Lab Assignment 10: Optimization for Machine Learning (SVM)

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(1) Solve the equality constrained problem using Newton method

$$\begin{aligned} \min \quad & \frac{1}{2}((x_1-2)^2+(x_2-2)^2+(x_3-2)^2) \\ & s.\ t.\ x_1+x_2+x_3=1 \end{aligned}$$

use initial approximation $x^0=(0,0,0)^T$ and $\mu^0=1$.

(2) Solve the equality constrained problem using Newton method

$$\begin{aligned} \min \quad & 100\{(x_3-x_2^2)^2+(x_2-x_1^2)^2\}+\{(1-x_1)^2+(1-x_2)^2+(1-x_3)^2 \\ & s.\ t.\ x_1+x_2+x_3=1 \end{aligned}$$

use initial approximation $x^0=(0,0,0)^T$ and $\mu^0=1$.

(3) Solve the following problem using barrier method

$$\begin{aligned} \min \quad & 2x_1^2+2x_1x_2+3x_2^2-2x_1+3x_2 \\ & s.\ t.\ 3x_1+2x_2\geq 6 \\ & x_1,x_2\geq 0 \end{aligned}$$

Use $\sigma_0=1$, $r=0.5$, stopping criteria $m\sigma_k<10^{-4}$. Solve unconstrained problem by 'scipy.optimize.minimize', method='nelder-mead'. Find KKT multipliers also.

(4) Write code form primal and dual of SVM for the following dataset
(a)diabetes, (b)generated_test, (c)4ColumnDataset