

A Study on the Role of Artificial Intelligence in Manufacturing Sector

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Abstract - The current COVID-19 pandemic has caused severe disruptions in economies. It is likely to cause supply chain disorder and eventually force companies and entire industries to rethink and adapt to the global supply chain model. Many manufacturing companies have halted their production, which has collaterally damaged the supply chain and the industry. The industries have started to restructure their business model for 2020, and many SMEs and large manufacturing plants have halted/postponed any new technology upgrade in their factories in order to recover from the losses caused by the lockdown and economic slowdown. The growth in the adoption of AI solutions is completely dependent on the growth of manufacturing units. AI refers to multiple technologies, working in tandem to allow the machines to sense, learn, understand, and act to augment human capabilities. AI technology can learn and handle vast amounts of information that will enhance and transform operations in different fields effectively. Over a certain period of learning and comprehending, AI technology can anticipate needs and make informed and relevant decisions. AI machines are efficient at quick data processing to generate relevant answers to any question arising in the business. They offer accurate predictions, and customers' needs based on what they learn. Due to the growing importance of AI in business, now the present study focuses on the role of Artificial Intelligence in manufacturing sector in India.

Index Terms - Covid-19, lockdown, economies, supply chain, manufacturing, artificial intelligence.

INTRODUCTION

In today's world, technology is growing very fast, and we are keeping in touch with different new technologies day by day. Here, one of the booming technologies of computer science is Artificial Intelligence which is ready to create a new revolution in the world by making intelligent machines. The

Artificial Intelligence is now all around us as we are using this in different areas. It is currently working with a variety of subfields, ranging from general to specific, such as self-driving cars, playing chess, proving theorems, playing music, Painting, etc. AI is one of the fascinating and universal fields of Computer science which has a great scope in future. AI holds a affinity to cause a machine to work like a human being.

ARTIFICIAL INTELLIGENCE-DEFINITION

Artificial Intelligence is composed of two words Artificial and Intelligence, where Artificial defines "man-made," and intelligence defines "thinking power", hence AI means "a man-made thinking power."

So, we can define it as: "It is a branch of computer science by which we can create intelligent machines which can behave like a human, think like humans, and able to make decisions."

Artificial Intelligence exists when a machine can have human based skills such as learning, reasoning, and solving problems. With Artificial Intelligence we do not need to preprogram a machine to do some work, in spite of that you can create a machine with programmed algorithms which can work with own intelligence, and that is the greatness of AI. It is believed that AI is not a new technology, and some people says that as per Greek myth, there were Mechanical men in early days which can work and behave like humans.

IMPORTANCE OF ARTIFICIAL INTELLIGENCE

The following are things that will tell us the importance of Artificial Intelligence.

- With the help of AI, we can create such software or devices which can solve real-world problems very easily and with accuracy such as health issues, marketing, traffic issues, etc.
- By using AI, we can create your personal virtual Assistant, such as Cortana, Google Assistant, Siri, etc.
- With the help of AI, we can build such Robots which can work in an environment where survival of humans can be at risk.
- AI opens a pathway for other new technologies, new devices, and new Opportunities.
- Components of Artificial Intelligence

Artificial Intelligence is not just a part of computer science even it's so immense and requires lots of other factors which can contribute to it. To create the AI first we should know that how intelligence is composed, so the Intelligence is an intangible part of our brain which is a combination of Reasoning, learning, problem-solving perception, language understanding, etc.

To achieve the above factors for a machine or software Artificial Intelligence requires the following discipline:

Mathematics

Biology

Psychology

Sociology

Computer Science

Neurons Study

Statistics.

Advantages of Artificial Intelligence

Following are the main advantages of Artificial Intelligence:

High Accuracy with fewer errors: AI machines or systems are prone to less errors and high accuracy as it takes decisions as per pre-experience or information as humans do.

High-Speed: AI systems can be of very high-speed and fast-decision making; because of that AI systems can beat a chess champion in the Chess game and with that much of fastness it is working.

High reliability: AI machines are highly reliable and can perform the same action multiple times with high accuracy.

Useful for risky areas: AI machines can be helpful in situations such as defusing a bomb, exploring the ocean floor, where to employ a human can be of risky.

Digital Assistant: AI can be very useful to provide digital assistant to the users such as AI technology is currently used by various E-commerce websites to show the products as per customer requirement.

Useful as a public utility: AI can be very useful for public utilities such as a self-driving car which can make our journey safer and hassle-free, facial recognition for security purpose, Natural language processing to communicate with the human in human-language, etc.

