

Chapter 17

Impact of Artificial Intelligence in Industry 4.0 and 5.0

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ABSTRACT

Industry 4.0 uses the network concept to establish an interconnected manufacturing system. Industry 4.0 integrates the more recent digital concepts such as artificial intelligence (AI), the internet of things (IoT), big data, cloud computing, and 3D printing. The next maturity level, Industry 5.0, aims to shift the focus back to human-centric production by creating a sustainable and collaborative environment with humans and machines. Every manufacturer aims to find new ways to increase profits, reduce risks, and improve production efficiency. AI tools can process and interpret vast volumes of data from the production floor to spot patterns, analyze and predict consumer behavior, and detect real-time anomalies in production processes. This work studies the impact of AI in Industries 4.0 and 5.0. In Industry 4.0, AI can help in classic tasks such as predictive maintenance, production optimization, and customer personalization. Industry 5.0 enables sustainable manufacturing development and human-AI interaction. In this work, the authors demonstrate the impact of AI in Industry 4.0 and 5.0.

1. INTRODUCTION

In recent years, we have witnessed remarkable advancements in artificial intelligence (AI) that have revolutionized various domains. AlphaZero's ability to learn from scratch and master complex games, like chess, shogi, and Go, without prior knowledge or human guidance marked a significant milestone in AI research in 2017. In 2020, another notable advancement in the medical field was the discovery of the antibiotic Halicina, inspired by the HAL software of the movie '2001: A Space Odyssey'. The same year, OpenAI's GPT-3 (Generative Pre-trained Transformer) made significant strides in natural language

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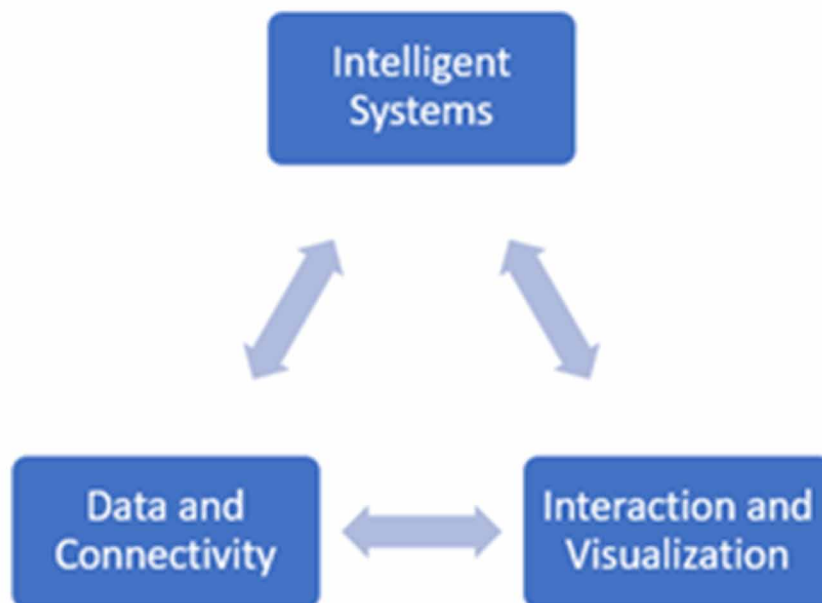
processing and generation. GPT models, such as GPT-3.5, have demonstrated impressive capabilities in understanding and generating human-like text (Kissinger et al. 2022).

Evaluating AI's impact in Industry 4.0 and 5.0 is challenging since many technologies contribute to this area. Various topics like the Internet of Things (IoT), Big Data, Cloud Computing, 3D printing, Robotics, Cobots, G6 networks, and FabLabs disperse the reader without giving him unity.

This work aims to find a framework for several technologies and study how AI relates to other technologies in Industry 5.0, recognizing the legacy of Industry 4.0.

For this purpose, we choose the classic I/O framework, or pipeline, with three steps: (i) data and connectivity, (ii) intelligent systems, and (iii) interaction and visualization, shown in Figure 1.

Figure 1. A framework of the types of technologies of Industry 4.0 and 5.0



The contribution of this work is to distinguish between Industry 4.0 and Industry 5.0 and prophesy which technologies are the most substantive in Industry 5.0 while focusing on AI.

In this work, we aimed to identify technologies encompassing Industry 4.0 and Industry 5.0 and align with the previous framework with three technology sets. The result with the more relevant technologies is presented in Figure 2. Each technology will be further developed in the document.

The remaining paper is organized as follows. Section 2 presents the technologies of Industry 4.0. Section 3 reports the technologies that support Industry 5.0. Finally, in Section 4, we draw some conclusions.

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