Guest Editorial Preface

Special Issue of Applications of Intelligent Decision Support Systems Using Particle Swarm Optimization

Thippa Reddy G., School of Information Technology and Engineering, Vellore Institute of Technology, India

Chiranji Lal Chowdhary, School of Information Technology and Engineering, Vellore Institute of Technology, India

Particle swarm optimization (PSO) is a computational method that optimizes a problem by iteratively trying to improve a candidate solution with regard to a given measure of quality. It solves a problem by having a population of candidate solutions, here dubbed particles, and moving these particles around in the search-space according to simple mathematical formulae over the particle's position and velocity. Each particle's movement is influenced by its local best known position, but is also guided toward the best known positions in the search-space, which are updated as better positions are found by other particles. This is expected to move the swarm toward the best solutions.

Decision Support Systems (DSS) play an important role in helping people at managerial level to make decisions from historical data. Intelligent DSS use concepts like Artificial Intelligence, Machine Learning to extract value from the data automatically and help stakeholders make decisions in a better way.

Intelligent DSS improves performance and effectiveness of the user, it enables faster decision making, it reduces the time taken to solve problems, it reduces training times because experience of the experts is available within the programs/algorithms, it provides more evidence in support of a decision, it increases decision maker satisfaction, it provides different perspective to a situation, it helps in automating several business processes.

This special issue of the *International Journal of Swarm Intelligence Research* (IJSIR) contains six peer-reviewed papers. This special issue explores the applications of PSO and other meta-heuristic algorithms in different domains.

The six papers in this special issue cover a range of applications of swarm optimization algorithms for Intelligent DSS ranging from software metrics, to blockchain based bitcoin prediction, to the information retrieval, to the intrusion detection, to the energy optimization in IoT, as well as the recommendation of turmeric variety for higher production. Each of these revised and extended papers has undergone full double blind peer review, prior to being selected for this special issue.

In the first article, Gokul Yenduri and Veeranjaneyulu Naralasetti presented a novel formula for Maintainability Index (MI) for checking the reliability of software that attains with a minimized error. In their article, "A Non-Linear Weight Optimized Maintainability Index of Software Metrics by Grey Wolf Optimization", Gokul and Veeranjeneyulu proposed an enhanced Grey Wolf Optimization algorithms based MI model for software reliability prediction.

Predicting the day to day value of Bitcoin is a very challenging and most important task which may increase the profit of the investors. In this decade many researchers proposed several models to predict future Bitcoin value. In "Study of Swarm Intelligence Algorithms for Optimizing Deep Neural Network for Bitcoin Prediction", Aarif Ahamed and Chandrasekar Ravi proposed Cuckoo Search optimized Long Short term Memory (LSTM) model to predict the value of bitcoins. The authors highlight how the performance of LSTM- a deep learning based model can be improved by tuning the hyper parameters through cuckoo search algorithm.

The third article titled, "BeeRank: A Heuristic Ranking Model to Optimize the Retrieval Process", is authored by Shadab Irfan and Rajesh Kumar Dhanaraj. In this article, the authors proposed, BeeRank, which is inspired by the Artificial Bee Colony algorithm for web page ranking and uses both the structural and content approach for calculating the rank value to provide better search results. It also helps the users in finding the relevant web pages by minimizing the computational complexity of the process and achieves the result in minimum time duration.

With the rapid growth of technology, intruders penetrate through the firewalls of the organizations to perform malicious activities. Strong intrusion detection mechanisms are need of the hour. Preethi and Neelu Khare presented the fourth article, entitled "An Intelligent Network Intrusion Detection System Using Particle Swarm Optimization (PSO) and Deep Network Networks (DNN)". In this article, they used PSO to extract important features from the intrusion detection dataset and the resultant dataset is classified by DNN.

With the recent advancements in Internet of Things, several applications such as smart grid, cyber physical systems, smart cities, etc., are gaining popularity and realizing their true potential. As IoT based applications are dependent on battery based sensors, conserving of energy plays a crucial role in prolonging the life time of the IoT network, thereby increasing the efficiency. Ravi Kumar and Lokesh Kumar proposed a "Meta-Heuristic MOALO Algorithm for Energy-Aware Clustering in the Internet of Things". In this article, the authors have used a Multi-Objective Ant Lion Optimizer Algorithm (MOALOA) to select an optimal cluster head in IoT networks that optimizes the energy consumption leading to the longevity of the IoT networks.

In the last article, titled "Recommending Turmeric Variety for Higher Production Using Interval-Valued Fuzzy Soft Set Model and PSO", R.K. Mohanthy and B.K. Tripathy presented an approach based on PSO and interval valued fuzzy soft sets (IVFSS) to recommend the suitable variety turmeric to the farmers based on their land type. The authors have used PSO to extract the most important parameters from a large collection and is fed to IVFSS that recommends the variety of turmeric to the farmers.

May these contributions pave the way for the broad and open waters ahead with all the new developments in PSO and other meta-heuristic algorithms across different domains which require intelligent DSS.

Thippa Reddy G.
Chiranji Lal Chowdhary
Guest Editors
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