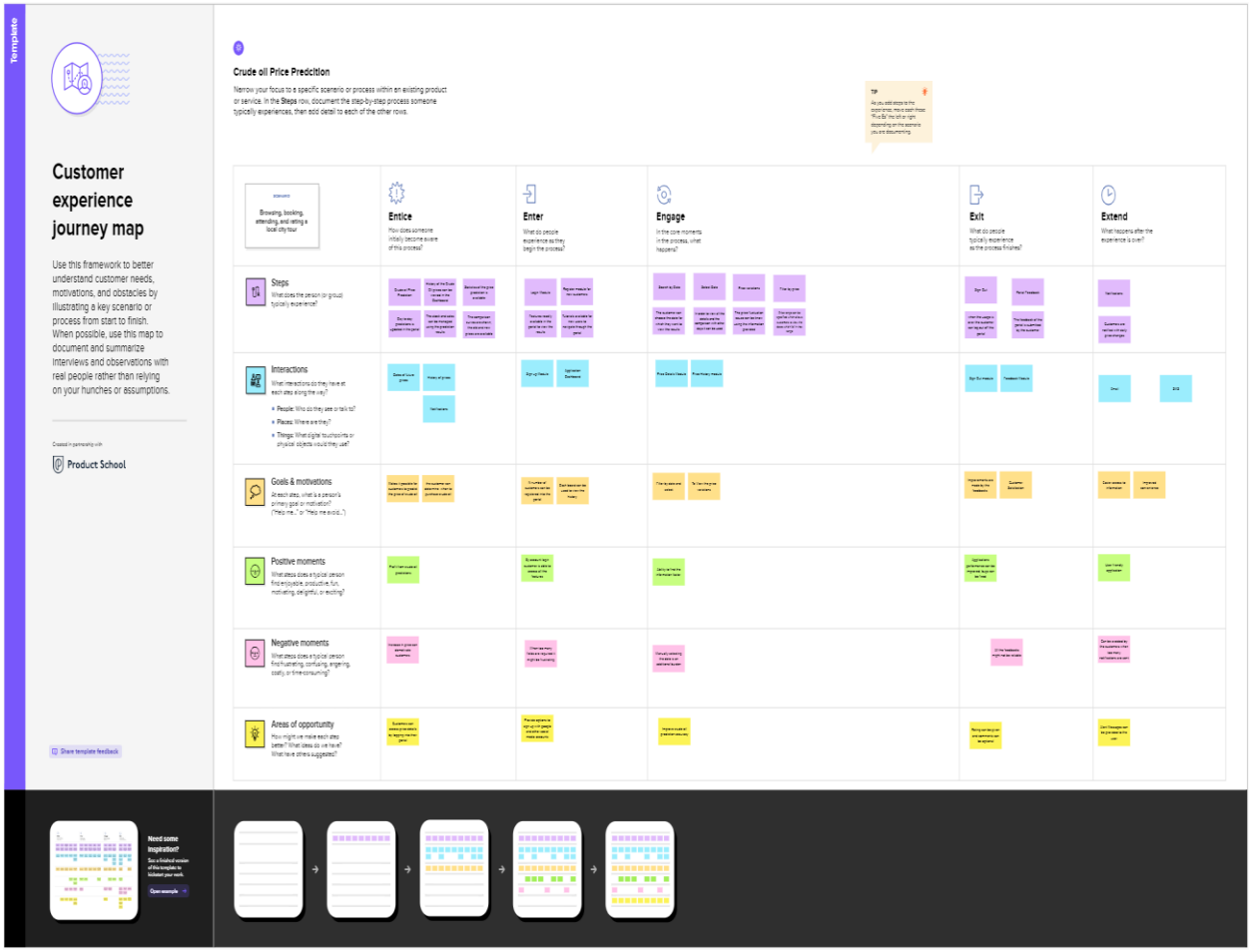
6.SOLUTION FIT:

Project Title: Crude oil price prediction **Project Design Phase-I - Solution Fit Template** **Team ID:** PNT2022TMID46996



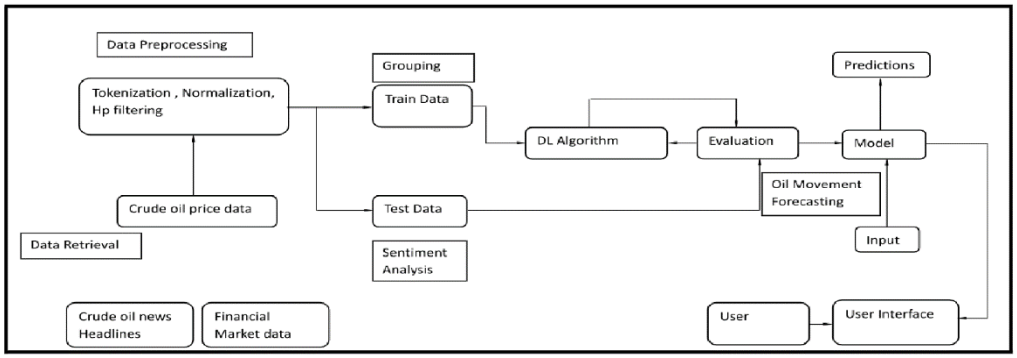


7.CUSTOMER JOURNEY MAP:



