

Applications of Artificial Intelligence

Jatinder Kumar

Assistant Prof, A. S. College,
Khanna

Abstract: Intelligence is commonly considered as the ability to collect knowledge and reason about knowledge to solve complex problems. In the near future intelligent machines will replace human capabilities in many areas. Artificial intelligence is the study and developments of intelligent machines and software that can reason, learn, gather knowledge, communicate, manipulate and perceive the objects. *Artificial intelligence is the intelligence exhibited by machines or software. Artificial Intelligence has revolutionized the quality of human life in many areas. Artificial intelligence in the last two decades has greatly improved performance of the manufacturing and service systems. Artificial Intelligence has affected the every walk of life and is used in various areas as science, engineering, business, medicine, weather forecasting. This paper explores the application areas of this technology.*

Keywords: Artificial Intelligence, Intrusion Detection Systems, Neural Networks (computer), Power System Stabilizer.

Introduction

Artificial intelligence (AI) has revolutionized information technology. Intelligence is the ability to think, imagine, create, memorize, and to understand, recognize patterns and then making choices, adapting to change and learn from experience. This is the branch of computer science concerned with making computers behave like humans.

Artificial Intelligence (AI) is the area of computer science focusing on creating machines that can engage on behaviors that humans consider intelligent. The ability to create intelligent machines has intrigued humans since ancient times and today with the advent of the computer and 50 years of research into AI programming techniques, the dream of smart machines is becoming a reality. Artificial intelligence has the advantage over the

natural intelligence as it is more permanent, consistent, less expensive, has the ease of duplication and dissemination, can be documented and can perform certain tasks much faster and better than the human. *Artificial intelligence can help make humanity better, not just by winning games or driving cars, but also by addressing some of the not-so-great aspects of human nature.* AI is pervasive in many of our daily routines, from shopping online to driving cars to organizing our photos. AI is not only more efficient, but often tackles problems in new and interesting ways that differ from the established norms that human experts have developed.

John McCarthy coined the term in 1956 as branch of computer science concerned with making computers behave like humans. It is the study of the computation that makes it possible to perceive reason and act. 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.

Application Areas of Artificial Intelligence

Major application areas of artificial Intelligence areas are Expert Systems, Natural Language Processing, Speech Understanding, Robotics and Sensory Systems, Computer Vision and Scene Recognition, Intelligent Computer- Aided Instruction, Neural Computing. The various techniques applied in artificial intelligence are Neural Network, Fuzzy Logic, Evolutionary Computing, and Hybrid Artificial Intelligence. Artificial intelligence has been used in a wide range of fields including medical diagnosis, stock trading, robot control, law, scientific discovery and toys. The most important and well-known areas within the AI are: solution search at combinatorial problems, knowledge base systems or expert systems, processing of the natural language , pattern recognition, robotics mechanical learning, logic(automatically verification and construction), statistical interference functions and automatically programming. The various applications of AI are:

1] Application of Artificial Intelligence in Medical Science: AI is applied in medical diagnosis in the following areas:

a) ***Fuzzy Logic:*** It is a data handling methodology that permits ambiguity and hence is

particularly suited to medical applications. It captures and uses the concept of fuzziness in a computationally effective manner. The most likely area of application for this theory lies in medical diagnostics and, to a lesser extent, in the description of biological systems. Fuzzy expert systems use the structure of a series of „if – then“ rules for modeling. The techniques of fuzzy logic have been explored in many medical applications. Fuzzy logic is preferred over the multiple logistic regression analysis in diagnosing lung cancer using tumour marker profiles. Fuzzy logic is also used in the diagnosis of acute leukaemia and breast and pancreatic cancer and also predict patients“ survival with breast cancer. They can also characterize MRI images of brain tumours ultrasound images of the breast, ultrasound. Fuzzy logic controllers have been designed for the administration of vasodilators in the peri-operative period to control blood pressure.

