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AI-ML and AI Implementation in Radiology and Drug Development

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ABSTRACT: Machine learning is one of the most exciting recent technologies in Artificial Intelligence. Learning algorithms in many applications that's we make use of daily. Every time a web search engine like Google or Bing is used to search the internet, one of the reasons that works so well is because a learning algorithm, one implemented by Google or Microsoft, has learned how to rank web pages. The analysis was done using the Web of Science and SCOPUS database. Furthermore, UCINET and N Vivo 12 software were used to complete them. A literature review on ML and AI empirical studies published in the last century was carried out to highlight the evolution of the topic before and after Industry 4.0 introduction, from 1999 to now. Eighty-two articles were reviewed and classified. A first interesting result is the greater number of works published by the USA and the increasing interest after the birth of Industry 4.0.

KEYWORDS: Artificial Intelligence; Machine Learning; Industry 4.0; Smart Production; Sustainability, Drug Development and Discovery.

I. INTRODUCTION

Smart production systems require innovative solutions to increase the quality and sustainability of manufacturing activities while reducing costs. In this context, artificial intelligence (AI)-driven technologies, leveraged by I4.0 Key Enabling Technologies (e.g., Internet of Thing, advanced embedded systems, cloud computing, big data, cognitive systems, virtual and augmented reality), are ready to generate new industrial paradigms [1]. On a very broad account, the areas of artificial intelligence are classified into 16 categories [2–3]. These are reasoning, programming, artificial life, belief revision, data mining, distributed AI, expert systems, genetic algorithms, systems, knowledge representation, machine learning, natural language understanding, neural networks, theorem proving, constraint satisfaction, and theory of computation [4–5]. Artificial intelligence (AI) is an integration of computer science and physiology. Intelligence in simple language is the computational part of the ability to achieve goals in the world. Intelligence is the ability to think to imagine creating memorizing and understanding, recognizing patterns, making choices adapting to change and learn from experience. Artificial intelligence concerned with making computers behave like humans more human like fashion and in much less time than a human takes so is called as Artificial Intelligence [6]. In the 21st century, AI has become an important area of research in all fields: Engineering, science, education, medicine, business, accounting, finance, marketing, economics, stock market, and law, among others [7-8] They also influence the larger trends in global sustainability. Artificial intelligence can be usefull to solve critical issue for sustainable manufacturing (e.g., optimization of energy resources, logistics, supply chain management, waste management, etc.). In this context, in smart production, there is a trend to incorporate AI into green manufacturing processes for stricter environmental policies [9] The accuracy and precision of the aforementioned techniques can be further enhanced by increasing the amount of training data to strengthen their learning capabilities and hence the automated decision efficiencies [10] Thus, subfields of AI, such as machine learning, natural language processing, image processing, and data mining, have also become an important topic for today's tech giants. The subject of AI generates considerable interest in the scientific community, by virtue of the continuous evolution of the technologies available today. The development of ML as a branch of AI is now very fast. Its usage has spread to various fields, such as learning machines, which are currently used in smart manufacturing, medical science, pharmacology, agriculture, archeology, games, business, and so forth. According to the above considerations, in this work, a systematic literature review of research from 1999 to 2019 was performed on AI and the ML technique. Therefore, it is considered necessary to create a classification system that refers to the articles that jointly treat the two topics, in order to have greater variance and reflection. Furthermore, to gain a deeper understanding, the influence of other variables was explored, such as the thematic areas and the sectors in which the technologies are most influential. The main contribution of this work is that it provides an overview of the research carried out to date. A number of impressive documentations of established research methods and philosophy have been discussed for several years. Unfortunately, little comparison and integration across studies exists. In this

article, a common understanding of AI and ML research and its variations was created.This paper is not attempting to provide an all-encompassing framework on the literature on AI and ML research. Rather, it attempts to provide a starting point for integrating knowledge across research in this domain and suggests paths for future research. It explores studies in certain novel disciplines: Environmental pollution, medicine, maintenance, manufacturing, etc.Further research is needed to extend the present boundary of knowledge in AI by integrating principles and philosophies of some traditional disciplines into the existing AI frameworks [11-13]

II. METHODOLOGY

The methodological approach used mixes bibliometric, content analysis, and social network techniques. In this study, a state-of-the-art research was conducted through the SCOPUS and Web of Science databases. For the publication time span, the time from 1999 to 2019 was considered with the intent to understand how the level of attention towards the topic has changed before and after the introduction of Industry 4.0. The research methodology chosen for this study was a systematic literature review [14]

Cyber-Security

A smart city is supposed to consist of safe, secure and reliable interconnected sensors, actuators, and relays to gather, process and transmit data to assure trusted and efficient digital services. This inter-connectivity of various devices has opened upcyber-security issues that need to be alleviated [15]

Machine Learning

In simple words learning means either acquiring new knowledge or enhancing or updating individual's skills. Learning new knowledge is the combination of various processes such as acquisition of significant concepts, understanding their meanings and relationships to each other and to the area concerned. Skill enhancement can be interpreted in biological terms as reinforcing a pattern of neural connections for performing the desired function [16]

Intelligent Transportation System

The ITS is a joint application of advanced sensors, control systems, and ICT that generates big data and has effectively impacted the future of ITS and the concept of smart cities [17] The AI, ML, and specifically the DRL techniques are playing a vital role to precisely monitor and estimate the realtime traffic flow data in an urban environment which is a key element for a sustainable ITS [18-19].

