

## QP Solver: Quadratic Programming Solver

### Introduction

QP Solver solves the linearly constrained optimization problem with quadratic objective function. This solver deals with a quadratic non linear objective function and finds the optimal solution that is constrained by the linear constraints defined for the system.

QP is often used for regression analysis, decision analysis, and quadratic approximations to generally complex functions. QP is very effective in simulating problems in economics, (such as demand-supply response and enterprise selection), finance (portfolio analysis), agriculture

### Challenges

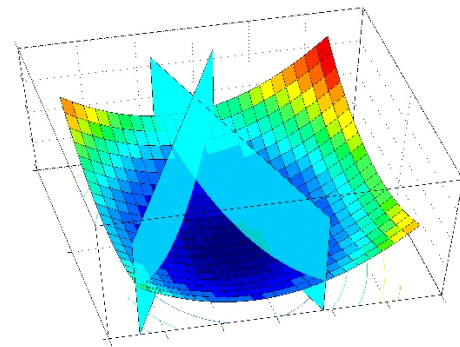
- ✎ Non linear problem
- ✎ Working with very large data (around 1000 variables and hundreds of constraints)
- ✎ Complex mathematics

### Key Features

- ✎ Quadratic objective function
- ✎ Linear constraints
- ✎ Works with very large data (> 1000 variables, 100s of constraints)
- ✎ Optimal solution

### Algorithms Implemented/Referred

- ✎ Gondzio Algorithm for Quadratic Programming
- ✎ Karmarkar's algorithm
- ✎ Mehrotra's algorithm



Quadratic Objective Function  
Linear Constraints

### Skill Set Demonstrated

- ✎ Ability to work with complex maths
- ✎ Implementing published Algorithms
- ✎ Fine tuning algorithms to get desired results
- ✎ Working on large matrices (1600x1600)

### Solution Approach

This project was very challenging because of complex mathematics involved. It greatly enhanced our ability of solving complex mathematical problems.

To solve the problem we implemented a variety of published algorithms like Gondzio's algorithm, Mehrotra's algorithm, Karmarkar's algorithm.

One of the biggest challenge in this project was working with very large matrices having 1600 rows and 1600 columns. And in the iterative process of finding optimal solution, we often faced the problem of matrix deterioration. We implemented several algorithms to deal with matrices reaching singularity, skewed matrices.

Finding optimal solution to a very high accuracy in shortest time was yet another challenge in the project.