MAP 533 : LAB

Computation question : $f(w) = \frac{1}{n} \sum_{i=1}^{n} \log\left(1 + e^{-y_i x_i^T w}\right) + \frac{\lambda}{2} \|w\|_2^2$

gradient of f :

$$\overrightarrow{\nabla f} = \frac{1}{n} \sum_{i=1}^{n} \vec{\nabla}\left(\log\left(1+e^{-y_i x_i^T w}\right)\right) + \lambda w$$

$$= -\frac{1}{n} \sum_{i=1}^{n} \left(\frac{y_i x_i}{1+e^{y_i x_i^T w}} \right) + \lambda w$$

partial derivative

$$\frac{\partial f(\vec{w})}{\partial w_j} = -\frac{1}{n} \sum_{i=1}^{n} \frac{\frac{\partial (y_i x_i^T w)}{\partial w_j} e^{-y_i x_i^T w}}{1+e^{-y_i x_i^T w}} + \lambda \overset{(j)}{w}$$

$$= -\frac{1}{n} \sum_{i=1}^{n} \frac{y_i \times x_i^T \times e_j}{1+e^{y_i x_i^T w}} + \lambda w \times e_j$$

gradient of f_i :

$$\overrightarrow{\nabla f_i} = \frac{y_i x_i}{1+e^{y_i x_i^T w}} + \lambda w$$