



Artificial Intelligence and Neural Network

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Abstract: It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable. While no consensual definition of Artificial Intelligence (AI) exists, AI is broadly characterized as the study of computations that allow for perception, reason and action. This paper examines features of artificial Intelligence, introduction, definitions of AI, history, applications, growth and achievements.

Keywords: Neural networks, Fuzzy Logic, artificial intelligence, knowledge based server, robotics.

I. INTRODUCTION

Artificial Intelligence (AI) is the branch of computer science which deals with intelligence of machines where an intelligent agent is a system that perceives its environment and takes actions which maximize its chances of success. It is the study of ideas which enable computers to do the things that make people seem intelligent. The central principles of AI include such traits as reasoning, knowledge, planning, learning, communication, perception and the ability to move and manipulate objects. It is the science and engineering of making intelligent machines, especially intelligent computer programs [1]

A. Artificial Intelligence Methods

At the present time, AI methods can be divided into two broad categories: (a) symbolic AI, which focuses on the development of knowledge-based systems (KBS); and (b) computational intelligence, which includes such methods as neural networks (NN), fuzzy systems (FS), and evolutionary computing. A very brief introduction to these AI methods is given below, and each method is discussed in more detail in the different sections of this circular.

B. Knowledge-Based Systems

A KBS can be defined as a computer system capable of giving advice in a particular domain, utilizing knowledge provided by a human expert. A distinguishing feature of KBS lies in the separation behind the knowledge, which can be represented in a number of ways such as rules, frames, or cases, and the inference engine or algorithm which uses the knowledge base to arrive at a conclusion.

a. *Neural Networks:* NNs are biologically inspired systems consisting of a massively connected network of computational "neurons," organized in layers. By adjusting the weights of the network, NNs can be "trained" to approximate virtually any nonlinear function to a required degree of accuracy. NNs typically are provided with a set of input and output exemplars. A learning algorithm (such as back propagation) would then be used to adjust the weights

in the network so that the network would give the desired output, in a type of learning commonly called supervised learning.

b. *Fuzzy Systems:* Fuzzy set theory was proposed by Zadeh (1965) as a way to deal with the ambiguity associated with almost all real-world problems. Fuzzy set membership functions provide a way to show that an object can partially belong to a group. Classic set theory defines sharp boundaries between sets, which mean that an object can only be a member or a nonmember of a given set. Fuzzy membership functions allow for gradual transitions between sets and varying degrees of membership for objects within sets. Complete membership in a fuzzy function is indicated by a value of +1, while complete non-membership is shown by a value of 0. Partial membership is represented by a value between 0 and +1. [2,3]

II. SOME DEFINITIONS OF AI

- Computers with the ability to mimic or duplicate the functions of the human brain
- Artificial Intelligence (AI) is the study of how computer systems can simulate intelligent processes such as learning, reasoning, and understanding symbolic information in context. AI is inherently a multi-disciplinary field. Although it is most commonly viewed as a subfield of computer science, and draws upon work in algorithms, databases, and theoretical computer science, AI also has close connections to the neurosciences, cognitive science and cognitive psychology, mathematical logic, and engineering."
- "The exciting new effort to make computers think ... machines with minds, in the full and literal sense" (Haugeland, 1985)
- "The automation of activities that we associate with human thinking, activities such as decision-making, problem solving, learning ..." (Bellman, 1978) "The study of mental faculties through the use of computational models" (Charniak and McDermott, 1985)

- "The study of the computations that make it possible to perceive, reason, and act" (Winston, 1992)
- "The art of creating machines that perform functions that require intelligence when performed by people" (Kurzweil, 1990)
- "The study of how to make computers do things at which, at the moment, people are better" (Rich and Knight, 1991) "A field of study that seeks to explain and emulate intelligent behavior in terms of computational processes" (Schalkoff, 1990)
- "The branch of computer science that is concerned with the automation of intelligent behavior" (Luger and Stubblefield, 1993)
- "Artificial intelligence is the study of ideas to bring into being machines that respond to stimulation consistent with traditional responses from humans, given the human capacity for contemplation, judgment and intention. Each such machine should engage in critical appraisal and selection of differing opinions within itself. Produced by human skill and labor, these machines should conduct themselves in agreement with life, spirit and sensitivity, though in reality, they are imitations."
- It is the science and engineering of making intelligent machines, especially intelligent computer programs. It is related to the similar task of using computers to understand human intelligence, but AI does not have to confine itself to methods that are biologically observable.

