

FROM DATA TO DECISIONS THE ROLE OF INTELLIGENT SYSTEMS IN ENGINEERING PRACTICES

PrateekBhanti

Professor, Department: Computer Science and Engineering, Institute: School of Engineering and Technology, University: Mody University of science and Technology, Sikar, Laxmangarh, Rajasthan

Nootan Verma

Research scholar, Department: Computer Science and Engineering, Institute: Mody University of Science and Technology, University: Mody University of Science and Technology, Sikar, Lakshmanagarh, Rajasthan

Abstract

The decision-making abilities of the organizational activities related to production and engineering are dependent on the employee's abilities and knowledge. In modern times, the use of AI tools has increased in engineering activities as this helps in the process of decision-making and helps to find faults. The implication of automated machinery, and robotics work systems is intimately interrelated with intelligent systems like AI and computerized machinery. These decrease the probability of biased output and enhance the engineer's potential to get higher achievements. The methods used to implicate the intelligent system are connected with the decision-making tools, data analysis tools and computerized technologies.

Keywords: *AI, robotics technology, Computerized system, data analytical tools and error detection system.*

INTRODUCTION

Intelligent system has a significant role in engineering practices which helps to make the system more progressive through including new approaches into the system. This system can be more intelligent through the use of system modelling, machine learning, artificial intelligence and system thinking. The next generation can benefit from this intelligent system and helps to provide computing benefits as well as artificial benefits to the engineers for making the systems intelligent. These systems can react as well as can respond based on their environmental condition. This study has analysed the effects of using the intelligent system in the development of engineering practices and decision-making systems from data.

Study background

Engineers can build the systems through the use of small and large devices. Intelligent systems help to build advanced software to analyse the data in a faster way and make decisions based on the analysis of data. Artificial intelligence helps this system to make better technologies which helps to improve the devices as well as helps to improve the algorithms. Advanced technological machines are used in intelligent systems which help to understand the world and their surroundings (Desouza, Dawson & Chenok, 2020). The use of AI algorithms can make

engineers more efficient in tasks and these algorithms have also been used for design optimizations. Engineers can get cost-effective solutions through the use of these advanced technologies. Artificial intelligence has provided innovative ideas in the fields of system engineering, product design and architecture.

