Soft Computing and Its Applications

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Abstract

This paper studies the improvement of Soft computing applications in different spaces. In particular, it quickly audits principle methodologies of Soft computing, the later advancement of Soft computing, and settle by exhibiting an all-encompassing perspective on applications: from the most abstract to the most specific ones. Inside this unique situation genetic algorithms (GA), fuzzy logic (FL), and artificial neural networks (ANN) just as their combination are explored so as to inspect the ability of soft computing techniques and systems to adequately address different difficult to-settle configuration design and issues. This paper present uses applications of using distinctive soft computing technique in both industrial, biological procedures, in various engineering designs, speculation and money related exchanging. It investigations the writing as indicated with the use of soft computing used, the investment discipline used, the victories illustrated, and the materialness of the research to a real world scenario.

Keywords: Soft computing applications, Fuzzy logic, Genetic algorithm, Neural networks, Investment and financial trading

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I. INTRODUCTION

Soft Computing is a sort of imprecision, kind of uncertainty, partial truth, and most of the approximation estimation. Essentially, soft computing is propelled like the structure of human brain. The main rule of soft computing is: to get the efficiency for imprecision, uncertainty, not fully truth, and estimation to accomplish tractability, power, and cost efficient solution and illuminates the fundamental issues which are faced by today's technologies, the absence of necessary knowledge of the ongoing researcher analyses as the human brain functionality.

The fundamental thought of soft computing hidden in its present manifestation have connections to the initially influenced. The incorporation of neural networking computing and genetic algorithm computing comes later.

At this point, the vital technics of Soft Computing (SC) are Fuzzy Systems (FS) algorithm, including Fuzzy System Logic (FL), Neural Network (NN), Evolutionary Computing (EC), including Genetic Algorithm(GA), Machine Learning (ML), including Neural network computing (NC), Probabilistic Reasoning (PR).

Fuzzy theory is an important job in the field of soft computing and with the help of this type of system from the way that the human thinking isn't critical in various situations. What is important to note is that soft computing isn't mish mashed. Or maybe, it is an organization in which every one of the accomplices contributes with the particular methods for addressing problem in its domain. This point of view, the principal methods are used in SC are complementary instead of competitive. Moreover, soft computing might be seen as a development part of the rising field of applied knowledge.

The soft computing is very different from the hard computing. Hard computing required the very accurate state or numbers to analyze the data for modeling and most of the time required the very large amount of time for the computation. Here most of the analytical model are valid for the ideal mode, but according to the real world problems are existing in the non-ideal situations. Here in soft computing make differ from the hard computing in the way that, here it is forbearance of uncertainty, not fully truth and can handle this situation kind of lack of accuracy.

It can be used in the situation of approximation for the ideal or kind of main model of soft computing in the human environment. The approach for the soft computing is very different for he hard computing i.e. Computational computing.

