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CSE 4309

## Assignment 1

### Task 1

#### Part A

A = Sensor reading is greater than 80

$$P(\text{Maine}) = 0.05$$

$$P(A \mid \text{Maine}) = 0.2$$

$$P(A \mid \text{Sahara}) = 0.9$$

$$P(A) = P(A \mid \text{Maine}) * P(\text{Maine}) + P(A \mid \text{Sahara}) * P(\text{Sahara}) = (0.2)(0.05) + (0.9)(0.98) = 0.865$$

$$P(A') = 1 - 0.865 = 0.135$$

$$P(\text{Maine} \mid A') = P(\text{Maine}) * P(A' \mid \text{Maine}) / P(A') = (0.05)(0.8) / 0.135$$

$$P(\text{Maine} \mid A') = 0.296$$

#### Part B

$$P(A') = P(A' \mid \text{Maine}) * P(\text{Maine}) + P(A' \mid \text{Sahara}) * P(\text{Sahara})$$

$$P(A') = (0.8)(0.296) + (0.1)(0.704) = 0.307$$

#### Part C

$$P(A')^3 = (0.307) * (0.307) * (0.307) = 0.289$$

### Task 2

P is possibly a probability function. Because we do not know P(C) and P(D), we cannot tell if it is valid. If  $P(C) + P(D) = 0.1$ , it is valid; otherwise, it is not valid.

### Task 3

Definitely not a density function.

$$\int_0^{10} 0.3 = 0.3x \Big|_0^{10} = 3$$

#### Task 4

Class 1, attribute 0, mean = 0.52, std = 0.10

Class 1, attribute 1, mean = 0.54, std = 0.10

Class 1, attribute 2, mean = 0.52, std = 0.07

Class 1, attribute 3, mean = 0.41, std = 0.17

Class 1, attribute 4, mean = 0.50, std = 0.00

Class 1, attribute 5, mean = 0.00, std = 0.00

Class 1, attribute 6, mean = 0.50, std = 0.05

Class 1, attribute 7, mean = 0.24, std = 0.05

Class 2, attribute 0, mean = 0.45, std = 0.11

Class 2, attribute 1, mean = 0.45, std = 0.10

Class 2, attribute 2, mean = 0.53, std = 0.06

Class 2, attribute 3, mean = 0.23, std = 0.11

Class 2, attribute 4, mean = 0.50, std = 0.04

Class 2, attribute 5, mean = 0.00, std = 0.00

Class 2, attribute 6, mean = 0.49, std = 0.06

Class 2, attribute 7, mean = 0.33, std = 0.14

Class 3, attribute 0, mean = 0.43, std = 0.10

Class 3, attribute 1, mean = 0.47, std = 0.11

Class 3, attribute 2, mean = 0.36, std = 0.06

Class 3, attribute 3, mean = 0.22, std = 0.08

Class 3, attribute 4, mean = 0.51, std = 0.05

Class 3, attribute 5, mean = 0.00, std = 0.00

Class 3, attribute 6, mean = 0.51, std = 0.04

Class 3, attribute 7, mean = 0.27, std = 0.09

Class 4, attribute 0, mean = 0.79, std = 0.07

Class 4, attribute 1, mean = 0.76, std = 0.07

Class 4, attribute 2, mean = 0.37, std = 0.06  
Class 4, attribute 3, mean = 0.32, std = 0.11  
Class 4, attribute 4, mean = 0.50, std = 0.00  
Class 4, attribute 5, mean = 0.00, std = 0.00  
Class 4, attribute 6, mean = 0.51, std = 0.07  
Class 4, attribute 7, mean = 0.27, std = 0.09  
Class 5, attribute 0, mean = 0.74, std = 0.15  
Class 5, attribute 1, mean = 0.62, std = 0.12  
Class 5, attribute 2, mean = 0.42, std = 0.08  
Class 5, attribute 3, mean = 0.29, std = 0.12  
Class 5, attribute 4, mean = 0.50, std = 0.00  
Class 5, attribute 5, mean = 0.00, std = 0.00  
Class 5, attribute 6, mean = 0.51, std = 0.06  
Class 5, attribute 7, mean = 0.24, std = 0.04  
Class 6, attribute 0, mean = 0.52, std = 0.13  
Class 6, attribute 1, mean = 0.48, std = 0.10  
Class 6, attribute 2, mean = 0.51, std = 0.05  
Class 6, attribute 3, mean = 0.22, std = 0.08  
Class 6, attribute 4, mean = 0.50, std = 0.00  
Class 6, attribute 5, mean = 0.52, std = 0.37  
Class 6, attribute 6, mean = 0.51, std = 0.03  
Class 6, attribute 7, mean = 0.24, std = 0.05  
Class 7, attribute 0, mean = 0.48, std = 0.11  
Class 7, attribute 1, mean = 0.47, std = 0.09  
Class 7, attribute 2, mean = 0.54, std = 0.06  
Class 7, attribute 3, mean = 0.22, std = 0.12  
Class 7, attribute 4, mean = 0.50, std = 0.04  
Class 7, attribute 5, mean = 0.00, std = 0.03  
Class 7, attribute 6, mean = 0.50, std = 0.06

Class 7, attribute 7, mean = 0.26, std = 0.09  
Class 8, attribute 0, mean = 0.74, std = 0.11  
Class 8, attribute 1, mean = 0.73, std = 0.11  
Class 8, attribute 2, mean = 0.49, std = 0.05  
Class 8, attribute 3, mean = 0.29, std = 0.07  
Class 8, attribute 4, mean = 0.50, std = 0.00  
Class 8, attribute 5, mean = 0.00, std = 0.00  
Class 8, attribute 6, mean = 0.46, std = 0.08  
Class 8, attribute 7, mean = 0.22, std = 0.01  
Class 9, attribute 0, mean = 0.54, std = 0.14  
Class 9, attribute 1, mean = 0.55, std = 0.16  
Class 9, attribute 2, mean = 0.50, std = 0.06  
Class 9, attribute 3, mean = 0.20, std = 0.06  
Class 9, attribute 4, mean = 0.50, std = 0.00  
Class 9, attribute 5, mean = 0.00, std = 0.00  
Class 9, attribute 6, mean = 0.53, std = 0.05  
Class 9, attribute 7, mean = 0.24, std = 0.05  
Class 10, attribute 0, mean = 0.75, std = 0.04  
Class 10, attribute 1, mean = 0.79, std = 0.04  
Class 10, attribute 2, mean = 0.53, std = 0.04  
Class 10, attribute 3, mean = 0.31, std = 0.06  
Class 10, attribute 4, mean = 1.00, std = 0.00  
Class 10, attribute 5, mean = 0.00, std = 0.00  
Class 10, attribute 6, mean = 0.55, std = 0.02  
Class 10, attribute 7, mean = 0.22, std = 0.00

Classification Accuracy = 0.4504