Overview of Artificial Intelligence

SAKSHI KATARIA

B. Tech Student Dronacharya College of Engineering, Gurgaon, Haryana

Abstract— Since the invention of computers or machines, their capability to perform various tasks went on grown exponentially. Humans have developed the power of computer systems in terms of their diverse working domains, their speed, and reducing size concerning time. A branch of Computer Science named "Artificial Intelligence" pursues creating computers or machines as intelligent as human beings. The term artificial intelligence broadly refers to applications of technology to perform tasks that resemble human cognitive function and is generally defined as "the capability of a machine to imitate intelligent human behavior."

Indexed Terms-- Machine Learning, Supervised and unsupervised learning, Natural Language Processing, Robotics process Automation, Applications of AI, Key Components of AI Applications.

I. INTRODUCTION

Artificial intelligence typically involves the theory and development of computer systems or machines able to perform tasks normally requiring human intelligence, such as visual perception, decision-making, language translation, and speech recognition. John McCarthy, one of the founders of AI research, once defined the field as getting a computer to do things that, when done by people, are said to involve intelligence. According to John McCarthy, it is "*The science and engineering of making intelligent machines, especially intelligent computer programs*".

AI is accomplished by studying how the human brain thinks, and how humans learn, decide, and work while trying to solve a problem, and then using the output of this study as an input basis for developing intelligent software and systems.

Goals of AI

- To create Expert Systems
- To implement Human Intelligence in Machines or Computer Systems

II. SCOPE OF ARTIFICIAL INTELLIGENCE

AI is used as an umbrella term that encompasses a broad spectrum of different technologies and applications, some of which are described as follows:

- MACHINE LEARNING: -
Machine learning (ML) is one of the most talked-about topics in the world of technology. Machine learning is a field of computer science that uses algorithms to process data and learn from it. ML models learn from input data to identify meaningful patterns without being regularly programmed to do so. There are different types of machine learning models, some of them are described below:

- Supervised Machine Learning: -
In supervised Machine Learning, the machine is trained with labeled input data that correlates to a specified output. For example, a dataset of animal photos can be labeled as "cats" or "not cats". The model is continuously refined to provide more accurate output as additional training data becomes available. After the model has studied the patterns in the training data, it can then analyze additional data to produce the desired output. In supervised learning, supervision is needed. Supervised machine learning is successful when the model can consistently produce accurate predictions when provided with new datasets.

Supervised learning is classified into two categories:
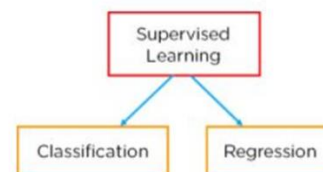
Classification: A classification problem is when the output variable is a category, such as *green* or *yellow, disease* or *no disease*.

Regression: A regression problem is when the output variable is a real value, such as *rupees* or *height*.

- Unsupervised Machine Learning: -

In unsupervised ML, the input data is not labeled nor is the output specified. The machines are fed large amounts of data and the algorithms are designed to identify any underlying meaningful patterns. The algorithms may cluster similar data but do so without any preconceived notion of the output. Here the task of the machine is to group unsorted information according to similarities, patterns, and differences without any prior training in data.

For Example, suppose a dataset contains both dogs and cats that the machine has never seen. Thus, the machine has no idea about the features of dogs and cats so we can't categorize them as 'dogs and cats, but it can categorize them according to their similarities, patterns, and differences. The first may contain all pics having *dogs* in them and the second part may contain all pics having *cats* in them. Here you didn't learn anything before, which means no training data is given.

It allows the model to work on its own to discover patterns and information that was previously undetected. It mainly deals with unlabelled data.

Unsupervised learning is classified into two categories of algorithms:
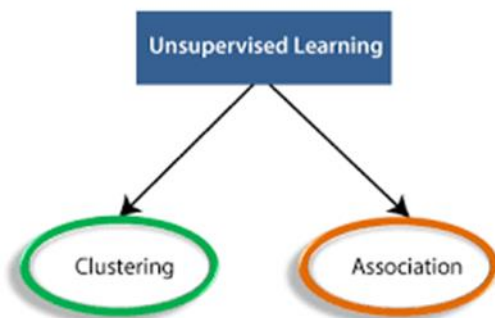
Clustering: A clustering problem is where you want to discover the inherent groupings in the data, such as grouping customers by purchasing behaviors.

Association: An association rule learning problem is where you want to discover rules that describe large portions of your data, such as suggestions about people that like X products and also tend to like Y products similar to X.
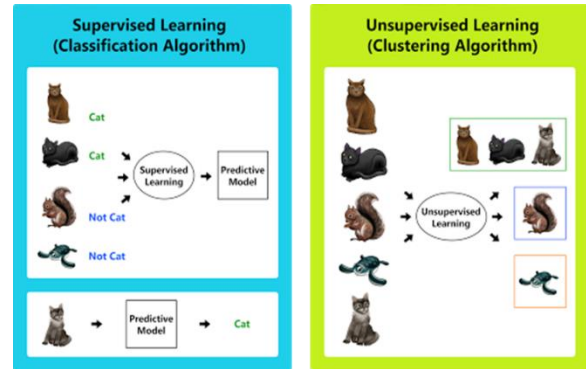
Reinforcement Learning: - In reinforcement learning agents can perceive and interpret their environment, take actions and learn through trial and error. If the model algorithm performs correctly and achieves the intended output, it is rewarded. And, if it does not produce the desired output, it is penalized. Accordingly, the model learns over time to perform in a way that maximizes the net reward. For example, in the securities industry, reinforcement learning models are being explored for options pricing.
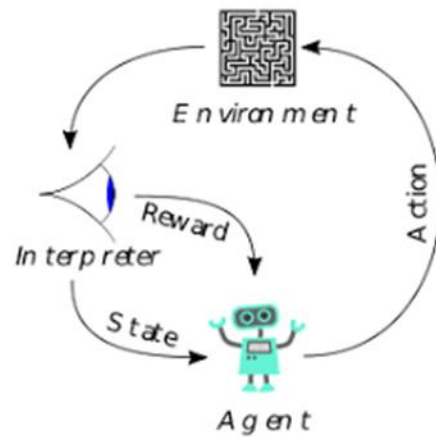
Deep Learning: A deep learning model is built on an artificial neural network, in which algorithms process

