

# Artificial Intelligence Problem Set 7

Willie Yee

## Problem 1.

We want to calculate  $P(M = 1|A = 1, D = 2, C = F, R = 1)$ ,  $P(M = 2|A = 1, D = 2, C = F, R = 1)$ , and  $P(M = 3|A = 1, D = 2, C = F, R = 1)$ . The maximum of these three probabilities is the classification attribute M that Naive Bayes will select.

$$\begin{aligned}P(M = 1|A = 1, D = 2, C = F, R = 1) &= P(M = 1)P(A = 1|M = 1)P(D = 2|M = 1)P(C = F|M = 1)P(R = 1|M = 1) \\&= \frac{1}{4} \cdot \frac{2}{25} \cdot \frac{22}{25} \cdot \frac{2}{25} \cdot \frac{15}{25} \\&= \frac{66}{78125}\end{aligned}$$

$$\begin{aligned}P(M = 2|A = 1, D = 2, C = F, R = 1) &= P(M = 2)P(A = 1|M = 2)P(D = 2|M = 2)P(C = F|M = 2)P(R = 1|M = 2) \\&= \frac{1}{4} \cdot \frac{12}{25} \cdot \frac{24}{25} \cdot \frac{12}{25} \cdot \frac{15}{25} \\&= \frac{2592}{78125}\end{aligned}$$

$$\begin{aligned}P(M = 3|A = 1, D = 2, C = F, R = 1) &= P(M = 3)P(A = 1|M = 3)P(D = 2|M = 3)P(C = F|M = 3)P(R = 1|M = 3) \\&= \frac{1}{2} \cdot \frac{6}{50} \cdot \frac{47}{50} \cdot \frac{12}{50} \cdot \frac{17}{50} \\&= \frac{7191}{3125000}\end{aligned}$$

Since  $\frac{15}{2914}$  is the largest of these three numbers, Naive Bayes will classify  $A = 1, D = 2, C = F, R = 1$  with  $M = 2$ .

## Problem 2.

A. 1-nearest neighbors:

- A. Red
- B. Red
- C. Blue
- D. Red

3-nearest neighbors:

- A. Red
- B. Blue
- C. Red
- D. Blue

B. The maximum accuracy is  $\frac{19}{29}$ . It will classify A-Blue, B-Blue, C-Red, D-Red