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CSE 4309

## Assignment 1

### Task 1

#### Part A

A = Sensor reading is greater than 80

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

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

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

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

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

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

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

#### Part B

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

$$P(A') = (0.8)(0.296) + (0.1)(0.704) = \mathbf{0.307}$$

#### Part C

$$P(A')^3 = (0.307) * (0.307) * (0.307) = \mathbf{0.0289}$$

### 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 = 0.517976, std = 0.099076

Class 1, attribute 1, mean = 0.537917, std = 0.100906

Class 1, attribute 2, mean = 0.515179, std = 0.072891

Class 1, attribute 3, mean = 0.409048, std = 0.172638

Class 1, attribute 4, mean = 0.500000, std = 0.000000

Class 1, attribute 5, mean = 0.000000, std = 0.000000

Class 1, attribute 6, mean = 0.500179, std = 0.049527

Class 1, attribute 7, mean = 0.242679, std = 0.053635

Class 2, attribute 0, mean = 0.454898, std = 0.109475

Class 2, attribute 1, mean = 0.452551, std = 0.103058

Class 2, attribute 2, mean = 0.528129, std = 0.055600

Class 2, attribute 3, mean = 0.231259, std = 0.109551

Class 2, attribute 4, mean = 0.503401, std = 0.041099

Class 2, attribute 5, mean = 0.000000, std = 0.000000

Class 2, attribute 6, mean = 0.493299, std = 0.055116

Class 2, attribute 7, mean = 0.332041, std = 0.139515

Class 3, attribute 0, mean = 0.425895, std = 0.101364

Class 3, attribute 1, mean = 0.473158, std = 0.105823

Class 3, attribute 2, mean = 0.361579, std = 0.055693

Class 3, attribute 3, mean = 0.216000, std = 0.080268

Class 3, attribute 4, mean = 0.505263, std = 0.051028

Class 3, attribute 5, mean = 0.000000, std = 0.000000

Class 3, attribute 6, mean = 0.510211, std = 0.035923

Class 3, attribute 7, mean = 0.268526, std = 0.088864

Class 4, attribute 0, mean = 0.789677, std = 0.071819

Class 4, attribute 1, mean = 0.762258, std = 0.071152

Class 4, attribute 2, mean = 0.374516, std = 0.058023  
Class 4, attribute 3, mean = 0.318387, std = 0.111416  
Class 4, attribute 4, mean = 0.500000, std = 0.000000  
Class 4, attribute 5, mean = 0.000000, std = 0.000000  
Class 4, attribute 6, mean = 0.511290, std = 0.067094  
Class 4, attribute 7, mean = 0.274516, std = 0.091822  
Class 5, attribute 0, mean = 0.735294, std = 0.154258  
Class 5, attribute 1, mean = 0.616765, std = 0.124988  
Class 5, attribute 2, mean = 0.416765, std = 0.080685  
Class 5, attribute 3, mean = 0.293235, std = 0.121067  
Class 5, attribute 4, mean = 0.500000, std = 0.000000  
Class 5, attribute 5, mean = 0.000000, std = 0.000000  
Class 5, attribute 6, mean = 0.512059, std = 0.060087  
Class 5, attribute 7, mean = 0.237647, std = 0.040516  
Class 6, attribute 0, mean = 0.520000, std = 0.127882  
Class 6, attribute 1, mean = 0.479231, std = 0.095954  
Class 6, attribute 2, mean = 0.510000, std = 0.052477  
Class 6, attribute 3, mean = 0.223077, std = 0.082311  
Class 6, attribute 4, mean = 0.500000, std = 0.000000  
Class 6, attribute 5, mean = 0.523846, std = 0.367414  
Class 6, attribute 6, mean = 0.510769, std = 0.034298  
Class 6, attribute 7, mean = 0.238462, std = 0.051268  
Class 7, attribute 0, mean = 0.480127, std = 0.108301  
Class 7, attribute 1, mean = 0.468038, std = 0.089820  
Class 7, attribute 2, mean = 0.535316, std = 0.063805  
Class 7, attribute 3, mean = 0.224051, std = 0.118110  
Class 7, attribute 4, mean = 0.503165, std = 0.039652  
Class 7, attribute 5, mean = 0.001582, std = 0.028083  
Class 7, attribute 6, mean = 0.496867, std = 0.064822

Class 7, attribute 7, mean = 0.256076, std = 0.093059  
Class 8, attribute 0, mean = 0.742381, std = 0.106900  
Class 8, attribute 1, mean = 0.727619, std = 0.108404  
Class 8, attribute 2, mean = 0.493333, std = 0.051671  
Class 8, attribute 3, mean = 0.288571, std = 0.068333  
Class 8, attribute 4, mean = 0.500000, std = 0.000000  
Class 8, attribute 5, mean = 0.000000, std = 0.000000  
Class 8, attribute 6, mean = 0.460476, std = 0.077550  
Class 8, attribute 7, mean = 0.224286, std = 0.013299  
Class 9, attribute 0, mean = 0.542667, std = 0.139689  
Class 9, attribute 1, mean = 0.553333, std = 0.157931  
Class 9, attribute 2, mean = 0.503333, std = 0.064876  
Class 9, attribute 3, mean = 0.202000, std = 0.064415  
Class 9, attribute 4, mean = 0.500000, std = 0.000000  
Class 9, attribute 5, mean = 0.000000, std = 0.000000  
Class 9, attribute 6, mean = 0.527333, std = 0.053225  
Class 9, attribute 7, mean = 0.243333, std = 0.045995  
Class 10, attribute 0, mean = 0.750000, std = 0.035590  
Class 10, attribute 1, mean = 0.793333, std = 0.041096  
Class 10, attribute 2, mean = 0.526667, std = 0.038586  
Class 10, attribute 3, mean = 0.310000, std = 0.064807  
Class 10, attribute 4, mean = 1.000000, std = 0.000000  
Class 10, attribute 5, mean = 0.000000, std = 0.000000  
Class 10, attribute 6, mean = 0.550000, std = 0.021602  
Class 10, attribute 7, mean = 0.220000, std = 0.000000

Classification Accuracy = 0.450413