Hong Kong Baptist University
Department of Computer Science

COMP7990 Principles and Practices of Data Analytics

Exercise on Classification

Given the following dataset where $x = \{x_0, x_1, x_2\}$ is the input vector and y is the true label:

x_0	x_1	x_2	y
1	1	-1	1
1	1	1	1
1	-1	1	1
1	-1	-1	-1

The initial values of the weight vector $\boldsymbol{w}$ are set to be $[-1, -1, -1]^T$.

1) Run through the perceptron algorithm by filling in the following table until the weight vector $\boldsymbol{w}$ converges.

Iteration #	$\boldsymbol{w}$ (old)	$\boldsymbol{x}$	y	$y(\boldsymbol{w}^T\boldsymbol{x})$	Update (Y/N)	$y\boldsymbol{x}$	$\boldsymbol{w}$ (new)
1	[-1, -1, -1]	[1, 1, -1]	1	-1	Y	[1, 1, -1]	[0, 0, -2]
2	[0, 0, -2]	…					
3							
4							
5							

2) Write down the equation of the decision boundary.

3) Plot the decision boundary of the perceptron.

4) Assume that the initial values of the weight vector $\boldsymbol{w}$ are [0.3, 0.5, 0.5]. Repeat 1-3.

Iteration #	$\boldsymbol{w}$ (old)	$\boldsymbol{x}$	y	$y(\boldsymbol{w}^T\boldsymbol{x})$	Update (Y/N)	$y\boldsymbol{x}$	$\boldsymbol{w}$ (new)
1							
2							
3							
4							
5							

5) Compare the two decision boundaries obtained and discuss which is better.