8.DATA FLOW DIAGRAM:

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



9.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)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account/ Displays Line graph / Bar graph.	High	Sprint-1
		USN-2	As a user, I will receive confirmation email once I have registered for theapplication	I can receive confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the my Account	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail	I can register through Already logged in Gmail account.	Medium	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password	After registration, I canlog in by only email & password.	High	Sprint-1
	Line\Bar graph		After entering the inputs, the model will display predictions in Line\Bar Graph Format.	I can get the expected prediction in various formats.	High	Sprint-3
Customer (Web user)	Login	USN-1	As the web user, I can login simply by using Gmail or Facebook account.	Already created Gmail can be used for Login.	Medium	Sprint-2
Customer Care Executive	Support		The Customer care service will provide solutions for any FAQ and also provide Chabot.	I can solve the problems arise by Support.	Low	Sprint-3

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

10.SOLUTION REQUIREMENT:

10.1.FUNCTIONAL REQUIREMENT:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Number Registration through Gmail Registration through LinkedIn
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User Solution	Model creation using python with necessary libraries needed
FR-4	User Acknowledgement	Sending and receiving data will be made using flask library
FR-5	User Understanding	For better UI experience Angular, HTML and CSS
FR-6	User Storage	Cloud data will be needed
FR-7	User access	To access information a server needed

Non-functional Requirements:

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

FR No.	Non-Functional Requirement	Description
NFR-1	**Usability**	Available in all Phone and laptop/computer systems.
NFR-2	**Security**	High Level Technology supporting for Two level authentication and Cryptography used for any message transactions.
NFR-3	**Reliability**	Stable Internet connection
NFR-4	**Performance**	High resolution screen for pictorial representation available without lagging in view.

NFR-5	**Availability**	Power needed for 24x7
NFR-6	**Scalability**	Online data will be feed into model for effective prediction

11.TECHNOLOGY STACK:

11.1. TECHNICAL ARCHITECTURE:

Technical Architecture:

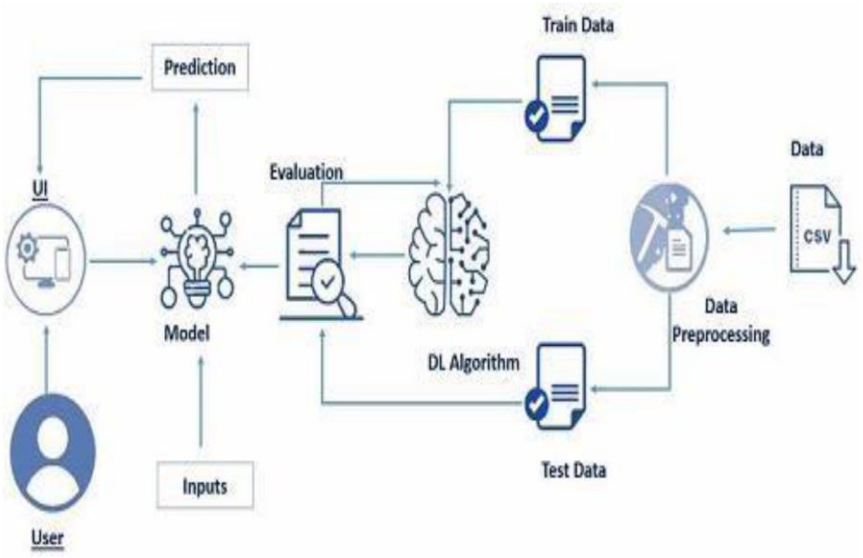


Table-1: Components & Technologies:

S.No	Component	Description	Technology
1.	User Interface	Web UI and Mobile App	HTML, CSS, JavaScript / Angular Js / React Js etc.
2.	Prediction	For the Prediction of the Price	Python
3.	Web Application	For the Web App	Python (Flask)
4.	Database	Email, Phone Number, Age, and Name (String, Integer, Integer, and String)	MySQL, NoSQL
5.	Cloud Database	Database Service on Cloud	IBM DB2, IBM Cloudant etc.
6.	File Storage	File storage requirements	IBM Block Storage or Other Storage Service or Local Filesystem
7.	Machine Learning Model	Recurrent Neural Networks	Tensor Flow and Keras
8.	Infrastructure (Server / Cloud)	Application Deployment on Local System / Cloud Local Server Configuration: i5 11^{th} gen,8Gb of ram Cloud Server Configuration: i3 10^{th} gen, 512MB ram	Kubernetes

Table-2: Application Characteristics:

S.No	Characteristics	Description	Technology
1.	Open-Source Frameworks	Flask	Web Application
2.	Security Implementations	OAuth Authentication	Authentication is Provided By Google or Facebook or Any Available Provides.
3.	Scalable Architecture	Microservices	AWS Lambda
4.	Availability	Distributed Servers	CDN
5.	Performance	25,000 Requests per second	Flask

11.2. COMPONENT AND TECHNOLOGIES

12.MILESTONE AND ACTIVITY LIST:

