Review

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Impact of Machine Learning Methods on the Development of Artificial Intelligence: A Review

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ABSTRACT

Artificial intelligence (AI) and machine learning (ML) have revolutionized a wide range of fields and sectors. Without explicit programming, machine learning methods allow artificial intelligence (AI) systems to examine massive volumes of data, spot trends, and make data-driven judgments. As a result, decision making has changed dramatically in industries such as marketing, banking, and healthcare, where AI can now deliver insights more quickly and accurately. Ultimately, the combination of artificial intelligence and machine learning has opened up a world of new possibilities by enabling AI systems to continuously learn, adapt, and change. Machine learning's influence on AI is changing how companies run, how services are provided, and how issues are resolved. This signals the arrival of an era in which intelligent systems will propel innovation and advancement in every industry.

This article discusses machine learning methods and impact of machine learning on artificial intelligence, such as making better decisions, personalization, data automation, and predictive analytics. Also, discusses applications of machine learning in artificial intelligence in various fields such as recommendation systems, healthcare, finance, self-driven artificial intelligence, and marketing and sales. In order for the reader to properly engage in this expanding sector, the review attempts to assist him in developing a solid knowledge basis and comprehending how these technologies impact different facets of life.

Keywords: machine learning; artificial intelligence; applications; analysis; prediction.

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INTRODUCTION

Thus, artificial intelligence refers to the optimum development of artificial human brains capable of comprehending, categorizing, interpreting and processing natural language. It is the theory and study of artificial intelligence these being the computer systems that are able perform functions that otherwise require the human intelligence including speech recognition, visual perception, language translation, and decision making. Artificial intelligence on information technology is mostly related to equipment intended to accomplish tasks that would otherwise be accomplished by people [1]. The last ten years in turn have witnessed, quite a revival of the fields very much related to Artificial intelligence or rather machine learning due to certain revolutionary developments in the realms of computer technology. Consequently, aspect of big data, that is, the collection and management of large volumes of data, has been found to have registered a significant progress [2]. They are the theory behind the design of computer systems for undertaking activities such as speech recognition and language translation, visual interpretation and decision making that require intelligence [3]. The Artificial Intelligence field in Information Technology mainly has to do with machines that are designed to perform in the capacity of humans [4].

Artificial intelligence is made of two key forms of learning: machine learning and deep learning. The models are used by people, business, and governors to predict and analyze data and other people. Such machine learning models are now under construction to factor in the variability and richness of data available in foods industry [5].

The remainder of the review is structured as follows: Explanation about the machine learning methods in section 2. Section 3 include clarification how does machine learning affect artificial intelligence. Furthermore, Section 4 Machine learning applications in the field of artificial intelligence. Finally, section 5 provides an outline of the conclusion.

Machine Learning Methods

Machine learning methods are specific mathematical models or procedures used to learn patterns from data and make predictions or decisions. The link between machine learning and artificial intelligence is seen in Fig. 1 [1].

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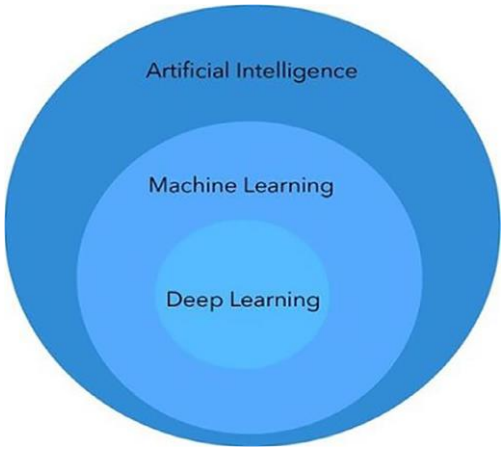

Figure 1: Relationship between AI and ML [1]

Here are some common machine learning algorithms, as shown in Fig. 2:

1) **Linear Regression**: One method for simulating the relationship between variables in engineering, physics, chemistry, and other fields is regression analysis. Regression analysis is the most popular statistical and predictive method [6]. Analyzing dependent and independent variables as well as their relationship which may be represented as a line crossing the collected data is what linear regression consists of. The formula $Y1=\alpha1+\beta1X1+\epsilon$, where $\alpha1$, $\beta1$ are the regression coefficients, X1 are the independent variables, and ϵ are the dependent variables, determines the simplest linear regression model. Analyzing dependent and independent variables as well as their relationship which may be represented as a line crossing the collected data is what linear regression consists of [7].

2) **Logistic Regression**: It is one of supervised machine learning methods that used to solve classification problems where the aim is to predict the probability of being the case belongs to a specific class or not. A procedure used in statistics to examine the relationship between two data components is called logistic regression. The article examines the kinds, applications, and foundations of logistic regression [8,9].

