CS221 Fall 2015 Homework Sentiment]

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By turning in this assignment, I agree by the Stanford honor code and declare that all of this is my own work.

Problem 1

(a) Mapping reviews into feature vectors as follows,

$$\phi_{x1} = \{pretty : 1, bad : 1\}, y_1 = -1$$
$$\phi_{x2} = \{good : 1, plot : 1\}, y_2 = +1$$
$$\phi_{x3} = \{not : 1, good : 1\}, y_3 = -1$$
$$\phi_{x4} = \{pretty : 1, scenery : 1\}, y_4 = +1$$

Recalling from the graph, gradient of hinge loss, for margin less than one, will be $-\phi_{(x)}y$ and 0 for margin greater than one.

$$\nabla_w Loss_{hinge}(x, y, w) = \begin{cases} -\phi_{(x)}y & \text{when}(w.\phi)y < 1 \\ 0 & \text{when}(w.\phi)y > 1 \end{cases}$$

Stochastic gradient descent is defined as

$$w \leftarrow w - \eta \nabla_w Loss_{hinge}(x, y, w)$$

Initialising $\mathbf{w} = [0, \ldots 0]$, or $\mathbf{w} = \{pretty : 0, bad : 0 \ldots scenery : 0\}$, and iterating over each feature vector to update w
First iteration, $w.\phi_{x1}y = 0, \nabla Loss = -\phi_{(x)}y$

$$w = w - \eta(\{pretty : -1, bad : -1\})$$
$$w = \{pretty : 0, bad : 0 \ldots scenery : 0\} - \{pretty : -0.5, bad : -0.5\}$$
$$w = \{pretty : 0.5, bad : 0.5\}$$

Second iteration, $w.\phi_{x2}y = 0, \nabla Loss = -\phi_{(x)}y$

$$w = w-$$

(b) (your solution)

Problem 2

(a) (your solution)

(b) (your solution)