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Advances In Intelligent Systems: From Artificial Intelligence To Machine Learning And Beyond

Dr. Marco Antonio Marcos Rodríguez[1], Dr. Carlos Alfredo Cerna Muñoz[2], Dra. Aracelli Mónica Aguado Lingán[3], Dr. Jesús Catherine Saldaña Bocanegra[4], Dr. Pedro Enrique Zata Pupuche[5], Dra. María Salomé Gonzales Lizarme[6]

[1]Universidad Cesar Vallejo de Trujillo
https://www.orcid.org0000-0002-6680-826X
[2]Universidad Católica de Trujillo Benedicto XVI Trujillo Perú.
https://www.orcid.org/0000-0002-2433-7703
[3]Universidad Nacional Federico Villareal
https://www.orcid.org/0000-0002-3747-4125
[4]Universidad Cesar Vallejo de Trujillo
https://orcid.org/0000-0001-8314-3215
jesusaldana7777@gmail.com
[5]Universidad Católica de Trujillo Benedicto XVI Trujillo Perú.
https://orcid.org/0000-0002-2433-7703
[6]Universidad Nacional Santiago Antúnez de Mayolo
https://www.orcid.org/0000-0002-7724-8093
sgonzalesl@unasam.edu.pe

Summary

A documentary review was carried out on the production and publication of research papers related to the study of the variables INTELLIGENT SYSTEMS, ARTIFICIAL INTELLIGENCE and AUTOMATIC LEARNING. The purpose of the bibliometric analysis proposed in this document was to know the main characteristics of the volume of publications registered in the Scopus database during the period 2017-2022 by Latin American institutions, achieving the identification of 196 publications. The information provided by this platform was organized through graphs and figures categorizing the information by Year of Publication, Country of Origin, Area of Knowledge and Type of Publication. Once these characteristics have been described, the position of different authors towards the proposed theme is referenced through a qualitative

analysis. Among the main findings made through this research, it is found that Brazil with 104 publications was the Latin American country with the highest scientific production registered in the name of authors affiliated with institutions of that nation. The Area of Knowledge that made the greatest contribution to the construction of bibliographic material referring to the study of Intelligent Systems, Artificial Intelligence and Machine Learning was Computer Science with 151 published documents, and the Type of Publication most used during the period indicated above were Conference Articles with 55% of the total scientific production.

Keywords: Intelligent Systems, Artificial Intelligence, Machine Learning.

1. Introduction

In the last decade, we have continued to witness an evident transformation in the technological environment, the great impulse caused by the integration of artificial intelligence and machine learning. These great advances have not only left behind the traditional paradigms of communication with machines, but bring with them a new facet for daily life, from medical care, finance and other diverse economic sectors. In this document it allows us to glimpse the extraordinary journey that the implementation of artificial intelligence and automatic learning brings us, allowing us to highlight its importance in recent years, evolution and infinity of impacts on society.

Artificial intelligence, often dominated by AI, is the field of computer science dedicated to the creation of new intelligent machines in order to simulate those thought processes and thereby impart human decision making. While, machine learning is considered a subset of AI, which has the function of training future computers to learn from data and thus improve their performance in a certain specific task without the need for programming in advance. Together, AI and ML have become a driver behind some of the most transformative technological advances of our time.

The evolution of AI and ML has been marked by important milestones. In the early days of AI research, the focus was on rule-based systems and expert systems. However, real breakthroughs began to emerge with the development of neural networks and deep learning algorithms. These techniques, inspired by the

structure of the human brain, allowed computers to process large amounts of data and recognize complex patterns, leading to substantial improvements in tasks such as image and speech recognition. One of the defining moments in the journey of AI and ML was the arrival of Big Data. With the proliferation of digital devices and the Internet, we now generate and have access to an unprecedented amount of data. This data became the lifeblood for training and fine-tuning machine learning models, making AI applications more accurate and powerful than ever before.

The rapid advancement of AI and machine learning also raises ethical and societal concerns, including issues related to bias, privacy, job displacement, and the potential for misuse. Addressing these challenges is essential to ensure that the benefits of AI and machine learning are accessible and equitable to all. As we continue to push the boundaries of artificial intelligence and machine learning, it is imperative to strike a balance between innovation and ethical considerations. The journey from early AI concepts to today's intelligent systems is impressive and it is clear that AI and machine learning will play a pivotal role in shaping the future of technology and society. This series will explore the remarkable developments, applications and implications of AI and ML, providing insights into this exciting and ever-evolving field. For this reason, this article seeks to describe the main characteristics of the compendium of publications indexed in Scopus database related to the variables INTELLIGENT SYSTEMS, ARTIFICIAL INTELLIGENCE and AUTOMATIC LEARNING, as well. As the description of the position of certain authors affiliated with Latin American institutions, during the period between 2017 and 2022.

