ARTIFICIAL INTELLIGENCE: AN INTRODUCTION TO THE WORLD OF INTELLIGENT

Rakesh Kumar Dwivedi

Professor, College of Computing Science and Information Technology,
Teerthanker Mahaveer University, Moradabad, Uttar Pradesh, India
Email Id- r_dwivedi2000@yahoo.com

ABSTRACT

AI has become a catch-all word for apps that execute difficult activities that formerly needed human intervention, such as online customer service or chess. The phrase is often used interchangeably with the subfields of machine learning (ML) and deep learning. The primary purpose of artificial intelligence is to offer decision-making mechanisms. This judgment is based on uncommon facts as input and will provide artificial intelligence results similar to the human mind. To answer real issues, AI employs concepts from probability theory, economics, and algorithm design. Furthermore, the AI area incorporates computer science, mathematics, psychology, and languages. Computer science tools are used to develop and create algorithms, whereas mathematics tools are used to represent and solve the ensuing optimization issues.

KEYWORDS: Brain, Computer, Cognitive, Human, Science.

INTRODUCTION

Because intellect is so crucial to us, we name ourselves Homo sapiens. For thousands of years, people have sought to figure out how humans think, or how a little amount of matter can see, comprehend, anticipate, and manage a universe considerably bigger and more complex than itself. The discipline of artificial intelligence, or AI, goes much further: it aims not just to comprehend but also to produce intelligent beings. AI is one of the most recent scientific and technical topics. Work began in earnest shortly after World War II, and the term was created in 1956. Along with molecular biology, artificial intelligence (AI) is often identified as the field I would most like to be in by scientists from other fields. A physics student would fairly believe that all of the excellent ideas have already been stolen by Galileo, Newton, Einstein, and others. AI, on the other hand, is still looking for full-time Einsteins and Edisons. AI now includes a wide range of subfields, from the general learning and perception to the specialized playing chess, proving mathematical theorems, creating poetry, driving a vehicle on a busy street, and detecting illnesses. AI is applicable to any intellectual work; it is genuinely a multidisciplinary science [1]–[3].

The definitions at the top are concerned with cognitive processes and reasoning, while the definitions at the bottom are concerned with behaviour. The definitions on the left define success in terms of faithfulness to human performance, while the definitions on the right define success in terms of an ideal performance metric known as rationality. A system is logical if it performs the right thing, given what it knows. Historically, each of the four approaches to AI has been pursued, each by a different person using a different technique. A human-centered approach must be empirical in nature, based on observations and theories regarding human behaviour. A rationalist1 approach incorporates mathematics and engineering. The different groups have both criticized and aided one another. Let's take a closer look at the four methods [4], [5].

Acting Humanly

Turing Test was intended to offer a sufficient practical definition of intelligence. A computer passes the test if a human interrogator cannot distinguish whether the written replies are from a person or from a computer after presenting certain written questions delves into the specifics of the exam and whether a computer that passed would be really intelligent. For the time being, we should notice that programming a computer to pass a carefully applied test gives enough of material to work with. The computer would need to have the following capabilities natural language processing to be able to communicate effectively in English

The majority of AI is composed on these six areas, and Turing deserves credit for developing a test that is still relevant 60 years later. However, AI researchers have made minimal attempt to pass the Turing Test, claiming that studying the basic concepts of intelligence is more essential than replicating an example. The Wright brothers and others achieved artificial flight when they stopped emulating birds and began utilizing wind tunnels and learning about aerodynamics. Aeronautical engineering textbooks do not define their field's goal as machines that fly so exactly like pigeons that they can fool even other pigeons [6]–[8].

Thinking Humanly

The cognitive modelling approach If we are to say that a given program thinks like a human, we must first determine how humans think. We must investigate the inner workings of human brains. There are three methods for doing so introspection trying to capture our own thoughts as they pass by, psychological experiments observing a person in activity, and brain imaging observing the brain in action. Once we've developed a sufficiently exact understanding of the mind, we may describe it as a computer program. If the program's input-output behaviour corresponds to equivalent human behaviour, this indicates that some of the program's processes may also be active in people. For example, Allen Newell and Herbert Simon, the creators of GPS, the General Problem Solver, were not satisfied with just having their software answer problems properly. They were more interested in comparing the trail of its reasoning stages to traces of human individuals answering the identical issues.