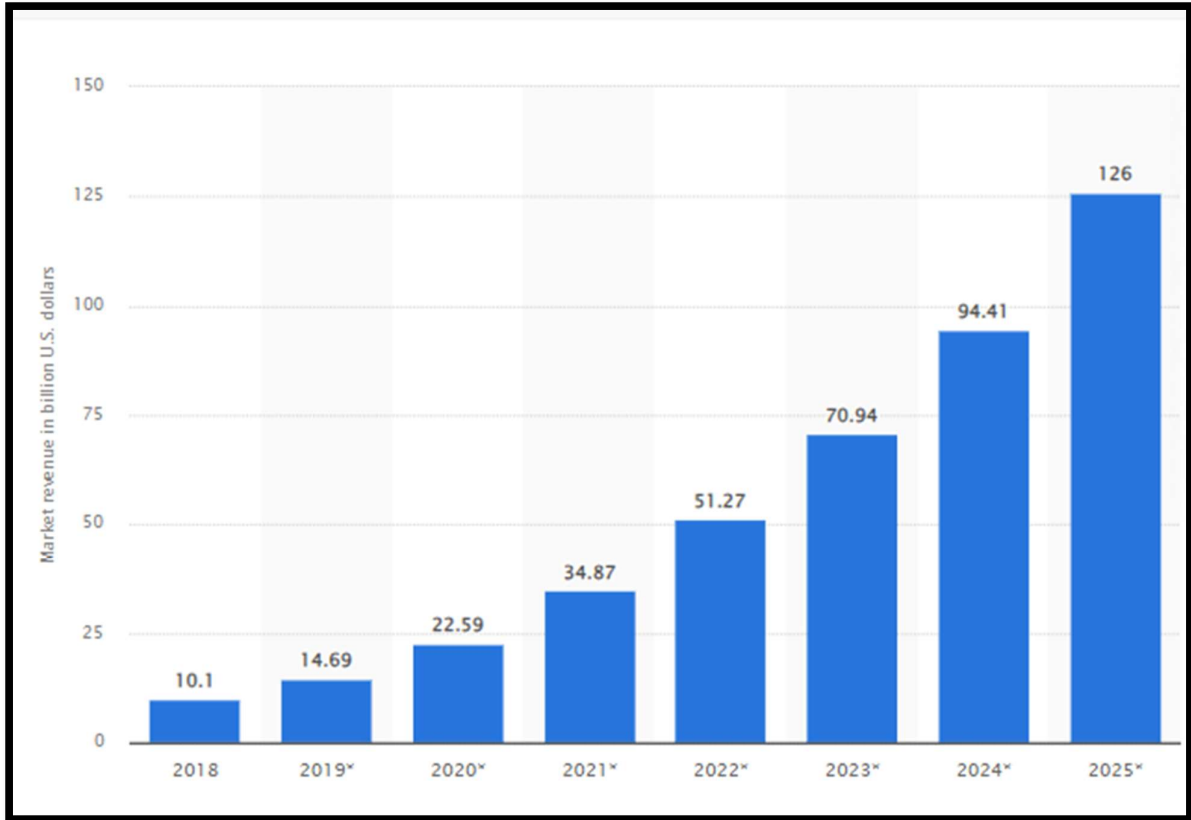


Figure 1: Revenue of AI-based software market from 2018 to 2025

(Source: Statista, 2022)

The above figure shows that the revenue of the AI-based software market has increased from 2018 to 2025. The revenue of the AI software market was 10.1 billion US dollars in 2018 and that increased to 94.41 billion US dollars in 2024 (Statista, 2022). This figure has been used in this study as this helps to understand that the demand for AI-based software increases with increasing their utilities.

Aim and objectives

Aim

This study aims to analyze the role of intelligent systems in modern engineering and helps to explore its opportunities, applications and challenges.

Objectives

- To make the system smarter machine learning, artificial intelligence and system thinking are used to enhance the performance of the systems.
- To analyse the potential ability of the systems and its implications based on artificial intelligence.
- To make the collaboration among the engineers and developers easier tools are used in this system.
- To gather and analyse the information based on the surrounding environments.

LITERATURE REVIEW

Concept of intelligent systems and its uses in engineering practices

Intelligent systems have shown predictive maintenance-related models that help engineers manage as well as maintain the equipment of an industry. According to the views of Fernandes et al. (2020), various advanced software are used in intelligent systems and it can reduce the maintenance cost of the equipment and infrastructures of an industry. The automation process helps in manufacturing and helps to explore the flexibility of multiple engineering applications. On the other hand, Hutchinson et al. (2021) argued that intelligent system helps to enhance the capability of smart systems which helps to analyse the real-time data to improve the efficiency of the engineers. It can improve the capability of the Internet of Things which can help in the practices of engineering. The implication of AI in intelligent systems can represent sustainable engineering by reducing the impact on the environment and optimizing the consumption of energy. Based on the views of Schmidt, Biessmann&Teubner (2020), engineers use intelligent systems to enhance the innovation, sustainability and efficiency of the industry. An intelligent system helps the leaders of an organization to make decisions to maintain the management process of an industry. On the other hand, Ng et al. (2021) argued that organizations can analyse a large amount of data and identify the pattern of the data through the use of intelligent systems. Engineers can use this information to monitor their operational process as well as help to optimize the decision-making process of enterprises.

Effect of Intelligent Systems on Engineering Practices

Intelligent systems can improve engineering education by offering instructional materials and learning opportunities to individuals. It can enhance the engineering ability of the students by providing interactive technology benefits to the students. According to the views of Ntoutsis et al. (2020), intelligent system algorithms are used to optimize as well as to design engineering systems and they help increase the performance of an industry through analyzing a large amount of data. This artificial technology can recognize the optimal design based on complex systems and this process has included the manufacturing processes, automobile and aircraft. On the other hand, Kellermann et al. (2021) argued that intelligent systems can influence the development of software which helps to bring innovation to an industry. Artificial intelligence is considered a transformative force that helps in the process of modern engineering by including new approaches into these practices.

Artificial intelligence can elevate the engineering process in several ways such as it can improve the decision-making process of an organization. It can provide a clear understanding to the engineers based on the analyses of data and engineers can understand the insights of data and make decisions based on the market trend of the product. Based on the views of Cao et al. (2022), intelligent system tools can help to create a flexible learning environment for students. This tool helps to enhance the comprehension as well as the memory of the students based on their understanding of the subject matter. On the other hand, Guo et al. (2022) argued that intelligent systems can provide powerful tools to engineers to strengthen engineering practices and improve the quality of products in an industry. Traditional engineering systems can be affected through the use of artificial intelligence and it can provide an opportunity for the engineers to optimize, manage and design the systems. This progress of the systems can help the students in engineering practices to perform in critical situations and find solutions to increase their task efficiency.