TITLE	DESCRIPTION	DATE
Literature Survey & Information Gathering	Literature survey on the selected project & gathering information by referring the, technical papers, research publications etc.	19 September 2022
Prepare Empathy Map	Prepare Empathy Map Canvas to capture the user Pains & Gains, Prepare list of problem statements	21 September 2022
Ideation	List the by organizing the brainstorming session and prioritize the top 3 ideas based on the feasibility & importance.	25 September 2022
Proposed Solution	Prepare the proposed solution document, which includes the novelty, feasibility of idea, business model, social impact, scalability of solution, etc.	27 September 2022
Problem Solution Fit	Prepare problem - solution fit document.	29 September 2022
Solution Architecture	Prepare solution architecture document.	01 October 2022
Customer Journey	Prepare the customer journey maps to understand the user interactions & experiences with the application (entry to Exit)	04 October 2022
Functional Requirement	Prepare the functional requirement document.	06 October 2022
Data Flow Diagrams	Draw the data flow diagrams and submit for review.	08 October 2022

Technology Architecture	Prepare the technology architecture diagram.	11 October 2022

Prepare Milestone & Activity List	Prepare the milestones & activity list of the project.	23 October 2022
Sprint Schedule	Prepare spring plan	23 October 2022
Delivery of Sprint-1	Develop & submit the developed code.	29 October 2022
Delivery of Sprint-2	Develop & submit the developed code.	05 November 2022
Delivery of Sprint-3	Develop & submit the developed code.	12 November 2022
Delivery of Sprint-4	Develop & submit the developed code.	17 November 2022

13.SPRINT PLANNING:

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

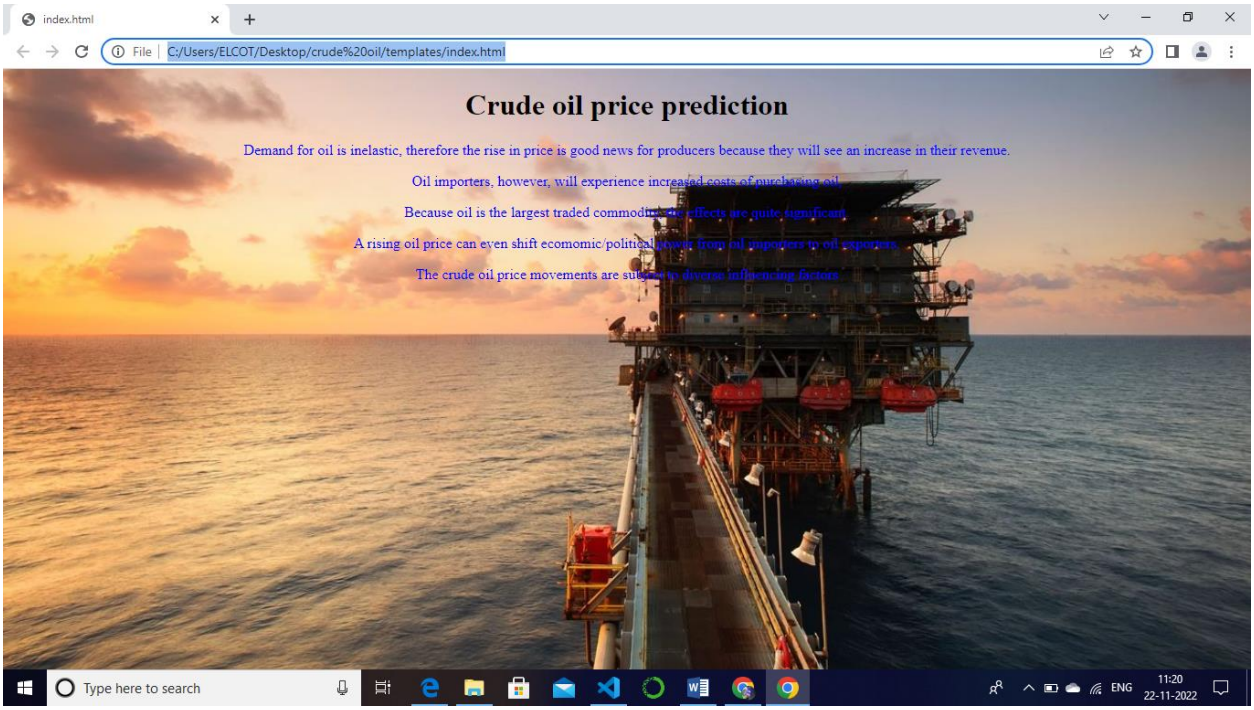
Use the below template to create product backlog and sprint schedule

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	2	High	Suvetha M Srinithi C
Sprint-1		USN-2	As a user, I will receive confirmation email once I registered for the application.	1	High	Srinithi T
Sprint-1	Login	USN-3	As a user, I can log into the application by entering email & password.	1	High	Suvetha M
Sprint-2	Dashboard	USN-4	As a user, I can log into my account in a given dashboard.	1	High	Srinithi C
Sprint-1	User interface	USN-5	Professional responsible for user requirements and needs.	1	High	Sharathi P
Sprint-3	Objective	USN-6	The goal is to describe all the inputs and outputs.	1	High	Srinithi T
Sprint-4	Privacy	USN-7	The developed application should be safe and secure for the users.	1	High	Prabhashree P