Cognitive Science

Cognitive science is an interdisciplinary study that combines computer models from AI with experimental methodologies from psychology to develop accurate and testable explanations of the human mind. Cognitive science is an enthralling subject in and of itself, deserving of multiple textbooks and at least one encyclopedia. We will periodically make observations on the parallels and differences between AI approaches and human cognition. True cognitive science, on the other hand, must be founded on experimental research on real people or animals. We'll leave it to other books since we believe the reader has just a computer to play with. There was sometimes misunderstanding between the methods in the early days of AI an author might claim that an algorithm performs well on a job and is hence a good model of human performance, or vice versa. Modern writers distinguish between the two types of statements; this difference has accelerated the development of AI and cognitive research. The two disciplines are still fertile, most notably in computer vision, which blends neurophysiological data into computational models.

Thinking Logically

The laws of thought approach Aristotle, the Greek philosopher, was among the first to seek to codify right thinking, that is, unassailable reasoning processes. His syllogisms provided patterns for argument structures that always yielded correct conclusions when given correct premises for example, Socrates is a man; all men are mortal therefore, Socrates is mortal. In the nineteenth century, logicians devised a precise notation for claims about all types of things in the world and their relationships. This is in contrast to regular arithmetic notation, which only allows for assertions about numbers. By 1965, programs were available that could, in theory, answer any solvable issue given in logical notation. However, if no solution exists, the program may run indefinitely. The logicist school within artificial intelligence seeks to build on such algorithms to construct intelligent systems. This strategy has two major challenges. First, it is difficult to translate informal information into the formal phrases needed by logical notation, especially when the knowledge is less than 100% definite. Second, there is a significant gap between in principle and in practice issue resolution. Even issues with a few hundred facts might exhaust a computer's computing capacity unless it is given some direction as to which reasoning processes to undertake first. Both of these challenges apply to any endeavour to develop computational reasoning systems, although they first surfaced in the logicist school [9], [10].

Acting Logically

The rational agent approach agent An agent is simply anything that acts the word agent originates from the Latin agere, which means to do. Of course, all computer programs do some function, but computer agents are intended to perform more act autonomously, observe their surroundings, endure over time, adapt to rational agent change, and generate and pursue objectives. A rational actor is one who behaves in such a way that the best result or, in the case of uncertainty, the best predicted outcome is obtained. The focus in the laws of thought approach to AI was on valid inferences. Making proper inferences is sometimes part of being a rational actor, since reasoning logically to the conclusion that a specific action would accomplish one's objectives and then acting on that conclusion is one way to behave rationally. On the other hand, right inference is not the end of rationality in certain cases, there is no provably proper action to take, yet something must be taken. There are other reasonable actions that cannot be stated to entail inference.

Recoiling from a hot stove, for example, is a reflex response that is generally more effective than a slower action made after careful consideration. All of the abilities required for the Turing Test enable an agent to behave logically. Agents can make effective judgments thanks to knowledge representation and reasoning. To function in a complicated society, we must be able to construct understandable phrases in natural language. Learning is important not just for erudition, but also for improving our capacity to develop successful behaviour. The rational-agent method offers two benefits over the other methods. For starters, it is more generic than the laws of thought approach since proper inference is just one of multiple ways for obtaining rationality. Second, it lends itself better to scientific advancement than techniques based on human behaviour or cognition. The rationality standard is mathematically well defined and entirely universal, and it may be unpacked to yield agent designs that achieve it provably.

Human behaviour, on the other hand, is well suited to a certain context and is described by, well, the sum amount of everything people do. As a result, this book focuses on broad concepts of rational agents as well as components for building them. We shall show that, despite the seeming ease with which the problem may be presented, a wide range of complications arise when we attempt to solve it. Some of these difficulties are discussed in further depth in Chapter 2. One thing to remember reaching complete rationality always doing the correct thing is not possible in complex circumstances. The computational needs are just too great. However, for the most of the book, we shall assume that perfect rationality is a reasonable starting point for analysis. It simplifies the issue and offers an adequate framework for the majority of the field's core content. Chapters 5 and 17 deal specifically with the subject of limited rationality acting with limited rationality when there isn't enough time to conduct all of the calculations one would want.

