
Artificial Intelligence & its Applications in various fields

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Abstract: *Artificial intelligence is the science of automating intelligent behaviour presently which is achievable by human beings. In future, intelligent machines will replace or enhance the human capabilities in many areas. It is the intelligence exhibited by machines or software. Artificial Intelligence has been becoming a popular topic in the field of computer science as it has changed/enhanced the human life in many areas. Artificial intelligence in the last two decades has greatly improved performance of the manufacturing and service sectors. Research in the area of artificial intelligence has given rise to the rapidly growing technology known as expert system. Artificial Intelligence is having a huge impact on various fields of life as expert system is widely used these days to solve the complex problems in various areas as science, engineering, business, medicine, education, traffic system, weather forecasting, etc. The areas employing the technology of Artificial Intelligence have seen an increase in the quality and efficiency. Artificial Intelligence areas are Expert Systems, Speech recognition, Robotics and Sensory Systems, Computer Vision and Scene Recognition, Intelligent Computer Aided Instruction, Neural Computing, Natural Language Processing. This paper gives an overview of the technology and its application areas like: PSS design to damp the power system oscillations caused by interruptions, Network Intrusion for protecting computer and communication networks from intruders, medical area, to improve hospital inpatient care, for medical image classification, accounting databases to mitigate the problems of it and in the computer games.*

Keywords: Artificial Intelligence, Expert system, Intrusion Detection Systems, Neural Networks, Power System Stabilizer.

INTRODUCTION

Artificial Intelligence (AI) also called Machine Intelligence (MI) is the intelligence possessed by machines, in contrast with the Natural Intelligence (NI) possessed by humans and other animals. In computer science AI research is defined as the study of "intelligent agents": any device that perceives its environment and takes actions that maximize its chance of success at some goal. Usually, the term "artificial intelligence" is applied when a machine mimics "cognitive" functions that humans associate with other human minds, such as "learning" and "problem solving". It is also claimed that AI is playing vital role in the research of management science and operational research fields. Intelligence is commonly considered as the ability to collect knowledge and reason about knowledge to solve complex problems. In 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 was founded as an academic discipline in 1956 and in the years since has experienced several waves of optimism, followed by disappointment and the loss of funding (known as an "AI winter"), followed by new approaches, success and renewed funding. AI research has been divided into subfields that often fail to communicate with each other. These sub-fields are based on technical considerations, such as particular goals (e.g. "robotics" or "machine learning"), John McCarthy coined the term as one of the branch of computer science concerned with making computers like human behaviour. It is the study of the computation that makes it possible to perceive reason and act. Artificial intelligence is different from psychology because it emphasis on computation and is different from computer science because of its emphasis on perception, reasoning and action. It makes machines smarter and more useful. It works with the help of artificial neurons (artificial neural network) and scientific



theorems (if then statements and logics). AI technologies have matured to the point in offering real practical benefits in many of their applications. Major Artificial Intelligence areas are Expert Systems, Speech recognition, Robotics and Sensory Systems, Computer Vision and Scene Recognition, Intelligent Computer Aided Instruction, Neural Computing, Natural Language Processing, etc. From these Expert System is a rapidly growing technology which is having a huge impact on various fields of life. The various techniques applied in artificial intelligence are Neural Network, Fuzzy Logic, Evolutionary Computing, and Hybrid Artificial Intelligence.

The overall research goal of artificial intelligence is to create technology that allows computers and machines to function in an intelligent manner. Artificial intelligence has the advantages 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.

Reasoning & problem solving

The development of algorithms through early research imitated step-by-step reasoning that humans use when they solve puzzles or make logical deductions. During the late 1980s and 1990s, Artificial Intelligence research had developed methods for dealing with uncertain or incomplete information, employing concepts from probability and economics.

For complex problems, algorithms may require enormous computational resources, such as a "combinatorial explosion": the amount of memory or computer time required becomes astronomical for problems of a certain size. The search for more efficient problem-solving algorithms is a high priority. Human beings ordinarily use fast, intuitive judgments rather than step-by-step deduction that early AI research was able to model. AI has progressed using "sub-symbolic" problem solving: embodied agent approaches emphasize the importance of sensor motor skills to higher reasoning; neural net research attempts to simulate the structures inside the brain that give rise to this skill; statistical approaches to AI mimic the human ability to guess.