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

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

14.RESULT: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Crude oil price prediction
Demand for oil is inelastic, therefore the rise in price is good news for producers because they will see an increase in their revenue.
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The crude oil price movements are subject to diverse influencing factors.
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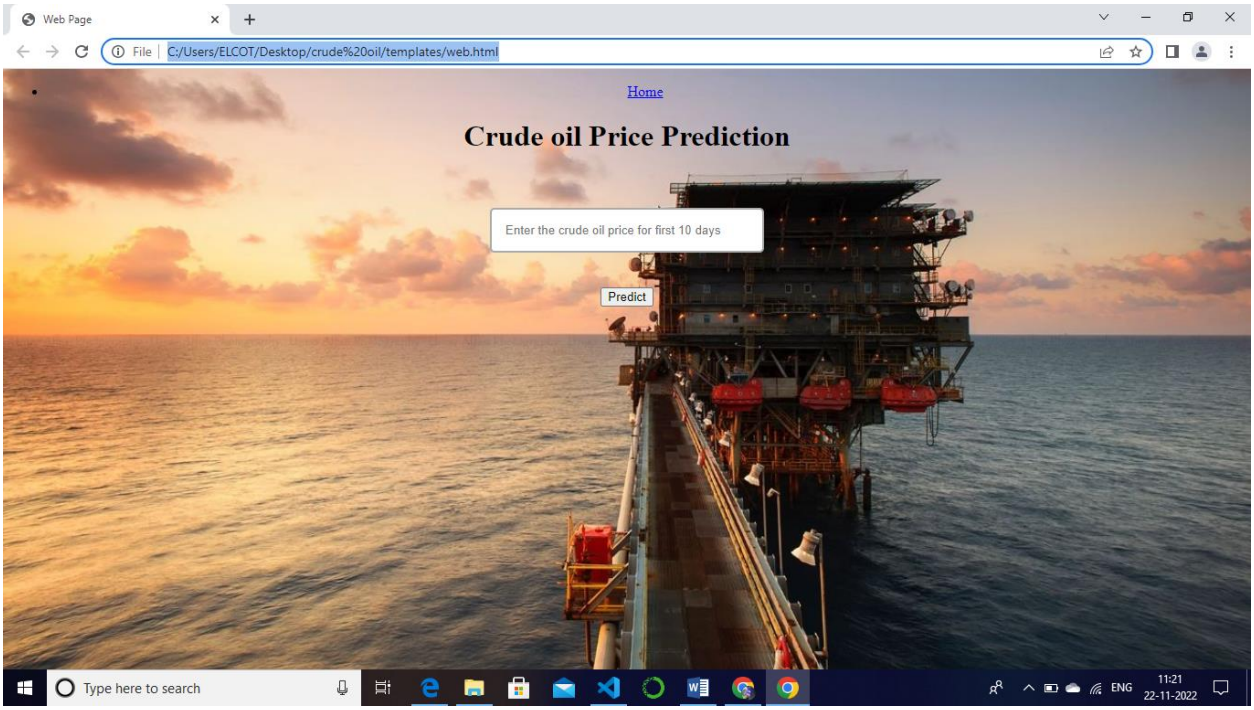