The next stage was to discover the limitations of logic and com algorithm putation. Euclid's approach for determining greatest common divisors is regarded to be the first nontrivial algorithm. The term algorithm and the concept of studying them stems from al-Khowarazmi, a 9th century Persian mathematician whose works also brought Arabic numbers and algebra to Europe. Boole and others studied logical deduction methods, and by the late nineteenth century, attempts were underway to codify broad mathematical reasoning as logical deduction. This foundational conclusion may alternatively be understood as demonstrating that certain integer functions cannot be represented by an algorithm, and so cannot be calculated. This concept is somewhat difficult since the concept of a computation or effective technique cannot be formalized. However, the Church-Turing thesis, which claims that the Turing machine can compute every computable function, is widely considered as a sufficient definition. Turing also demonstrated that certain functions could not be computed by a Turing machine. For example, no computer can predict whether a particular program will produce a response to a given input or continue indefinitely. Although decidability and computability are vital in understanding computation, the concept of tractability has had a bigger influence. In general, a problem is said to be intractable if the time needed to solve instances of it rises exponentially with the number of the instances.

In the mid-1960s, the contrast between polynomial and exponential complexity increase was initially highlighted. It is significant because, due to exponential growth, even modestly big examples cannot be solved in any acceptable period. As a result, rather than intractable difficulties, one should seek to split the overall challenge of creating intelligent behaviour into tractable subproblems. How can an intractable situation be identified? Cook and Karp demonstrated the existence of vast classes of NP-complete canonical combinatorial search and reasoning problems. Any issue class that can be reduced to the class of NP-complete problems is likely to be intractable. While it has not been shown that NP-complete problems are inherently intractable, most theoreticians assume they are. These findings contrast with the enthusiasm with which the public press welcomed the first computers Electronic Super-Brains that were Faster than Einstein Intelligent systems will be distinguished by their careful use of resources, despite the increasing speed of computers. Simply put, the globe is a massive issue instance.

DISCUSSION

AI research has helped to explain why certain NP-complete problems are difficult while others are simple. Aside from logic and computing, the probability theory of probability is the third major contribution of mathematics to AI. Gerolamo Cardano (1501-1576), an Italian, defined probability by outlining the probable outcomes of gaming situations. In a letter to Pierre Fermat (1601-1665) in 1654, Blaise Pascal (1623-1662) demonstrated how to predict the future of an incomplete gambling game and allocate average payoffs to the players. Probability rapidly became an essential component of the quantitative disciplines, assisting in the handling of imprecise observations and imperfect theories. The idea was expanded and new statistical methods were presented by James Bernoulli (1654-1705), Pierre Laplace (1749-1827), and others. The front cover of this book features Thomas Bayes (1702-1761), who devised a formula for revising probability in light of new data. Most recent methods to uncertain reasoning in AI systems are based on Bayes' rule.

The discipline of economics began in 1776, with the publication of An Inquiry into the Nature and Causes of the Wealth of Nations by Scottish philosopher Adam Smith (1723-1790). While the ancient Greeks and others had made contributions to economic philosophy, Smith was the first to approach it as a science, based on the premise that economies are made up of individual actors optimizing their own economic well-being. Most people associate economics with money, but economists argue that they are really interested in how individuals make decisions that lead to desirable results. When McDonald's offers a $1 hamburger, they are claiming that they would prefer the dollar and hope that consumers would utility prefer the hamburger. L'eon Walras (1834-1910) formalized the mathematical study of preferred outcomes or utility, which was further enhanced by Frank Ramsey (1931) and later by John von Neumann and Oskar Morgenstern in their book The Theory of Games and Economic Behaviour (1944).

Decision Theory

Decision theory, which combines probability theory with utility theory, offers a comprehensive framework for choices made in the face of uncertainty that is, in circumstances where probabilistic descriptions adequately describe the decision maker's environment. This is appropriate for large economies in which each agent does not need to pay attention to the behaviour of other agents as individuals. For small economies, the situation is much more akin to a game: one player's actions might have a considerable impact on the utility of another either favourably or adversely. The unanticipated conclusion of Von Neumann and Morgenstern's invention of game.

