An Overview of Artificial Intelligence

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ABSTRACT: Artificial Intelligence is the study of how machines can learn exactly like people and how to respond to specific actions. Artificial intelligence (AI) deals with the theory and practise of developing systems that exhibit human intelligence-like traits, such as perception, natural language processing (NLP), problem solving and planning, and learning and adaptation, as well as the ability to act in response to the environment. In terms of science, its major objective is to understand the principles that enable intelligent behaviour in people, animals, and synthetic entities. Artificial Intelligence has roots in and intersects with a wide range of other disciplines, including mathematics, linguistics, psychology and neuroscience as well as electrical and mechanical engineering as well as statistics, economics, control theory and cybernetics, as well as philosophy. However, it has also contributed to these fields by adopting numerous concepts and approaches. There is still a lot of scope of research in field of artificial intelligence which might completely revolutionize the world. Artificial intelligence-enabled human-computer super minds are expected to enable new kinds of social activity in business, research, and art that are as distinct from what humans know.

KEYWORDS: Algorithms, Artificial Intelligence, Machines, Research, Support Vector Machine.

1. INTRODUCTION

1.1 History of Artificial Intelligence:

As early as 1956, John McCarthy introduced the idea of artificial intelligence as part of his first academic conference. Alan Turing, a mathematician, proposed the concept that robots might think and learn like humans. When Alan Turing tested if "machines can think" he was able to put his theories and questions into action. Testing (later referred to as the Turing Test) has shown that robots can think and learn just like humans. In the early days of artificial intelligence research, basic toy domains were employed to achieve some amazing outcomes. For example, Newell and Simon devised an algorithm that proved most of the theorems in second chapter by Russell and Whitehead Arthur Samuel created a checker playing programme that trains against itself and other players and by playing games with books. A little more than 53,000 locations were stored in the memory after training and the programme became a better than average novice, but clearly not an expert demonstrating that it is possible for rote learning alone to produce meaningful and quantifiable learning[1].

1.2 Basics Introduction of Artificial Intelligence:

Artificial Intelligence is the study of how machines can learn exactly like people and how to respond to specific actions. As technology advances, so does artificial intelligence. As soon as artificial intelligence (AI) was introduced to the market, technology and business industries saw a rapid transformation. Computer scientists anticipate that by 2020, 85 percent of consumer contacts will be managed without a person". So, people will have to rely on computers and artificial intelligence for simple requests such as asking Siri or Galaxy for the weather temperature[2].

Artificial Intelligence (AI) is a branch of science and engineering concerned with the theory and practise of creating systems that exhibit the characteristics we associate with intelligence in human behaviour, such as perception, natural language processing, problem solving and planning, learning and adaptation, and acting on the environment. Its major scientific objective is to decipher the principles that allow people, animals, and artificial entities to behave intelligently. This scientific goal directly supports a number of engineering goals, including the development of intelligent agents, formalising knowledge and mechanising reasoning in all areas of human endeavour, making working with computers as simple as working with people, and developing human-machine systems that take advantage of the complementarity of human and automated reasoning[3].

As a science and engineering field, artificial intelligence (AI) deals with the theory and practise of developing systems that exhibit human intelligence-like traits, such as perception, natural language processing (NLP), problem solving and planning, and learning and adaptation, as well as the ability to act in response to the environment. In terms of science, its major objective is to understand the principles that enable intelligent behaviour in people, animals, and synthetic entities. This scientific aim directly supports numerous technical goals, such as the development of intelligent agents, formalising knowledge and automating reasoning in all fields of human effort, and making working with computers as simple as working with humans, for example building human-machine systems that take use of the complementarity between the two reasoning.

In addition to all computing disciplines, Artificial Intelligence has roots in and intersects with a wide range of other disciplines, including mathematics, linguistics, psychology and neuroscience as well as electrical and mechanical engineering as well as statistics, economics, control theory and cybernetics, as well as philosophy. However, it has also contributed to these fields by adopting numerous concepts and approaches. A few systems, such as an expert or a planning system, can be classified as pure AI applications, but most AI systems are developed as components of complex applications to which they add intelligence in various ways, such as by enabling them to reason with knowledge, process natural language, or learn and adapt.

In their effort to create intelligent behaviour, artificial intelligence researchers use sophisticated approaches. These approaches, however, are widely used and are no longer classified as artificial intelligence once they reach the mainstream. To name just a few: time-sharing, symbolic programming languages (e.g. Lisp, Prolog, and Scheme), symbolic mathematics (e.g. Mathematical), and graphical user interfaces (GUI) and computer games. That said, the area of artificial intelligence (AI) continues to produce new findings and has become a significant technology in many new applications due to its present maturity and the availability of inexpensive processing power.

