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A novel Magnificent Frigatebird Optimization algorithm with proposed movement strategies for enhanced Global Search

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Abstract

Global optimization plays a critical role in solving complex real-world problems, where identifying the optimal solution is essential. Metaheuristic algorithms, inspired by natural phenomena and biological processes, have demonstrated significant effectiveness in addressing such challenges. In this context, the present study introduces an enhanced variant of the Magnificent Frigatebird Optimization (MFO) algorithm, a bio-inspired metaheuristic model that simulates the kleptoparasitic behavior of frigatebirds. The proposed variant incorporates novel movement strategies aimed at improving both convergence speed and solution quality.Specifically, it integrates K-means clustering to structure and guide the population, local search via the BFGS algorithm for refined exploitation, and a termination criterion that detects convergence and prevents stagnation. The algorithm is validated on an extensive set of benchmark functions commonly found in the optimization literature, demonstrating superior performance compared to traditional evolutionary approaches.

Keywords: Global optimization; evolutionary methods; stochastic methods

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