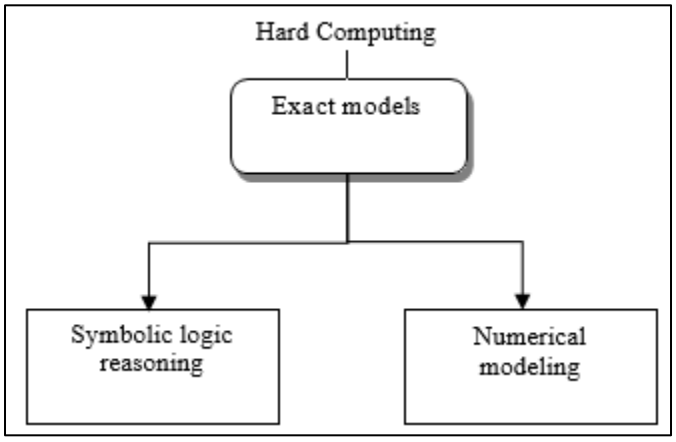

Fig. 1: Problem solving approach of Hard computing

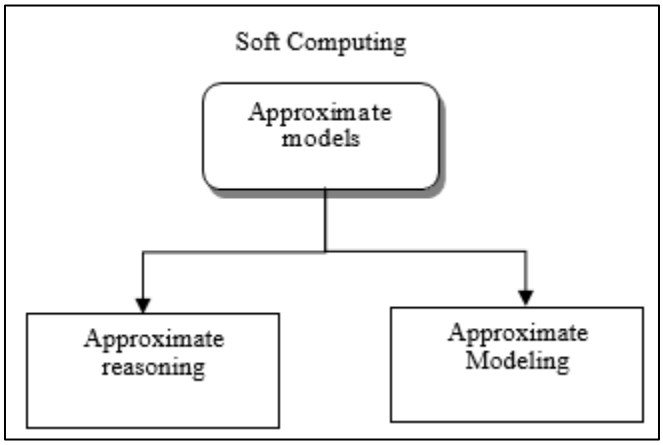

Fig. 1.1: Problem solving approach of Soft computing

II. APPLICATION OF SOFT COMPUTING

Soft Computing techniques build the machine intelligence. Scientists have coordinated their consideration toward naturally enlivened approaches, for example, brain modeling, evolutionary algorithm and immune modeling. Soft computing technique are used to provide the abilities to learn and understand in the situation of uncertainty. Modern Artificial Intelligence uses the soft computing technique for speech recognition, smell, face, object, institute, learning new skills, decision making and abstract thinking. It's all to make computer think according to the situation that how human do in that situation.

Soft Computing are used in various situations, according to the need we have different technique to used that soft computational skills. Soft computing is used in pure and applied mathematics, algebraic study and development of equation to predict the vagueness, imprecision and uncertainty. Just because of their strong learning ability and understanding ability, soft computing application are used in the multimedia processing also.

Soft computing is used in the robotics, here basically neural network algorithm technique is used to link one command to other and response according to the situation for uncertainty, lack of accuracy. Soft computing is used in the image processing also, here with the help of various image features it search and retrieve the similar image form the database of a big files. Soft computing is used in the field of business and Economical situations in the decision making to deal with the situation hard for human to tackle and difficult in estimating the input values. Soft computing neural network technique are used for the character reorganization. Soft computing can be used in the case based reasoning.

A. Fuzzy and similarity based Reasoning Problem

Existing handling tools for learning representation and make the judgement logically according to the situations, such as Prolog-based usage, are being reached out to the structure of fuzzy logic or, even, halfly analyzed logic. In this form, we can refer to the work of soft computing applications.

Some different methodologies additionally incorporate the adjustment of improvements and explicit advancement techniques, such as the classification (or tabling) strategies for logical programming.

B. Used in Mathematics problems

A considerable lot of Soft computing technique began from a simple mathematical idea. Soft computing can analyze the mathematical problem and solve according to its strategy that how it can predict the very accurate result for that problems. The fundamental numerical describe in the form of mathematically and logically and soft computing have set off an increased interest in the long term theories, for example, that of resituated lattices or the hypothesis of t-norm what's more, copulas, and have started a total design of well-established regions, such as the hypothesis of various conditions (with the expansion of fuzziness), network topology (counting closeness), advancement and logarithmic analysis of new intelligent frameworks for managing vagueness, imprecision and, uncertainty. Soft computing can predict the solution for the problem which are difficult to handle with the conventional method of soft computing.

C. Cased based Reasoning

Here the model of thinking logically incorporates critical thinking, comprehension and learning, and incorporates every one of them with memory forms. It includes receiving of previous answers for fulfill new needs, utilizing old cases to disclose new circumstances or to legitimize new arrangements, what's more, thinking from points of reference to translate another circumstance. With the help of soft computing it can provide the solution for cased based problem according to previously provided data and use that in predicting the solution for the current problems.

Later look into is exhibiting the job of delicate figuring devices, both exclusively and in blend, for performing diverse undertakings of case based reasoning upon the original applications.

