CS 557: PATTERN RECOGNITION AND LEARNING
QUIZ 1
SEPTEMBER 01, 2016
FALL 2016

PROBLEM

Given the following data:

Color is red x_1	*Shape is rectangle* x_2	*Class label*
0	1	+1
0	1	+1
1	0	+1
0	1	-1
0	1	-1
0	1	-1
0	0	-1
1	0	-1
1	0	-1

Using the naïve Bayes' assumption find the class of the vector $[1\ 0]^T$

SOLUTION (BASED ON MAP)

$P(\text{class} = +1 \mid \mathbf{x} = [1\ 0]^T) = P(\mathbf{x} = [1\ 0]^T \mid \text{class} = +1)\ P(\text{class} = +1) / P(\mathbf{x} = [1\ 0]^T)$
$= 1/3*1/3*3/9*1/P(\mathbf{x} = [1\ 0]^T)$
$= 1/27 * 1/P(\mathbf{x} = [1\ 0]^T)$

$P(\text{class} = -1 \mid \mathbf{x} = [1\ 0]^T) = P(\mathbf{x} = [1\ 0]^T \mid \text{class} = -1)\ P(\text{class} = -1) / P(\mathbf{x} = [1\ 0]^T)$
$= 2/6*3/6*6/9*1/P(\mathbf{x} = [1\ 0]^T)$
$= 1/9 * 1/P(\mathbf{x} = [1\ 0]^T)$

Comparing the two posterior probabilities above we see that our predicted class label is -1