2. General Objective

Analyze from a bibliometric and bibliographic perspective, the elaboration and publication of research works in high impact journals indexed in Scopus database on the variables Intelligent Systems, Artificial Intelligence, Machine Learning during the period 2017-2022 by Latin American institutions.

3. Methodology

This article is carried out through a mixed orientation research that combines the quantitative and qualitative method.

On the one hand, a quantitative analysis of the information selected in Scopus is carried out under a bibliometric approach of

the scientific production corresponding to the study of the variables Intelligent Systems, Artificial Intelligence, Machine Learning. On the other hand, examples of some research works published in the area of study indicated above are analyzed from a qualitative perspective, starting from a bibliographic approach that allows describing the position of different authors against the proposed topic. It is important to note that the entire search was performed through Scopus, managing to establish the parameters referenced in Figure 1.

3.1. Methodological design

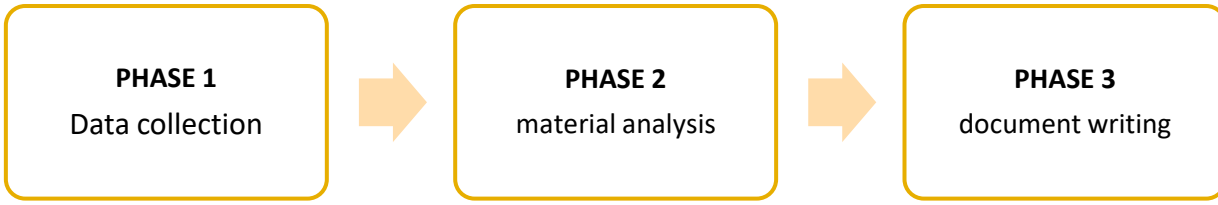

Figure 1. Methodological design
Source: Authors.

3.1.1 Phase 1: Data collection

Data collection was executed from the Search tool on the Scopus website, where 196 publications were obtained from the choice of the following filters:

TITLE-ABS-KEY (intelligent AND systems AND artificial AND intelligence, AND machine AND learning) AND PUBYEAR > 2016 AND PUBYEAR < 2023 AND (LIMIT-TO (AFFILCOUNTRY , "Mexico") OR LIMIT-TO (AFFILCOUNTRY , "Brazil") OR LIMIT-TO (AFFILCOUNTRY , "Colombia") OR LIMIT-TO (AFFILCOUNTRY , "Ecuador") OR LIMIT-TO (AFFILCOUNTRY , "Chile") OR LIMIT-TO (AFFILCOUNTRY , "Argentina") OR LIMIT-TO (AFFILCOUNTRY , "Uruguay") OR LIMIT-TO (AFFILCOUNTRY , "Peru") OR LIMIT-TO (AFFILCOUNTRY , "Costa Rica") OR LIMIT-TO (AFFILCOUNTRY , "Venezuela") OR LIMIT-TO (AFFILCOUNTRY , "Cuba") OR LIMIT-TO (AFFILCOUNTRY , "Puerto Rico"))

- Published documents whose study variables are related to the study of the variables Intelligent Systems, Artificial Intelligence and Machine Learning.
- Limited to the period 2017-2022.
- Limited to Latin American countries.
- Without distinction of area of knowledge.
- Regardless of type of publication.

3.1.2 Phase 2: Construction of analysis material

The information collected in Scopus during the previous phase is organized and subsequently classified by graphs, figures and tables as follows:

- Co-occurrence of words.
- Country of origin of the publication.
- Area of knowledge.
- Type of publication.

3.1.3 Phase 3: Drafting of conclusions and outcome document

In this phase, we proceed with the analysis of the results previously yielded resulting in the determination of conclusions and, consequently, the obtaining of the final document.

4. Results

4.1 Co-occurrence of words

Figure 2 shows the co-occurrence of keywords found in the publications identified in the Scopus database.