Game Theory

Unlike decision theory, game theory does not provide a clear prescription for choosing actions. Economists, for the most part, did not address the third challenge outlined above, namely, how to make rational judgments when the payoffs from acts are not instantaneous but rather result from multiple actions conducted in succession. This issue was addressed in the discipline of operations research, which arose during World War II from British attempts to improve radar installations, and eventually found civilian applications in complicated management choices. Richard Bellman's (1957) work formalized a class of sequential choice problems known as Markov decision processes, which we will look at in Chapters 17 and 21. Although work in economics and operations research has contributed significantly to our understanding of rational agents, AI research has grown along wholly independent routes for many years. One factor was the seeming difficulty of logical decision-making. Herbert Simon (1916-2001), a pioneering AI researcher, won the Nobel Prize in economics in 1978 for his early satisficing work, which demonstrated that models based on satisficingmaking decisions that are good enough, rather than laboriously calculating an optimal decision provided a better description of actual human behaviour. There has been a renaissance of interest in decision-theoretic strategies for agent systems since the 1990s.

Neuroscience

The study of the nervous system, especially the brain, is known as neuroscience. Although the precise mechanism by which the brain permits cognition is one of science's great mysteries, the fact that it does enable thought has been known for thousands of years due to evidence that powerful blows to the head may result in mental incapacity. It has also long been recognized that human brains are unique; around about 335 B.C. Aristotle said, Of all the animals, man has the largest brain in proportion to his size.5 However, it was not until the middle of the 18th century that the brain was commonly acknowledged as the seat of awareness. Previously, possible areas included the heart and spleen. In 1861, Paul Broca (1824-1880) proved the presence of discrete regions of the brain responsible for distinct cognitive processes in his research of aphasia speech loss in brain-damaged individuals.

He demonstrated, in particular, that speech production was localized to the portion of the left hemisphere now known as Broca's area. Although it was known at the time that the brain was made up of nerve cells, or neurons, it was not until 1873 that Camillo Golgi developed a staining technique that allowed the observation of individual neurons in the brain . We now have some information on the connections between brain regions and the portions of the body that they govern or from which they get sensory input. Such mappings may vary dramatically in a few of weeks, and some species seem to have numerous maps. Furthermore, we do not completely comprehend how other regions might assume functions when one area is harmed. There are essentially no theories on how individual memories are preserved.

Hans Berger's discovery of the electroencephalograph (EEG) in 1929 marked the beginning of the measuring of complete brain activity. The recent discovery of functional magnetic resonance imaging (fMRI) provides neuroscientists with unprecedentedly precise pictures of brain activity, allowing measurements that match to current cognitive processes in intriguing ways. Advances in single-cell recording of neuron activity supplement these findings. Individual neurons may be activated electrically, chemically, or even optically, enabling neuronal input-output interactions to be mapped. Despite these breakthroughs, we are still a long way from fully comprehending cognitive processes. Mysticism is the only viable alternative theory: brains work in some spiritual world beyond physical science. The features of brains and digital computers vary somewhat. The brain compensates for this by having significantly more storage and connections than even a high-end home computer, while even the greatest supercomputers have capacity comparable to the brain's.

Psychology

The work of Hermann von Helmholtz (1821-1894) and his pupil Wilhelm Wundt (1832-1920) is often regarded as the foundation of scientific psychology. Helmholtz used science to explore human vision, and his Handbook of Physiological Optics is still regarded as the single most important treatise on the physics and physiology of human vision (Nalwa, 1993, p.15). Wundt established the first laboratory of experimental psychology at the University of Leipzig in 1879. Wundt insisted on meticulously controlled studies in which his employees would undertake a perceptual or sociative task while introspecting on their cognitive processes. The strict controls contributed significantly to psychology becoming a discipline, but the subjective character of the data made it improbable that an investigator would ever disprove his or her own hypotheses. Animal behaviour biologists, on the other hand, lacked introspective data and devised an objective technique, as explained by H.