3) **Support Vector Machines (SVM):** is a technique in machine learning that by doing optimal transformation on data delimits data points based on the defined classes, labels or outputs. This it achieves through tackling complex issues of identification of classes, regression and outlier detection under the supervised learning[10]. SVM translates the data in to a high dimensional feature space for classification independent of the fact that the data might not be linearly separable. Once a separator between the categories has been found, it means that some modifications should be made on the data, to ensure that this separator can be represented as a hyperplane [11,12].

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4) **Decision Trees:** A decision tree is a graphical representation of analytically forecasting or decision-making tool in the form of a tree. It has nodes that characterise an attribute decision or test, branches that present the consequences of these decisions or tests, and end nodes that present conclusion or prognosis. Every node at the base level provides a class label or a continuous value, every internal node provides a test of the attribute and every arrow reflects the result of the test [13]. At this stage, there is a common issue known as overfitting, which plagues decision trees where the tree is allowed to become very detailed and complex, and extends to a very large number of levels. This is where pruning and using ensemble techniques such as the Random forests help decision trees to perform better not to mention that the decision trees will be free from cases of overfitting. Thus, the decision trees often apply to activities such as fraudulent account detection, risk evaluation, consumers' classification, and many others within various industries, to mention the marketing, banking or healthcare [14].

5) **Random Forest:** From the decision trees one system for group learning is known as Random Forest. In the training phase, it grows a large number of decision trees from which it generates the mode of the classes (classification) or the average of the prediction (regression) of the individual trees [15].

6) **K-Nearest Neighbors (KNN):** For problems involving regression and classification, this algorithm is a straightforward yet effective supervised machine learning approach. It functions according to the idea that comparable data points are probably members of the same class or have comparable values [16].
Since KNN is an instance-based, non-parametric method, it does not make any strong assumptions about the distribution of the underlying data. It may be applied to binary and multiclass classification issues and is resilient to noisy input. For instance, if K is set to 5 and a new image of a digit is given, by examining the five closest photos in the training set, the algorithm determines the class label that is the most frequently used among those five images. A KNN model is used to categorize handwritten digits based on pixel values. Although KNN is simple to comprehend and apply, the computation of distances that separate each new data point from each current data point during prediction can be costly, particularly when dealing with huge datasets [17].

7) **K-Means Clustering:** K-Means unsupervised machine learning method called clustering divides a dataset into K unique, non-overlapping clusters. K-Means aims to cluster data points according to how similar they are, with each cluster being identified by its centroid, which is the average of the data points in that cluster [18]. Distance calculations between new and existing data points make predictions computationally expensive, especially for large datasets.

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These algorithms, with their unique characteristics and capabilities, play a crucial role in various machine learning applications, contributing to the development of artificial intelligence and data-driven decision-making [19].

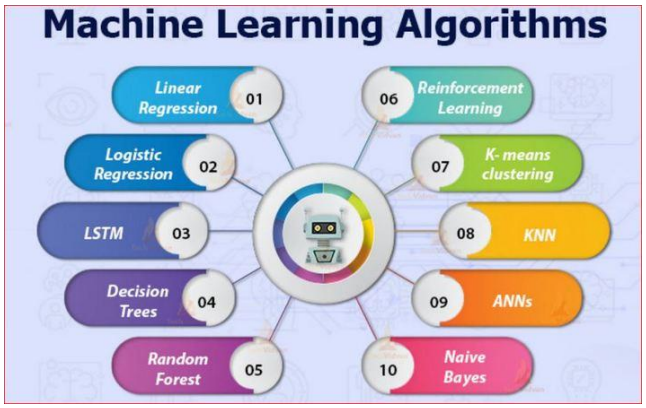

Figure 2 : Machine learning algorithms [20]

How does machine learning affect artificial intelligence?

Machine learning is the field of artificial intelligence (AI) that concentrates on evolving models and algorithms that enable computers to learn from data and make decisions or predictions without needing to an explicit programming. Machine learning has improved the capabilities of artificial intelligence in several ways:

1) **Better Decision Making:** Because machine learning can quickly handle large amounts of data, it is an essential tool for decision-making because it can ensure objectivity and accuracy while reducing bias and human mistake. In today's data-driven environment, its versatility, inventive potential, and capacity to manage intricate, multiple issues render it necessary. Furthermore, by continuously learning from fresh data, machine learning advances, providing a proactive and effective method of decision-making that is unmatched by human judgment [21].
2) **Personalization:** The potential of AI in marketing to create hyper-personalized experiences for customers is one of its biggest benefits. AI algorithms are able to personalize offers, product recommendations, and marketing messages to each customer by examining their unique tastes, historical behavior, and contextual data. Personalization increases conversion rates, strengthens brand loyalty, and increases customer engagement.
3) **Processing of natural language:** Within the artificial intelligence field, processing of natural language examines how people and robots communicate using natural language. NLP systems can read, process, and generate text by studying and comprehending human language, which helps organizations communicate with their consumers more effectively[23].