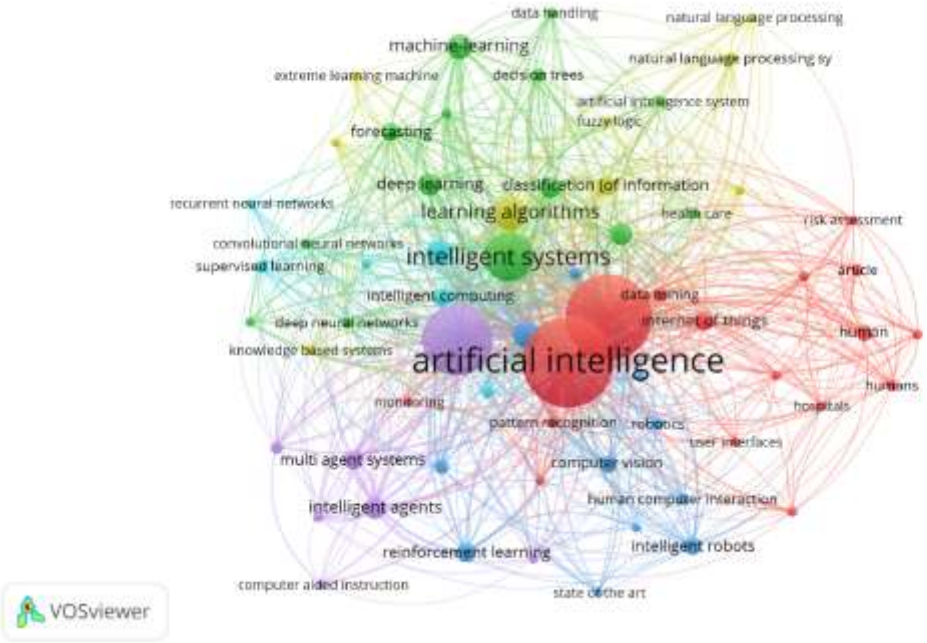

Figure 2. Co-occurrence of words
Source: Own elaboration (2023); based on data exported from Scopus.

Artificial Intelligence was the most frequently used keyword within the studies identified through the execution of Phase 1 of the Methodological Design proposed for the development of this article. Intelligent Systems is also among the most frequently used variables, associated with variables such as Intelligent Agents, Big Data, Information and Classification, Machine Learning, Natural Language. From the above, it is striking that the present advances in artificial intelligence and machine learning are achieving a transformation in industries, from the creation of new opportunities and new important approaches. These technologies are constantly evolving and are expected to bring greater innovation and change, impacting diverse fields such as finance, education, entertainment and more. As artificial intelligence and machine learning continue to evolve, their impact on our daily lives and society as a whole is undeniable, making them an essential part of the digital age.

4.2 Distribution of scientific production by year of publication

Figure 3 shows how scientific production is distributed according to the year of publication.

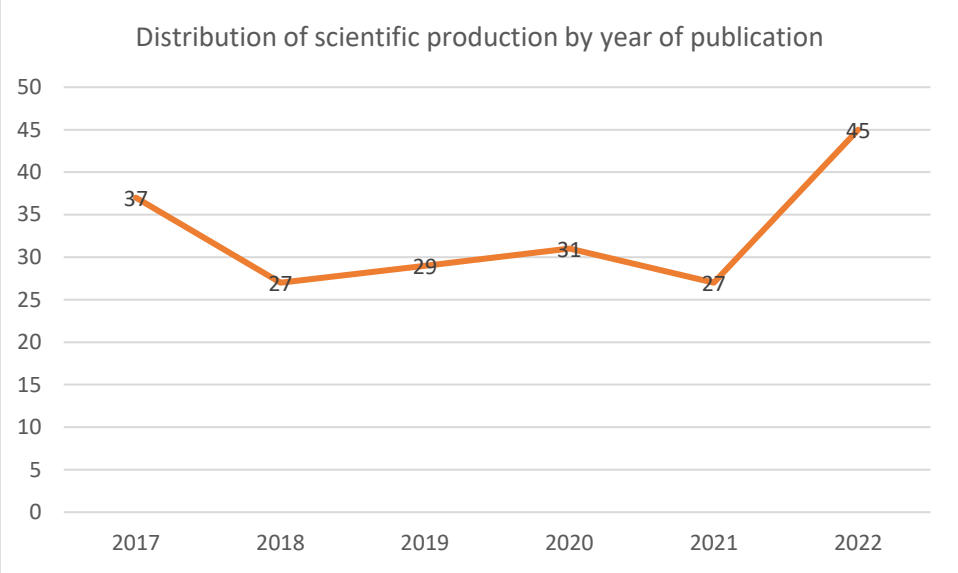

Figure 3. Distribution of scientific production by year of publication.
Source: Own elaboration (2023); based on data exported from Scopus