b) *Evolutionary Computation in Medicine:* Evolutionary computation is the general term for several computational techniques based on natural evolution process that imitates the mechanism of natural selection and survival of the fittest in solving real-world problems. The most widely used form of evolutionary computation for medical applications are Genetic Algorithms. Genetic Algorithms based on the natural biological evolution are the most widely used form of evolutionary computation for medical applications. The principles of Genetic algorithms have been used to predict outcome in critically ill patients. MRI segmentation of brain tumours to measure the efficacy of treatment strategies is also done through evolutionary computation. They have also been used in computerized analysis of mammographic micro calcification.

c) *Using Artificial Intelligence to Improve Hospital Patient Care:* *Clinical decision support systems (CDSS) were one of the first successful applications of AI, focusing primarily on the diagnosis of a patient“s condition given his symptoms and demographic information. Mycin a rule-based expert system for identifying bacteria causing infections and recommending antibiotics to treat these infections was developed in 1970 under the work of CDSS for medical diagnosis. Pathfinder, which used Bayesian networks to help pathologists more accurately diagnose lymph-node diseases. AI has also been useful for computer-aided detection of tumors in medical images. Such approaches help in the diagnosis of various forms of cancer, and congenital heart defects.*

d) ***Artificial Intelligence Approaches for Medical Image Classification:*** Artificial intelligence techniques are used for diagnostic sciences in biomedical image classification. Model-based intelligent analysis and decision-support tools are important in medical imaging for computer-assisted diagnosis and evaluation. CAD helps radiologist who uses the output from a computerized analysis of medical images as a second opinion in detecting lesions, assessing extent of disease, and improving the accuracy and consistency of radiological diagnosis to reduce the rate of false negative cases.

e) ***Artificial Neural Networks Approach on Diagnostic Science:*** For the MRI brain tumour images a general regression neural network (GRNN) based automatic three dimensional classification method was proposed. This method had good time consuming rate and classification accuracy. Another intelligent classification technique proposed was Least Squares Support Vector Machines (LS-SVM). It identifies normal and abnormal slices of brain MRI data. This technique had a higher accuracy of classification over other classifiers as the false negative in LS-SVM was very low compared. Due to automatic defects detection in MR images of brain, extensive research is being performed.

II) Application of Artificial Intelligence in Accounting Databases: The use of artificial intelligence is investigated as the basis to mitigate the problems of accounting databases. The following are some difficulties with existing accounting database systems. The needs of decision makers are not met by accounting information. Humans do not understand or cannot process the computerized accounting databases. Systems are not easy to use. There is focus on the numeric data. Integrating intelligent systems with accounting databases can assist (either with the decision maker or independent of decision maker) in the investigation of large volumes of data with or without direct participation of the decision maker. Thus, the systems can analyze the data and assist the users understanding or interpreting transactions to determine what accounting events are captured by the system. .With the artificial intelligence we store and retrieve knowledge in natural language. There are some artificial intelligence tools or techniques that help in the broader understanding of events captured by the accounting system. There is more emphasis on symbolic or text data rather than just numeric data to capture context. The artificial intelligence and expert system builds intelligence into the database to assist users.

Without users direct participation such models help the users by sorting through large quantities of data. Such models also assist the decision makers under time constraints; suggest alternatives in the searching and evaluation of data. 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

III) Application of Artificial Intelligence Techniques in the Computer Games

Playing games is one of the most popular uses for computer technology. In the evolution of computer games, they have grown from modest text based to the three dimensional graphical games with complex and large worlds. The systems as graphics rendering, playing audio, user input and game artificial intelligence (AI) when put together provide the expected entertainment and make a worthwhile computer game. Artificial intelligence is the most important part of every computer game and playing the game without artificial intelligence would not be any fun!. If we remove artificial intelligence from computer games, the games will be so simple that nobody will be interested in playing the computer games anymore!. Without the game AI, the winning would not be difficult at all. Artificial intelligence is used to solve common problems in the computer games and provide the features to the games. Specifically, non-playing character (NPC) path finding, decision making and learning are examined. There are several ways that AI contributes to modern computer games. Most notably are unit movement, simulated perception, situation analysis, spatial reasoning, learning, group coordination, resource allocation, steering, flocking, target selection, and so many more. Even context dependent animation and audio use AI. AI has also been applied to video games.