Knowledge representation

Knowledge representation and knowledge engineering are central to AI research. Many of the problems machines are expected to solve will require extensive knowledge about the world. Among the things that AI needs to represent are: objects, properties, categories and relations between objects situations, events, states and time, causes and effects, knowledge about knowledge (what we know about what other people know) and many other, less well researched domains. A representation of "what exists" is an ontology: the set of objects, relations, concepts, and properties formally described so that software agents can interpret them. The semantics of these are captured as description logic concepts, roles, and individuals, and typically implemented as classes, properties, and individuals in the Web Ontology Language. The most general ontologies are called upper ontologies, which attempt to provide a foundation for all other knowledge by acting as mediators between domain ontologies that cover specific knowledge about a particular knowledge domain (field of interest or area of concern). Such formal knowledge representations are suitable for content-based indexing and retrieval, scene interpretation, clinical decision support, knowledge discovery via automated reasoning (inferring new statements based on explicitly stated knowledge), etc. Video events are often represented as SWRL rules, which can be used, among others, to automatically generate subtitles for constrained videos.

APPLICATIONS OF ARTIFICIAL INTELLIGENCE

AI is relevant to any intellectual task. Modern artificial intelligence techniques are pervasive and are too numerous to list here. Frequently, when a technique reaches mainstream use, it is no longer considered artificial intelligence; this phenomenon is described as the AI effect.



The examples of AI include autonomous vehicles (such as drones and self-driving cars), medical diagnosis, creating art (such as poetry), proving mathematical theorems, playing games (such as Chess or Go), search engines (such as Google search), online assistants (such as Siri), image recognition in photographs, spam filtering, prediction of judicial decisions and targeting online advertisements.

With social media sites overtaking TV as a source for news for young people and news organisations increasingly reliant on social media platforms for generating distribution, major publishers now use artificial intelligence (AI) technology to post stories more effectively and generate higher volumes of traffic.

Healthcare

Artificial intelligence is breaking into the healthcare industry by assisting doctors. According to Bloomberg Technology, Microsoft has developed AI to help doctors find the right treatments for cancer. There is a great amount of research and drugs developed relating to cancer. In detail, there are more than 800 medicines and vaccines to treat cancer. This negatively affects the doctors, because there are too many options to choose from, making it more difficult to choose the right drugs for the patients. Microsoft is working on a project to develop a machine called "Hanover". Its goal is to memorize all the papers necessary to cancer and help predict which combinations of drugs will be most effective for each patient.

Fuzzy Expert Systems in Medicine: Fuzzy logic 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 modelling. 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.

Hospital Inpatient 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 tumours in medical images. Such approaches help in the diagnosis of various forms of cancer, and congenital heart defects.

Artificial Neural Networks Approach on Diagnostic Science: Endoscopic Images and MRI Brain Tumour Analysis.

Automotive

Advancements in AI have contributed to the growth of the automotive industry through the creation and evolution of self-driving vehicles. There are more than 30 companies utilizing AI into the creation of driverless cars. Some companies involved with AI include Tesla, Google, and Apple. Many components contribute to the functioning of self-driving cars. These vehicles incorporate systems such as braking, lane changing, collision prevention, navigation and mapping. Together, these systems, as well as high performance computers, are integrated into one complex vehicle.

Finance

Financial institutions have long used artificial neural network systems to detect charges or claims outside of the norm, flagging these for human investigation. The use of AI in banking can be traced back to 1987 when Security Pacific National Bank in USA set-up a Fraud Prevention Task force to counter the unauthorised use of debit cards.

Programs like Kasisto and Money stream are using AI in financial services.

Banks use artificial intelligence systems today to organize operations, maintain book-keeping, invest in stocks, and manage properties. AI can react to changes overnight or when business is not taking place. In August 2001, robots beat humans in a simulated financial trading competition. AI has also reduced fraud and financial crimes by monitoring behavioral patterns of users for any abnormal changes or anomalies.

The use of AI machines in the market in applications such as online trading and decision making has changed major economic theories. For example, AI based buying and selling platforms have changed the law of supply and demand in that it is now possible to easily estimate individualized demand and supply curves and thus individualized pricing.

