

Lab assignment 1

Optimization in ML (CSL4010)

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1. Price of house (in Rs) with respect to area (sq feet) is give in 2 column excel sheet. Construct and solve the problem

$$\min_x \frac{1}{2} \|Ax - y\|^2 + \frac{\lambda}{2} \|x\|^2,$$

where $\lambda = |R/10 - 5|$, where R is last digits of your roll number.

2. Price of house based on area, bedrooms, and bathrooms are given in four column data. Find the best fitting hyperplane $y = a^T x + \beta$. Construct and solve the problem

$$\min_x \frac{1}{2} \|Ax - y\|^2 + \frac{\lambda}{2} \|x\|^2$$

, $\lambda = |R/10 - 5|$, where R is last digits of your roll number.

3. Given the dataset construct unconstrained optimization for logistic regression with l_2 regularization and solve using (i) gradient descent (ii) mirror descent method by using a symmetric positive definite matrix with diagonal elements in $[5, 10]$ and off diagonal elements in $[0, 1]$ (iii) Newton method.
4. Using proximal gradient method find

$$\min_x \frac{1}{2}(x_1 - 2)^2 + \frac{1}{2}(x_2 - 2)^2 + 0.5\|x\|_1$$

Use $\alpha_k = 1/2$ and $\alpha_k = 1/(r + k)$, r is last digit of your roll no.

5. Solve Problem 1, 2 using least square l_1 regularization using proximal gradient method. Use $\alpha_k = 1/2$ and $\alpha_k = 1/(r + k)$, r is last digit of your roll no.
6. Solve Problem 3 using logistic regression with l_1 regularization using proximal gradient method. Use $\alpha_k = 1/2$ and $\alpha_k = 1/(r + k)$, r is last digit of your roll no.