Game artificial intelligence refers to techniques used in computer and video games to produce the illusion of intelligence in the behavior of non-player characters (NPCs). The techniques used typically draw upon existing methods from the field of artificial intelligence (AI). However, the term game AI is often used to refer to a broad set of algorithms that also include techniques from control theory, robotics, computer

graphics and computer science in general.

IV] Application of Artificial Intelligence Techniques in the Natural Language Processing

Natural language processing gives machines the ability to read and understand the languages that humans speak. Many researchers hope that a sufficiently powerful natural language processing system would be able to acquire knowledge on its own, by reading the existing text available over the internet. Some straightforward applications of natural language processing include information retrieval(or text mining) and machine translation

V] Application of Artificial Intelligence Techniques in ROBOTICS

Industrial robots usually have to solve certain tasks in a specially developed environment, but autonomous robots have to work in the real world requiring the ability to perceive a changing environment and to be able to solve problems independently, because a programmer cannot predict all the possible difficulties. In modern robots the control generally works with a coupled system of two parallel working micro computers. They are either located in one device or according to their functions are more separated from each other. The 1990s saw some of the first attempts to mass-produce domestically aimed types of basic Artificial Intelligence for education, or leisure. This prospered greatly with the Digital Revolution, and helped introduce people, especially children, to a life of dealing with various types of AI and the first widely released robot, Furby. A mere year later an improved type of domestic robot was released in the form of Aibo, a robotic dog with intelligent features and autonomy.

VI] Application of Artificial Intelligence Techniques in Aviation

The Air Operations Division AOD, uses AI for the rule based expert systems. The AOD has use for artificial intelligence for surrogate operators for combat and training simulators, mission management aids, support systems for tactical decision making, and post processing of the simulator data into symbolic summaries. The use of artificial intelligence in simulators is proving to be very useful for the AOD. Airplane simulators are

using artificial intelligence in order to process the data taken from simulated flights. Other than simulated flying, there is also simulated aircraft warfare. The computers are able to come up with the best success scenarios in these situations. The computers can also create strategies based on the placement, size, speed, and strength of the forces and counter forces. Pilots may be given assistance in the air during combat by computers. The artificial intelligent programs can sort the information and provide the pilot with the best possible maneuvers, not to mention getting rid of certain maneuvers that would be impossible for a sentient being to perform. Multiple aircraft are needed to get good approximations for some calculations so computer simulated pilots are used to gather data. These computer simulated pilots are also used to train future air traffic controllers. The AOD also uses artificial intelligence in speech recognition software. The air traffic controllers are giving directions to the artificial pilots and the AOD wants to the pilots to respond to the ATC's with simple responses. The programs that incorporate the speech software must be trained, which means they use neural networks. The program used, the Verbex 7000, is still a very early program that has plenty of room for improvement. The improvements are imperative because ATCs use very specific dialog and the software needs to be able to communicate correctly and promptly every time. The Artificial Intelligence supported Design of Aircraft, or AIDA, is used to help designers in the process of creating conceptual designs of aircraft. This program allows the designers to focus more on the design itself and less on the design process. The software also allows the user to focus less on the software tools. In 2003, NASA's Dryden Flight Research Center, and many other companies, created software that could enable a damaged aircraft to continue flight until a safe landing zone can be reached. . The software compensates for all the damaged components by relying on the undamaged components. The neural network used in the software proved to be effective and marked a triumph for artificial intelligence.

CONCLUSION

The field of artificial intelligence gives the ability to the machines to think analytically, using concepts. Tremendous contribution to the various areas has been made by the Artificial Intelligence techniques from the last 2 decades. Artificial Intelligence will continue to play an increasingly important role in the various fields. AI techniques are

used in computer games to solve the common problems and to provide features to the games so as to have fun. There is bright future in the analysis of Network Intrusion Detection and there is also definite future in the area of Power System Stabilizers. The field of AI is very promising area of computer science and its applications will likely have far-reaching effects on human life in the years to come.

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