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INFLUENCE OF ARTIFICIAL INTELLIGENCE IN MANUFACTURING INDUSTRIES.

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Abstract-

Artificial intelligence is fully based on disciplines such as Science, Computer Science, Biology, Psychology, Linguistics, Mathematics, and Engineering. AI is the best key for better future. The purpose of AI is simply smoothening everyone's life. Now a day the problems that we are facing in present and upcoming future could definitely get solved through AI. There are several reasons for the recent popularity of manufacturing industrial AI. More cheap sensors and the automated process of data acquisition; More powerful computation capability of computers to perform more complex tasks at a faster speed with lower cost, Faster connectivity infrastructure and more accessible cloud services for data management and computing power outsourcing. This paper is a study on impacts challenges of AI in manufacturing industries.

INTRODUCTION

AI is a brain which is created by humans. The brain which acts independently. It comprises of Logic, Knowledge, conscious, emotions, Creativity, natural language processing [1] (communication), Learning, Planning, Sensors that connects its brain to physical environment to interact with Humans, etc. Artificial intelligence (AI) is formerly just a field which deals with academic researchers; machine learning and deep learning are becoming conformist technologies that any organization can harness. This could have dramatic indication for many industries, including manufacturing. The influence of AI on manufacturing is likely to usher in a whole new era of industrial development. The first three industrial revolutions were activated by the introduction of mechanical, electrical and digital technologies, respectively. Developing AI's cognition is simply a process similar to raising a new born child. But there is a difference as this conscious doesn't have a physical structure. The physical structure could be a Data server lab or simply a robot that have similar brain structure as of humans. There's also no question that artificial intelligence holds the key to future growth and success in manufacturing industry or we can say in factories of future. In a recent survey on artificial intelligence, 45% of respondents from the automotive and manufacturing sectors classified AI as "highly important" to the manufacturing function in the next five years, while almost half 49% said it was "absolutely critical to success." There's no doubt that the manufacturing sector is leading the way in the application of artificial intelligence technology. From significant cuts in unexpected downtime to increased better designed products, manufacturers are applying AI-powered analytics to data to improve efficiency, product quality and the safety of employees. Here we look at key insurgency AI brings to the manufacturing industry.

1. SMART MAINTANANCE

In manufacturing processes, occurring maintenance of production line machinery and equipment results in considerably major expense, having a crucial impact on the bottom line of any asset reliant production operation. Moreover, studies show that unexpected downtime costs manufacturers an estimated $50 billion annually, and that asset failure is the cause of 42 percent of this unplanned downtime. For this reason, predictive maintenance has become a must-have solution for manufacturers who have much to gain from being able to predict the next failure of a part, machine or system. Predictive maintenance uses advanced AI algorithms in the form of machine learning and artificial neural networks to formulate predictions regarding asset malfunction .This allows for drastic reductions in costly unexpected downtime, as well as for extending the Remaining Useful Life (RUL) of production machines and equipment .In cases where maintenance is unavoidable, technicians are briefed ahead of time on which components need assessment and which tools and methods to use, resulting in very focused repairs that are scheduled in advance.

2. *THE RISE OF QUALITY*

Due to today's very short time-to-market deadlines and a rise in the complexity of products, manufacturing companies are finding it increasingly harder to maintain high levels of quality and to comply with quality regulations and standards. On the different side, customers have come to expect quality products, pushing manufacturers to up their quality game while understanding the damage that high defect rates and product recalls can do to a company and its brand. Quality introduce the use of AI algorithms to notify manufacturing teams of emerging production faults that are likely to cause product quality issues. Faults can introduce deviations from recipes, subtle abnormalities in machine behavior, change in raw materials, and more. By tending to these type of issues early on, a high level of quality can be maintained additionally, Quality enables manufacturers to collect data about the use and performance of their products in the field. This information can be more powerful to product development teams in making both strategic and tactical engineering decisions.

