

## Preface

# Quantum Inspired Evolutionary Computing Algorithms for Complex Optimization Problems

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Quantum-inspired evolutionary algorithms have been a significant field of study in soft computing, computational intelligence, and optimization. However, traditional optimization methods have limitations in dealing with increasingly complex problems. Quantum computing emerges as a promising solution to overcome these limitations and enhance optimization processes. Quantum computing brings several advantages including fast problem-solving, efficient handling of large datasets, error correction, overcoming state preparation constraints and introducing novel approaches for wireless IoT systems. Ongoing research in this area holds great potential for societal benefits and the development of complex applications. This special issue aims to provide a state-of-the-art research contribution on quantum-inspired evolutionary algorithms for solving complex optimization problems. The focus is on reducing computational inefficiencies and improving performance measures. The special issue underwent a rigorous peer-review process resulting in the acceptance of twelve papers that met the assessment criteria. The following sections highlight the major findings presented in these accepted papers.

1. In the paper titled “**The Application of Improved HMM Training Detection Algorithm in the Improvement of Dragon Boat Sports Skills,**” the GA-BW algorithm is obtained by improving the HMM training detection algorithm, and the relevant model is constructed to achieve

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the effective recognition of HMM model in dragon boat training detection, and its effectiveness and accuracy are verified. The experimental results show that the overall recognition rate of GA-BW model is high, and the recognition rate can reach 93.8%, and the highest recognition rate can be achieved when the number of HMM model states is 5.

2. In the paper titled “**Innovation and development of Scientific Research Management Mode under the Background of the Internet of Things and Fuzzy Control**” the author proposes a Fuzzy-derivative Mode Management Method (FDM3) for improving the performance of research-aided scientific systems. In this process, the performance is varied across multiple low-to-high or vice versa mappings. The proposed method’s performance is analyzed using the metrics efficiency, fuzzification rate, derivation analysis, and time complexity.
3. In the paper titled “**Analysis of Concurrent Systems Based on Interval Order**” the author introduces the sequence of events describing the operation of a multithreaded concurrent system. The sequence of events has order, bias order, complete order, and hierarchical sequence, interval sequence. In order to better analyze the running of multi-threading of the concurrent system, the events of read and write data are presented as interval sequence, presented in the form of trace, describing the results of multi-threading running.
4. In the paper titled “**Improvement of Random Forest Ensembling Algorithm Efficiency Through Cardinal Tuning of  $n_*$  estimators Parameter,**” a scheme to improve the Random Forest algorithm performance for skilful class prediction by use of tuning of a parameter named  $n_*$  estimators have been proposed. The cardinal work includes tuning of  $n_*$  estimators’ parameter and then applying this tuned parameter Random Forest algorithm, which lead to improvement in accuracy, precision, recall and F1-score values.
5. In the paper titled “**Examining the College Mathematics Classroom Teaching Quality using Fuzzy Evaluation Model**” the author proposes a Type-2 Fuzzy Model-based Teaching Evaluation (T2FM-TE) exclusively for high-class mathematics. The assessment improves the teaching quality; hence, the features are extracted from different intervals. This extraction identifies the uncertainty footprint under primary and secondary membership function objectives. Based on the low-to-high and high-to-low membership representation, the threshold is decided for identifying the uncertainty below.
6. In the paper titled “**Cognitive Support System for Collaborative Learning and Blended Learning Based on Fuzzy Logic,**” A new type of cognitive support system for college students is designed. Firstly, the fuzzy K-Means algorithm is applied to obtain the screening principle,

and then the neural network is integrated into the system to design a 6-layer cognitive support system. When the classification threshold is 0.6, the performance of the four hybrid collaborative learning models is the best, and the specificity, sensitivity, and accuracy of the new hybrid collaborative learning model are improved by about 23.5%, 26.5%, and 18.6%, respectively.

7. In the paper titled “**Data Screening Algorithm of Power Grid Security Hidden Danger Based on Edge Computing,**” an edge computing-based power grid security hidden danger data investigation algorithm is proposed. The experimental results show that the method has high accuracy and good throughput for the data investigation of power grid security risks, and can efficiently and accurately realize the data investigation of power grid security risks.
8. In the paper titled “**Online Text Retrieval Method Based on Convolution Neural Network,**” in order to improve the accuracy of text retrieval, a text online retrieval method based on convolution neural network is proposed. Here, the convolution neural network model is constructed and designed layer by layer. The experimental results show that the designed convolutional neural network has high accuracy, integrity and short retrieval time. The completeness of this method decreases slowly, from 98% to 91%, and the text content is well preserved.
9. In the paper titled “**Color Enhancement Method of Artistic Image Edge based on CANNY Operator,**” an edge color enhancement method based on the CANNY operator is proposed. The experimental results show that the peak signal-to-noise ratio, structural similarity index, and CCI value of the method in this paper are high. Additionally, the LOE value is low. The visual effect after image enhancement has been significantly improved. These findings indicate that the enhancement effect is in line with human vision.
10. In the paper titled “**Artificial Intelligence and Fuzzy Logic Approach based Aerobic Physical Education Training in Colleges,**” the author introduces a Training Assessment Method (TAM) for Physical Education (PE). The proposed method identifies two perspectives namely: the time constraints and output efficiency from the training sessions. This identification is performed using two-level fuzzification. The results show that his method improves the recommendations and reduces constraint issues for specific training.
11. In the paper titled “**Tension Control System for Cable-laying Based on a Fuzzy Adaptive PID,**” the author presents a tension control system for cable-laying based on a fuzzy adaptive PID controller. This system takes the advantages of fuzzy logic control and formulates appropriate fuzzy

rules. The simulation and operation results show the proposed system has better performance than conventional PID control.

12. In the paper titled “**Improving Holistic Business Intelligence with Artificial intelligence for Demand forecasting,**” the prediction of potential demands for businesses has been introduced in this research with the help of artificial intelligence. This forecast is based on data obtained from multiple sources. The simulation results show that the accuracy of the demand forecast is non-compromising. Furthermore, the model’s performance is validated by combining the projected results with accurate data and calculating the percentage error.

We would also like to express our deep appreciation to the Editor-in-Chief of this esteemed journal for granting us the opportunity to host this special issue. We firmly believe that the valuable insights and findings presented in this special issue will greatly benefit the academic community as a whole.