Soft Computing Techniques in Various Areas

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Abstract: - Soft computing is a study of the science of logic, thinking, analysis and research that combines real-world problems with biologically inspired methods. Soft computing is the main motivation behind the idea of conceptual intelligence in machines. As such, it is an extension of heuristics and the resolution of complex problems that are very difficult to model mathematically. Smooth computing tolerates printing; uncertainty and approximation that differ from manual calculation. Soft Computing enumerates techniques like ANN, Evolutionary computing, Fuzzy Logic and statistics, they are advantageous and separately applied techniques which are used together to solve problems which are complex, very easily. This article highlights the various soft computing ting techniques and emerging areas of soft computing ting where they have been successfully implemented.

I. INTRODUCTION

There are many problems in the real world that we have to deal with every day, and we try to solve them rationally and theoretically, but we have failed to address them due to the huge resources and computing time requirements. These problems work very systematically and consistently when resolved by natural methods. Sometimes in many practical situations the ideal solution is enough. So these types of conditions could be handled by some biologically inspired methods called soft computing.

The major covers of soft computers are the Genetic Algorithm, Fuzzy Logic, and the Artificial Intelligence Network. This discipline applies to individual problems or forms. Soft computers are part of the family of computer technology or computer intelligence. Two types of problem-solving technology are Hard Computing and Soft Computing. Hard computing deals with the precise model where exact and accurate solutions are obtained. Soft computing is based on approximate models. It is different from hard computing i.e. conventional computing which involves symbolic logic reasoning and totally passed on numerical modeling and search. Meanwhile, soft computers build up the human mind. It is impatient, unpredictable, fuzzness, cheap solutions and a better quality of life. It refers to the collection of many financial systems such as engineering, aviation, telephone, robots, cooling and heating, electrical equipment etc.

II. SOFT COMPUTING

Soft computing is a term entered into circulation in 1994. The main goal of soft computing is to follow the human mind or bring the thinking and thinking behavior closer to the human mind as much as possible. Soft computing combines various technologies to create a hybrid technology that, in fact, will inherit all the advantages and features of simple computer components. Soft computing is a promising approach to computing that gives the human mind a great ability to debate and learn in environments of uncertainty and distrust. Soft computing is a technique based on some biological induced methods such as genetics, ant behaviour, the human nervous system, etc.

Hybrid computing is a combination of raw computing and soft computing that brings its advantages and disadvantages. To use both methods, their individual constraints are reduced to solve problems more efficiently with mixed computation. Hybrid models of light-emitting computers have been applied to many classification, forecasting and management problems.

Soft computation is the only solution when we do not have mathematical models (e.g., algorithm) to solve the problem. It has major applications in a variety of applications: medical imaging, computer vision, computer technology, air safety, air conditioning, LSI development, drafting, acknowledging the model, improving the writing etc.

III. TECHNIQUES USED IN SOFT COMPUTING

Soft computing differs from conventional (hard) computing. Unlike hard computing, it is tolerant of imprecision, uncertainty, partial truth and approximation. In effect, the role model for soft computing is the human mind. Soft Computing is basically optimization technique to find solution of problems which are very hard to answer.

a). Optimization

It is the process of making something better. Optimization is the process of adjusting the inputs to find the minimum or maximum output or result.

Optimization is a mechanism by which we find the maximum or minimum value of a function or process. This mechanism is used in areas such as physics, chemistry, economics, and engineering, where the goal is to maximize efficiency, production, or other measures. Optimization may relate to minimization or maximization; maximizing the function f is equivalent to minimizing the opposite of this function $-f$. Engineers or scientists create new ideas and optimize them to improve. Using obtained information to try to improve the concept of core concepts in optimization, computers are the ideal tool for optimization if you can enter ideas or variables that influence them electronically. Send data to your computer and find a solution.

b). Neural Networks (ANN)

The human mind somehow describes real situations that computers cannot. To solve this problem, neural networks were developed for the first time in the 1950s. Artificial neural networks are an attempt to emulate a network of neurons that builds the human brain so that computers can learn things and make decisions in a human way. ANN is made by regular computer programming, as if they are mutually associated with brain cells.

The brain is made up of millions of very simple or simple processing elements, which are connected in largely parallel ways. It is believed to be responsible for human intelligence and discriminatory power. Neural networks have been developed to try to achieve the performance of the biological system using close connections with simple transformation elements corresponding to biological neurons. Neural networks are based on information rather than data. Typically, there are at least two layers, an input layer and an output layer. One of the most common networks is the Back Propagation Network (BPN) which consists of an input layer, and an output layer with one or more intermediate hidden layers.