D. Media Analysis

Because of their solid learning and the ability to think logically, soft computing methods have discovered software in multimedia analysis and, these days, there is various scope of analysis territories of Soft computing research in interactive media handling including video grouping, shading quantization, text computing, web computing, picture recovery, meeting video, and report image examination, image breaking up and biometric application.

The expanded potential outcomes to catch and dissect pictures have contributed to make use in the logically analyzed field of picture preparing that has various business solutions, logical, modern and military applications.

E. Used in Information Retrieval

Retrieving the data goes for characterizing frameworks ready to give a quick and powerful substance based access to a lot of putting away data. Right now, Soft computing strategies are being utilized to display subjectivity and favoritism so as to give an adaptive condition of data recovery, one which learns the client's idea of significance.

The demonstrating is performed by the information portrayal segments of Soft computing, for example, fuzzy logic, unpleasant sets and probabilistic reasoning, and. Along these lines, the use of soft computing procedures can be assistance to acquire more noteworthy pliability in Information retrieval frameworks.

F. Used in Medical Engineering

The ongoing advancements in Medical engineering doing have been accomplished by cutting edge of keen computing technique, including CAD, CAR, computer assisted surgery, advancements in the field of soft computing including Information retrieving, signal/image handling, and datamining is by all accounts Uncommonly promising in this field. With the help of soft computing we can provide the more accurate result in the recognition and curing of various diseases.

G. Used in Robotics

This field is very used in various subareas which can benefit from soft computing strategies. For example, as that any drive controls the robot in so frequent time performed by a neuro fuzzy system which creates activity directions to engines, the contribution of these frameworks originates from encompassing data, as far as information gotten by the vision subsystem and the objective recognizing gadget. At that point, fuzzy induction instruments are typically given by neural systems. In addition, the frameworks are instructed how to carry on by methods for changing its information base by a neural network learning technique.

H. Aerospace Applications

soft computing has been connected to aviation and airship control framework. soft computing (neuro and evolutionary computing) is utilized in the field of aerospace system in light of the big level, of nonlinearity vulnerability, and a complexity of these type of issues, due to the contribution of human being. Soft computing is used in the airships for the sending the accuracy of data from one end to other end. Someone make the best use of soft computing for the NASA space activities, for example, orbital range of various task to perform in the space transport, counting the height control from the earth and rendezvous docking operations.

Alvarezs èt al. utilized fuzzy methodologies for the constant speed of the aircraft self-governing planetary smaller scale meanderers, it is used for the self-driving of airship according to the data provide by the soft computing methodologies that need the boost in the range and numerical value of intriguing logical locales visited aimed restricted life time. They utilized a total arrangement of methods including fuzzy logical analysis, real time reasoning, quick and strong wanderer position estimation dependent on odometer, angular rate detecting according to the sensor results, and effective stereo vision.

I. Investment and Financial Trading

Soft computing can be used to analysis the previous data and with the help of graphical view soft computing can predict the true asset management for investment. The field to invest in various assets trading is the type where the wealth of various information. It is around there that conventional processing commonly offers an approach of soft computing, as the strong conditions connected by normal computing approach can't be met. This is especially obvious where similar arrangements of info conditions may seem to be very common in various results, or there is a wealth of absent or low-quality information. There are various methodologies inside that are written for which manage applying soft computing methods to investment and exchanging. In spite of the fact that there are conditions of being no formal segmentation of these various methodologies, this paper arranges writing in the points made by tan and increases that arrangements can be one or various category, in particular, hybrid. The following are the type categories of soft computing:

1) Time Series

Anticipating the upcoming information focuses on utilizing authentic information sets. The research evaluated there by and large endeavors to predict for upcoming estimations of some time series. Possible time series include: Base on time series information (for example Shutting Costs), or with time series got from base information for the series of time for prediction, (for example Pointers - much of the time utilized in technical Analysis).

