

Exercises in Optimization (ACM 40990 / ACM41030)

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Exercises #1

1. Program the steepest-descent and Newton algorithms using the backtracking line search algorithm. Use them to minimize the Rosenbrock function:

$$f(x, y) = 100(y - x^2)^2 + (1 - x)^2. \quad (1)$$

Set the initial step length $\alpha_0 = 1$ and print the step length used by each method at each iteration. First try the initial point $\mathbf{x}_0 = (1.2, 1.2)^T$ and then try the more difficult starting point $\mathbf{x}_0 = (-1.2, 1)^T$.

2. Program the steepest-descent and Newton algorithms with the stepsize determined by the SWCs. Use them to minimize the Rosenbrock function in Equation (1).
3. Program the BFGS algorithm using the SWCs for the stepsize. Have the code verify that $\langle \mathbf{y}_k, \mathbf{s}_k \rangle$ is always positive. Use the code to minimize the Rosenbrock function in Equation (1).