A study of artificial intelligence applications in Interactive engineering systems

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ABSTRACT

In the future, intelligent machines will replace or enhance human capabilities in many areas. Artificial intelligence is the intelligence exhibited by machines or software. It is the subfield of computer science. Artificial Intelligence is becoming a popular field in computer science as it has enhanced the human life in many areas.In future, the intelligent machines will be replaced to improve the capability of a human in many areas. The intelligence of AI is revealed by machines or software. It also the subfield of computer science, now a day's becoming popular in power station. Artificial intelligence in the last two decades has greatly improved performance of the manufacturing and service systems. Study in the area of artificial intelligence has given rise to the rapidly growing technology known as expert system. Application areas of 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, weather forecasting. The areas employing the technology of Artificial Intelligence have seen an increase in the quality and efficiency. This paper gives an overview of this technology and the application areas of this technology. This paper will also explore the current use of Artificial Intelligence technologies in the PSS design to damp the power system oscillations caused by interruptions, in Network Intrusion for protecting computer and communication networks from intruders, in the medical area medicine, to improve hospital inpatient care, for medical image classification, in the accounting databases to mitigate the problems of it and in the computer games.

Keywords: Artificial Intelligence, Neural Networks (computer), Robotics, Human Intelligence.

INTRODUCTION

The artificial intelligence group studies the computational mechanisms underlying intelligent behavior. We are active in a wide variety of research areas, including machine learning, natural language processing, probabilistic reasoning, automated planning, machine reading, Brain-Computer Interfaces & Computational Neuroscience , Computational Biology, Robotics, Graphics and Imaging Laboratory (GRAIL) , and intelligent user interfaces. UW CSE is one of the leading centers for AI research in the world, as demonstrated by our track record at the top conferences in our field, individual student and faculty honors, and high-profile research collaborations such as our work with the Allen Institute for Artificial Intelligence (AI2). In artificial intelligence, an expert system is a computer system that emulates the decision-making ability of a human expert.[1] Expert systems are designed to solve complex problems by reasoning through bodies of knowledge, represented mainly as if–then rules rather than through conventional procedural code.[2] The first expert systems were created in the 1970s and then proliferated in the 1980s.[3] Expert systems were among the first truly successful forms of artificial intelligence (AI) software.[4][5][6][7][8]

An expert system is divided into two subsystems: the inference engine and the knowledge base. The knowledge base represents facts and rules. The inference engine applies the rules to the known facts to deduce new facts. Inference engines can also include explanation and debugging abilities.[9]

The domain of artificial intelligence is huge in breadth and width. While proceeding, we

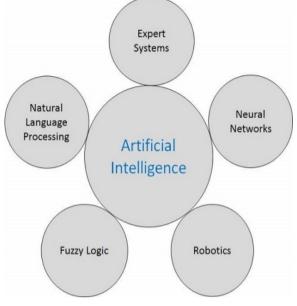consider the broadly common and prospering research areas in the domain of AI.

Figure 1:

Real Life Applications of AI Research Areas:

There is a large array of applications where AI is serving common people in their day-to-day lives.

Expert Systems: Expert systems (ES) are one of the prominent research domains of AI. It is introduced by the researchers at Stanford University, Computer Science Department.

The expert systems are the computer applications developed to solve complex problems in a particular domain, at the level of extra-ordinary human intelligence and expertise.

Examples – Flight-tracking systems, Clinical systems.

Natural Language Processing: Natural Language Processing (NLP) refers to AI method of communicating with an intelligent systems using a natural language such as English.

Processing of Natural Language is required when you want an intelligent system like robot to perform as per your instructions, when you want to hear decision from a dialogue based clinical expert system, etc.

The field of NLP involves making computers to perform useful tasks with the natural languages humans use. The input and output of an NLP system.

Examples: Google Now feature, speech recognition, Automatic voice output.

Neural Networks : Expert systems (ES) are one of the prominent research domains of AI. It is

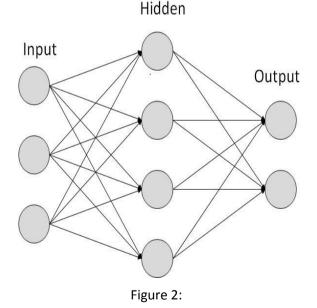introduced by the researchers at Stanford University, Computer Science Department.

The expert systems are the computer applications developed to solve complex problems in a particular domain, at the level of extra-ordinary human intelligence and expertise.

The idea of ANNs is based on the belief that working of human brain by making the right connections, can be imitated using silicon and wires as living **neurons** and **dendrites**.

The human brain is composed of 86 billion nerve cells called **neurons.** They are connected to other thousand cells by **Axons.** Stimuli from external environment or inputs from sensory organs are accepted by dendrites. These inputs create electric impulses, which quickly travel through the neural network. A neuron can then send the message to other neuron to handle the issue or does not send it forward. ANNs are composed of multiple **nodes**.

which imitate biological **neurons** of human brain. The neurons are connected by links and they interact with each other. The nodes can take input data and perform simple operations on the data. The result of these operations is passed to other neurons. The output at each node is called its **activation** or **node value.**

Each link is associated with **weight.** ANNs are capable of learning, which takes place by altering weight values. The following illustration shows a simple ANN.

Figure 2:

Examples – Pattern recognition systems such as face recognition, character recognition, handwriting recognition.

Robotics: Robotics is a domain in artificial intelligence that deals with the study of creating intelligent and efficient robots.Robots are the artificial agents acting in real world environment. Robots are aimed at manipulating the objects by perceiving, picking, moving, modifying the physical properties of object, destroying it, or to have an effect thereby freeing manpower from doing repetitive functions without getting bored, distracted, or exhausted. Robotics is a branch of AI, which is composed of Electrical Engineering, Mechanical Engineering, and Computer Science for designing, construction, and application of robots.

Examples – Industrial robots for moving, spraying, painting, precision checking, drilling, cleaning, coating, carving, etc.

Fuzzy Logic Systems: Fuzzy Logic (FL) is a method of reasoning that resembles human reasoning. The approach of FL imitates the way of decision making in humans that involves all intermediate possibilities between digital values YES and NO.

Examples – Consumer electronics, automobiles, etc.

Computer Vision

The world is composed of three-dimensional objects, but the inputs to the human eye and computers' TV cameras are two dimensional. Some useful programs can work solely in two dimensions, but full computer vision requires partial three-dimensional information that is not just a set of two-dimensional views. At present there are only limited ways of representing three-dimensional information directly, and they are not as good as what humans evidently use.

Speech Recognition

In the 1990s, computer speech recognition reached a practical level for limited purposes. Thus United Airlines has replaced its keyboard tree for flight information by a system using speech recognition of flight numbers and city names. It is quite convenient. On the the other hand, while it is possible to instruct some computers using speech, most users have gone back to the keyboard and the mouse as still more convenient.

The speech recognition aims at understanding and comprehending **WHAT** was spoken.It is used in hand-free computing, map, or menu navigation. Machine does not need training for Speech Recognition as it is not speaker dependent.Speaker independent Speech Recognition systems are difficult to develop.

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 highquality 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.We conclude that further research in this area can be done as there are very promising and profitable results that are obtainable from such techniques. While scientists have not yet realized the full potential and ability of artificial intelligence. This technology and its applications will likely have far-reaching effects on human life in the years to come.

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