1.3 Objective of Artificial Intelligence:

Artificial Intelligence's major objective is to create computer entities that display the traits we associate with intelligence in human behaviour. The reasoning skills of such an entity are based on an internal representation of its external world. In general, an agent uses a huge quantity of information and heuristic approaches to tackle complicated real-world issues. Humans should be able to comprehend the agent's knowledge and reasoning, and the agent should be able to explain its behaviour, including what decisions it is making and why. The agent may reason with data pieces that are in some ways contradictory to one another and give a solution without all of the necessary information. The agent should be able to communicate with its users in natural language if possible, and it should be able to learn on its own.

1.4 Early AI systems:

This is due to the fact that most of them had a very limited understanding of their subject matter. Since the search space was relatively tiny, they were able to solve issues by attempting all the potential combinations of steps until a solution was discovered When it was discovered that a system would need enormous quantities of information in order to tackle complicated real world issues, it also needed heuristics to restrict the search for answers in broad problem spaces. Because the cognitive tasks to be automated are not fully understood, developing an intelligent agent is exceedingly challenging. Researchers in artificial intelligence are now focusing on specific cognitive processes, such as learning, and on investigating simple issues in depth, such as concept learning. In the end, artificial intelligence was broken apart, with knowledge representation, search, gaming, theorem proving and planning, probabilistic reasoning and learning being some of the fields that were affected, as well as robotics, neural networks, genetic algorithms, and so on and so forth. There is a research community in each of these fields, with its own conferences and publications, and there is minimal connection with research communities in other areas.

1.5 Problem solving and Planning in Artificial Intelligence:

For theorem-proving, problem-solving and planning, artificial intelligence has created broad approaches such as resolution, state space search, adversarial search, issue reduction, constraint fulfilment, and case-based reasoning. The use of heuristic information, which leads the search for solutions in huge problem areas, is a key aspect of these techniques. It is true that heuristics do not always lead to ideal results, but they do lead to solutions that are good enough most of the time. As a result, a variety of algorithms have been devised to tackle the problem of state-space searching, such as breath-first and depth-first searches, as well as uniform cost and iterative deepening depth-first searches as well as greedy best-first searches. For real-world issues, a large search space makes thorough searches impractical. It is consequently necessary for algorithm developers to incorporate domain-specific information into their heuristics so that they can focus on only a subset of a node's descendants. An extensive range of real-world issues have been solved using this generic problem solving method, including route finding in computer networks; automated travel advising systems; airline trip planning systems; and automatic circuit board drilling planning.

1.6 AI Algorithms and Models:

Since algorithms and models are created using scientific insights from math, statistics and biology, AI is mostly algorithmic. A number of algorithms are used in AI, including: Ant Colony Algorithm, Immune

Algorithm, Fuzzy Algorithm and Decision Tree; Genetic Algorithm, Particle Swarm Algorithm; Neural Networks; as well as Deep Learning.

1.7 Support Vector Machine:

Support Vector Machine (SVM) is used for building classification models by determining the optimum hyperplane from a set of training samples. There are a variety of applications, including power transformer fault diagnostics, illness diagnosis, and therapy optimization that have made use of it.[4]

1.8 Artificial Neural Network:

This model represents the physical connections between neurons in comprehending ideas and behaviours. Through its ability to create mathematical models that can replicate natural processes from the brain's perspective, ANN has been applied for a wide range of issues. It will be able to solve any issue using this method, much like the human brain[5].

1.9 Knowledge Acquisition and Learning:

An intelligent agent's power comes from its knowledge base. It is exactly to enable an agent to gain or learn this information from a user, input data, or through the agent's own problem solving expertise that knowledge acquisition and machine learning research is primarily focused. Dies leads to an increase in the agent's ability to solve a wider range of issues and less error-prone problem-solving. As a result, the agent may be able to solve issues faster and with reduced memory use. Many studies have focused on fundamental idea learning, such as learning the notion "cup" or "person who would default on bank loan," because of the difficulty of learning. To understand ideas, you need to discover some way to classify things into those that are examples of concepts and those that are not. For example, comparing positive and negative examples of the same concept in terms of similarities and differences and then inductively describing their similarities can be considered empirical inductive learning from examples, which involves learning the concept's definition by comparing positive and negative examples of the same concept. As a result of this, some approaches rely on information theory to categorise objects in the form of a decision tree.