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4) **Computer Vision:** Machine learning techniques have improved the comprehension and analysis of visual data by AI systems. Applications for computer vision include driverless cars, object identification, facial recognition, and medical picture analysis [24].
5) **Automation:** AI systems can now automate repetitive jobs and processes, which boosts productivity and efficiency. Automation is widely used in industries like data input, customer service, and manufacturing. This is made possible by machine learning [25].
6) **Predictive analytics:** By using historical data, machine learning models are able to predict future patterns, behaviors, and results. This predictive power improves decision-making in fields such as marketing (forecasting client demand), healthcare (diagnosing diseases), and finance (stock price prediction) [26].

The incorporation of machine learning techniques into artificial intelligence (AI) systems has essentially broadened the scope and possible uses of AI across multiple domains, resulting in increasingly intelligent, effective, and flexible systems that possess the ability to learn and evolve over time [2].

Machine learning applications in the field of artificial intelligence

Machine learning (ML) is employed in Artificial intelligence (AI) in numerous ways in order to enhance the capability of AI systems to perform the tasks that require learning from data. It is now possible, by focusing on a few particular AI uses for machine learning as illustrated in Fig. 3:

1) **Recommendation Systems:** Recommendation engines, which offer users tailored content or product recommendations based on their behavior and preferences, are powered by machine learning algorithms. Machine learning is used by Amazon and Netflix in their recommendation algorithms [27].

2) **Healthcare:** Medical imaging analysis, disease diagnosis, individualized therapy recommendations, and drug development are among the AI applications in healthcare that use machine learning (ML) [28].

3) **Finance:** Within the finance sector, machine learning is used in credit scoring, algorithmic trading, fraud detection, and risk assessment. Financial data is analyzed by ML algorithms to find trends and abnormalities that point to fraud [29].

4) **AI-driven autonomous vehicles**: rely heavily on machine learning (ML) to perform tasks like course planning, object detection, and real-time decision-making. ML algorithms are used by companies such as Tesla to power its self-driving car technology [30].
5) **Marketing and Sales:** In marketing and sales applications, machine learning is used for customer segmentation, churn prediction, marketing campaign optimization, and sales forecasting. Artificial intelligence (AI) technologies evaluate consumer data to tailor marketing campaigns and boost revenue [31].

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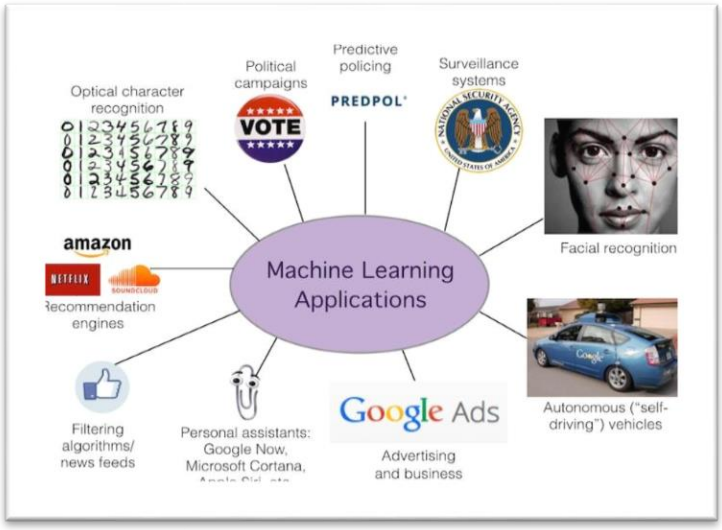

Figure 3: Machine learning applications [32]

CONCLUSION

Artificial intelligence is greatly influenced by machine learning. Because machine learning makes it possible for AI systems to learn from data, recognize patterns, and generate well-informed opinions on their own, it has revolutionized industries, enhanced user experiences, and sparked creativity. Through the application of machine learning techniques, artificial intelligence has transformed a number of industries, including computer vision, natural language processing, predictive analytics, and personalized recommendations. In addition to increasing productivity and accuracy, this collaboration has opened the door for the creation of more sophisticated AI systems with practical applications.

Conflict of interests.

There are non-conflicts of interest.

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