



National Iranian Oil Refining and Distribution Company
(NIORDC)



Journal of Farayandno

Review Paper

Investigating the Artificial Intelligence Application in Oil and Gas Supply Chain

Ali Asghar Rouhani^{*1}, Rezvan Mohammadabadi²

¹ Member of scientific Board, Research Institute of Petroleum Industry, Tehran, Iran

² Research Institute of Petroleum Industry, Tehran, Iran

Received: 3 Aug 2022

Accepted: 9 Nov 2022

1. ABSTRACT

The purpose of this research is to gain a better understanding of the application of artificial intelligence in the oil industry and the background of research in the management and development of the oil and gas supply chain. Using of artificial intelligence in important topics was investigated in three upstream, Midstream and downstream sections. The results of the analysis showed essential artificial intelligence implementation in the oil and gas industry. In addition, various recommendations were provided for technology managers, policy makers, professionals and leaders in the oil and gas industry to ensure the successful implementation of AI¹. Finally, based on the analysis and review, recommendations and potential directions for the application of artificial Intelligence in the oil field development were presented.

Keywords: Digital Transformation, Artificial Intelligence, Machine Vision, Big Data, Oil Industry.

2. INTRODUCTION

Artificial intelligence is a set of technologies that includes ML, natural language processing (NLP), and robotics that allow machines to sense, interpret, act on and learn from data to help decision -making. Artificial intelligence disrupt and transforms the relationship between people and machines and makes businesses more productive. (Figure 1).

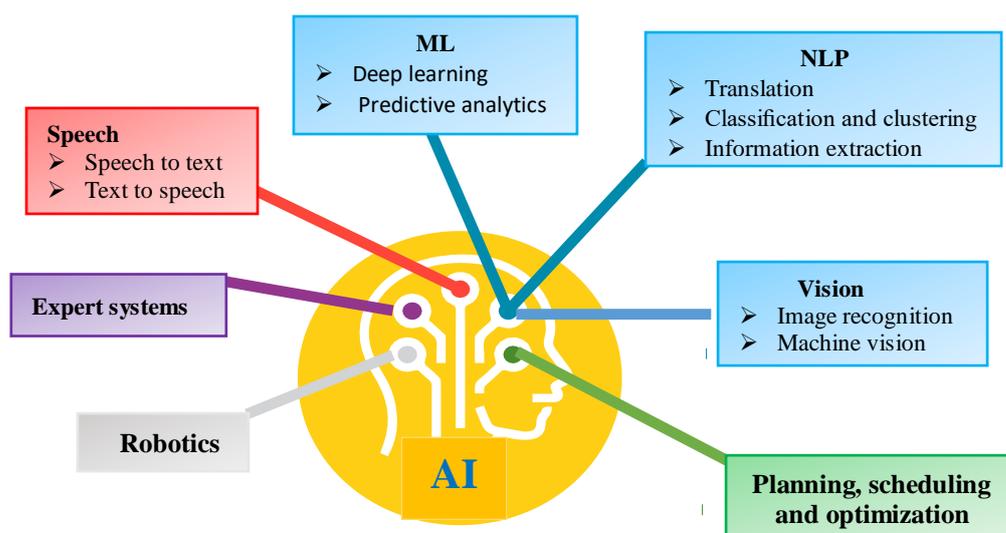


Figure 1. Applications of Artificial Intelligence

* Corresponding Author: Email: rohaniasa@ripi.ir

¹ Artificial Intelligence

Please Cite This Article Using:

Rouhani, A.A., Mohammadabadi, R., "Investigating the artificial intelligence application in oil and gas supply chain", Journal of Farayandno – Vol. 17 – No. 79, pp. 57-73, In Persian, (2022).



In Figure 2, the increasing trend of the number of articles on artificial intelligence in the world in three areas of the oil industry can be clearly seen.