III. HISTORY

The modern history of AI can be traced back to the year 1956 when John McCarthy proposed the term as the topic for a conference held at Dartmouth College in New Hampshire devoted to the subject. The initial goals for the field were too ambitious and the first few AI systems failed to deliver what was promised. After a few of these early failures, AI researchers started setting some more realistic goals for themselves. In the 1960s and the 1970s, the focus of AI research was primarily on the development of KBS or expert systems. During these years, expert systems technology were applied to a wide range of problems and fields ranging from medical diagnosis to inferring molecular structure to natural language understanding. The same period also witnessed early work on NNs, which showed how a distributed structure of elements could collectively represent an individual concept, with the added advantage of robustness and parallelism. However, the publication of Minsky and Papert's book *Perceptrons* in 1969, which argued for the limited representation capabilities of NN, led to the demise of NN research in the 1970s.

The late 1980s and the 1990s saw a renewed interest in NN research when several different researchers reinvented the back propagation learning algorithm (although the algorithm was really first discovered in 1969). The back propagation algorithm was soon applied to many learning problems causing great excitement within the AI community. The 1990s also witnessed some dramatic changes in the content and methodology of AI research. The focus of the field has been shifting toward grounding AI methods on a rigorous mathematical foundation, as well as to tackle real-world problems and not just toy examples.

There is also a move toward the development of hybrid intelligent systems (i.e., systems that use more than one AI method) stemming from the recognition that many AI methods are complementary. Hybrid intelligent systems also started to use newer paradigms that mimic biological behavior such as GAs and fuzzy logic.[1,2,3]

IV. APPLICATIONS OF AI

A. Finance

Banks use artificial intelligence systems to organize operations, invest in stocks, and manage properties. In August 2001, robots beat humans in a simulated financial trading competition. Financial institutions have long used artificial neural network systems to detect charges or claims outside of the norm, flagging these for human investigation. Some other applications in this section include loan investigation, ATM design, safe and fast banking etc.

B. Medicine

A medical clinic can use artificial intelligence systems to organize bed schedules, make a staff rotation, and provide medical information. Artificial neural networks are used for medical diagnosis, functioning as Machine differential diagnosis. AI has also application in fields of cardiology (CRG), neurology (MRI), embryology (sonography), complex operations of internal organs etc.

C. Heavy Industry

Now a days in big industries all the work and machine operations are controlled by principles of Artificial Intelligence. These huge machines involve risk in their manual maintenance and working. So it becomes necessary part to have an efficient and safe operation agent in their operation.

a. Application Types and Situations: Intelligent software systems play a number of roles in heavy industry. Selected examples are discussed below.

PROCESS CONTROL: These tasks usually involve automation of low-level control in a real-time system. The implemented systems are concerned with fault detection, diagnosis and alarming, and with operating the control devices in the control loops. Integral functions of intelligent software are sensor diagnostics, handling of erroneous or missing data, and performing temporal reasoning.

PROCESS MONITORING: Artificial Intelligence systems monitor, compare and analyze the process behavior of events that are crucial to successful operation and suggest any corrective action that should be implemented by the operators.

FAULT DIAGNOSIS AND MAINTAINANCE: It is practically impossible to diagnose huge machines regularly and precisely. Working of faulty machines may cause great loss to the industry. So, Artificial Intelligence systems offer a number of advantages for working with diagnostic problems. First, they can monitor and analyze hundreds of sensors, determine any anomalies in their functions and identify probable causes of the discrepancies between expected and actual operating conditions.

SCHEDULING AND PLANNING: In the present day world TIME ELEMENT plays an important role. So, completion of manufacturing within short period of time in addition to good quality becomes very important. Intelligent software offers several advantages in developing computerized scheduling systems. Instead of presenting one optimization schedule, AI-based scheduling systems present several schedules with their evaluation indexes. The operator can then select the "best" optimum schedule.

D. Telecommunications

Many telecommunications companies make use of heuristic search in the management of their workforces, for example BT Group has deployed heuristic search in a scheduling application that provides the work schedules of 20000 engineers.

E. Music

AI, scientists are trying to make the computer emulate the activities of the skillful musician. Composition, performance, music theory, sound processing are some of the major areas on which research in Music and Artificial Intelligence are focusing on. Some of them are

OrchExtra: This program was designed to provide small-budget productions with instrumentation for all instruments usually present in the full-fledged orchestra.

Computer Accompliment: The Computer Music Project at CMU develops computer music and interactive performance technology to enhance human musical experience and creativity.

Smart Music: Smart Music is an interactive, computer-based practice tool for musicians.

Chuck: Chuck is a text-based, cross-platform language that allows real-time synthesis, composition, performance and analysis of music.

