

Numerical Optimization

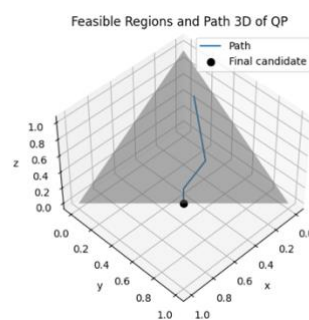
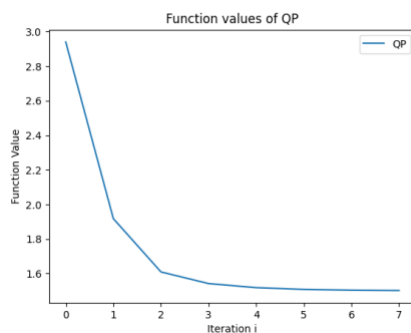
Programming Assignment 2 – Report

[GITHUB Link](#)

In this assignment, we implemented an interior point method solver for constrained optimization problems using the log-barrier method. We defined an InteriorPointSolver class with a minimize method to handle both inequality and affine equality constraints. The log-barrier method involved constructing a barrier function, performing Newton's method for solving the inner optimization problem, and employing backtracking line search to ensure feasibility of the constraints. We then applied this solver to quadratic programming (QP) and linear programming (LP) examples, plotting the optimization paths and results.

Objective Functions:

1. QP:



Logger:

Outer Iteration: i=0 , Current location: $x_i=[0.1 \ 0.2 \ 0.7]$, Objective value: 2.9399999999999995

Outer Iteration: i=0 , Current location: $x_i=[0.25586482 \ 0.46513258 \ 0.2790026]$, Objective value: 1.9176627809048152

Outer Iteration: i=1 , Current location: $x_i=[0.45216493 \ 0.45216493 \ 0.09567014]$, Objective value: 1.6093993061125031

Outer Iteration: i=2 , Current location: $x_i=[0.48011783 \ 0.48011783 \ 0.03976435]$, Objective value: 1.5421361534954934

Outer Iteration: i=3 , Current location: $x_i=[0.49099395 \ 0.49099395 \ 0.0180121]$, Objective value: 1.5184987556195324

Outer Iteration: i=4 , Current location: $x_i=[0.49582329 \ 0.49582329 \ 0.00835342]$, Objective value: 1.508458093914577

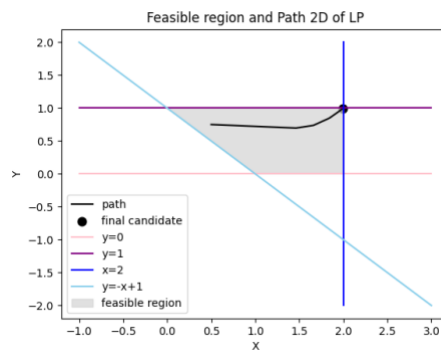
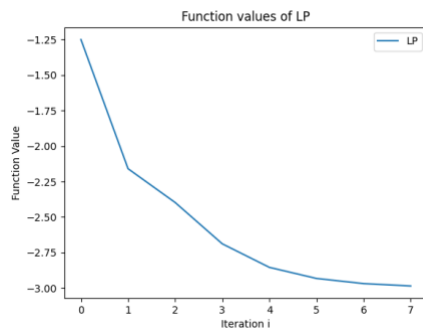
Outer Iteration: i=5 , Current location: $x_i=[0.49805577 \ 0.49805577 \ 0.00388845]$, Objective value: 1.5039111305118484

Outer Iteration: i=6 , Current location: $x_i=[0.49909558 \ 0.49909558 \ 0.00180883]$, Objective value: 1.5018137378329999

Final candidate: $[0.49909558 \ 0.49909558 \ 0.00180883]$

Objective function of final candidate: 1.5018137378329999

2. LP:



Logger:

Outer Iteration: i=0 , Current location: $x_i=[0.5 \ 0.75]$, Objective value: -1.25

Outer Iteration: i=0 , Current location: $x_i=[1.46302832 \ 0.69668651]$, Objective value: -2.159714829844046

Outer Iteration: i=1 , Current location: $x_i=[1.66053388 \ 0.73720095]$, Objective value: -2.397734828642288

Outer Iteration: i=2 , Current location: $x_i=[1.84144783 \ 0.84724207]$, Objective value: -2.6886899003081384

Outer Iteration: i=3 , Current location: $x_i=[1.92714455 \ 0.92742458]$, Objective value: -2.854569131387903

Outer Iteration: i=4 , Current location: $x_i=[1.96629785 \ 0.96631103]$, Objective value: -2.9326088859540906

Outer Iteration: i=5 , Current location: $x_i=[1.98437035 \ 0.98437097]$, Objective value: -2.9687413266798295

Outer Iteration: i=6 , Current location: $x_i=[1.99274682 \ 0.99274684]$, Objective value: -2.9854936601382986

Final candidate: [1.99274682 0.99274684]

Objective function of final candidate: -2.9854936601382986