A neural network is developed to perform a particular task by adding values of connectivity (machines) between objects that use multiple samples before they can work with existing problems. The methods used to develop these data on the training of the neural network and to teach the proposed algorithm have a significant impact on the function of the neural network. One of the training methods used is the Back Propagation (BP) algorithm. The algorithm aims to reduce the discrepancies in the value of the desired value and the value of the value function.

c) Fuzzy Logic

Fuzzy logic is a mathematical logic, which attempts to solve problems with an open, imprecise spectrum of data that makes it possible to get an array of precise findings. Fuzzy logic is designed to be considered the best possible decision by considering all available information

c) Genetic Algorithm

Nature is and always will be a wonderful source of inspiration for humanity. Genetic algorithms (GAs) take all their inspiration from nature, and there are no fewer genetic algorithms based on research-based algorithms that are rooted in concepts of natural selection and genetics. The genetic algorithm is also a subset of a large branch of computation (also called evolutionary computation).

The basic principles were developed by Holland, while the efficiency of using Genetic Algorithm to solve complex problems. Genetic Algorithm is a comprehensive research strategy that uses inspiring principles to promote problem solving. As a human being, the concept of seed is understood as an evolutionary theory based on Darwin's theory of evolution. They have been well documented on many scientific and engineering problems, like optimization, machine learning, automation, transportation problems, maintenance management, etc.

The genetic algorithm begins with a set of randomly generated chromosomes, each of which represents a candidate solution to a specific problem to be solved, and moves toward a better chromosome using genetic factors based on natural genetic processes. Until now, the genetic algorithm has been very successful in research and optimization problems due to its strong ability to use the information gathered under the unknown search space. Particularly Genetic Algorithm specialize in large, complex and poorly understood search spaces where classic tools are inappropriate, inefficient or time consuming.

As we mentioned, the idea of a basic genetic algorithm is to preserve a number of chromosomes. This population grows over time through a process of successive repetition of competition and controlled difference. Each country of the population is called a generation. Each chromosome of each generation is linked to the fitness value, which indicates the quality of the solution, represented by the chromosomal values. Based on these fitness values, the chromosomes that make up the new generation are chosen. As in nature, new chromosomes are created using genetic factors such as exchange and mutation.

Hybrid

Computer Science & Information Technology (CS & IT) 61 computing is the combination of hard computing and soft computing which having their inherent advantages and disadvantages. To get the advantages of both these techniques their individuals limitations are reduced for solving a problem more efficiently by Hybrid computing. Hybrid soft computing models have been applied to a large number of classification, prediction, and control problems

IV. APPLICATION AREAS OF SOFT COMPUTING

Soft computing is a tool that can provide problem resolution methods, optimization approximation methods including search methods. Soft computing techniques are used in different fields such as Wireless Communication, Data Mining, Communication System, Transportation, Healthcare, Robotics, Consumer Appliances(AC, Refrigerator etc), game playing , Recognition of Hand Writing, Image Processing, Architecture, Decision Support etc. The important applications are discussed below:

a)Wireless Communication

Leading network management capabilities include extensive resource allocation, task management, network configuration, power management, consulting and more. Troubleshooting and converting methods for wireless networks for use in resource management, such as using ANN technology, and using bandwidth allocation for mobile phones to increase and optimize bandwidth distribution. To individuals. An algorithm based system can be used to achieve fast and reliable

information for optimizing resource allocation. The use of advanced techniques uses a computer algorithm for achieving WWAN control. The algorithm helps in reducing mobile terminal power consumption and increasing the cellular network capacity. In WLANs, security is also enhanced by artificial neural network techniques and fog logic. DoS and MITM attacks are common on wireless LANs. Soft computing is designed to minimize validation fraud and detection delays.

b) Communication Systems

In Communication Systems Soft Computing can be used effectively to find solutions that have not yet been resolved by Hard Computing. Neural Networking and Fuzzy Logic combine and provide approaches from Neuro-Fuzzy to use for information purposes and representation. Some researchers present their ideas and use different methods of Soft Computing techniques.

c) Consumer Appliances

The area of consumer activity is related to improvement in product performance. Recently, perceptions of change have become more recognized in this area. These techniques are used for various applications such as washing machines, heaters, refrigerators, microwaves and more.

d) Robotics

Robotics is a new field based on human thinking and behavior. Fuzzy logic techniques and expert systems can develop useful applications in the real world applications. Also interfaces of the neuro-fuzzy system are the representation of fuzzy logic with learning capabilities. A neuro-fuzzy technique can avoid obstacles and wall behavior in a small-sized robot. Modern information is considered to be an interactive information processing of human and artificial materials. Human intelligence such as information processing and learning, evolution and prediction environment. Soft computing is widely used in this field.

e) Transportation

Soft computing is used to create smart vehicles and provide a seamless environment for each of the machines and drivers. Intelligent car control requires recognition of the driving environment and driving planning that is easily accepted by drivers. The area of transportation deals with passengers, logistics operations, fault diagnosis etc.