Among the main characteristics evidenced by the distribution of scientific production by year of publication, a level of number of publications registered in Scopus was the years 2022, reaching a total of 45 documents published in journals indexed in said platform. This can be explained thanks to articles such as the one entitled "Approaches based on LAMDA control applied to the regulation of HVAC systems of buildings" This article presents new control alternatives for HVAC systems based on LAMDA (Learning Algorithm for Multivariable Data Analysis). This algorithm has been used in the field of machine learning, however, we have taken advantage of its learning features to propose different types of intelligent controllers to improve the performance of the global control system in regulation and reference change tasks. For comparative analysis in the context of HVAC systems, conventional methods such as PID and Fuzzy-PID are compared with LAMDA-PID, LAMDA-Z-number-based sliding mode control (ZLSMC), and adaptive LAMDA. Specifically, two HVAC systems are implemented through simulations to evaluate the proposals: an HVAC MIMO (Multiple-input Multiple-output) system and an HVAC system with downtime, which are used to qualitatively and quantitatively compare the results. The results show that ZLSMC is the most robust controller, which efficiently controls HVAC systems in cases

of reference changes and presence of disturbances.(Morales L, 2022)

4.3 Distribution of scientific production by country of origin.

Figure 4 shows how scientific production is distributed according to the nationality of the authors.

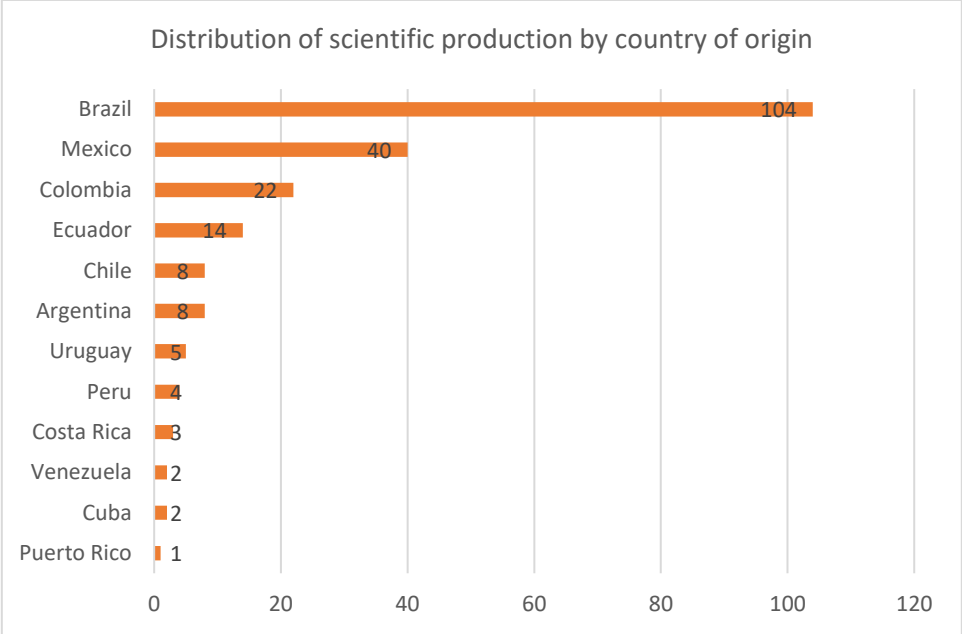

Figure 4. Distribution of scientific production by country of origin.
Source: Own elaboration (2023); based on data provided by Scopus.

