Course Project

This project is designed to offer insights into theory and application of metaheuristic optimization methods. You are asked to implement a genetic algorithm (GA) solver, optimize an analytical equation, and perform a parametric study on the GA solver.

1. GA solver implementation

The GA solver should be built on the iterative process with the basic steps, including initialization, parent selection, crossover, mutation, and survivor selection. Except for the Initialization, there should be at least two choices in each step. For example, the Roulette Wheel can be offered with Tournament Selection when selecting parents. It is recommended to code the solver using Python, but you have the freedom to choose your favorite programming language.

2. GA solver test

We will test the GA solver on the Styblinski-Tang Function:

f(x,y) = (x**4 - 16*x**2 + 5*x + y**4 - 16*y**2 + 5*y)/2

It is a function with a bumpy surface with multiple minima. The analytical solution for the global minima of $f(x,y)_{min}$=78.33233 is found at x=−2.9035,y=−2.9035. Show that your solver is able to find solutions sufficiently close to the global minimum with reasonable computational cost.

3. Parametric study

Perturb the parameters of the solver and evaluate their impact on the performance of the solver. the parameters include but not limited to the population size, the number of generations, crossover scheme, mutation scheme. Performance metrics should at least include solution accuracy and efficiency.

Deliverables: You are required to submit the original code/script along with a short project report. The report should give a brief description of Part 1, test procedure and results analysis of Part 2, and results of Part 3. There are no specific requirements on the report format.