

MATH 3423: ADV LINEAR ALG & OPTIMIZATION

HOMEWORK 4

1. Given the data points

$$(2, 3), (3, 2), (5, 1), (6, 0)$$

derive the equation of the least-squares line

$$y = mx + b$$

that best fits the given data points. Solve the system using the QR factorization, the SVD, and the Normal Equations.

Use functions from `SCIPY.OPTIMIZE.MINIMIZE` to minimize:

2. THE ROSENBROCK FUNCTION

$$f(x_1, x_2) = (7 - x_1)^2 + 100(x_2 - x_1^2)^2 + 10$$

3. THE BOOTH FUNCTION

$$f(x_1, x_2) = (x_1 + 2x_2 - 7)^2 + (2x_1 + x_2 - 5)^2$$

Derive the Gradient & the Hessian for each function to be minimized. Apply 5 minimization algorithms and test each algorithm using 3 different starting (x, y) values. Report which of the methods performed better by comparing the number of iterations and the number of function evaluations required for convergence to the minimum.

► E-MAIL YOUR HOMEWORK IN A SINGLE JUPYTER NOTEBOOK.