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Editorial

Nature-Inspired Intelligence Methods and Applications

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Research in nature-inspired intelligence methods and applications has increased exponentially in the past decade. Inspired by a natural phenomenon from biology, physics, or sociology, population-based nature-inspired algorithms aim to achieve satisfactory results for many difficult optimization problems effectively. Compared with deterministic optimization methods, they have many advantages, such as scalability, adaptability, collective robustness, and individual simplicity. However, they still face many challenges that require further research.

The target of this special issue was to provide a comprehensive and latest collection of research works on various aspects of population-based nature-inspired algorithms, as well as its potential application in various sciences and engineering domains. This special issue received 15 submissions in total. The authors were from 26 affiliations in 7 countries. Each submitted article was subject to assessment by at least two independent reviewers. After a fair and rigorous peer-review process, 6 of them are published in the special issue, with an acceptance rate of 40.0%.

The research paper submitted by Cheng et al., entitled "A novel crow search algorithm based on improved flower pollination", proposed a crow search algorithm based on an improved flower pollination algorithm (IFCSA) to prevent stagnation and convergence to local minima. In order to balance the global search and local search capabilities, an inverse incomplete gamma function was first introduced to make the awareness probability decrease nonlinearly. In addition, a cross-pollination strategy with Cauchy mutation was also introduced, to avoid the blindness of individual location update. Experimental results on benchmark problems show that this algorithm has better performance than the original crow search algorithm.

In the paper "Multiobjective brain storm optimization community detection method based on novelty search" by Pan et al., a multiobjective brain storm optimization based on novelty search (MOBSO-NS) was proposed to solve the premature convergence caused by the loss of diversity in complex network community detection. A novelty multipopulation parallel search mechanism based on elite, ordinary, and novelty clusters was used effectively to avoid premature convergence. Secondly, a restarting strategy was introduced to help individuals escape from the local optimal point. Experimental results show that the algorithm can find the Pareto optimal network community structure set and excavate the network community with higher quality.

The paper entitled "Virtual screening of drug proteins based on imbalance data mining" by Li et al. dealt with the imbalanced data problem in traditional molecular docking-based virtual screening methods. As a preprocessing method, the GA-SMOTE algorithm can balance the imbalanced dataset by increasing the number of minority class samples. Furthermore, the idea of integrated learning was introduced to improve the prediction accuracy. More specifically, in this paper, the random forest was combined with the support vector machine (SVM). The effectiveness of the proposed technique was verified by experiments on three important datasets.

The task of determining the hyperparameters of a machine learning model can be modelled as an optimization problem. In the paper "Remote sensing-based urban green space detection using marine predators algorithm optimized machine learning approach" by Hoang et al., a marine

predators algorithm (MPA) was employed to optimize the SVM training phase by identifying an appropriate set of the SVM's hyperparameters. The hybrid method was developed and verified for urban green space detection.

The paper by Yuan et al. entitled "Multirobot task allocation in e-commerce robotic mobile fulfilment systems" studied the multirobot task allocation (MRTA) in an e-commerce robotic mobile fulfilment system. First, considering both the picking time balance and the load balance, a multirobot task allocation model was established to minimize the overall picking time. Then, a four-stage balanced heuristic auction algorithm was designed to solve the model efficiently.

In the paper "On-demanding information acquisition in a multi-UAV-assisted sensor network: A satisfaction-driven perspective" by Yang et al., a multi-UAV task assignment problem was developed as a complex optimization problem. The objective function is defined as both maximizing the priority-weighted satisfaction of users and minimizing the total energy consumption of UAVs. Then, a multi-population-based cooperation genetic algorithm (MPCGA) was proposed, and the numerical results demonstrated its effectiveness.

We are convinced that this special issue has led to important and inspiring contributions to the research of nature-inspired intelligent methods and applications.

Conflicts of Interest

The guest editors declare that there are no conflicts of interest regarding the publication of this special issue.

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