3. *HUMAN-ROBOT COLLABORATION*

The International Federation of Robotics predicts that by the beginning of 2019 there will be more than 1.3 million industrial robots at work in factories all over the world. In theory, as most of the jobs are taken over by robots, workers will be trained for more advanced positions in design, maintenance, and programming. In this meantime phase, human-robot collaboration will have to be efficient and safe as more industrial robots enter the production floor alongside human workers. Advances in AI will be prime to this development which enabling robots to handle more tough and cognitive tasks and make autonomous decisions based on real-time environmental data, further optimizing processes.

4. *MAKING BETTER PRODUCTS WITH GENERATIVE DESIGN*

Artificial intelligence is also tending to changing the way we design the required products. One procedure is to enter a detailed brief defined by designers and engineers as input into an AI algorithm (in this case referred to as "generative design software"). The brief describing can include data describing limitations and various number of parameters such as material types, available production methods, budget limitations and time constraints. The algorithm which explores every possible configuration, before homing in on a set to the best solutions. The advanced solutions can then be tested using machine learning, offering additional insight as to which designs work best. The process can be continuously repeated until an optimal design solution is reached. One of the important advantages of this approach is that an AI algorithm is completely objective – it doesn't default to what a human designer would regard as a "logical" starting point. No assumptions are taken at face value and everything is tested according to actual performance against a global range of manufacturing scenarios and conditions.

5. *ADAPTING TO AN EVER-CHANGING MARKET*

Artificial intelligence is a core element of the Industry revolutions and is not limited to use cases from the production floor. AI algorithms can also be used to make optimal manufacturing supply chains, helping companies anticipate market changes. This gives management a huge advantage, moving from a reactionary/response mindset, to a strategic one. AI algorithms formulate estimations of market demand by looking for patterns linking location, socioeconomic and macroeconomic factors, weather patterns, political status, consumer behavior and more. This information is not valuable to manufacturers as it allows them to optimize staffing, inventory control, energy consumption and the supply of raw materials.

6. *CHALLENGES*

The challenges of industrial AI to unlock the value lies in the transformation of raw data to intelligent predictions for rapid decision-making. In general, there are four major challenges in realizing industrial AI.

i) Data: Engineering systems now generate a lot of data and modern industry is indeed a big data environment. However, industrial data usually is structured, but may be low quality. The quality of the data may be poor, and unlike other consumer-faced applications, data from industrial systems usually have clear physical meanings,

which makes it harder to compensate the quality with volume. Data collected for training machine learning models usually is lacking a comprehensive set of working conditions and health states/fault modes, which may cause false positives and false negatives in online implementation of AI systems. Industrial

data patterns can be highly transient and interpreting them requires domain expertise, which can hardly be harnessed by merely mining numeric data.

ii) Speed: Production process happens fast and the equipment and work piece can be expensive, the AI applications need to be applied in real-time to be able to detect anomalies immediately to avoid waste and other consequences. Cloud-based solutions can be powerful and fast, but they still would not fit certain computation efficiency requirements. Edge computing may be a better choice in such scenario.

iii) High fidelity requirement: Unlike consumer-faced AI recommendations systems which have a high tolerance for false positives and negatives, even a very low rate of false positives or negatives rate may cost the total credibility of AI systems. Industrial AI applications are usually dealing with critical issues related to safety, reliability, and operations. Any failure in predictions could incur a negative economic and/or safety impact on the users and discourage them to rely on AI systems. [1]

iv) Interpretability: Besides prediction accuracy and performance fidelity, the industrial AI systems must also go beyond prediction results and give root cause analysis for anomalies. This requires that during development, data scientists need to work with domain experts and include domain know-how into the modeling process, and have the model adaptively learn and accumulate such insights as knowledge.

7. *CONCLUSIONS*

The manufacturing sector is a perfectly suitable for the application of artificial intelligence. Even though the Industry revolution is still in its early stages, we're already witnessing significant benefits from AI. From the design process and production floor manufacturing, to the supply chain and administration, AI is intended to change the way we manufacture products and process materials forever.

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