Behaviour

In his famous book Behaviour of behaviourism the Lower Organisms, S. Jennings (1906). When it came to people, the behaviourism movement, founded by John Watson (1878-1958), rejected any hypothesis including mental processes on the grounds that introspection could not produce trustworthy proof. Behaviourists concentrated on analyzing only objective measurements of an animal's percepts and its subsequent behaviours. Behaviourism learned a lot about rats and pigeons but struggled to grasp people. Cognitive psychology, which regards the brain as an information-processing apparatus, may be traced back to the writings of William James (1842-1910). Helmholtz also emphasized on the existence of an unconscious logical inference in perception. The cognitive perspective was largely superseded by behaviourism in the United States, while cognitive modelling flourished at Cambridge's Applied Psychology Unit, supervised by Frederic Bartlett (1886-1969).

Engineering in Computer Science

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The cognitive perspective was largely superseded by behaviourism in the United States, while cognitive modelling flourished at Cambridge's Applied Psychology Unit, supervised by Frederic Bartlett (1886-1969). The first operating computer was the electromechanical Heath Robinson8, which Alan Turing's team created in 1940 for a single purpose: decoding German transmissions. The Z-3, invented by Konrad Zuse in Germany in 1941, was the first operational programmed computer.

Zuse also devised floating-point integers and Plankalk ul, the first high-level programming language. The ABC, the first electrical computer, was built at Iowa State University between 1940 and 1942 by John Atanasoff and his student Clifford Berry. The ENIAC, built as part of a covert military project at the University of Pennsylvania by a team comprising John Mauchly and John Eckert, proved to be the most significant predecessor of modern computers; Atanasoff's research got little funding or acknowledgment. Since then, each generation of computer hardware has increased speed and capacity while decreasing price. Performance doubled every 18 months or so until roughly 2005, when manufacturers began doubling the number of CPU cores rather than the clock speed due to power dissipation issues. Current assumptions are that future improvements in power will result from huge parallelisma strange convergence with brain features. Of course, before the electrical computer, there were calculating machines. On page 6, we explored the oldest automated devices, which date back to the 17th century. The earliest programmable machine was a loom designed in 1805 by Joseph Marie Jacquard (1752-1834) that employed punched cards to store weaving pattern information.

Charles Babbage (1792-1871) developed two machines in the mid-nineteenth century, neither of which he completed. The Difference Engine was designed to do mathematical table computations for engineering and scientific tasks. It was ultimately constructed and shown in 1991 at the Science Museum in London. Babbage's Analytical Engine was significantly more ambitious, with addressable memory, stored programs, and conditional jumps, making it the first device capable of universal computing. Ada Lovelace, the poet Lord Byron's daughter and Babbage's coworker, was perhaps the world's first programmer. She created programs for the incomplete Analytical Engine and predicted that the computer might play chess or compose music. AI also owes a debt to computer science's software side, which has provided the operating systems, programming languages, and tools required to develop current programs. However, in one area, the debt has been repaid: work in AI has pioneered many ideas that have made their way back to mainstream computer science, such as time sharing, interactive interpreters, personal computers with windows and mice, rapid development environments, the linked list data type, automatic storage management, and key concepts of symbolic, functional, declarative, and object-oriented programming.

CONCLUSION

Artificial intelligence and technology are two aspects of life that constantly fascinate and amaze us with new ideas, themes, discoveries, products, and so on. AI is still not implemented as shown in films, but there are many key attempts to achieve that level and compete in the market, such as the robots seen on TV at times. Nonetheless, the growth and concealed initiatives in industrial firms. In the last five years, the area of artificial intelligence has made amazing development, with real-world implications for individuals, organizations, and society.

The capacity of computer programs to execute complex language- and image-processing tasks has evolved greatly since the field's inception in the 1950s. Although present AI technology falls well short of the field's primary goal of replicating complete human-like intelligence in computers, research and development teams are capitalizing on these breakthroughs and merging them into societal-facing applications. For example, the application of AI approaches in healthcare is becoming a reality, and the brain sciences benefit from and contribute to AI advancements. To differing degrees, old and new firms are devoting money and effort to discover methods to build on this success and deliver services that scale in unprecedented ways.

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