# Parameterless Metaheuristics for the MDMKP

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## 1 Goals

Metaheuristics commonly have a wide array of parameters that must be tuned in order to obtain good performace. This task is often time consuming, and can lead to brittle systems ill-equiped to handle changing problems. Instead, we focus solely on metaheuristics that do not require any parameter tuning. These methods often have the side effect of being simple and easy to implement, while still giving competitive results.

## 2 Algorithms Used

### 2.1 Jaya

Jaya is a metaheuristic proposed by Dr. Rao of the Sardar Vallabhbhai National Institute of Technology [1]. It was originally developed to work on continous problems, but has been modified to work on binary problems.

Given a population $X$, define *best* as the best performing solution, and *worst* as the worst performing solution. *rand* randomly selects an element from the set. For every solution $S$ in the population, construct a modified solution according to the following transformation:

$$S = S + rand(\{0,1\}) * (best - S) - rand(\{0,1\}) * (worst - S)$$

If any element in the solution is greater than 1, set it equal to 1, and if any element is less than 0, set it equal to 0. If the new solution performs better than the old solution, replace it in the population. Continue this process until some termination criteria is met.

### 2.2 TLBO

Teaching-Learning Based Optimization is another metaheuristic developed by Dr. Rao for continous problems [2]. It is a two phase algorithm: the Teaching phase, and the Learning phase.

#### 2.2.1 TBO

**Adapting the median**

## References


[1] Ravipudi Venkata Rao. Jaya: A simple and new optimization algorithm for solving constrained and unconstrained optimization problems. *International Journal of Industrial Engineering Computations*, 7:19–34, 01 2016.

[2] Ravipudi Venkata Rao, Vimal Savsani, and D P. Vakharia. Teaching-learning-based optimization: A novel method for constrained mechanical design optimization problems. *Computer-Aided Design*, 43:303–315, 03 2011.