DISADVANTAGES OF ARTIFICIAL INTELLIGENCE

Every technology has its own advantages and disadvantages, and the same goes for Artificial intelligence. Being so advantageous technology still, it has some disadvantages which we need to keep in our mind while creating an AI system. Following are the disadvantages of AI:

High Cost: The hardware and software requirement of AI is very costly as it needs lots of maintenance to meet current world requirements.

Can't plan of the box: Even we are making smarter machines with AI, but still they cannot compute of the box, because the robot will only do that work that they're trained or programmed by humans. That's why they can't plan of the box.

No feelings and emotions: AI machines are often a powerful performer, but still it doesn't have the feeling so it cannot make any quite emotional attachment with human, and sometimes could also be harmful for users if the right care isn't taken.

Increase dependency on machines: With the increment of technology, people are becoming more hooked in to devices and hence they will lose their mental capabilities. An excessive amount of dependence on technology isn't suggestible.

No Original Creativity: As humans are so creative and should imagine some new ideas but still AI machines

cannot beat this power of human intelligence and cannot be creative and imaginative.

ROLE OF AI IN MANUFACTURING SECTOR

Application of AI in manufacturing sector in India is presently growing at a compound annual rate of growth of 49.5%. The market of the manufacturing industry is predicted to be evaluated at \$1 billion in 2019. It's forecasted to surge to \$17 billion by 2025. These figures cover a vibrant landscape of definite need and an ultimate scope for any manufacturer with AI. AI will help manufacturers to remain competitive, reduce costs, optimize capital employed and supply a far better environment for his or her employees and repair to their customers. Manufacturers are frequently facing different challenges like unexpected machinery failure or defective product delivery. Leveraging AI and machine learning, manufacturers can improve operational efficiency, launch new products, customize product designs and plan future financial actions to progress on their AI transformation.

Implementing AI in manufacturing facilities is getting popular among manufacturers. Consistent with Capgemini's research, quite half the EU manufacturers (51%) are implementing AI solutions, with Japan (30%) and therefore the US (28%) following in second and third. An equivalent study also reveals that the majority popular AI use cases in manufacturing are improving the upkeep (29% of producing AI use cases) and quality (27%).

This recognition is driven by the very fact that manufacturing data may be a good fit AI/machine learning. Manufacturing is crammed with analytical data which is easier for machines to research. Many variables impact the assembly process and while these are very hard to research for humans, machine learning models can easily predict the impact of individual variables in such complex situations. In other industries involving language or emotions, machines are still operating at below human capabilities, slowing down their adoption.

COVID-19 pandemic also increases the interests of manufacturers in AI applications. Thanks to lockdowns have forced manufacturers shift their focus to AI.

APPLICATIONS OF AI IN MANUFACTURING

Digital twins

A digital twin could also be a virtual representation of a real-world product or asset. With this digital twins, manufacturers can improve their understanding of the merchandise and permit businesses to experiment in future actions which will enhance asset performance. There are typically 4 applications of digital twins in manufacturing as highlighted within the next examples.

a) Development

Manufacturers can use digital twins before its physical counterpart is manufactured. This application enables businesses to gather data from the virtual twin and improve the first product supported the data.

b) Design customization

Due to the shift toward personalization in consumer demand, manufacturers can leverage digital twins to style various permutations of the merchandise. This enables customers to urge the merchandise supported performance metrics rather than its design.

Shop floor performance improvement

A digital twin are often used to monitor and analyze the assembly process to identify where quality issues may occur or where the performance of the merchandise is a smaller amount than intended.

Logistics optimization

Digital twins allow manufacturers to understand a transparent view of the materials used and provide the prospect to automate the replenishment process.

Other areas where we are using AI

Predictive maintenance

Manufacturers leverage AI technology to identify potential downtime and accidents by analyzing the sensor data. AI systems help manufacturers forecast when or if functional equipment will fail so its maintenance and repair are often scheduled before the failure occurs. With this AI-powered predictive maintenance, manufacturers can improve the operational efficiency while reducing the value of machine failure.

Generative design

Generative design uses machine learning algorithms to imitate an engineer's approach to style. Designers or engineers enter parameters of design (such as

materials, size, weight, strength, manufacturing methods, and price constraints) into generative design software and therefore the software provides all the possible outcomes which will be created with those parameters. With this method, manufacturers quickly generate thousands of design options for one product.

Price forecasting of raw materials

The extreme price instability of raw materials has always been a challenge for manufacturers. Businesses need to adapt to the unstable price of raw materials to stay competitive within the market. AI powered software like Kantify can predict materials prices more accurately than humans and it learn from its mistakes.

