

**EDITORIAL**

**Optimization by Hybrid/Combined Artificial Intelligent Models**

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As *Journal of Management Science & Engineering Research (JMSEER)* is oriented toward publication of high-quality research, which is focused on advancing practice through theory of operations management, thus, the *JMSEER* aims to make a guide contribution to the management science and operation practice in today's global institutions. Along with the development of the artificial intelligence, accurate and precise forecasting results can be achieved. As the data may be with complexity, such as seasonality, cyclicity, fluctuation, dynamic nonlinearity, and so on, these forecasting models would suffer from the problem of inaccuracy while data characteristics and patterns are difficult to be determined. Therefore, hybridizing the artificial intelligent methods and superior meta-heuristic algorithms can improve the problem of inaccuracy, which is of great assistance to actions taken by decision-makers.

The so-called hybrid model, including hybridizing

advanced optimization methods with meta-heuristic algorithms and evolutionary computation techniques in energy forecasting, which aims to attract researchers with an interest in the research areas described above. As Fan et al. <sup>[1-3]</sup> and Li et al. <sup>[4,5]</sup> indicate that there are three kinds of hybrid models: (1) hybridizing these artificial intelligent models with each other; (2) hybridizing with traditional statistical tools; and (3) hybridizing with those superior meta-heuristic algorithms to significantly improve forecasting accuracy. There are many relevant research papers in this new research trend. The editor believes that the hybridizing the meta-heuristic algorithms and artificial intelligent methods will receive more attention.

For **hybrid different evolutionary algorithms**, to concentrate the theoretical shortcomings of the meta-heuristic algorithms, by hybridizing artificial intelligent methods to adjust their embedded designs (e.g., mutation rate, crossover rate, annealing temperature, etc.) to receive

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more satisfied forecasting results, such as hybridizing grey catastrophe and random forest [1]; hybridizing simulated annealing algorithm and genetic algorithm [6]; and hybridizing wavelet transform and random forest [7]. For **hybrid different models**, to concentrate the worst disadvantage of each single model, which almost is its theoretical limitation, to integrate some additional process from other model into the conducting process, such as seasonal mechanism, by computing the seasonal index (*SI*) for each seasonal point in a dataset with seasonal period, then, calculating the forecasting value by considering *SI* [11-13]. The other hybrid model example is inspired from the concept of recurrent neural networks (RNNs) [14] and long-short term memory method [15-17], which employing past information to capture more accurate data patterns to improve the forecasting results.

On the other hand, the disadvantages of those artificial intelligent models are embedded in their theoretical design, such as premature convergence. Therefore, to overcome or to improve these drawbacks, it is feasible by conducting some theoretical arrangements to receive more accurate forecasting results. **Applications of chaos theory**, chaoticized the searching variables into chaotic variables to comprehensively extend its searching space to increase the particle diversity [18], i.e., let variable travel ergodically over the searching space. Several adopting chaotic mapping functions can be employed to map the searching variable into chaotic variable, such as the Logistic mapping function, the Tent mapping function, the An mapping function, and the cat mapping function. **Using cloud theory**, cloud theory is a model of the uncertainty transformation between quantitative representation and qualitative concept using language value [8], like a fuzzy system in which the molecules move from large scale to small scale randomly as the temperature decreases. The cloud theory can realize the transformation between a qualitative concept in words and its numerical representation. **Applications of quantum computing mechanism**, the quantum computing mechanism (QCM) is used to quantize searching variables in a meta-heuristic algorithm, particularly the operation of quantum rotation gate can enable the particle to determine the most suitable rotation angle to escape from the local optimal solution to toward to its best solution. Many QCM trials have been proposed with meta-heuristic algorithms to improve the performances of the algorithm, such as the quantum PSO (QPSO) algorithm [19,20], the quantum bat algorithm (QBAT) [21], and the quantum fruit fly optimization algorithm (QFOA) [22]. In addition, the quantum rotation gate is also considered by the individual in the searching space to demonstrate the superiority

of quantum behaviors [4,23,24] during the local searching process, to avoid trapping into local optima.

This discussion of the work by the editor highlights work in an emerging area of hybrid optimization methods with superior evolutionary algorithms that has come to the forefront over the past decade. These collected articles in this text span a great deal more of cutting edge areas that are truly interdisciplinary in nature.

## Conflict of Interest

The author declare no conflict of interest.

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