Quiz 1

● Graded

Student

Brian Bertness

Total Points

30 / 30 pts

Question 1

Q1 — **6** / 6 pts

1.1 (a) — **3** / 3 pts

✔ **+ 3 pts** Correct (two relevant features wrt to activity classification task)

+ 1.5 pts Features are not relevant/only 1 feature is provided.

+ 0 pts Unattempted/Incorrect

1.2 (b) — **3** / 3 pts

✔ **+ 3 pts** Correct (rest during time period/physical activity during time period)

+ 1.5 pts Labels are partially correct

+ 0 pts Unattempted/Incorrect

Question 2

Q2 — **10** / 10 pts

✔ **+ 10 pts** Everything correct: options (a) and (e) selected

+ 2 pts Option (a) IS selected

+ 2 pts Option (b) NOT selected

+ 2 pts Option (c) NOT selected

+ 2 pts Option (d) NOT selected

+ 2 pts Option (e) IS selected

+ 0 pts Unattempted/Incorrect

Question 3

Q3 **14** / 14 pts

3.1 **(a)** **7** / 7 pts

✔ **+ 7 pts** Everything is correct

+ 2 pts Correct Answer C2 (Choose the correct class)

+ 3 pts Correct Reasons (need to mention Bayes Rules; or demonstrates we need to compute the posteri/ likelihood*prior to make decision)

+ 1 pt Use correct value for priors (Mathematical Approach - Approach 1)

+ 1 pt Use correct value for likelihoods (Mathematical Approach - Approach 1)

+ 2 pts Correct argument about why the posterior is larger (Observation Approach - Approach 2, which is a good replacement for mathematical approach)

– 1 pt Arithmetic error

+ 0 pts Unattempted/Incorrected

3.2 **(b)** **7** / 7 pts

✔ **+ 7 pts** Everything is correct

+ 2 pts Correct Answer C1 (Choose the correct class)

+ 3 pts Correct Reasons (need to use Bayes Rules and/or demonstrate that we need to compute the posteri/ likelihood*prior to make decision)

+ 1 pt Use correct value for priors

+ 1 pt Use correct value for likelihoods

– 1 pt Arithmetic error

+ 0 pts Unattempted/Incorrect

Questions assigned to the following page: 1.1 and 1.2

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1.a) The heartbeat rate per minute
i.e. 60 beats per minute.
etc.

The variability between the heart beats.

b) Class Labels: Physical Activity
Rest

I am assuming I am just to answer A) and B) for this question. I sent an email asking if you wanted a Bayes like model or not but did not get a response.

Question assigned to the following page: 2

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2. Both

(a) - Collect 30% more new training data.

and

(e) - Decrease polynomial degree so that the model becomes a linear regression model

would reduce overfitting in a polynomial regression model.

Question assigned to the following page: 3.1

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3. A) If we assume that priors are equal then, $P(C_1) = P(C_2)$. Since $P(C_1) + P(C_2) = 1$ by the laws of probability, we know $P(C_1) = P(C_2) = 0.5$.

Also, we are given by the graph at $X = 0.5$

$$P(X|C_1) = 0.24$$
$$P(X|C_2) = 0.33$$

By Bayes Rule: $P(C_1|X) = \frac{P(C_1)P(X|C_1)}{P(X)}$

$$P(C_2|X) = \frac{P(C_2)P(X|C_2)}{P(X)}$$

$P(X)$ is the same in both equations!

Now, $P(C_1)P(X|C_1) = (0.5)(0.24) = 0.12$
$P(C_2)P(X|C_2) = (0.5)(0.33) = 0.165$

Since $0.165 > 0.12 \Rightarrow P(C_2|X) > P(C_1|X)$

The data point belongs to C_2

Remark: Since $P(C_1) = P(C_2)$ we could simply observe that $P(X|C_2) > P(X|C_1) \Rightarrow P(C_2|X) > P(C_1|X)$ but this will not work if the priors are not equal.

Question assigned to the following page: 3.2

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3. B) Here the values and formulas are the same except we assume

$P(C_1) = 0.6$ and $P(C_2) = 0.4$.

Then,

$P(C_1)P(X|C_1) = (0.6)(0.24) = 0.144$

$P(C_2)P(X|C_2) = (0.4)(0.33) = 0.132$

Since $0.144 > 0.132 \Rightarrow P(C_1|X) > P(C_2|X)$

The data point belongs to C_1