Robotics

Industrial robots, also mentioned as manufacturing robots, automate repetitive tasks, prevent or reduce human error to negligible rate, and shift human workers' focus to more on the productive areas of the operation. Applications of robots in plants vary. Applications include assembly, welding, painting, product inspection, picking and placing, die casting, drilling, glass making, and grinding. of these activities are done by robots itself.

Industrial robots are in manufacturing plants since the late 1970s. With the addition of AI, an industrial robot can monitor its own accuracy and performance, and train itself to urge better. Some manufacturing robots are equipped with machine vision that helps the robot achieve precise mobility in complex and random environments.

Cobots are another robotics application that uses machine vision to figure safely alongside human workers to end a task that cannot be fully automated.

EDGE ANALYTICS

Edge analytics provides fast and decentralized insights from data sets collected from sensors on machines. Manufacturers collect and analyze the data on edge to reduce time to insight. Edge analytics has three use cases in manufacturing:

Improving production quality and yield.

Detecting early signs of deteriorating performance and risk of failure.

Tracking worker health and safety by using wearables.

Quality Assurance

Quality assurance is the maintenance of a desired level of quality in a service or product. Assembly lines are data-driven, interconnected and autonomous networks. These assembly lines work based on a set of parameters and algorithms that provide guidelines to produce the best possible end-products. AI systems can detect the differences from the usual outputs by using machine vision technology since most defects are visible. When an end-product is lower quality than expected, AI systems trigger an alert to users so that they can react to make adjustments.

INVENTORY MANAGEMENT

Machine learning solutions can promote inventory planning activities as they are good at dealing with demand forecasting and supply planning. AI-powered demand forecasting tools provide more accurate results than traditional demand forecasting methods (ARIMA, exponential smoothing, etc) engineers use in manufacturing facilities. These tools enable businesses to manage inventory levels better so that cash-in-stock and out-of-stock scenarios are less likely to happen.

PROCESS OPTIMIZATION

AI powered software can help organizations optimize processes to achieve sustainable production levels. Manufacturers can prefer AI-powered process mining tools to identify and eliminate bottlenecks in the organization's processes. For instance, appropriate and accurate delivery to a customer is the ultimate goal in the manufacturing industry. However, if the company has several factories in different regions, building a consistent delivery system is difficult. By using a process mining tool, manufacturers can compare the performance of different regions down to individual process steps, including duration, cost, and the person performing the step. These insights help streamline processes and identify where the bottlenecks are so that manufacturers can take action.

CONCLUSION

As humans, we have always been fascinated by technological changes and fiction, right now; we are living amidst the greatest advancements in our history. Artificial Intelligence has emerged to be the next big

thing in the field of technology. Organizations across the world are coming up with breakthrough innovations in artificial intelligence and machine learning. Artificial intelligence is not only impacting the future of every industry and every human being but has also acted as the main driver of emerging technologies like big data, robotics and IoT. Considering its growth rate, it will continue to act as a technological innovator for the foreseeable future. The future is definitely gravitating towards automation. Artificial Intelligence will be the driving force behind eliminating the human error factor from business operations. As these technologies continue to grow, they will have more and more impact on the social setting and quality of life.

REFERENCES

- [1] Brynjolfsson, E.; McAfee, A. (2014). *The Second Machine Age*, W. W. Norton & Co., ISBN 978-0-393-23935-5, New York.
- [2] Buchmeister, B. & Palcic, I. (2017). Product development using an intelligent supporting system, In: DAAAM International Scientific Book 2017, Katalinic, B. (Ed.), pp. 43-54, DAAAM International, ISBN 978-3-902734-12-9, Vienna.
- [3] Byrum, J. (2018). Preparing for an AI future, *ORMS Today*, Vol. 45, No. 6, pp. 24-26, ISSN 1085-1038 Carr, N. (2014). *The Glass Cage*.
- [4] Hall, S. (2017). *Manufacturing Global: Megatrends pushing manufacturers towards Industry 4.0*.
- [5] *Plant Automation (2019). Technology: The future of artificial intelligence in manufacturing industries*.
- [6] Puitinen, M. (2018). *Nordcloud: 10 examples of AI in manufacturing to inspire your smart factory*.
- [7] Zavalishina, J. (2017). *Manufacturing Global: AI and sustainability: go green and get paid for it*.
- [8] Zhou, J.; Li, P.; Zhou, Y.; Wang, B.; Zang, J. & Meng, L. (2018). *Toward new-generation intelligent manufacturing*.
- [9] <https://www.mygreatlearning.com/blog/what-is-artificial-intelligence/>.
- [10] <https://www.javatpoint.com/artificial-intelligence-tutorial>.
- [11] <https://research.aimultiple.com/manufacturing-ai/>.