2) Pattern Recognition and Classification

Try to characterize perceptions into categories, soft computing can have recognized the patter according to the stored data in the database. It can be used by and large by learning designs in the data. Research audited around there included the discovery of examples and isolation of base data having the 'winner' and 'loser' classifications.

3) Advancement

Includes taking care of issues where pattern in the data are not known, frequently non-polynomial (NP)- complete issues. Research inspected around there secured the ideal choice, and deciding feasible point for the exchanges.

4) Hybrid conditions

This class can be utilized to are cognize inquire about what we have to misuse the collaboration impact by joining with the more than one type of exchanges.

These are the various acceptance benefits of the synergy effect, whereas the full complete module seems to be greater and more stable than the individual one.

J. Communication System Model

As we can see now a day's communication is one of the most important aspects for human being, here soft computing can be applied in this field also. Soft computing provides the solution for the communication system issue that have not be solved by the conventional computing (hard computing) method. Chaos computing in the field of soft computing can be used as the one of the method to solve the communication related issues in digital communication system. Neuro – fuzzy method is used for the utilizing the equalizers and data compression. Network Topologies are defined with the help of evolutionary computing.

K. Decision Making and Modelling

Previously we are using the standard approach for the decision making situation, as of now most of the decision making problem are solved using the soft computing preference modelling technique. As a result, new fuzzy approach is used to integrating various preference modelling representation format for the decision making related problem have the very importance.

Moreover, missing data also make the additional difficulty for dealing with the real life decision making problem. In this field fuzzy logic theory extended of various fuzzy sets or various operation on fuzzy sets to find the most certain and accurate data in the decision making situation.

Knowledge-based engineering applications, coming of artificial engineering, the accentuation on information building moved with the social and the knowledgeable thinking in critical situations to the issue of knowledge analysis in the field of accurate data. Soft computing used for decision making situation for various problem in real life, it can predict output with very much accuracy. The inalienable cooperative energy of the unique techniques for soft computing permits to consolidate human information successfully, manage imprecision and vulnerability, and figure out how to adjust to get the solution for the changing conditions for better execution. One can see applications to a few territories identified with the board of information, for example, learning portrayal, information procurement, learning based deduction, demonstrating and creating information based frameworks, learning coordination, and information revelation.

III. IMPLEMENTATION

In this section we applied the theory to implement in real life functions. Here we use the soft computing neural network technique for the implementation purpose. In this we have used the backpropagation algorithm in artificial neural network to calculate the gradient which is needed to calculate the weights used in the network.

There is various no of hidden layers in it, which one layer elements are fully dependent on the previous layer weight and the activation value of each node. The activation values are range from 0 to 1 and weight are the wattage for that activation node. The output of neuron depends on the sum of all the inputs as

$$Y = w1x1 + x2w3$$

Where w1, w2 are the weights on the connection from the input layer unit to the output, here the error depends on the incoming weight which will be change in the network accordingly to enable the learning.

X1 and x2 the activation values for that neuron in the input layer. The summation of both weight and activation value make the output of that neuron. To make the output value in the range of 0 to 1 we use the sigmoid function. Sigmoid is nonlinear and differentiable function.

$$S(x) = \frac{1}{1+e^{-x}}$$

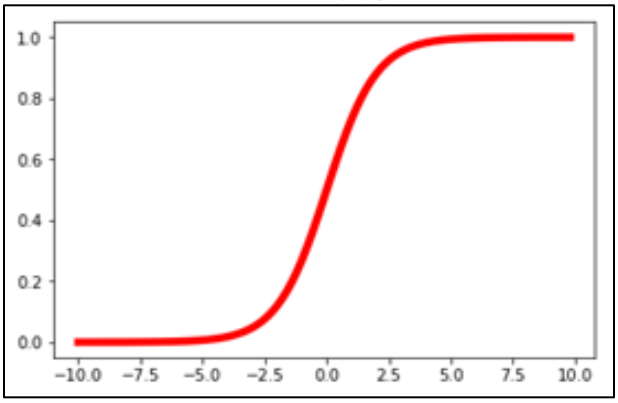

Fig. 3: Sigmoid function

Sigmoid function makes the output value in the range of 0 to 1 here it takes input of only -10 to 10 for this we use the bias value to make the input value in the rage of -10 to 10. It's basically the probabilistic approach that at what extent the particular node in a layer depends on the output. Here we considered an example to see that how this hidden layers are interrelated to each other.