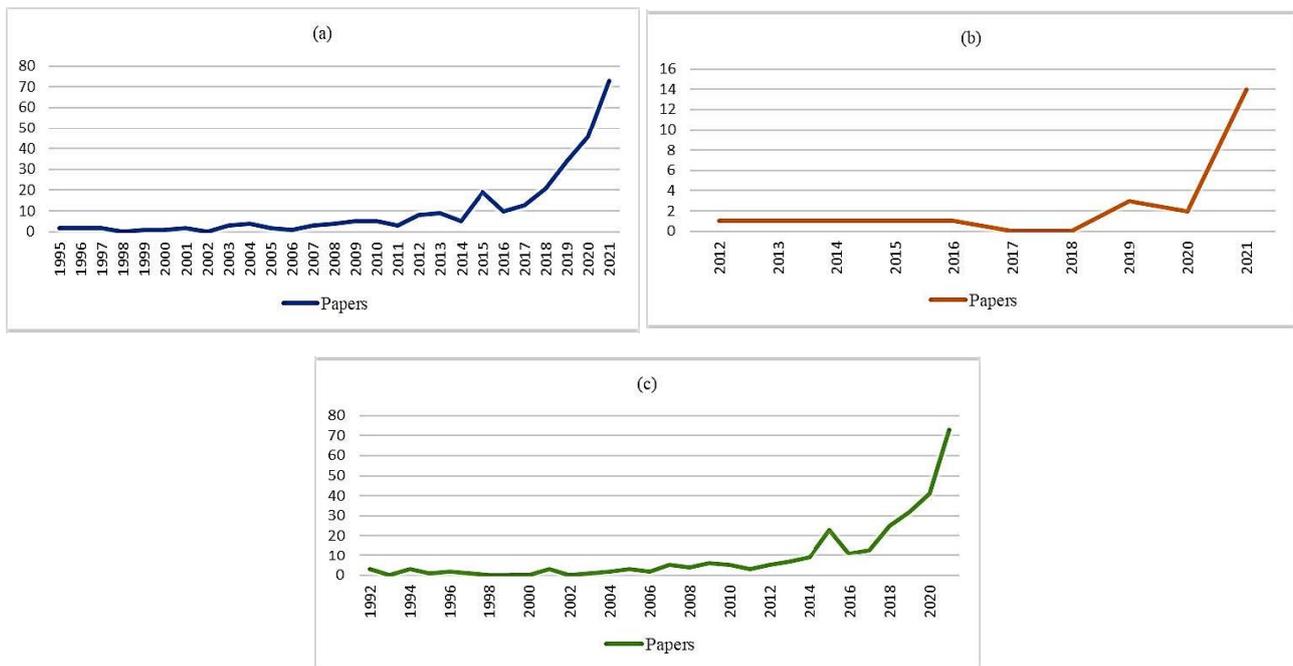


Figure 2. The increasing trend of the number of articles on artificial intelligence in the world (a) upstream, (b) midstream and c) Downstream [1]

3. Artificial intelligence in oil and gas supply chain

Some important applications of artificial intelligence in oil and gas are shown in Figure 4 in the three upstream, midstream and downstream sectors.

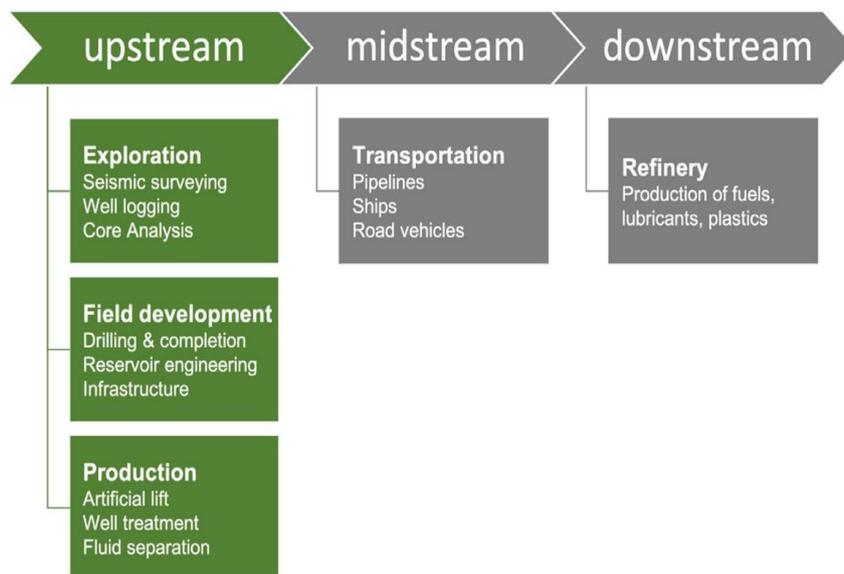


Figure 4. Upstream sector of the oil and gas industry [2]