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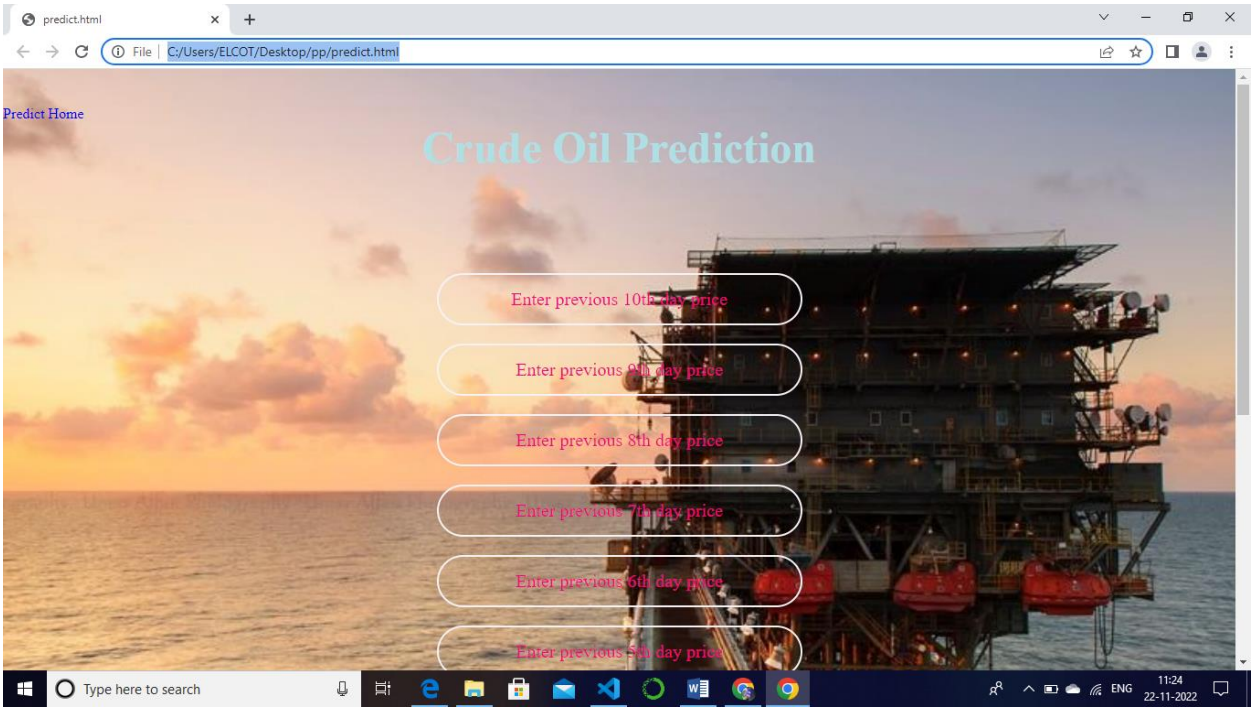
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11:24
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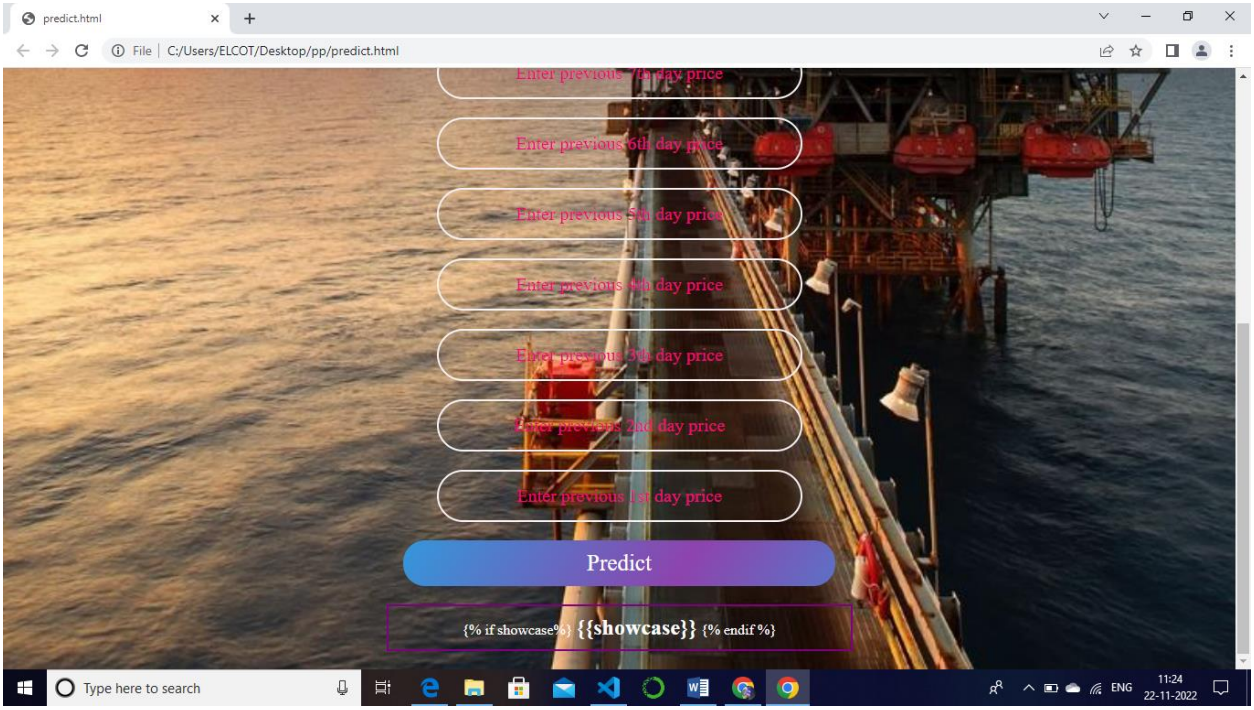
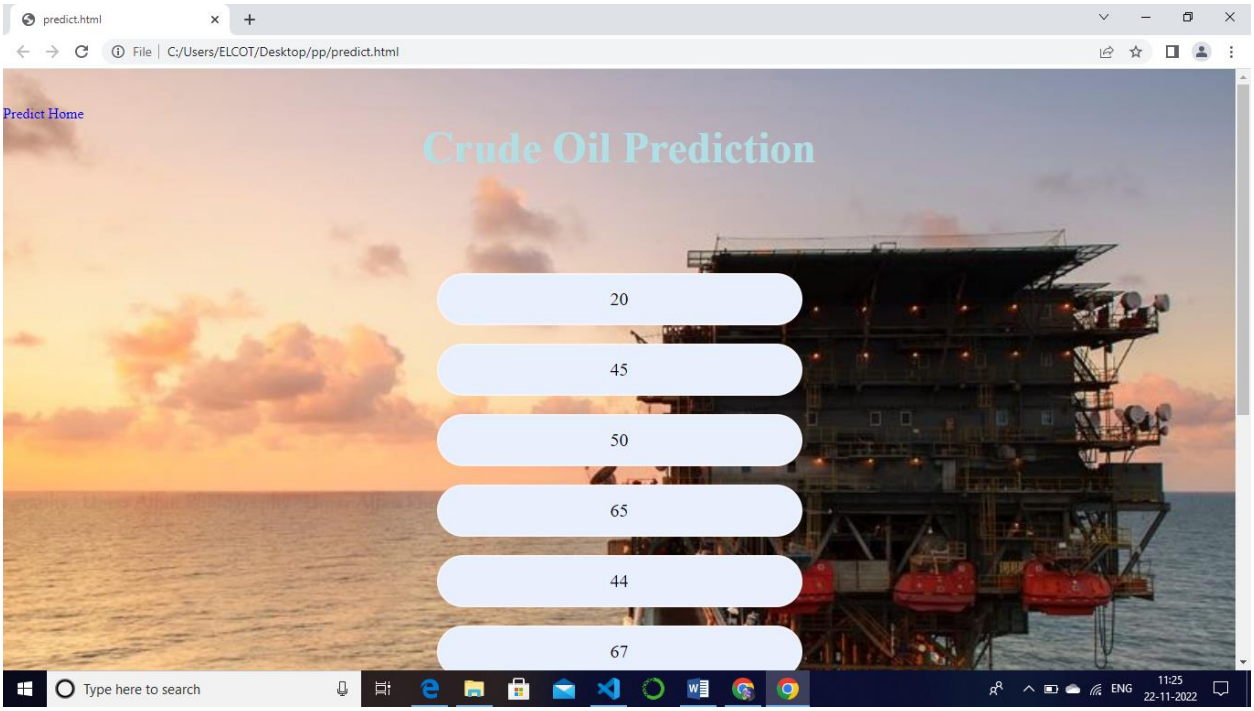
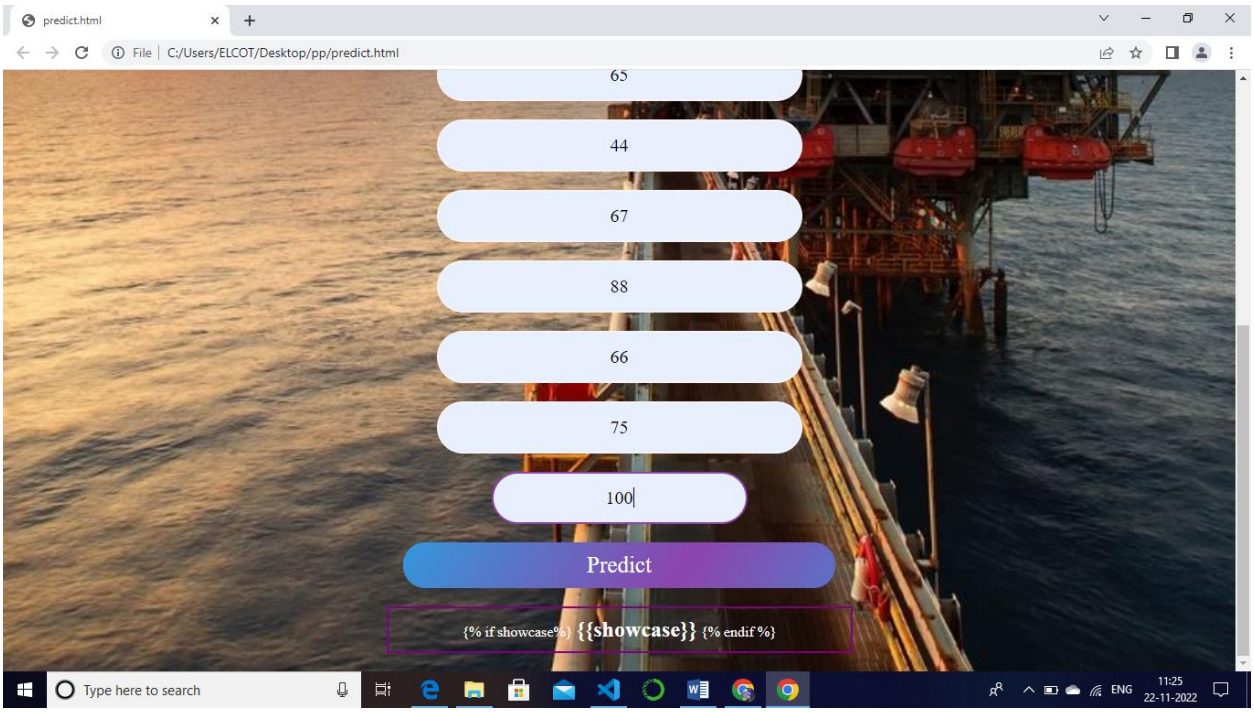

