

# ComS 474

## Homework 4

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$$1) \begin{pmatrix} w1 \\ w2 \\ w3 \end{pmatrix} = \lambda_1 * \begin{pmatrix} a_1 \\ b_1 \\ c_1 \end{pmatrix} - \lambda_3 * \begin{pmatrix} a_3 \\ b_3 \\ c_3 \end{pmatrix} = 4.5 * (1) * \begin{pmatrix} .5 \\ .25 \\ .125 \end{pmatrix} + 1.5 * (-1) * \begin{pmatrix} .3 \\ .75 \\ .325 \end{pmatrix} = \begin{pmatrix} 1.8 \\ 0 \\ .075 \end{pmatrix}$$

$$\text{Prediction} = (1, 1, 0) * \begin{pmatrix} 1.8 \\ 0 \\ .075 \end{pmatrix} = 1.8 > 0, \text{ thus the predicted class is 1.}$$

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2) As the gutters span from  $wx + w_b - 1$  to  $wx + w_b + 1$ , the size of the margin is  $\frac{2}{\|w\|}$ , and the size of each gutter is  $1/2$  that  $\Rightarrow \frac{1}{\|w\|} = \frac{1}{\sqrt{w_1^2 + w_2^2}} = \frac{1}{\sqrt{1.8^2 + .075^2}} = \frac{1}{1.802} = 0.555$ .

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3)  
(1)