4. Comparative analysis on the implementation of artificial intelligence technologies in upstream, Midstream and downstream sectors

About 40 studies considered for review that focused on specific AI technologies in the oil and gas supply chain landscape, 50% were upstream, 18% midstream, and 15% downstream. Additionally, 17% of articles focused on all three supply sectors for selected AI technologies in the oil and gas supply chain. The overall distribution is shown in Figure 5.

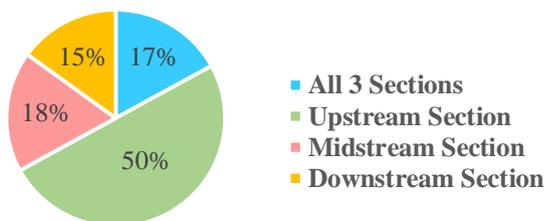


Figure 5. Literature review location focus quantitative analysis

Figure 6 shows the general distribution for the same body of knowledge, focusing on the implementation of selected AI technologies in the entire supply chain. It can be seen that 85% of the implementation of artificial intelligence technology is related to machine learning and hybrid algorithms, 5% is related to computer vision, 8% is related to robotics and 2% is related to natural language processing (NLP) [1,2].

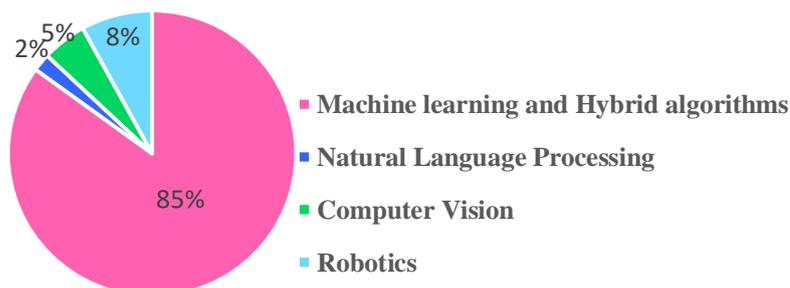


Figure 6. Literature review quantitative analysis for AI technology type

5. RESULTS AND DISCUSSION

Current research focuses on the applications of artificial intelligence in the upstream part of the oil and gas supply chain more than anywhere else. Intermediate activities are mainly related to the impact of artificial intelligence technology on improving pipeline transportation, which includes investments in smart pipelines that ensure the tracking of oil deliveries.

Regarding the downstream, various artificial intelligence solutions have been proposed for the development of intelligent refinery systems. The role of artificial intelligence integrated with the Internet of Things is clearly visible in these new refineries. Today, there is a significant gap in the use of artificial intelligence and intelligence between the research and technology sector of the oil industry with the world's current knowledge (edge of knowledge) in the leading countries in the world, which must be reduced in order to sustainably develop the oil industry. Some of the challenges facing the implementation of AI across the oil and gas supply chain include: (a) lack of open source quality data related to oil and gas; (b) lack of cooperation and open standardization. (c) high cost of implementing artificial intelligence and (d) lack of interdisciplinary talent.

In terms of the high cost of artificial intelligence implementation, in addition to cost reduction techniques, more research should be done to discover the investment portfolio and optimal planning. Currently, we are witnessing large investments by oil companies in the region in the field of artificial intelligence and technologies related to digital transformation.

Digital transformation requires culture-building and awareness of various oil managers about the importance of intelligence and the necessity of its implementation in the oil industry.

6. REFERENCES

[1] A. Deif and T. Vivek, "Understanding AI Application Dynamics in Oil and Gas Supply Chain Management and Development: A Location Perspective, HighTech and Innovation Journal, vol. 3, 2022, pp. 1-14.
 [2] D. Koroteev and Z. Tekic, "Artificial intelligence in oil and gas upstream: Trends, challenges, and scenarios for the future, Energy and AI, vol. 3, 2021, p. 100041.