There are further techniques that use neural networks to represent the learnt idea, whose output unit decides whether or not the thing at its input units belongs or not to the concept. This involves continually categorising known samples and changing the weights associated with the connections between units in order to enhance recognition accuracy in a neural network." It maps the positive and negative instances of the idea nonlinearly into a higher-dimensional feature space through a kernel function, and constructs a separating hyperplane with greatest margin in the higher-dimensional feature space. Bayesian classifiers find the most likely hypothesis or idea by applying the Bayes' rule, which computes the posterior probability of the hypothesis H based on its prior probability and the observed data. Statistical natural language processing makes heavy use of this form of learning, which has proven to be highly successful in cases where prior probabilities can be estimated.

1.10 Applications on Artificial Intelligence:

Many algorithms can be used to build artificial intelligence. Using these methods, the system is able to predict the expected reaction, which in turn tells the computer what to do next. Here some of these uses, which we undoubtedly use every day without realising it, in our daily lives: Voice recognition , Virtual agents, Machine learning platform, Ai optimized hardware, Decision management , Deep learning platform , Biomatters , Robotic process automation , Text analytics and NLP and Adaptive Manufacturing.

1.11 Advantages:
- When it comes to AI, it's dependable and cost-effective.
- It can handle complex issues, make choices, as well as keep your data secure.
- AI is used in a wide variety of sectors, including business and engineering.
- In artificial intelligence, "reinforcement learning" is a powerful method for increasing the dependability of systems.

1.12 Disadvantages:
- The capabilities and functioning of artificial intelligence are restricted.
- While Artificial Intelligence (AI) has made our lives simpler and saved us more time than ever before, experts warn that because of our reliance on AI, mankind may go extinct in the near future.
- Scientists say that having AI robots would result in humans losing their jobs, and hence their sense of purpose in life

- A machine's ability to learn and do tasks more efficiently might be the reason for human being's demise.

2. LITERATURE REVIEW

Rebecca Henderson et al. discussed impact of artificial intelligence on innovation in which they explained how Existing economies might benefit significantly from artificial intelligence. As a general-purpose "technique of invention," it has the potential to alter the character of innovation and the structure of R&D. As a result of this "transition" in the importance of application-oriented learning research, researchers made a distinction between automation-oriented applications such as robots and current advancements in "deep learning" as a general-purpose innovation technique. Researchers believe that this will lead to a major shift away from more routinized, labour-intensive research towards research that takes use of the interaction between passively generated huge datasets and improved prediction algorithms. At the same time, the potential financial gains from mastering this method of research will likely usher in a period of racing, driven by enormous incentives for individual businesses to acquire and dominate key huge datasets and application-specific algorithms[6].

Thomas W. Malone et al. discussed Artificial intelligence and related future work in which he explained how one of the most significant technologies in the world today is artificial intelligence (AI). In terms of its development, the United States and China are in direct competition with one another. This, according to CEOs, is going to fundamentally alter the way they do business and it has enabled firms such as Facebook, Google, and Apple become some of the world's largest companies as a result of it. They discussed the following questions: How will this technology influence the future of work in terms of productivity? If so, would it create a permanent class of unemployed individuals whose occupations have been taken over by computers? Someday, will the world be ruled by super-intelligent computers that have no need for the people who developed them? Is it possible that robotic servants will usher in a golden age of leisure and wealth for humankind[7].

Pooja Agarwal et al. discussed Artificial Intelligence. They explained how the goal of the Artificial intelligence field of computer science is to make computers behave like real people. AI encompasses game-playing and expert systems as well as neural networks and natural language processing and robotics. Currently, there are no computers that are capable of displaying full artificial intelligence (that is, are able to simulate human behaviour). Game playing has seen the most progress. Currently, the greatest computer chess systems are capable of beating human players. In the field of artificial intelligence, neural networks are now the trendiest technology. Many programming languages are referred to be AI languages because they are virtually exclusively utilised in artificial intelligence (AI) applications. LISP and Prolog are the two most common. Artificial intelligence reduces human labour to a great extent, but at the expense of progress. They discussed history of artificial intelligence. They discussed Probabilistic Methods for Uncertain Reasoning along with Classifiers and Statistical Learning Methods in AI. They discussed neural networks, inductive programming, decision tree learning, data mining, etc.[8].

Robert Kowalski discussed Artificial Intelligence and Human Thinking. They explained how many disciplines, including formal logic, probability theory, decision theory, management science, linguistics and philosophy have contributed tools and approaches to AI research. As a result, various advancements and expansions have been developed as a result of the use of these disciplines in artificial intelligence (AI). The methods of computational logic are among the most powerful. ALP agent model normative aspects and how it may assist us better our own human thinking is the focus of this paper. There are several ways it might help people interact more effectively with others and make smarter life choices. According to author it offers a theoretical basis for both [Williams, 1990, 1995] and [Hammond et al., 1999]'s recommendations on better decision-making. This paper is based upon [Kowalski, 2011], which contains the technical underpinnings of the ALP agent model, as well as references to related work[9].

