Industry 4.0 Revolution (4IR): Applications and Challenges: An Overview

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Abstract - *In this paper the technology used in the Industry 4.0 is discussed besides applications and challenges that are hindered in it by the use of the technology like Artificial Intelligence, Machine Learning.*

Keywords—*Industry 4.0, Artificial Intelligence, Machine learning.*

I. INTRODUCTION

Industry 4.0 is not directly achieved concept; it has a huge background of achievement. It is a step wise process occurred during the building of different technologies that are used in the latest technologies. The stepwise concept of Industry X.0 is given in the following table.

Industry x.0	Technology	Duration
Industry 1.0	Steam Engine Mechanisation of Production	Early 1800
Industry 2.0	Electricity Assembly line Production Mass Production	Began in 19th Century
Industry 3.0	Partial Automation Memory programmable Controls and Computers Factory Automation Robotics	Began in 20th Century
Industry 4.0	Information and Communication to Industries Smart Factories Digitization in Manufacturing	Now

2.0 SCOPE OF INDUSTRY 4.0:

Type of AI	Description	Examples	Power
Rule-based AI	Uses a set of pre-programmed rules to make decision or perform tasks	Expert Systems, decision trees, Production system	Low
Machine Learning	Uses algorithms to learn from Data and improve over time	Supervised learning, unsupervised learning, reinforcement learning	Medium
Deep Learning	A type of machine learning that uses neural networks to process large amounts of data and improve accuracy.	Image recognition, natural language processing, speech recognition	High
Artificial General Intelligence (AGI)	An AI system that can perform any intellectual task that a human can.	None currently exist	Very High
Artificial Super Intelligence (ASI)	An AI systm that surpasses human intelligence and is capable of creating its own solutions and ideas.	None currently exist	Extremely High

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(Source- Artificial Intelligence- A Step to the Most Significant Change)

3.0 Chatbot:

Chatbot is a software program uses for conversation with humans. It uses technology like Artificial Intelligence & Natural Language Processing.

Types of Chabot-

1. Rule – Based Chabot

These are based on certain rules

2. AI-Powered Chabot

These Chabot uses AI and NLP

3. Virtual Assistants

Like Siri, Google Assistant & Alexa

4. Transactional Chatbot

These Chabot used for booking appointments, book our orders

5. Conversational Agent

To do human interaction

6. Hybrid Chabot

It is a combination of 1 and 2

Examples of Chabot

1. Siri by Apple

2. Google Assistant by Google

3. Alexa by Amazon

4. Mitsuku

4.0 APPLICATIONS OF ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING IN THE INDUSTRY 4.0

1. **Marketing**

Marketing is the brain of any industry to survive in the market. Now a days, various social media platform like Chabot are used for improving the overall product reach to the customers.

2. **Farming**

Different data collection with respect to crops seed, fertilizers and pestisides are available for the better result in the farming crops. Now a days Unmanned Aerial Vehicles are used for the inspection of plants and its growth.

3. **Companies**

Numerous Companies are gathering information in the form of data and using these data for further analysis and also for forecasting of company growth.

4. **Healthcare**

In industry 4.0, Artificial Intelligence has a tremendous potential to help doctors in diagnosing patient deceases, helping in treatment of patient and improving health of petient

5. **Banking**

In Industry 4.0, Artificial Intelligence is used to take decisions of investment, to avoid fraudulent cases and to improve the overall risk management.

6. **Education**

Artificial Intelligence results more comprehensive result in education sector by improving by new education structure and easy availability of knowledge based system.

7. **Construction**

In construction, the data collection and analysis results in easier ways for the new construction.

8. **Manufacturing**

Manufacturing is the heart of every production company. Day by day new technologies are inculcated in the manufacturing sector resulting in automation of the product flow. Machine learning helps in manufacturing sector, particularly in maintenance activities.

9. **Robotics**

Use of Artificial intelligence in robots makes them competitive to the human being. It is going to be improved day by day in recent days

10. **Weather Forecasting**

Use of weather forecasting is made very precise using the latest trends like AI techniques. It helps farmers to take care of their crops.

11. **Transportation**

Self-driving cars or vehicles are the best examples that uses Artificial Intelligence used in the transportation. Drones are also used now in different companies to transport the products.

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5.0 TECHNOLOGY USED IN INDUSTRY 4.0:

1. **Internet of Things (IOT) and Industrial Internet of Things (IIOT)**

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Anything not to be measured is incomplete understanding about that property or products. The sensors are the answer for measuring the things and are widely used in the collection of data that can be used for the improvement of that particular process. Human body has a different sensors like for smelling, vision and feeling temperature etc. Now a days, industries are trying to manufacture the various sensors which uses electricity to operate. Internet of Things makes the physical devices to connect with internet and utilized for human benefits.

2. **Augmented Reality (AR)**
   Augmented reality (AR) is the integration of digital information with the user's environment in Real Time.

3. **Virtual Reality (VR)**
   Virtual Reality (VR) is complete use of unrealistic environment to the user. It is now a days are used in the gaming, vehicle driving simulators. Glasses are so designed that one can see the unrealistic things comparable to realistic things.

4. **Cloud Computing**
   In earlier days, when computers are at its initial phase the information was stored in the Hard Disc of the computer. Now a days it is possible to keep all these information on cloud and one can access this information authentically.

5. **3D printing**
   Additive Manufacturing, is possible for such products which are manufacture in less number of quantities with precise quality of product in short time. 3D printing is an example for the same.

6. **Block chain**
   Decentralized distribution of information is possible using block chain. Various currencies are now a days are converted and used by the peoples which is possible by block chain technology. One Centralized system is avoided here, rather than this the decentralized distribution of network is kept.

6.0 CHALLENGES IN INDUSTRY 4.0

1. **Focus on Work-**
   As robots are involved in the industry which results in reduction of human errors when integral part of Artificial Intelligence.

2. **Focus on training of the employees**
   The complexity of job becomes as we use the robots and cloud computing techniques in the industry, the focus should be given to the training of human factor which ultimately avoid the job loss of an employee. Highly educated and skilled worker are the requirement of the current market in any kind of organization.

3. **Focus on job creation-**
   Various sectors are getting automated, the various jobs are need to be fulfilled by the use of technology and it should result in more job creation.

4. **Demand for remote working**
   More flexibility will be arise in job working.

7.0 CONCLUSION

Industry 4.0 is a combination of the recent technologies to improve human living and it tends towards the betterment of the industrial product creation using Artificial Intelligence and Machine Learning.

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