Within the distribution of scientific production by country of origin, records from Latin American institutions were taken into account, establishing Brazil, as the country of that community, with the highest number of publications indexed in Scopus during the period 2017-2022, with a total of 104 publications in total. In second place, Mexico with 40 scientific papers, and Colombia occupying the third place presenting to the scientific community, with a total of 22 documents among which is the article entitled "Intelligent autonomous model of detection and classification of small ships enabled for deep learning" whose scope of study is based on presenting an efficient technique of optimal mask regional convolutional neural network (Mask-CNN) for ship detection small (OMRCNN-SHD) in autonomous shipping technologies. Primarily, the data augmentation process is done to solve the problem of the

limited number of real-world small ship samples and helps to detect small ships accurately in most cases. In addition, the Mask RCNN model with SqueezeNet is used to detect ships and the hyperparameter adjustment of the SqueezeNet model is done by using the Adagrad optimizer. In addition, the collision body optimization (CBO) algorithm with the weighted regularized extreme learning machine learning (WRELM) technique is used to classify detected ships effectively. The comparative analysis of results demonstrates the improvement of the OMRCNN-SHD technique over current methods with a maximum accuracy of 98.63%.(Escorcia-Gutierrez, 2022)

4.4 Distribution of scientific production by area of knowledge

Figure 5 shows the distribution of the elaboration of scientific publications from the area of knowledge through which the different research methodologies are implemented.

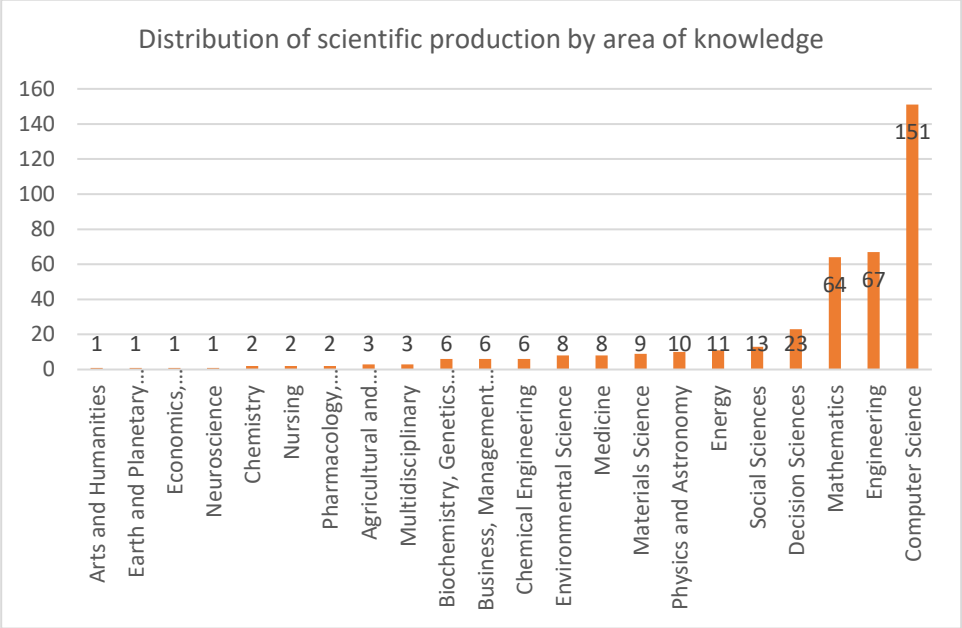

Figure 5. Distribution of scientific production by area of knowledge.
Source: Own elaboration (2023); based on data provided by Scopus.

Computer Science was the area of knowledge with the highest number of publications registered in Scopus with a total of 151 documents that have based their variable methodologies INTELLIGENT SYSTEMS, ARTIFICIAL INTELLIGENCE and MACHINE LEARNING. In second place, Engineering with 67 articles and

Mathematics in third place with 64. The above can be explained thanks to the contribution and study of different branches, the article with the greatest impact was registered by the Computer Science area entitled "Traffic flow prediction for intelligent traffic lights using machine learning algorithms" This article proposes machine learning (ML) and deep learning (DL) algorithms to predict traffic flow at an intersection, thus laying the foundation for adaptive traffic control, either by remote control of traffic lights or by applying an algorithm that adjusts the time according to the predicted flow. Therefore, this work only focuses on predicting traffic flow. Two public datasets are used to train, validate and test the proposed ML and DL models. The first contains the number of vehicles sampled every five minutes at six intersections for 56 days using different sensors. For this research, four of the six intersections are used to train the ML and DL models. The multilayer perceptron neural network (MLP-NN) performed better (R-squared and EV score of 0.93) and required less training time, followed closely by gradient momentum and then recurrent neural networks (RNNs), with good results in metrics but with longer training. time, and finally Random Forest, Linear Regression and Stochastic Gradient. All ML and DL algorithms obtained good performance metrics, indicating that they are feasible to implement in smart traffic light controllers.(Navarro-Espinoza, 2022)

4.5 Type of publication

In the following graph, you will observe the distribution of the bibliographic finding according to the type of publication made by each of the authors found in Scopus.

