
Optimization Mini-Project

Part(I): Numerical Unconstrained Optimization Techniques

You should write a program to compare the performance of the following methods:

- 1- Uuni-variate search method
- 2- Powell's method
- 3- Gradient descent method (once with fixed step size and another with optimal step size)

from the viewpoints of time required (or number of function evaluations) and quality of solutions obtained for each of the following benchmark functions:

- De Jong's function in 2D
- Rosenbrock's valley in 2D
- Rastrigin's function in 2D
- 4-Easom's function
- Branins's function

Plot the function in 3-D and locate the result on the graph to visualize to what extent your result matches the correct answer and to detect whether you are trapped in a local minimum or not. Moreover, you should investigate the effect of changing the initial guess on the quality of solution as well as time needed.

Part(II): Numerical Constrained Optimization Techniques

You should write a program that solves constrained optimization problems using the penalty function method studied in class with gradient descent method for unconstrained minimization. Clearly, describe the parameters settings. Test your program and provide sample runs in the report accompanying your implementation.

Regulations

- 1- You should work in groups of 6 students, as a maximum limit.
- 2- You should prepare a report that is well-formatted including all requirements with screen shots of the sample runs outputs.
- 3- Try to make your programs as general as possible to receive bonus marks.
- 4- Deadline for submission is Tuesday 27/12/2022.