Imam Al Razi **010850660**

1. Derive the Equation for $\nabla_b J(w, b)$.

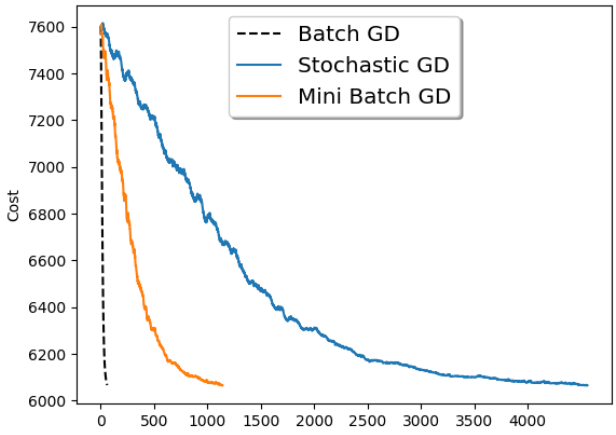
Solution:

$$\nabla_b J(w,b) = C \sum_{i=1}^{m} \frac{\partial L\left(x^{(i)},\ y^{(i)}\right)}{\partial b};$$

$$here\ \frac{\partial L\ (x^{(i)},\ y^{(i)})}{\partial b} = \begin{cases} 0 & ;if\ y^{(i)}\left(X^{(i)}w + b\right) \geq 1 \\ -y^{(i)} & ;otherwise \end{cases}$$

2. Plot of $J_k(w, b)$ vs. the number of iterations (k).

Solution:



3. Convergence times in seconds.

Solution:

Plot=True	Plot=False
BGD convergence time: 0.028690814971923828 SGD convergence time: 0.8405246734619141 MBGD convergence time: 0.3373892307281494	BGD convergence time: 0.02623438835144043 SGD convergence time: 0.4165914058685303 MBGD convergence time: 0.18897056579589844

In both of the above cases, final cost = 6065 (approx.)

4. Source code is attached in zip file.