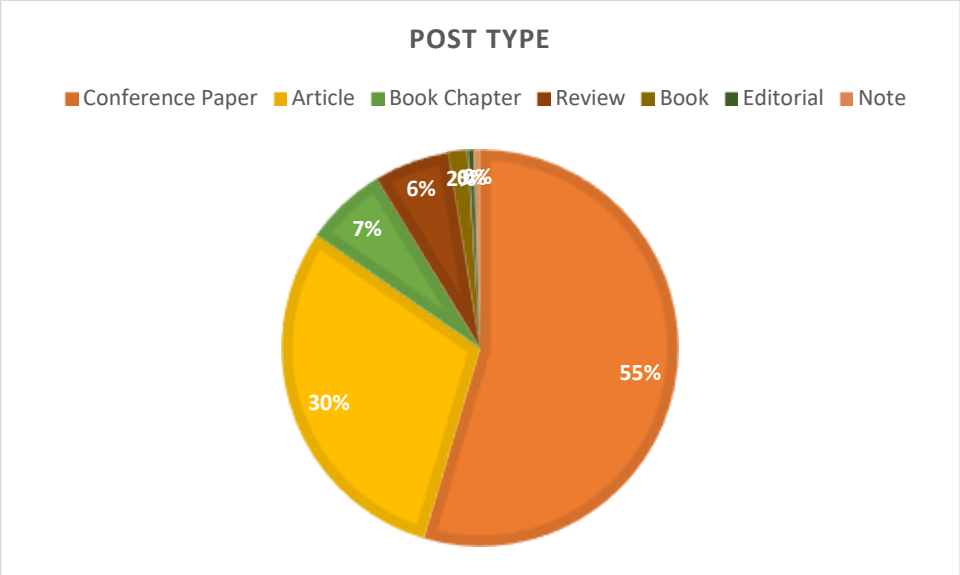

Figure 6. Type of publication.
Fountain: Own elaboration (2023); based on data provided by Scopus.

The type of publication most frequently used by the researchers referenced in the body of this document was entitled Conference Article with 55% of the total production identified for analysis, followed by Journal Article with 14%. Chapter of the Book are part of this classification, representing 4% of the research papers published during the period 2017-2022 in journals indexed in Scopus. In this last category, the one entitled "Using care methods to predict judicial outcomes" stands out In this study, we used an artificial intelligence classifier to predict the decisions of Brazilian courts. Also, kindly confirm that the metadata details are correct. To this end, we developed a text tracker to extract data from official Brazilian electronic legal systems, consisting of two datasets of second-degree murder and active corruption cases. We apply various classifiers, such as support vector machines, neural networks, and others, to predict judicial outcomes by analyzing text characteristics of the dataset. Our research showed that regression trees, closed recurrent units, and hierarchical attention networks tended to have higher metrics in our datasets. As an end goal, we searched the weights of one of the algorithms, Hierarchical Attention Networks, to find samples of the words that could be used to acquit or convict defendants based on their relevance to the algorithm.(Bertalan, 2022)

5. Conclusions

Through the bibliometric analysis carried out in the present research work, it was established that Brazil was the country with the largest number of records published for the variables INTELLIGENT SYSTEMS, ARTIFICIAL INTELLIGENCE and AUTOMATIC LEARNING. with a total of 104 publications in the Scopus database. In the same way, it was established that the application of theories framed in the area of Computer Science, technological advances in artificial intelligence and machine learning have revolutionized various industries and impacted our daily lives in numerous ways. Machine learning algorithms have played a crucial role in data analysis and predictive modeling. They have been employed in various fields, including healthcare, finance, and marketing, to discover patterns and make accurate predictions. Machine learning has also driven advances in autonomous vehicles, allowing them to navigate and make decisions based on real-time data. These technological advances have brought both benefits and challenges. On the one hand, AI and ML have improved efficiency, productivity and decision-making processes. They have also created new job opportunities and improved personalized experiences for consumers. On the other hand, concerns have arisen regarding privacy, security, and ethical implications. Regulations and guidelines are needed to ensure the responsible and unbiased use of AI and ML technologies. Looking ahead, the potential of AI and ML is immense. Continuous research and development will lead to new breakthroughs, making these technologies even more sophisticated and capable. However, it is important to strike a balance between innovation and ethical considerations to ensure that these advances are used to improve society as a whole.

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