Performance on Soft Computing Techniques

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Abstract: Soft computing techniques occupy a phenomenal position in terms of classifying cloud, forecasting rainfall, thunderstorms, wind speed, and atmospheric temperature. Many researchers focused on studying the utility of neural network models, a method of soft computing used to forecast weather and other environmental factor. However, Soft computing mechanism such as fuzzy sets, artificial neural networks, evolutionary computation, rough sets, and probabilistic reasoning could be applied to various field of study. Through earlier research studies, it is evident that working with soft computing techniques is much easier as compared to the traditional statistical methods.The present studyexplores the reviews of those papers that deal with the concept of 'modern soft computing techniques'.

Keywords: Soft Computing technique, Statistical methods, Computing mechanism, Neural network.

I. SOFT COMPUTING TECHNIQUES

Two decades before the concept 'soft computing' came into existence. The concept was introduced to deal with all kind of real life situations. It is built based on the conception of human brain. Soft computing is a combination of both the computer science and mathematics. (Chaturvedi, 2008).There are several components of soft computing namely (i) Fuzzy logic – It is used to identify the truth and false values of the variables, (ii) Evolutionary computation – It is also known as evolutionary biology that produces optimized algorithms, (iii) Machine learning – The algorithms build mathematical data to enhance the performance level of a specified task, and (iv) Probabilistic reasoning –It involves probabilistic components to deal with uncertainty (Zadeh et al. 1994; Yanget al. 2013).An accurate data should be provided in hard computing whereas in soft computing the output could be derived even from ambiguous data.Comparatively, soft computing techniques have more advantages rather than the traditional statistical methods. These techniques can be applied in all the branches such as engineering, bio informatics, modern medicine, and metrological studies.The research studies that focused on studying the soft computing techniques and its application in present scenario is reviewed in the present study.

II. RESEARCH PROOF

Das et al. (2013) in their research identified the two main advantages of soft computing namely (i) nonlinear problems with no mathematical models can be solved, and (ii) cognitive skills of mankind is commenced to the field of computing.

The study also emphasized the utility of hybrid computing, an intersection of hard computing and soft computing technique to solve control problems. Further, Kumar et al. (2013) made comparison in between fuzzy logic and artificial neural network (ANN) techniques in their study. Further, these two techniques were used to predict defects in software release. The researchers concentrated specifically on these two techniques, as there is a rapid increase in its application to all fields of the study. It was found that fuzzy logic can provide improved results when there is a fewer data. Whereas ANN serve as a valuable tool in terms of predicting the defect density.

Sharma et al. (2014) made weather forecasting by the use of soft computing techniques. The longitudinal study was conducted during the year 2008-12. The data was obtained from metrological station.Two models namely (i) Adaptive Neuro- Fuzzy Inference System (ANFIS), and (ii) Multi-Layer Perceptron (MLP) were used to forecast temperature, wind speed, and rainfall. The performance level of these models was assessed by making comparison between one another. The result revealed that ANFIS perform better with minimal errors as compared to MLP model. The study concluded that the two models could be applied to estimate weather conditions.Further, Lai and Wang (2015) constructed 'monthly electricity forecasting model' using GA, and NN techniques. With regard to the demand for electricity, the impact of weather was given more preference. The model was constructed based on the two series, (i) fluctuation series – fluctuation in demands, and (ii) trend series – trend is described through fluctuations. The model was adopted in a private enterprise to assess the validation. The study concluded that the monthly electricity could be predicted using this model.

Govindarajanand Ravichandran (2017) combined soft computing techniques and termed it as combined schema. The study mainly focused on studying the application of soft computing techniques in the field of medical science. It was found that most of the system works in association with fuzzy logic (FL) followed by genetic algorithm (GA) with neural network (NN) and GAwith FL respectively. Considering the field of modern medicine, FL with NN is found to be used to a greater extent. Further,Omolaye et al. (2017) carried out research in this area andassessed the effectiveness of soft computing techniques using twelve attributes.

With regard to the attribute 'adaptability', probabilistic reasoning (PR), NN, and artificial intelligence (AI) were rated as 'good'. For the attribute 'expert knowledge representation', FL, PR and AI were rated good followed by the attribute 'explanation ability' rated 'good' for

FL and AI, attributes 'fault tolerance', 'imprecision tolerance', 'non linearity','uncertainty tolerance', rated good for all the soft computing techniques except for AI, 'learning capability' rated good for NN, and evolutionary computation (EC), 'maintainability' rated good for NN, 'mathematical model' rated good for PR, 'optimization ability' rated good for EC, and 'real-time operation' rated good for FL and PR respectively. Phonsa and Bansal (2018) proceeded in this area of research and highlighted the uses of soft computing techniques. The study also made the comparison in between algorithms such as genetic algorithm, swarm optimization, ant colony optimization technique (ACO), firefly technique, and artificial bee colony (ABC). Darwinian principle is applied in genetic algorithm. The concept swarm optimization is evolved from the swarm behavior to estimate the velocity of a particle. It is interesting to note that ACO is developed based on the ant behavior to provide better solutions. On the contrary, firefly technique is based on the behavior of flies and ABC is applied to choose the best out of alternatives.

The present study concludes that the technological innovations have paved the way for soft computing techniques. It is preferred in all the areas because of its accuracy and comfort. Moreover, forecasting enable to make timely decisions and provide optimal solutions for a problem. Though 'Computational Intelligence' is the term that comes to our mind when considering soft computing, there is no exact definition for it. The future study could concentrate in this area. The present study enables the readers to identify the utility and application of soft computing techniques in various field of study.

III. CONCLUSION

This paper describes the modern techniques of Soft Computing which leads to many real time applications.

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