f) Healthcare

With the advancement of computing technologies, the use of soft computing techniques provides better and more advanced help, which in many cases helps the physician to detect diseases quickly and in real time diagnosis. Soft computing is used in a variety of medical applications, such as medical image registration using genetic algorithms, machine learning techniques for solving predictive problems in the medical field, artificial neural networks(ANN) for cancer diagnosis, and fusion logic for various diseases.

g) Actuarial Science

Acturial science is a discipline that uses interventions and statistics to evaluate problems in insurance and financial services. Advanced science is based on a number of topics related to risk, mathematics, accounting, finance, finance, finance, and computer programming.

h) Civil Engineering

Civil engineering is a professional engineering discipline that teaches the design, operation, analysis, and maintenance of natural habitats and natural environments, including pathways, bridges, gardens, concrete, and buildings. Civil engineering takes place at all levels: on a public scale from the municipal to national level, and in private offices, from home offices to international businesses.

i) Imaging Processing

In image science, image processing is any form of signal processing where the signal input is an image (such as a video frame or photo); the output of the image processing can be an image or a set of features or parameters. Image processing techniques include image processing as a two-dimensional signal and standard image processing techniques.

j) Pattern Recognition

Pattern recognition is usually intended to provide a reasonable response to all possible inputs and to perform a match with the inputs, taking into account the definition of the statistics. Pattern recognition has been studied in many fields like psychology, ethics, cognitive science, traffic flow, computer science etc

V. CONCLUSION & FUTURE RESEARCH

Since the development of the systems is in many disciplines, including physics, chemistry, biology and physics, computer scientists learn about the roles and their relationship with the future of soft computing. We hope that this holistic view will be useful for IT professionals who are happy to contribute in the area of soft computing.

Comprehensive soft computing technologies are characteristic of all areas of physics, mathematics, computational chemistry, statistics, etc. Reliability, cost-effectiveness and simplicity are several characteristics of soft computing applications. Fuzzy Logic is very useful for tracking errors and uncertainties. Whereas ANN offers good prediction capabilities due to its generalization and learning features. On the other hand, Evolutionary computing techniques have been shown to be very much applicable in optimization problems. As the development of soft computing flourish day by day, the application areas will also be felt increasing in coming years. Soft computing based products are increasing day by day. Majority of such products uses the soft computing technique inside their sub systems which are not known to end user. The bottom line is that soft computing is too advanced in many applications and can solve imprecise problems.

There are many bioinspired metaheuristics to solve optimization problems. Although (Corona Virus Optimization Algorithm) CVOA has been conceived to optimize any kind of problems.

It is hard to find consensus among the researchers on which method should be applied to which problem, and, for this reason, many optimization methods have been proposed to improve deep learning models. Generally, the criterion for selecting a method is its performance from a variety of perspectives. Accuracy and Low computation cost or even implementation difficulty can be accepted as one of these criteria. The Virus Optimization Algorithm (VOA) was proposed by Liang and Cuevas-Ju´arez in 2016. The results of its application are highly dependent on its initial configuration and it simulates generic viruses, without adding individualized properties for particular viruses. The results achieved shows its usefulness beyond doubt.

This work has introduced a novel bioinspired metaheuristic, based on the coronavirus behavior. On the one hand, CVOA has two advantages. First, its highly relation to the coronavirus spreading model, prevents the authors to make any decision about the inputs' values. Second, it ends after a certain number of iterations due to the exchange of individuals between healthy and dead/recovered lists. Additionally, a novel discrete and dynamic codification has been proposed to hybridize deep learning models. On the other hand, it has got some limitations like the exponential growth of the infected population as time (iterations) goes by.

Further parallel version is proposed so that CVOA is easily transformed into a multi-virus metaheuristic, in which different coronavirus strains search for the best solution in a collaborative way. This fact allows to model every strain with different initial setups (higher DEATH RATE, for instance), sharing recovered or dead lists.

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Advantages and Disadvantages

Soft computing components such as machine learning, evolutionary computing, fuzzy logic, genetic algorithms, etc. are actively used to solve computational problems. These are common technologies in the market today and there is a lot of scope in these areas in the future as well. It is used to make many realistic decisions, which create problems in mysterious situations. Its purpose is to imitate human capabilities.

One of the biggest applications of these techniques can be seen in bio-informatics. Some other areas where this technique is used are writing recognition, image processing, data compression, decision support systems, and neuroscience. It is also used to make several data-dependent predictors.

Soft Computing finds research gap in the area of cost optimization and mapping , further work is recommended in this area because according to survey, cost and mapping is stated as the fastest growing concern and soft computing techniques can help to optimize cost which could eventually help tackle this challenge.

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