Let's look with an example of character recognition, in this the first layer we have each pixel in the letter and after the second layer we have small cluster of pixel to form the small part of that letter as shown below in the fig.3.1

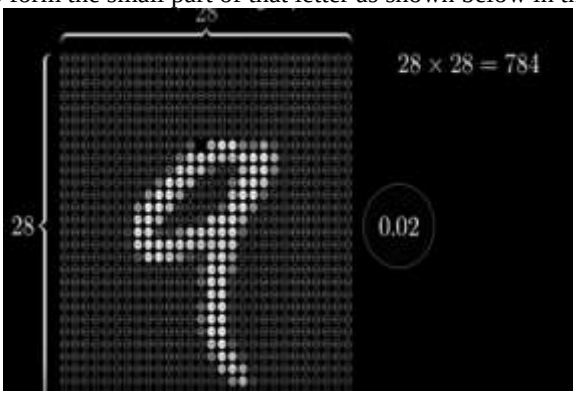

Fig. 3.1: Pixel representation of a latter

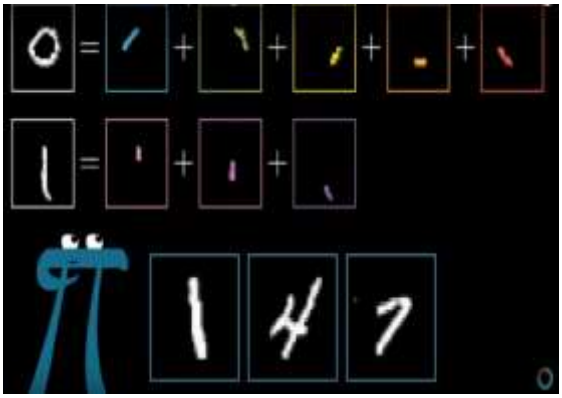

Fig. 3.2: cluster representation of pixels

In this each latter are divided into the 28*28 pixels formats so total of 784 nodes in the first layer of it and second layer have the cluster of pixel to form some sort of small pattern as shown in the fig.3.2

In the last layer of it we have only the upper and lower part of latter as shown in the fig.3.3. In between we have 16 nodes in the middle 2 hidden layer and first is the input layer and last contain the 10 node are the letter from 0 to 1.

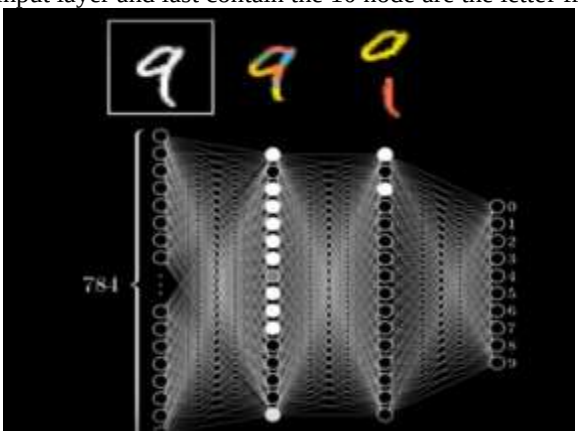

Fig. 3.3: Layer representation of numbers

IV. CONCLUSION

Here we have given the information of soft computing application domain. Through this Soft Computing have various technique that we can use for various applications. Soft Computing provide solution for problem are typically associated with fizzy, complex and dynamical system with uncertain parameters. Soft computing has various technique which can be used as they required to get the solution in the situation of approximation. Through this paper expert can choose the area of their selected domain. This survey paper is useful for the people who are interested in soft computing related domain and provide the needful information for them.

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