F. Antivirus

Artificial intelligence (AI) techniques have played increasingly important role in antivirus detection. At present, some principal artificial intelligence techniques applied in antivirus detection are proposed, including heuristic technique, data mining, agent technique, artificial immune, and artificial neural network. It improves the performance of antivirus detection systems, and promotes the production of new artificial intelligence algorithm and the application in antivirus detection to integrate antivirus detection with artificial intelligence. This paper introduces the main artificial intelligence technologies, which have been applied in antivirus system. Meanwhile, it also points out a fact that combining all kinds of artificial intelligence technologies will become the main development trend in the field of antivirus.

G. Robotics

Definition: What is a Robot?: Robots are physical agents that perform tasks by manipulating the physical world. They are equipped with sensors to perceive their environment and effectors to assert physical forces on it (covered in more detail in next section). Robots can

be put into three main categories: manipulators, mobile robots and humanoid.

Robotics and AI: Artificial intelligence is a theory. The base object is the *agent* who is the "actor". It is realized in software. Robots are manufactured as hardware. The connection between those two is that the control of the robot is a software agent that reads data from the sensors decides what to do next and then directs the effectors to act in the physical world.

Robot Application Software: Most robot manufacturers keep their software hidden. It is impossible to find out how most robots are programmed. It is almost as if they had no software in many cases. Regardless which language is used, the end result of robot software is to create robotic applications that help or entertain people. Applications include command-and-control and tasking software. Command-and-control software includes robot control GUIs for tele operated robots, point-n-click command software for autonomous robots, and scheduling software for mobile robots in factories. Tasking software includes simple drag-n-drop interfaces for setting up delivery routes, security patrols and visitor tours; it also includes custom programs written to deploy specific applications. General purpose robot application software is deployed on widely distributed robotic platforms.

H. Gaming

In the earlier days gaming technology was not broadened. Physicist Willy Higinbotham created the first video game in 1958. It was called "Tennis For Two" and was plan oscilloscope. But now AI technology has become vast and standard has also been increased. More realistic, heavily graphical, 3-D games are been designed by developers. Some of most popular games of present day are Crisis, Fear, Fall Out, Halo etc.

I. Some Other Applications

- Credit granting
- Information management and retrieval
- AI and expert systems embedded in products
- Plant layout
- Help desks and assistance
- Employee performance evaluation
- Shipping
- Marketing
- Warehouse optimization
- In space workstation maintenance
- Satellite controls
- Network developments
- Military activity controls
- Nuclear management

V. THE EXPLOSIVE GROWTH OF AI

Since AI is applicable in almost all fields, they become the needs of our life .It make the development of AI field. It is the reason behind the explosive growth of AI.

The growth can be divided into two parts based on the application area and what purpose the used, they are as follows

Growth in positive sense(useful to society)

Growth in negative sense(harmful to society)

VI. SOME ACHIEVEMENTS of AI

- DARPA Grand challenge- 123 miles through the desert
- DARPA Urban Challenge- Autonomous driving in traffic
- Deep Thought is an international grand master chess player.
- Sphinx can recognize continuous speech without training for each speaker. It operates in near real time using a vocabulary of 1000 words and has 94% word accuracy.
- Navlab is a truck that can drive along a road at 55mph in normal traffic.
- Carlton and United Breweries use an AI planning system to plan production of their beer.
- Natural language interfaces to databases can be obtained on a PC.
- Machine Learning methods have been used to build expert systems.
- Expert systems are used regularly in finance, medicine, manufacturing, and agriculture

VII. FUTURE OF AI

Having discussed about AI one debatable question arises that is artificial intelligence more powerful than natural intelligence. Looking at the features and its wide applications we may definitely stick to artificial intelligence. Seeing at the development of AI, is it that the future world is becoming artificial.

Biological intelligence is fixed, because it is an old, mature paradigm, but the new paradigm of non-biological computation and intelligence is growing exponentially. The crossover will be in the 2020s and after that, at least from a hardware perspective, non-biological computation will dominate...

The memory capacity of the human brain is probably of the order of ten thousand million binary digits. But most of this is probably used in remembering visual impressions, and other comparatively wasteful ways. One might reasonably hope to be able to make some real progress [towards artificial intelligence] with a few million digits [of computer memory].

Hence we can say that as natural intelligence is limited and volatile too world may now depend upon computers for smooth working.

VIII. CONCLUSION

Till now we have discussed in brief about Artificial Intelligence. We have discussed some of its principles, its applications, its achievements etc. The ultimate goal of institutions and scientists working on AI is to solve majority of the problems or to achieve the tasks which we humans directly can't accomplish. It is for sure that development in this field of computer science will change the complete

scenario of the world. Now it is the responsibility of creamy layer of engineers to develop this field.

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