Thursday Jan 23, 2025

Name:

Discuss and complete the following questions with the person nearest you. You **may** be asked to share your thoughts with the class.

1. Using mean absolute error, determine the loss when

- $\mathbf{X} = \begin{pmatrix} 6 & 2 & 3 & 1 & 1 \\ 4 & 7 & 0 & 9 & 1 \\ 2 & 3 & 1 & 6 & 1 \end{pmatrix}$

- $\mathbf{w} = \begin{bmatrix} 2 \\ 1 \\ 1 \\ 1 \\ 2 \end{bmatrix}$

- $\mathbf{y} = \begin{bmatrix} 22 \\ 20 \\ 17 \end{bmatrix}$

$$\mathbf{y} = \begin{bmatrix} 20 \\ 26 \\ 16 \end{bmatrix}$$

$$\text{MAE}(\mathbf{X}, \mathbf{y}; \mathbf{w}) = \frac{1}{m} \sum_{i=0}^{m} |y^{(i)} - \hat{y}^{(i)}| \tag{1}$$
$$= 3 \tag{2}$$

2. Calculate one update step to the parameters of a linear regression model using gradient descent. Assume the following:

- The initial parameters are -2 for w_1 and 10 for b
- Your data is one point, 2, with the label 9
- The learning rate is 0.5

$$w_1 = w_1 - \eta\, 2x_1(w_1 x_1 + b - y) \tag{3}$$
$$= -2 - 2(-4 + 10 - 9) \tag{4}$$
$$= -2 + 6 \tag{5}$$
$$= 4 \tag{6}$$

$$b = b - \eta\, 2(w_1 x_1 + b - y) \tag{7}$$
$$= 10 - 0.5(-4 + 10 - 9) \tag{8}$$
$$= 10 + 1.5 \tag{9}$$
$$= 11.5 \tag{10}$$