Technion – Israel Institute of Technology



HW6

Numerical Methods

019003

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# Question 1

We were asked to solve with five optimization methods three different test functions: Rosenbrock’s banana, Easom, and Eggholder. In each method we required to implement five runs with different initial conditions.

The following tables summarize the results for Quasi-Newton method:

Rosenbrock’s banana function:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Iterations | Evaluations | Last step size | Change of function value in the last | X Init | Y Init | X Min | Y Min | Function minimum |
| 1 | 16 | 63 | 9.99e-06 | 6.315e-09 | 2.49 | 2.16 | 2 | 4 | 2.48e-10 |
| 2 | 28 | 108 | 6.58e-04 | 3.04e-08 | -2.79 | 5.48 | 2 | 4 | 1.58e-10 |
| 3 | 20 | 78 | 3.196e-04 | 2.55e-08 | 2.58 | 0.59 | 2 | 4 | 4.35e-11 |
| 4 | 19 | 72 | 9.41e-04 | 1.28e-06 | 2.83 | 1.59 | 2 | 4 | 8.05e-11 |
| 5 | 19 | 72 | 1.04e-04 | 4.04e-08 | -0.08 | 1.58 | 2 | 4 | 5.65e-11 |

Easom function:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Iterations | Evaluations | Last step size | Change of function value in the last | X Init | Y Init | X Min | Y Min | Function minimum |
| 1 | 5 | 33 | 3.46e-05 | 1.78e-09 | 2.30 | 2.07 | 3.141 | 3.141 | -1 |
| 2 | 26 | 165 | 1.788e-05 | 1.6699e-10 | 0.747 | 4.074 | 2.4364 | 2.8807 | -0.4180 |
| 3 | 14 | 84 | 4.96e-05 | 3.326-09 | 4.86 | 2.46 | 3.141 | 3.141 | -1 |
| 4 | 6 | 21 | 3.136e-04 | 1.151e-07 | 3.32 | 3.88 | 3.141 | 3.141 | -1 |
| 5 | 6 | 36 | 2.99e-06 | 1.31e-11 | 1.80 | 2.96 | 3.141 | 3.141 | -1 |

Eggholder function:

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | Iterations | Evaluations | Last step size | Change of function value in the last | X Init | Y Init | X Min | Y Min | Function minimum |
| 1 | 5 | 33 | 3.46e-05 | 1.78e-09 | 2.30 | 2.07 | 3.141 | 3.141 | -1 |
| 2 | 26 | 165 | 1.788e-05 | 1.6699e-10 | 0.747 | 4.074 | 2.4364 | 2.8807 | -0.4180 |
| 3 | 14 | 84 | 4.96e-05 | 3.326-09 | 4.86 | 2.46 | 3.141 | 3.141 | -1 |
| 4 | 6 | 21 | 3.136e-04 | 1.151e-07 | 3.32 | 3.88 | 3.141 | 3.141 | -1 |
| 5 | 6 | 36 | 2.99e-06 | 1.31e-11 | 1.80 | 2.96 | 3.141 | 3.141 | -1 |