Ideation Phase
Literature Survey

Date	19 September 2022
Team ID	PNT2022TMID21644
Project Name	Crude Oil Price Prediction
Maximum Marks	4 Marks

CRUDE OIL PRICE PREDICTION

Abstract:

Crude oil is the "key" commodity for the global economy since it is the most significant strategic resource on the planet. As a result, forecasting it has been difficult because many different factors affect its price, making it difficult to predict. The price of crude oil is highly volatile and erratic. Numerous research have recently been conducted in an effort to analyse the difficulty of predicting oil prices and find the best solutions. It will be beneficial for our government, businesses, and investors to anticipate its demands. As part of this research, artificial neural networks (ANNs) will be built to forecast crude oil prices. In this study, we suggest a cutting-edge method for predicting the price of crude oil using analytical.

Keywords: Crude oil, economy, energy, fuel, price.

Litreature Survey:

A. Predictive Analytics

Predictive analytics is a cutting-edge field of study that employs statistical models and other scientific methods to assess hazy future opportunities with a view to producing actual forecasts and verifying the accuracy of these forecasts in the real world [2]. The predictive analytics model can provide meaningful insights by extracting knowledge from data and use statistical or machine learning methods to assist with the analytical task.

B. Determining the Crude Oil Price

Various significant elements, including a supply and demand curve, the present financial market, the commodities market, speculative factor, and geopolitical factor, may have an impact on fluctuations in crude oil prices, according to Miao et al. [3]. Each of these variables has a number of determining factors (sub-variables) that impact the price of the commodity.

According to an article published on the Caltex website [4], the fuel (such as petrol) prices change is closely related to the cost of crude oil–and it has a long-term effect on the fluctuation of the commodity price. Additionally, the cost of crude oil alone has contributed to nearly 50 percent of the retail petroleum price [4].

C. Neural Network For Predictive Analytics

The neural network contains a set of neurons (or perceptron's) which acts as processing units [5], interlinked, and may reside within an extensive network.
The most basic form of the neural network consists of an input layer, one hidden layer, and an output layer [6], as visualized in Figure 1. The number of hidden layers may vary based on the complexity of computation.

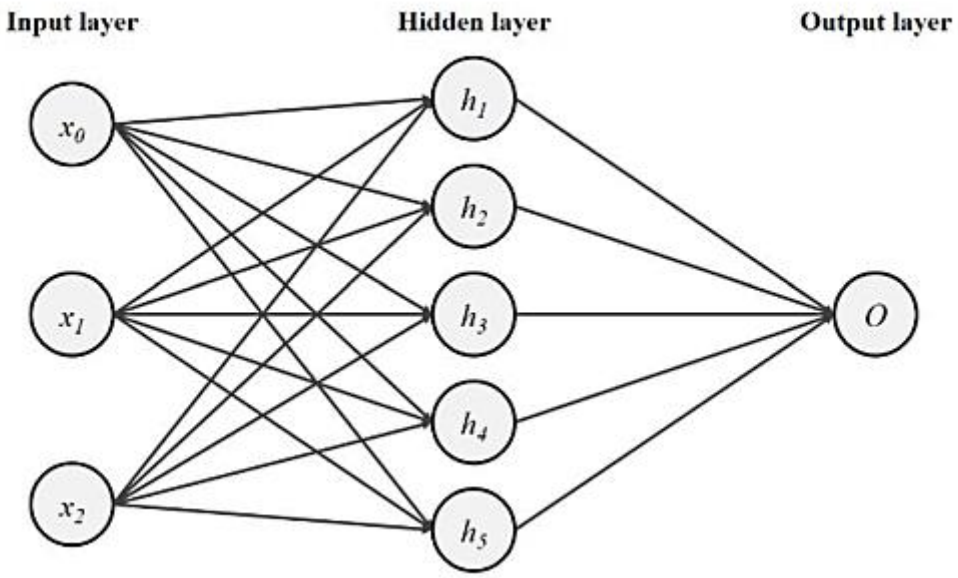

Figure 1 A neural network consists of an input layer, a hidden layer(s), and an output layer

D. RNN-LSTM Network

Traditional neural network techniques function well for applications requiring prediction, but they cannot store memories. On the other hand, the Recurrent Neural Network (RNN) is a section of a neural network that has been converted into a loop, providing it the ability to retain knowledge from its previous state.