large amounts of unlabelled or unstructured data through multiple layers of learning in a manner inspired by how neural networks function in the brain. These models are basically used when the data is large in volume, obtained from disparate sources, and may have different formats (*e.g.*, text, voice, and video).

III. APPLICATIONS OF ARTIFICIAL INTELLIGENCE

AI has been used in various fields of technologies such as -

- Gaming: -AI plays a crucial role in strategic games such as chess, poker, tic-tac-toe, etc., where the machines can think of a large number of possible positions based on heuristic knowledge.
- Expert Systems: - Some applications integrate machines, software, and special information to impart reasoning and advising. They provide explanations and advice to the users.
- Speech Recognition: -Some intelligent systems are capable of hearing and comprehending the language in terms of sentences and their meanings while a human talks to it. It can handle different accents, slang words, noise in the background, changes in human noise due to cold, etc.
- Handwriting Recognition: - The handwriting recognition software reads the text written on paper with a pen or on-screen by a stylus. It can recognize the shapes of the letters and convert them into editable text.
- Intelligent Robots: - Robots can perform the tasks given by a human. They have sensors to detect physical data from the real world such as light, heat, temperature, movement, sound, bumps, and pressure. They have efficient processors, multiple sensors, and huge memory, to exhibit intelligence. In addition, they are capable of learning from their mistakes and they can adapt to a new environment.
- Fraud Prevention: - Credit card fraud and fake reviews are two of the most significant issues that E-Commerce companies deal with. By considering the usage patterns, AI can help reduce the possibility of credit card fraud taking place. Many customers prefer to buy a product or service based on customer reviews. AI can help identify and handle fake reviews.

- Spam Filters: - The email that we use in our day-to-day lives has AI that filters out spam emails sending them to spam or trash folders, letting us see the filtered content only.

IV. DIFFERENCE BETWEEN HUMAN AND MACHINE INTELLIGENCE

- Humans perceive by patterns whereas the machines perceive by a set of rules and data.
- Humans store and recall information by patterns, machines do it by searching algorithms. For example, the number 121212 is easy to remember, store, and recall as its pattern is simple.
- Humans can figure out the complete object even if some parts of it are missing, whereas the machines cannot do it correctly.

V. KEY COMPONENTS OF AI APPLICATIONS

AI applications generally involve the use of data, algorithms, and human feedback.

Data: Data generation in the financial services industry has grown exponentially over the past decade, in part due to the use of mobile technologies and the digitization of data. The importance of data is increasing rapidly, and some have even referred to data as a more valuable resource than crude oil. Furthermore, cloud technology has enabled firms to collect, store, and analyze significantly large datasets at very low costs Data plays a critical role in the training and success of any AI applications. AI applications are generally designed to analyze data by identifying patterns and making determinations or predictions based on those patterns. The applications continuously learn from any inaccurate determinations made by such applications, typically identified through human feedback as well as from new information, and tune the outputs accordingly.

- Algorithms: An algorithm is a set of well-defined instructions for a machine to solve a problem and generate an output using a set of input data. An Artificial Intelligence algorithm is "not programmed to perform a task, but is programmed

to learn to perform the task." The availability of algorithms, including those from the largest technology companies has helped fuel AI innovation and made the technology more accessible to the financial industry.

- Human interaction: Human involvement is imperative throughout the lifecycle of any Artificial Intelligence application, from preparing the data and the algorithms to checking the output, maintaining the model, and verifying results. As data is collected and prepared, human reviews are essential to curate the data as appropriate for the application. As algorithms sift through data and generate output, the next important component is human feedback on the output for relevancy, accuracy, and usefulness

REFERENCES

[1] American Association for Artificial Intelligence (AAAI), Welcome to AI Topics, 2003, http://www.aaai.org/AITopics/ -- a Web-based library of introductory information about various areas of artificial intelligence; altogether, a resource with links to hundreds (thousands?) of sites, organized by an easy-to-use, interactive index.

[2] George Luger, Artificial Intelligence: Structures and Strategies for Complex Problem Solving, Fourth Edition Addison-Wesley, 2002 -- a well-respected introduction to artificial intelligence, as witnessed by its being in its fourth edition.

[3] Peter Norvig, AI on the Web, http://aima.cs.berkeley.edu/ai.html -- a list of over 800 links on various aspects of artificial intelligence.

[4] Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kaufmann Publishers, 1998 -- another fine introductory textbook on artificial intelligence.

[5] Stuart Russell and Peter Norvig, Artificial Intelligence: A Modern Approach, Second Edition, Prentice-Hall, 2003 -- the leading introductory textbook in the field.