predict.html
File | C:/Users/ELCOT/Desktop/pp/predict.html
Enter previous 7th day price
Enter previous 6th day price
Enter previous 5th day price
Enter previous 4th day price
Enter previous 3th day price
Enter previous 2nd day price
Enter previous 1st day price
Predict
{% if showcase%} {{showcase}} {% endif %}
Type here to search
ENG
11:24
22-11-2022


predict.html
File | C:/Users/ELCOT/Desktop/pp/predict.html
Predict Home
Crude Oil Prediction
20
45
50
65
44
67
Type here to search
ENG
11:25
22-11-2022


predict.html
File | C:/Users/ELCOT/Desktop/pp/predict.html
65
44
67
88
66
75
100
Predict
{% if showcase%} {{showcase}} {% endif %}
Type here to search
ENG
11:25
22-11-2022

15.ADVANTAGES AND DISADVANTAGES:

15.1 ADVANTAGES:

- ✓ An RNN remembers each and every information through time where it is useful for time series prediction.
- ✓ The main advantage of this approach of RNN is that it continuously captures the unstable pattern of the crude oil prices.
- ✓ LSTM is capable of learning long term dependencies, especially in sequence prediction problems.
- ✓ Minimizing the risk associated with long time volatility in oil prices.
- ✓ Price forecasts are very important to various stake holders; government, public and private enterprises, policy makers and investors.
- ✓ LSTM units include a 'memory cell' that can maintain information in memory for long period of time.
- ✓ RNN can model a collection of record (i.e., time collection so that each pattern can be assumed to be dependent on previous ones.
- ✓ This model is highly suggested because investors can use it not only to initiate trades but also has an effective tool.

15.2 DISADVANTAGES:

- ✓ The previous algorithms does not execute very well solution when the dataset sounds high.
- ✓ It will take more time while training the data.
- ✓ The changes in the stack prices have the same distribution and on independent of each other.
- ✓ ARIMA models are simply checked for their adequacy. However, the disadvantages of this method include the need for a large number of initial data and the absence of a simple method of adjusting the parameters of the model.

- ✓ The performance of back propagation relies very heavily on the training data. Back propagation needs a very large amount of time for training.
- ✓ The past movement or trend of a stock price or market cannot be used to predict its future movement.
- ✓ As the support vector classifier works by placing data points, above and below the classifying hyper plane there is no probabilistic clarification for the classification.

16. CONCLUSION:

In this project, an LSTM (Long Short Term Memory) model is presented with the task of determining the most favorable lag in the crude oil price data. The prediction is accurate till there is a massive and sudden change in the actual data, where it becomes challenging to predict the exact new price with the change, however, the proposed model has efficiently taken into consideration these patterns. Else ways, this also proves the theory that financial markets are unpredictable and change anytime because of known and unknown factors. This work indicates that the LSTM model is an effective tool for crude oil price prediction and can be efficiently used for long-term price forecasting by determining the optimal lags. The proposed model is powerful and highly suggested because investors can use it not only to initiate trades but also as a effective tool to judge various strategies relating to investments.

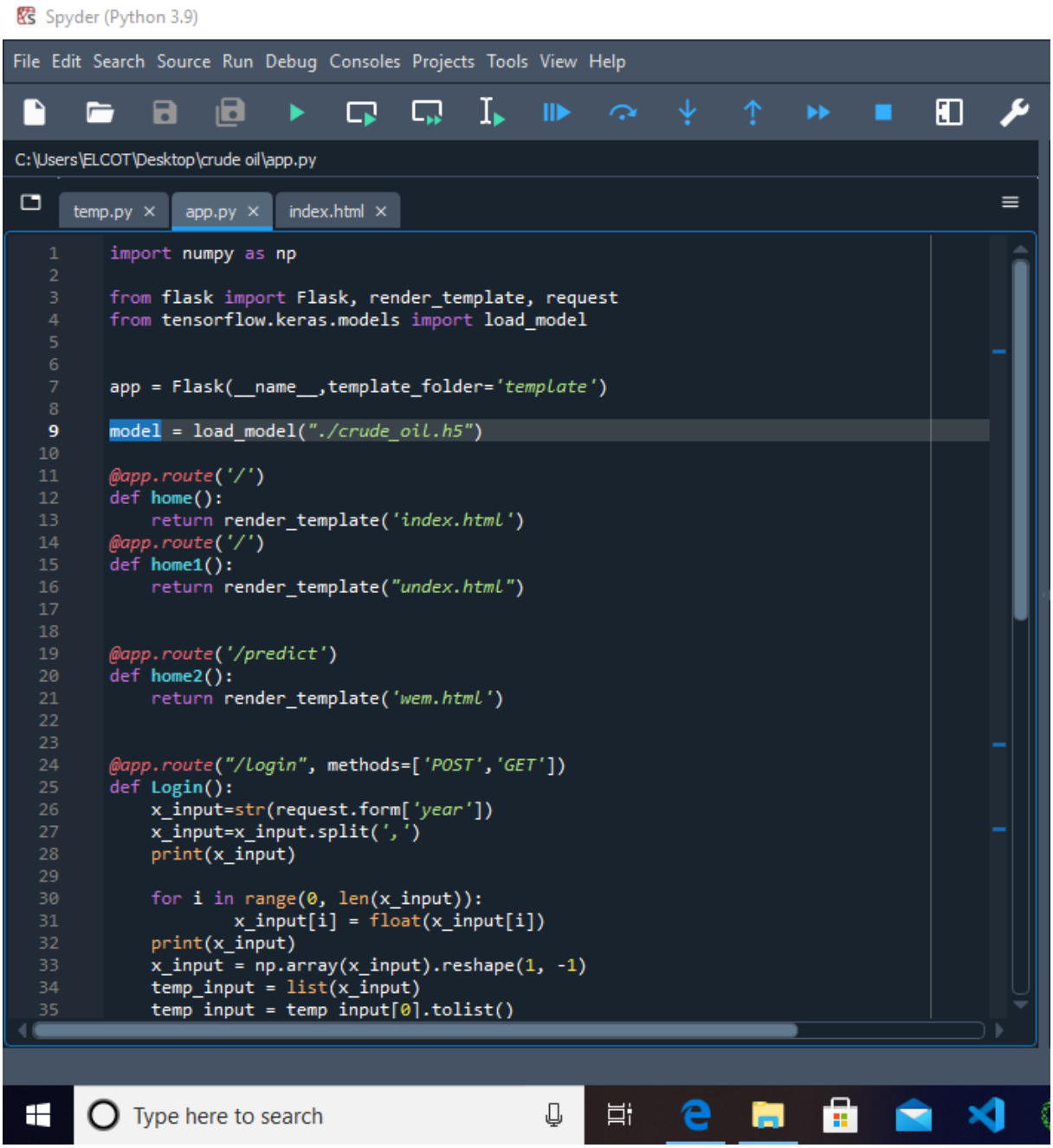
17. FUTURE SCOPE:

