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Artificial Intelligence and its Application

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ABSTRACT : Artificial intelligence is a field that attempts to provide machine with human-like thinking. This paper describe the application areas of AI technologies and future of AI in the real world. Application areas of AI are having huge impact on various fields of human everyday life as expert system is widely used these days to solve the complex problems. In the future, intelligent machines will replace or enhance human capabilities in many areas. Successful implementation of purely AI is illustrated by applications as an adaptive power system stabilizer to improve damping and stability of an electric generating unit. AI will enable significantly reducing, even bringing to zero, traffic accidents and deaths. The study analyzes the relative impact of AI on two different types of accounting works-auditing and tax. 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 areas, 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: Network Intrusion, Fuzzy inference system, Power system stabilization.

I. INTRODUCTION

Artificial Intelligence (AI) is one of the most advanced technologies in the world.Artificial intelligence is a branch of computer science capable of analyzing complex medical data. Their potential to exploit meaningful relationship with in a data set can be used in the diagnosis, treatment and predicting outcome in many clinical scenarios. AI technologies have matured to the point in offering real practical benefits in many of their applications. Artificial Intelligence (AI) is a science and a set of computational technologies that are inspired by the ways people use their nervous systems and bodies to sense, learn, reason, and take action. While the rate of progress in AI has been patchy and unpredictable, there have been significant advances since the field's inception sixty years ago. Once a mostly academic area of study, twenty-first century AI enables a constellation of mainstream technologies that are having a substantial impact on everyday lives. Computer vision and AI planning, for example, drive the video games that are now a bigger entertainment industry than Hollywood. Deep learning, a form of machine learning based on layered representations of variables referred to as neural networks, has made speech-understanding practical on our phones and in our kitchens, and its algorithms can be applied widely to an array of applications that rely on pattern recognition. Natural Language Processing (NLP) and knowledge representation and reasoning have enabled a machine to beat the Jeopardy champion and are bringing new power to Web searches. Major 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. 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. 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.

A) Application of Artificial Intelligence Techniques in Medical Area: Judging by the volume of publication in the last two decades, ANN is the most popular AI technique in medicine. ANNs are computational analytical tools which are inspired by the biological nervous system. They consist of networks of highly interconnected computer processors called 'neurons' that are capable of performing parallel computations for

data processing and knowledge representation. Their ability to learn from historical examples, analyze non-linear data, handle imprecise information and generalize enabling application of the model to independent data has made them a very attractive analytical tool in the field of medicine. McCulloch and Pitts (1943) invented the first artificial neurons using simple binary threshold functions. The next important milestone came when Frank Rosenblatt, a psychologist, developed the Perceptron in 1958 as a practical model. Many variations of the basic Perceptron network have been proposed but the most popular model has been multilayer feedforward Perceptron. These networks are made up of layers of neurons, typically an input layer, one or more middle or hidden layers and an output layer, each of which are fully connected to other layer. The neurons are connected by links, and each link has a numerical weight associated with it. A neural network 'learns' through repeated adjustments of these weights. One of the important characters of ANNs is that they can learn from their experience in a training environment. The use of multilayer feedforward Perceptron was restricted by the lack of a suitable learning algorithm until Paul Werbos (1974) a PhD student introduced 'back propagation' learning. Some of the other popular network designs include Hopfield networks, Radial Basis Function and the Self-Organizing Feature Map. ANNs have already found a wide variety of applications in the real world. Their ability to classify and recognise patterns accurately has attracted researchers to apply them in solving many clinical problems. As we realize that diagnosis, treatment and predicting outcome in many clinical situations is dependent on a complex interaction of many clinical, biological and pathological variables there is a growing need for analytical tools like ANNs which can exploit the intricate relationships between these variables. Figure 1 Multilayered feedforward artificial neural networks. Baxt was one of the first researchers to explore the clinical potentials of ANNs. He developed a neural network model which accurately diagnosed acute myocardial infarction and latter prospectively validated his work with similar accuracy. Since then, ANNs have been applied in almost every field of medicine.

