

A novel hybrid antlion optimization algorithm for multi-objective task scheduling problems in cloud computing environments

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Efficient task scheduling is considered as one of the main critical challenges in cloud computing. Task scheduling is an NP-complete problem, so finding the best solution is challenging, particularly for large task sizes. In the cloud computing environment, several tasks may need to be efficiently scheduled on various virtual machines by minimizing makespan and simultaneously maximizing resource utilization. We present a novel hybrid antlion optimization algorithm with elite-based differential evolution for solving multi-objective task scheduling problems in cloud computing environments. In the proposed method, which we refer to as MALO, the multi-objective nature of the problem derives from the need to simultaneously minimize makespan while maximizing resource utilization. The antlion optimization algorithm was enhanced by utilizing elite-based differential evolution as a local search technique to improve its exploitation ability and to avoid getting trapped in local optima. Two experimental series were conducted on synthetic and real trace datasets using the CloudSim tool kit. The results revealed that MALO outperformed other well-known optimization algorithms. MALO converged faster than the other approaches for larger search spaces, making it suitable for large scheduling problems. Finally, the results were analyzed using statistical t-tests, which showed that MALO obtained a significant improvement in the results.

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