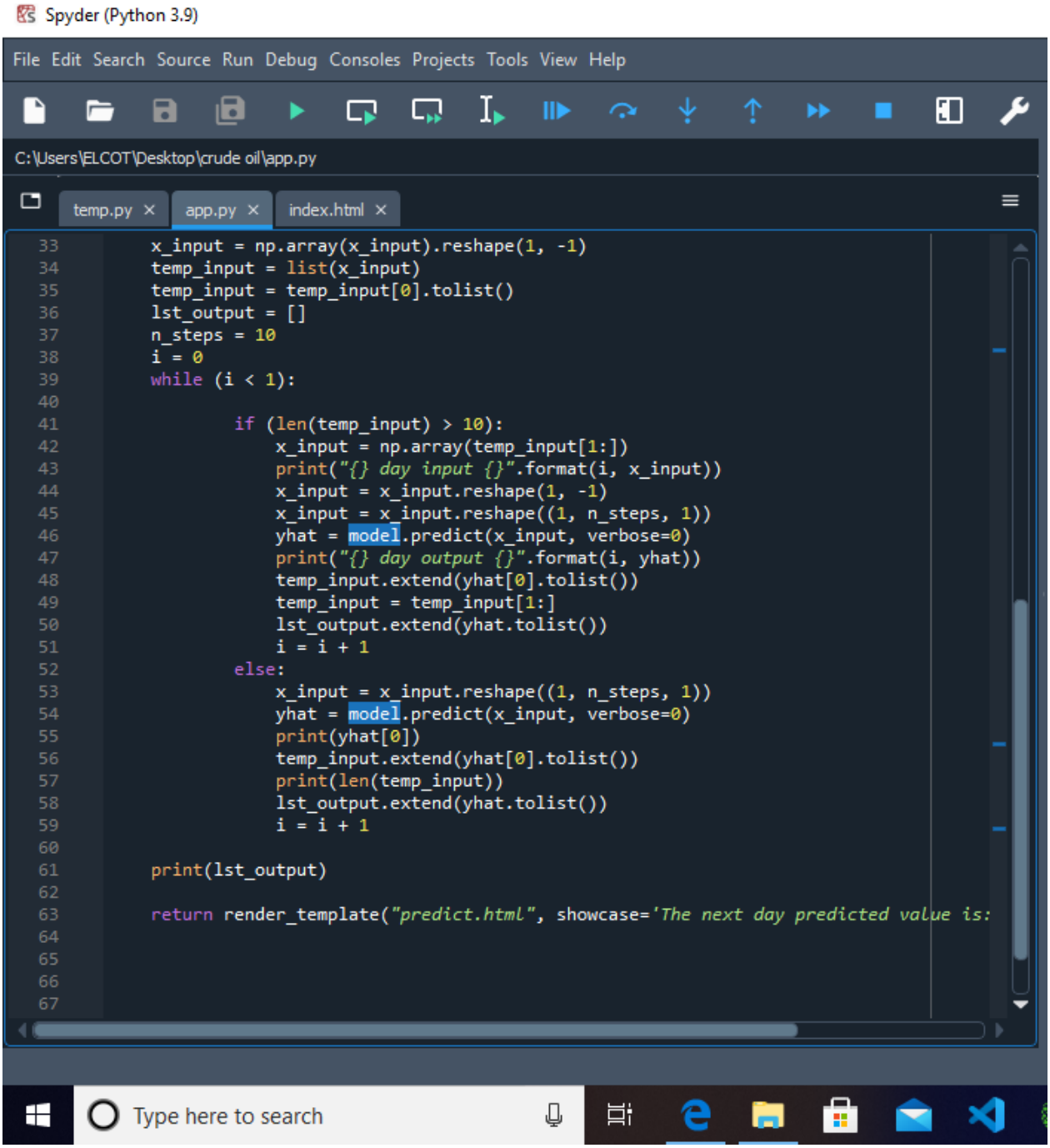
In the coming future, fundamental indicators and market trends have been plan to be In- corporated into a model which will help the proposed model perform more efficient.

18.APPENDIX:

18.1SOURCE CODE:

18.2App.py:





19.GIT HUB LINK:

https://github.com/IBM-EPBL/IBM-Project-5917-1658819801