B) Power System Stabilization Based On AI : Small amplitude low frequency oscillations have been observed in power system since 1960's. 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. A CPSS can be modeled by a two stage (identical), lead-lag network which is represented by a gain K and two time constants T1 and T2. This network is connected with a washout circuit of a time constant Tw. The signal washout block acts as a high-pass filter with the time constant Tw that allows the signal associated with the oscillations in rotor speed to pass unchanged. Furthermore, it does not allow the steady state changes to modify the terminal voltages. The phase compensation blocks with time constants T1i – T4i supply the suitable phase-lead characteristics to compensate the phase lag between the input and the output signals. In the field of power system operations and planning,very sophisticated computer programs are required anddesigned in such a way that they could be executed andmodified frequently according to any variations. Artificialintelligence (AI) is a powerful knowledge-based approachthat has the ability to deal with the high non-linearity ofpractical Systems. AI has a benefit to decrease themathematical complexity beside the rapid response whichcan be utilized for transient analysis. AI techniques, whichpromise almost a global optimum, such as ANN, FL, andEvolutionary Computation (EC), have appeared in recentyears in power systems applications as efficient tools tomathematical approaches. Recently, many researchers areconcerned with various types of AI techniques to developefficient PSSs. The real beginning of AI was presented in1958.

C) Application of Artificial Intelligence Techniques in 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.

3.1) 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.

3.2) Fuzzy Inference Systems (FIS) in IDS: Sampada et al proposed two machine learning paradigms: Artificial Neural Networks and Fuzzy Inference System, for the design of an Intrusion Detection System. They used SNORT to perform real time traffic analysis and packet logging on IP network during the training phase of the system. They constructed a signature pattern database using Protocol Analysis and Neuro-Fuzzy learning method. They then

tested and validated the models using the 1998 DARPA Intrusion Detection Evaluation Data and TCP dump raw data. The data set contains 24 attack types. The attacks fall into four main categories viz. Denial of Service (DOS), Remote to User (R2L), User to Root (U2R), and Probing. From the results, it was shown that the Fuzzy Inference System was faster in training, taking few seconds, than the Artificial Neural Networks which took few minutes to converge. Generally, both techniques proved to be good, but with the Fuzzy Inference System having an edge over Artificial Neural Networks with its higher classification accuracies. Their experiment also showed the importance of variable selection, as the two techniques performed worse when all the variables were used without selection of the variables. Good results were recorded when a subset (about 40%) of the variables were used .

D) Application of Artificial Intelligence Techniques in the Computer Games : Artificial intelligence (AI) in computer games covers the behaviour and decision-making process of game-playing opponents (also known as nonplayer character or NPC). Current generations of computer and video games offer an amazingly interesting testbed for AI research and new ideas. Such games combine rich and complex environments with expertly developed, stable, physics-based simulation. They are real-time and very dynamic, encouraging fast and intelligent decisions. Computer games are also often multiagents, making teamwork, competition, and NPC modelling key elements to success. In commercial games, such as action games, role-playing games, and strategy games, the behaviour of the NPC is usually implemented as a variation of simple rule-based systems. With a few exceptions, machine-learning techniques are hardly ever applied to state-of-the-art computer games. Machine-learning techniques may enable the NPCs with the capability to improve their performance by learning from mistakes and successes, to automatically adapt to the strengths and weaknesses of a player, or to learn from their opponents by imitating their tactics. FSMs (finite state machines) describe under which events/conditions a current state is to be replaced by another—for example, switching from an attack mode to an escape mode if the NPC is hit. It is mostly only a design concept—that is, the game has no general FSM interpreter, but the FSMs are realized by scripts and simple if-then statements. An FSM is a simple and powerful tool for modeling an NPC's behavior. There are extensions to cope with more complex behaviors, such as hierarchical FSMs, as well as nondeterministic variants to introduce random elements.

Decision trees conceptually are even slightly simpler than FSMs and represent branching structures that are often used to make high-level strategic decisions–for example, if a computer-guided opponent in a strategy game should prepare an attack or concentrate on resource gathering. The nodes in the tree are test conditions, which lead to different sub-trees.

II. CONCLUSION

Artificial intelligence (AI) is awakening fear and enthusiasm in equal measures. Some have likened the advances in AI to "summoning the devil" and there are concerns that AI threatens to end humanity. AI can scare people, perhaps due to the science fiction notion that machines will take all of our jobs; 'wake up' and do unintended things. However, where some see danger, others see opportunity!Artificial Intelligence and the technology are one side of the life that always interest and surprise us with the new ideas, topics, innovations, products …etc. This technology and its applications will likely have far-reaching effects on human life in the years to come. There is compelling evidence that medical AI can play a vital role in assisting the clinician to deliver health care efficiently in the 21st century. There is little doubt that these techniques will serve to enhance and complement the 'medical intelligence' of the future clinician.

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