Modern Optimization Techniques - Exercise Sheet 9

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Solutions need to be handed in until **Monday, January 22th, 2018 at 10:00**

Exercise 1: Computing the Dual Problem (10P)

Let us consider the following optimization problem:

$$\begin{aligned} \text{minimize} \quad & f_0(x_1, x_2) = x_1^2 + x_2^2 \\ \text{subject to} \quad & f_1(x_1, x_2) = x_1 + x_2 \leq 1 \\ & h(x_1, x_2) = x_2 - 2x_1 = 1/2 \end{aligned}$$

Compute the dual optimization problem as a function of λ and ν. Plot the resulting function and reason about its concavity.

Exercise 2: Newton Algorithm for Equality Constrained Problems (10P)

Same exercise as Bonus exercise 2, you can earn the missing points from exercise sheet 8 if you submit again

Let us again consider the following equality constrained optimization problem

$$\begin{aligned} \text{minimize} \quad & f_0(x_1, x_2) = x_1^2 + x_2^2 \\ \text{subject to} \quad & h(x_1, x_2) = x_1 + 2x_2 = 3 \end{aligned}$$

Optimize this problem using the Newton Algorithm for Equality Constrained Problems with a step size of $\mu = 1$. Start it once in the feasible point $x = (0, 1.5)$ and once in the non-feasible point $x = (0, -5)$. How many iterations does the algorithm need to converge? Explain your findings!