Challenges to the use of intelligent systems in the field of engineering

Intelligent systems have required large amounts of quality data which has created biases in the analysis process of data. It has created challenges in an industry to predict the trend of the data based on a biased analysis (Jamail&Jamail, 2020). The challenges which are faced by the engineering field of an industry are discussed below.

Functional behaviour based on learning components

Engineering approaches have represented the functionality based on the predicted mathematical models. According to the views of Asemi, Ko&Nowkarizi (2020), learning components can develop a model through analyses of the vast amount of information and make decisions in an organization. Engineers can face difficulties in exactly identifying the behaviours of the models and face challenges in understanding the insights based on the trend of the data.

Lack of human accountability

The advanced intelligent system model is used in various fields to increase the productivity of the industry and these models are formed based on hidden components. According to the views of Feng et al. (2023), organizations can face challenges in identifying the hidden components of the intelligent system models which can help to provide better outcomes in a production process. It has created difficulties for humans to review the models and humans can only able to review the AI model based on the testing of the outputs.

Bias in intelligent system

The accuracy as well as quality of the artificial intelligence can depend on the training data that are available in the system. Based on the views of Chen& Lin (2021), the accuracy of data can be gained in the industry through the monitoring process of the data. Engineers need a larger amount of training data to bring accuracy to the analysis process of data. On the other hand, Nazar et al. (2021) argued that high-quality massive amounts of data can create bias in the data

and can decrease the production of an organization. Engineers can use IBM Watson's open scale to reduce the bias of the artificially intelligent system and can able to enhance efficiency as well as increase revenue in the market.

METHODOLOGY

The modernized innovative approach to decision-making is a data-based decision-making system. This modernized approach and system of decision-making increases organisational opportunities to develop more scopes and growth in future. According to the views of Alhayani et al. (2021), the implementation of data-based decisions increases organisational opportunities and reduces the possibility of losses. This means that data-based decision-making helps to make the most effective decisions regarding developmental activities and the process of decision-making. The intelligent system includes artificial intelligence, system modelling, system thinking, machine learning, and learning of IoT tools. This technology helps the system engineers to make effective decisions after analysing the data. Based on the views of Serban et al. (2020), modernised technology of decision-making makes the output based on the input quality as well as it helps the engineers to analyze the changes in their practices with their effectiveness. Thus, AI-based technologies are mainly used to make effective data-based decisions and improve engineering practices.

FINDING AND RESULTS

Intelligent systems can assist in the decision-making process of the engineers and help to maximize the consumption of the resources in an industry. The application of the intelligent system in an organization can help to minimize waste and can help to apply eco-friendly practices in the engineering process. According to the views of Hamrouni et al. (2021), intelligent systems consist of artificial intelligence which can help to provide sustainable solutions to the industry. Cooperation among the team members can be improved through the adoption of advanced technology in the production process of the organization. Collaboration tools based on intelligent systems can help engineers create a strong relationship among the members of an industry. Based on the views of Liu et al. (2022), the use of advanced technologies in intelligent systems can help to detect anomalies in the production process of an organization. Engineers can design the structures of the systems through the help of AI benefits and can evaluate the safety concerns based on their projects.

DISCUSSION

Intelligent system technology helps to transform the project design of the engineers and helps to analyse the projects in an industry. Engineers can use algorithms based on machine learning to analyse massive amounts of data and can able to make decisions based on data. According to the views of Desouza, Dawson & Chenok (2020), advanced tools of intelligent systems can help in the designing process of production and can help to reduce the time to reach the products in the market. This advanced technology can help engineers optimize designs and find out the potential areas of development in an industry.

The maintenance of the engineering industry can create a cost-effective process and the use of AI-related predictive maintenance has brought a change in the industry. Engineers can monitor

the health of the pieces of equipment through the help of data analytics as well as machine learning tools. Based on the views of Hutchinson et al. (2021), intelligent systems can predict the anomalies and the failures of the systems and reduce cost as well as help in the maintenance process to improve the infrastructure of the industry. AI has a significant effect on the automation process which helps engineers to build intelligent systems and improve the efficiency of performing critical tasks in an industry.

CONCLUSION

Energy consumption has created a concern in the engineering field and intelligent systems help to optimize the energy consumption of an industry. The algorithms that are included in the machine learning process can analyse the patterns of the energy and identify the areas based on waste. It helps to mitigate the impact on the environment by bringing control in energy distribution and helps to advise strategies based on energy saving in an industry. The integration of the intelligent system in engineering has represented a new era of opportunities and it can empower engineers to gain greater efficiency and innovation in the field of engineering practices.

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