John McCarthy discussed several important questions related to artificial intelligence which included questions like what is artificial intelligence (AI) and how does it work. What is the best way to define intelligence that doesn't rely on human intellect? What exactly is intelligence? Is it a yes-or-no question like "Is this machine intelligent or not?" If artificial intelligence is about simulating human intellect, isn't that what it is? How about intelligence? Is it possible for computer programmes to have intelligence? Do you know of any additional parallels between human intellect and that of computers? AI research began when? Artificial Intelligence (AI) aims to transfer human intelligence into a machine. What is a Turing test and how does it work? Where does AI stand in relation to the human brain in terms of intelligence? When is it going to occur? And many other such questions have been discussed in this paper[10].

3. DISCUSSION

This paper solely focuses on several aspects of artificial intelligence. It discusses basic concepts of artificial intelligence. It discusses history of artificial intelligence along with how it grew in past years with a high grow rate. It discusses how Artificial intelligence is a field that combines science and engineering to create intelligent devices such as computer programmes. Computers may also be used for this purpose, although AI does not have to rely solely on physiologically observable techniques. It discusses how Research in AI has built upon the tools and techniques of many different disciplines, including formal logic, probability theory, decision theory, management science, linguistics and philosophy. It discusses several advantages and disadvantages of artificial intelligence. It discusses objective and history of Artificial Intelligence and numerous other aspects which play important role in application of artificial intelligence in several areas. Figure 1 illustrates the applications of Artificial Intelligence in numerous fields.
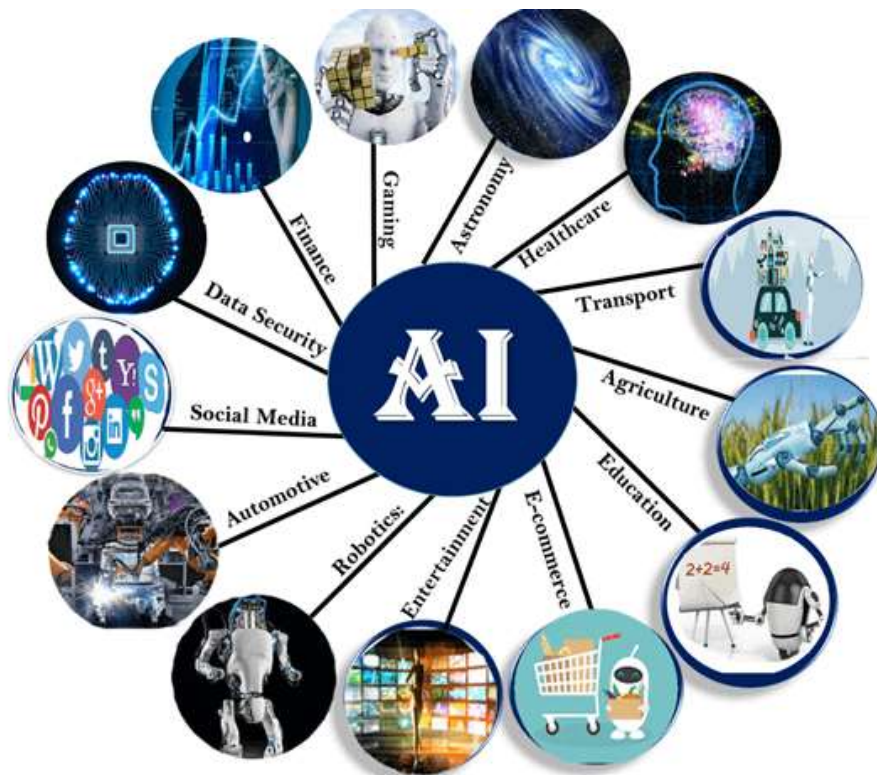
Figure 1: Illustrates the applications of Artificial Intelligence in numerous fields [Javatpoint].

4. CONCLUSION

Artificial Intelligence's major objective is to create computational entities that show the traits we associate with intelligence in human behaviour. There are numerous aspects of our everyday life that are affected by artificial intelligence (AI), ranging from quick credit card authorizations to simple speech-to-text transcriptions. A concerted effort will be required to ensure that the benefits of AI's changes are spread across the workforce and around the world. This will include facilitating the creation of new jobs, matching job seekers with available positions and providing education, training and sometimes financial support to people as they transition from their old jobs to their new ones. Artificial intelligence technologies are in high demand because of its several amazing applications and tendency to make several tasks easier. There is still a lot of scope of research in field of artificial intelligence which might completely revolutionize the world. Artificial intelligence-enabled human-computer super minds are expected to enable new kinds of social activity in business, research, and art that are as distinct from what we know.

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