Power system stabilizers (PSSs) Design

Since the 1960s, PSSs have been used to add damping to electromechanical oscillations. The PSS is an additional control system, which is often applied as a part of an excitation control system. The basic function of the PSS is to apply a signal to the excitation system, producing electrical torques to the rotor in phase with speed differences that damp out power oscillations. They perform within the generator's excitation system to create a part of electrical torque, called damping torque, proportional to speed change.

In the field of power system operation computer programs are executed and modified frequently according to any variations. Artificial intelligence (AI) has the ability to deal with the high non-linearity of practical Systems. The various technologies that are used in PSSs optimization problems are ANN, FL, ES etc.

Network Intrusion Detection

Intrusion Detection Systems (IDS) uses the various Artificial Intelligence techniques for protecting computer and communication networks from intruders. Intrusion Detection System (IDS) is the

process of monitoring the events occurring in network and detecting the signs of intrusion.

Artificial Neural Network in IDS: ANN is a mathematical model that consists of an interconnected group of artificial neurons which processes the information. In IDS ANN are used to model complex relationships between inputs and outputs or to find patterns in data. In this a neuron calculates the sum by multiplying input by weight and applies a threshold. The result is transmitted to subsequent neurons.

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.

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.

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. This paper is based on the concept of artificial intelligence, areas of artificial intelligence and the artificial intelligence techniques used in the field of Power System Stabilizers (PSS) to maintain system stability and damping of oscillation and provide high quality performance, in the Network Intrusion Detection to protect the network from intruders, in the medical area in the field of medicine, for medical image classification, in the accounting databases, and described how these 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. There are tremendous scopes of further

research in the area as there are very promising and profitable results that are obtainable from such techniques.

REFERENCES

- [1] N Ramesh, C Kambhampati, JRT Monson, PJ Drew, "Artificial intelligence in medicine", 2004.
- [2] Charles Weddle, Graduate Student, Florida State University "Artificial Intelligence and Computer Games", unpublished.
- [3] C. Sampada,, et al, "Adaptive Neuro-Fuzzy Intrusion Detection Systems", Proceedings: International Conference on Information Technology: Coding and Computing (ITCC'04),2004.
- [4] Daniel B. Neill, "Using Artificial Intelligence to Improve Hospital Inpatient Care".
- [5] Daniel E.O."Leary Artificial Intelligence and Expert System in Accounting Databases: Survey and Extensions", Expert Systems with Applications, vol-3, 1991.
- [6] Fatai Adesina Anifowose, Safiriyu Ibiyemi Eludiora, "Application of Artificial Intelligence in Network Intrusion Detection", World Applied Programming, Vol (2), No (3), March 2012.
- [7] F. D. Laramee, Genetic Algorithms: Evolving the Perfect Troll, AI Game Programming Wisdom, Charles River Media, Inc., Hingham, MA, 2002
- [8] Holland JH, "Adaptation in Natural and Artificial Systems", 1975.
- [9] J. Matthews, Basic A* Path finding Made Simple, AI Game Programming Wisdom, Charles River Media, Inc., Hingham, MA, 2002.
- [10] Mahdiyeh EslamiI, Hussain Shaareef, Azah Mohamed, "Application of artificial intelligent techniques in PSS design: a survey of the state-of-the-art methods".
- [11] Oscar Firschein, Martin A. Fischler, L.Stephen Coles, Jay M. Tenenbaum,



“FORECASTING AND ASSESSING THE IMPACT OF ARTIFICIAL INTELLIGENCE ON SOCIETY”, unpublished.

[12] S.N. Deepa, B. Aruna Devi, “A survey on artificial intelligence approaches for medical image classification”, Indian Journal of Science and Technology, Vol. 4 No. 11 (Nov 2011).

[13] Vassilis S Kodogiannis and John N Lygouras (2008) Neuro-fuzzy classification system for

wireless capsule endoscopic images. J. World Acad. Sci.Engg. & Technol., 45, 620-628.

[14] Zadeh L, “Fuzzy sets Inf Control”, 1965

[15]
https://en.wikipedia.org/wiki/Artificial_intelligence.