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# Best-Worst-Play (BWP): A metaphor-less Optimization Algorithm

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**Abstract :** A novel algorithm which is an ensemble of two metaphor-less algorithms is presented in this paper. The algorithm is inspired by Rao-1 and Jaya algorithms. Since the algorithm always plays around with the best and worst solutions; the algorithm is named as Best-Worst-Play (BWP) algorithm. The algorithm does not require any algorithm specific parameters, however, algorithm control parameters are required. To test the effectiveness and performance of the proposed algorithm, a number of unconstrained and constrained benchmark functions are considered. It is found that proposed algorithm has outperformed several well-established metaphor based algorithms. The proposed BWP algorithm may be used by researchers to solve the unconstrained and constrained optimization problems

Keywords: Jaya, Rao-1; Best-Worst Play; BWP; Optimization algorithm; hybrid;

## 1. Introduction

The meta-heuristic optimization algorithms are categorized as: evolutionary, physics-based, swarm-based, and human-based algorithms. For an instance, Genetic Algorithm (GA), Evolution Strategy (ES), Genetic Programming (GP), Biogeography based Optimizer (BBO), etc., these algorithms are inspired by the phenomenon of natural evolution, and hence they come under evolutionary algorithms. Likewise, the category that is inspired from the social behaviour of animals comes under nature-inspired or swarm intelligence algorithms [1,6, 11]. Some of the examples include: Particle Swarm Optimization (PSO), Ant-Colony Optimization (ACO), Marriage in Honey Bees Optimization (MBO), Monkey Search (MS), Firefly Algorithm, etc. The algorithms such as Big-Bang Big-Crunch (BBBC), Simulated Annealing (SA), Black Hole (BH), etc., fall in the realm of physics-based algorithms. The fourth category of the optimization algorithms is human-based algorithms which include algorithms like teaching-learning based optimization (TLBO), Harmony Search (HS), Tabu Search (TS), League Championship Algorithm etc. [1, 2, 4].

These algorithms are population-based meta-heuristics which shares a common tendency. Due to this tendency, the algorithm is portioned as exploration and exploitation phases [3]. Exploration phases allows the random disturbance of design variables to the highest possible extent. This phase is followed by the exploitation phase in which the most promising areas are identified. To avoid entrapping in a local optima, a right balance between exploration and exploitation is needed. Because of the stochastic nature of these algorithms, it becomes a challenging task [5, 10].

In the realm of meta-heuristic population-based optimization algorithms, the algorithms are based on the swarm behaviour, physics laws, or natural phenomenon. Therefore, these are also known as metaphor-based algorithms. Lately, many researchers are proposing new algorithms and they all prove that their algorithm outperform other algorithms. Many of those algorithms are not used for the research while some gained some popularity. Nevertheless, the researchers may focus on developing simpler and metaphor-less algorithms. Therefore, in this paper, a new metaphor-less algorithm named as "Best-Worst-Play (BWP)" algorithm is proposed. The algorithm makes use of two popular metaphor-less algorithms, namely, Jaya, and Rao-1. Due to their hybridization, the algorithms contains two operators, besides, the algorithm has a right balance between exploration and exploitation.



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