

A Review on Recent Advances of Artificial Intelligence Applications in Manufacturing

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Abstract: The recent advances in artificial intelligence have already begun to penetrate our daily lives. Even though the development is still in its infancy, it has been shown that it can outperform human beings even in terms of intelligence. There are much recent advancement like machine learning, Deep learning and Artificial Intelligence. Future manufacturing industries are moving towards the modernization of facilities in terms of advanced gadgets, machineries and tools etc. In this paper detailed comprehensive review is done to collect much information related to advancements of AI (Artificial Intelligence) in manufacturing industries. Future manufacturing companies are going the follow the concept of virtualization using modern technology like augment reality in modeling the product designs and process system in specific. All the process will be carried out by means of smart automation procedures. Artificial Intelligence improves the accuracy of working methods and procedural guidelines.

Keywords – Machine Learning, Deep Learning, Artificial Intelligence

1. INTRODUCTION

Traditional Manufacturing is forced to adopt modern approach of technological methods namely artificial intelligence. Industry 4.0 is said to be the new modern concepts in manufacturing systems. Industry 4.0 monitors every process through integration of cyber physical system. Artificial Intelligence helps to connect the real time communication between physical assets within the organization, smart decision making and virtual man-machine interface in manufacturing enterprises. It is trusted that industry 4.0 technologies have made high degree of excellence by sustainable manufacturing in order to improve the efficiency. Artificial intelligence (AI) is now at the forefront in the pursuit of industry 4.0. Over the past several years, the accumulation of big data via Internet-of-Things (IoT) technology has led to the rapid growth of information retrieval and analysis techniques such as AI. Such advancement in ways to deal with a large amount of data is about to revolutionize many manufacturing industry sectors, and it is the driving force behind the foundation of smart factories where everything is conducted intelligently and in an automated fashion during every cycle of the manufacturing process.

2. OVERVIEW OF AI TECHNOLOGIES

With so much data being produced daily by industrial IoT and smart factories, artificial intelligence has several potential uses in manufacturing. Manufacturers are increasingly turning to artificial intelligence (AI) solutions like machine learning (ML) and deep learning neural networks to better analyse data and make decisions. Predictive maintenance is often touted as an application of artificial intelligence in manufacturing. Artificial intelligence (AI) can be applied to production data to improve failure prediction and maintenance planning. This results in less costly maintenance for production lines. Many more applications and benefits of AI in production are possible, including more accurate demand forecasting and less material waste. Artificial intelligence (AI) and manufacturing go hand in hand since humans and machines must collaborate closely in industrial manufacturing environments.

The initial phase would be to teach the AI to accomplish a task by seeing how humans do it. If done thus, not only will progress be made but expansion will be sustained. With enough time and practice, it will learn on its own and be able to perform a wide range of tasks without constant supervision. Crowdsourcing is the next logical step. Using this method, you can collect data from the general public to train an AI. It can accomplish this in a flash and then compare the results to anything else it has stored. The result will be an AI with access to collective wisdom and the ability to "hive mind" or to know what everyone else knows.

© 2023 IJNRD | Volume 8, Issue 5 May 2023 | ISSN: 2456-4184 | IJNRD.ORG 3. IMPORTANCE OF AI TO THE MANUFACTURING INDUSTRY

Every manufacturer aims to find fresh ways to save and make money, reduce risks, and improve overall production efficiency. This is crucial for their survival and to ensure a thriving, sustainable future. The key lies with 4IR technologies, especially AI-based and ML-powered innovations. AI tools can process and interpret vast volumes of data from the production floor to spot patterns, analyze and predict consumer behavior, detect anomalies in production processes in real-time, and more. These tools help manufacturers gain end-to-end visibility of all manufacturing operations in facilities across all geographies. Thanks to machine learning algorithms, AI-powered systems can also learn, adapt, and improve continuously. Such capabilities are crucial for manufacturers to thrive in the aftermath of pandemic-induced rapid digitization. AI has the potential to transform the manufacturing industry completely. Examples of possible upsides include increased productivity, decreased expenses, enhanced quality, and decreased downtime. Big factories are just some of the ones that can benefit from this technology. Many smaller businesses need to realise how easy it is to get their hands on high-value, low-cost AI solutions. There are many possible uses for AI in manufacturing. It improves defect detection by using complex image processing techniques to classify flaws across a wide range of industrial objects automatically.

4. AI IN MANUFACTURING

AI is having a significant effect on the manufacturing industry. Artificial intelligence is improving the manufacturing process in many ways.

A.Artificial Intelligence in Logistics

Production losses due to overstocking or under stocking are persistent problems. Waste and decreased profits are typical results of overstocking. Businesses might gain sales, money, and patronage when products are appropriately stocked.

B. AI Robots - Robotic Process Automation

Commonly known as "industrial robots, "robotics in manufacturing allow for the automation of monotonous operations, the elimination or reduction of human error, and the reallocation of human labour to higher-value activities. Robots have a wide range of potential uses in manufacturing facilities. Machine vision is included in several industrial robots, allowing them to move precisely in chaotic settings.

C. Management of Supply Chains with Artificial Intelligence

With AI, factories can better manage their entire supply chains, from capacity forecasting to stocktaking. By establishing a realtime and predictive model for assessing and monitoring suppliers, businesses may be alerted the minute a failure occurs in the supply chain and can instantly evaluate the disruption's severity.

D. AI Autonomous Vehicles

Vehicles that drive themselves may automate the entire factory floor, from the assembly lines to the conveyor belts. Deliveries may be optimized, run around the clock, and completed more quickly with the help of self-driving trucks and ships. To better plan delivery routes, decrease accidents, and notify authorities in emergency, connected cars with sensors can track real-time information regarding traffic jams, road conditions, accidents, and more. This change enhances both the speed and safety of deliveries.

E. AI for Factory Automation

Operators in factories rely on their knowledge and intuition to manually modify equipment settings while keeping an eye on various indications on several screens. In addition to their regular duties, operators in this system are now responsible for troubleshooting and testing the system. This leads some business owners to ignore or downplay the need to generate a financial return on investment, among other undesirable outcomes.

F. AI for IT operations

Intelligent automation in IT operations, or AIOps, is essential for this purpose. AIOps, as defined by Gartner, is an approach to IT operations automation that uses big data and machine learning. AIOps is most helpful in automating extensive data management. Besides these, IT service management, event correlation and analysis, performance analysis, anomaly identification, and causation determination are all potential applications.

CONCLUSION

To reap the benefits of AI in manufacturing, it is essential to incorporate AI as soon as possible. However, doing so demands a substantial investment of time, effort, and resources, as well as the up skilling of your workforce. Finishing pilot projects to be scaled up rapidly and out of the pilot phase is crucial. The window of opportunity to integrate AI into production processes is closing for those who still need to do so. AI is now at the heart of the manufacturing industry, and it's growing every year. Skillsets are still in short supply, so there is value in training for AI engineers who can create practical applications using a wide range of intelligent agents; machine learning experts who are trained in supervised and unsupervised learning, mathematical and heuristic techniques and hands-on modeling.

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