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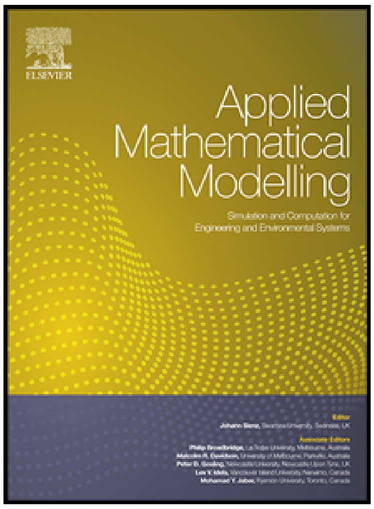

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An Improved Grasshopper Optimization Algorithm with Application to Financial Stress Prediction

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Highlight

1. This paper proposes an improved grasshopper optimization strategy (GOA) for continuous optimization
2. We have applied the improved GOA successfully to the financial stress prediction problem
3. Levy flight, Gaussian mutation and opposition-based learning are embedded in GOA
4. The experimental results reveal the improved performance of the proposed algorithm

Abstract

This study proposed an improved grasshopper optimization algorithm (GOA) for continuous optimization and applied it successfully to the financial stress prediction problem. GOA is a recently proposed metaheuristic algorithm inspired by the swarming behavior of grasshoppers. This algorithm is proved to be efficient in solving global unconstrained and constrained optimization problems. However, the original GOA has some drawbacks, such as easy to fall into local optimum and slow convergence speed. To overcome these shortcomings, an improved GOA which combines three strategies to achieve a more suitable balance between exploitation and exploration was established. Firstly, Gaussian mutation is employed to increase population diversity, which can make GOA has stronger local search ability. Then, Levy-flight strategy was adopted to enhance the randomness of the search agent's movement, which can make GOA have a stronger global exploration capability. Furthermore, opposition-based learning was introduced into GOA for more efficient search solution space. Based on the improved GOA, an effective kernel extreme learning machine model was developed for financial stress prediction. As the experimental results show, the three strategies can significantly boost the performance of GOA and the proposed learning scheme can guarantee a more stable kernel extreme learning machine model with higher predictive performance compared to others.

Keywords: Kernel extreme learning machine; Grasshopper optimization algorithm; Parameter optimization; Opposition-based learning; Levy-flight; Gaussian mutation