Hochreiter & Schmidhuber [7] have introduced the concept of Long-Short Term Memory (LSTM), which has proven its accuracy across various domains [7]. LSTM is a type of Recurrent Neural Network (RNN) that can learn long-term dependencies and is useful for a sequence to sequence prediction–such as prediction of upcoming crude oil prices using time-series data.

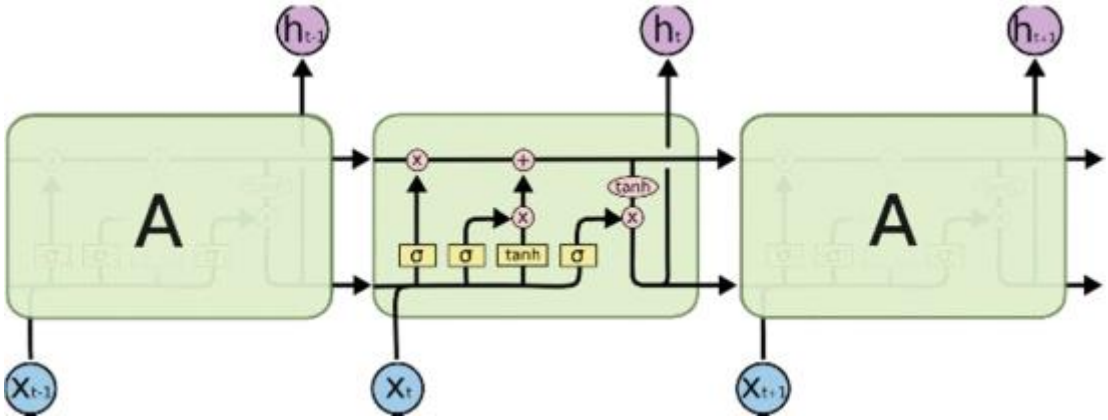

Figure 2 The RNN-LSTM architecture

References:

1. N. Aziz, M. H. A. Abdullah and A. N. Zaidi, "Predictive Analytics for Crude Oil Price Using RNN-LSTM Neural Network," 2020 International Conference on Computational Intelligence (ICCI), 2020, pp. 173-178, doi: 10.1109/ICCI51257.2020.9247665.
2. G. Shmueli and O. R. Koppius, "Predictive analytics in information systems research", *MIS Q*, pp. 553-572, 2011.
3. H. Miao, S. Ramchander, T. Wang and D. Yang, "Influential factors in crude oil price forecasting", *Energy Econ*, vol. 68, pp. 77-88, 2017.
4. "Determining Fuel Prices", Mar 2020, [online] Available: https://www.caltex.com/my/motorists/tips-resources/determining-fuel-prices.html.
5. M. H. A. Abdullah, "Comparative Analysis of Spatio/Spectro-Temporal Data Modelling Techniques", *Data Engineering And Information Security*, 2017.
6. M. H. A. Abdullah, M. Othman, S. Kasim and S. A. Mohamed, "Evolving Spiking Neural Networks Methods for Classification Problem : A Case Study in Flood Events Risk Assessment Evolving spiking neural networks methods for classification problem : a case study in flood events risk assessment", *Indones. J. Electr. Eng. Comput. Sci*, vol. 16, no. 1, pp. 222-229, 2019.
7. S. Hochreiter and J. Schmidhuber, "Long short-term memory", *Neural Comput*, vol. 9, no. 8, pp.