Top Highly Influential Analysis

This section lists the most highly cited documents in WoS and Scopus. The list is structured by research source, date, title, authors, source title, and top citation (TP) in WoS or Scopus, according to the research source. The whole list is available in the Appendix A. Looking into the Appendix A, it is possible underline that the document by Larrañaga, Calvo. [20]

III. COMPUTER ASSISTED INSTRUCTION SYSTEMS

Computer assisted instruction has been in use for many years, bringing the power of the computer to bear on the educational process. Early CAI programs essentially imitated previously existing instructional materials. For example, a common CAI technique mirrors a method called programmed instruction. In a programmed instruction text, students read brief instructional material and then are presented with short questions to test their comprehension. Students turn to different pages of the book, depending on their answers to the questions, so that each student effectively programs a different path through the material based on individual comprehension abilities. The CAI technique based on programmed instruction is known as frame-based CAI. The effectiveness of frame based CAI program depends entirely on how well it is designed. Although many successful programs have been developed, frame based CAI programs use computers simply as electronic page turners. An obvious potential application of ES within libraries is for the selection of book sellers or other vendor of library materials carried to its logical conclusion, a system might be developed to select a vendor automate ethical based on past performance in the supply of publications of a particular type such a capability would be especially valuable in the acquisition of material that are less routine-conference proceeding.[21]

IV. AI IMPLEMENTATION IN RADIOLOGY

One practical method for ensuring the viability of AI applications in radiology is adaptive intelligence, which is a part of continuous learning artificial intelligence. Continuous learning AI systems are not like many of its "turnkey" predecessors in that they cannot be employed in a passive way. Instead, radiology departments should be more involved in the development of continuous learning AI through the provision of timely and accurate data feeds, participation in

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quality control, analysis of continuous learning AI results, and ongoing testing of the technology's efficacy. We should realize that, for the time being at least, people tolerating subpar AI output poses a greater risk than AI outsmarting humans. We need to learn how to collaborate with "self improving machines" if we are serious about using them to enhance healthcare. In order to do this, we must completely reframe AI solutions from the adversarial, distant "machines replacing humans" to the cooperative, integrated, and "machines augmenting the work of humans." The uses of AI in daily life are expanding exponentially. Surgeons who specialize in dentistry have always been at the forefront of integrating technology. Understanding a range of ideas and the methods involved will be very beneficial in the future when it comes to quickly adjusting to changes and redefining responsibilities for a fulfilling career. Artificial intelligence has already had a significant impact on the field of medicine and is predicted to have more in the future, especially given the increasing pressure on healthcare facilities to offer high-quality, reasonably priced care to a growing number of patients.[22]

V. ARTIFICIAL INTELLIGENCE IN DRUG DEVELOPMENT AND DISCOVERY

Artificial intelligence has demonstrated tremendous potential as a tool for medication development and discovery in recent years. Artificial intelligence has the potential to accelerate drug development by identifying new targets for drugs, predicting the properties of molecules, and producing treatment options with higher chances of success. Furthermore, artificial intelligence may be used to assess vast amounts of data from clinical trials and real world evidence in order to optimize drug development and improve patient outcomes. Artificial intelligence systems can be trained with vast amounts of biological and chemical data, including molecular structures, clinical trial results, and pharmaceutical information. These algorithms can then be used to predict the qualities of innovative drug candidates, such as their efficacy, safety, and potential side effects. Artificial intelligence will be used more frequently in the pharmaceutical industry, which will lead to new advancements in the study and creation of pharmaceuticals. Artificial intelligence's ability to predict a compound's properties, identify new therapeutic targets, and optimize clinical trials has the potential to fundamentally alter the drug development process. By using artificial intelligence, researchers can expedite the development of novel medicines, enhance patient outcomes, and reduce the time and cost associated with introducing new drugs to the market. Artificial intelligence has a lot of potential to improve healthcare and address unmet medical requirements in the drug development process.[23]

VI. CONCLUSION

This research focused on the study of the state of the art of AI and ML applications, selecting literature on what has now become a particularly hot topic in scientific research. It is necessary to understand the advantages and disadvantages of Artificial Intelligence and machine learning for better user and its application in Libraries and Information Centers. Using artificial intelligence algorithms and data-driven methodologies, researchers can discover new combinations, enhance treatment plans, and personalize medications for each patient, all of which improve patient outcomes. However, the successful integration of artificial intelligence in drug research and discovery requires overcoming a number of challenges. Among these are ensuring data quality, addressing algorithm robustness and interpretability, and considering ethical and legal considerations. Collaboration between researchers, pharmaceutical companies, regulatory bodies, and technology developers will be necessary to fully realize artificial intelligence's potential to revolutionize medication discovery and development. In conclusion, the use of artificial intelligence in drug discovery and research is ground-breaking and incredibly promising. Technologies based on artificial intelligence are being utilized to provide faster and more efficient ways to find therapeutic targets, optimize lead compounds, improve medication safety, and develop personalized medicines. With further research, collaboration, and sensible application, artificial intelligence has the potential to drastically change the pharmaceutical industry and enhance patient care.

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