# ABSTRACT

This study proposes a novel metaheuristic algorithm called *Battlefield Optimization Algorithm* (BfOA) that has excellent stability and scalability. Stability and scalability are two things that are very much needed by a metaheuristic algorithm in order to consistently solve all forms of optimization problems with large dimensions.

Stability and scalability are still one of the main obstacles of a *metaheuristic* algorithm. A good balance between exploration and exploitation can improve the stability and scalability. Battle tactics and strategies have existed for more than 5,000 years and have evolved to date. The characteristics of battle tactics and strategies have many similarities with the characteristics of a metaheuristic algorithm. BfOA takes inspiration from a battle simulation between two parties, each of which has its own tactics. By using an analogy of battle tactics that are already at the mature level, the balance of exploration and exploitation is expected to be much improved.

The proposed algorithm was tested using 23 benchmark functions representing the types of existing optimization problems. Then, to test the algorithm's ability to the alteration of the objective function, testing was also carried out for four variants of the CEC 2021 *Single Objective Bound Constrained Numerical Optimization* (SO-BCO) benchmark functions. After that, the algorithm was tested to solve a simple engineering problem called the Three-bar truss problem. The test results showed that BfOA had the best performance among the tested algorithms. BfOA was able to guarantee the global optimum point at 18 out of 23 *benchmark functions* (78.26 %), better than other algorithms.

In the next stage, BfOA was implemented to solve the optimization problem of electric vehicle charging station placement with population density per $100m^2$ as the main parameter. The execution results again show that BfOA has the best performance compared to other tested algorithms.

The results of the tests and implementation carried out in this study show that BfOA is a very potential metaheuristic algorithm for solving optimization problems, and that battle tactics or strategies are very suitable to be used as inspiration for a metaheuristic algorithm. With hundreds of battle tactics or strategies that is still yet to be explored, there is still an opportunity to develop the algorithm to be even better.

***Keywords:*** *Optimization algorithm, Metaheuristic algorithm, Swarm Intelligence, Nature-inspired algorithm, Algorithm scalability, Algorithm stability, Battle inspired algorithm, Battle Tactics.*