Quiz 4

Q1

0.0/1.0 point (graded)

Consider the multivariate Gaussian PDF given as

$$\frac{1}{\sqrt{32\pi^2}} e^{-\frac{(x-2)^2}{8}+\frac{(x-4)^2}{4}}$$

Its mean and covariance matrix are

- ( ) $\begin{bmatrix} 2 \\ 4 \end{bmatrix}, \begin{bmatrix} 8 & 0 \\ 0 & 4 \end{bmatrix}$
- ( ) $\begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 2 & 0 \\ 0 & \sqrt{2} \end{bmatrix}$
- ( ) $\begin{bmatrix} 2 \\ 4 \end{bmatrix}, \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix}$
- (•) $\begin{bmatrix} \frac{1}{4} \\ 1 \end{bmatrix}, \begin{bmatrix} 4 & 0 \\ 0 & 2 \end{bmatrix}$

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Q2

1.0/1.0 point (graded)

In LDA , we choose $\mathcal{C}_0$ if

- ( ) $p(\bar{\mathbf{x}}; \mathcal{C}_0) > p(\bar{\mathbf{x}}; \mathcal{C}_1)$
- (•) $p_0 \times p(\bar{\mathbf{x}}; \mathcal{C}_0) > p_1 \times p(\bar{\mathbf{x}}; \mathcal{C}_1)$
- ( ) $p_0 \times p(\bar{\mathbf{x}}; \mathcal{C}_0) \leq p_1 \times p(\bar{\mathbf{x}}; \mathcal{C}_1)$
- ( ) $p(\bar{\mathbf{x}}; \mathcal{C}_0) \leq p(\bar{\mathbf{x}}; \mathcal{C}_1)$

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Q3

1.0/1.0 point (graded)

LDA can be imported in PYTHON as

- ( ) from sklearn.discriminant_analysis import LDA
- (•) from sklearn.discriminant_analysis import LinearDiscriminantAnalysis
- ( ) from sklearn.discriminant import LinearDiscriminantAnalysis
- ( ) from sklearn.discriminant import LDA

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Q4

1.0/1.0 point (graded)

PDF of a Gaussian random vector is

- $\frac{1}{\sqrt{(2\pi)^n|\mathbf{R}|}}e^{-\frac{1}{2}(\bar{\mathbf{x}}-\bar{\boldsymbol{\mu}})^T\mathbf{R}(\bar{\mathbf{x}}-\bar{\boldsymbol{\mu}})}$
- $\frac{1}{\sqrt{(2\pi)^n\mathbf{R}}}e^{-\frac{1}{2}(\bar{\mathbf{x}}-\bar{\boldsymbol{\mu}})^T\mathbf{R}^{-1}(\bar{\mathbf{x}}-\bar{\boldsymbol{\mu}})}$
- $\frac{1}{\sqrt{(2\pi)^n\mathbf{R}}}e^{-\frac{1}{2}(\bar{\mathbf{x}}-\bar{\boldsymbol{\mu}})^T\mathbf{R}(\bar{\mathbf{x}}-\bar{\boldsymbol{\mu}})}$
- $\frac{1}{\sqrt{(2\pi)^n|\mathbf{R}|}}e^{-\frac{1}{2}(\bar{\mathbf{x}}-\bar{\boldsymbol{\mu}})^T\mathbf{R}^{-1}(\bar{\mathbf{x}}-\bar{\boldsymbol{\mu}})}$

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Q5

1.0/1.0 point (graded)

Consider the two classes C_0, C_1 distributed as below and determine when the classifier chooses $\mathcal{H}_0$. Consider $P_0 = P_1 = ½$

$$C_0 \sim N\left(\bar{\boldsymbol{\mu}}_0 = \begin{bmatrix}-4\\-6\end{bmatrix}, \mathbf{R} = \begin{bmatrix}\frac{1}{2} & 0\\ 0 & \frac{1}{4}\end{bmatrix}\right), C_1 \sim N\left(\bar{\boldsymbol{\mu}}_1 = \begin{bmatrix}8\\4\end{bmatrix}, \mathbf{R} = \begin{bmatrix}\frac{1}{2} & 0\\ 0 & \frac{1}{4}\end{bmatrix}\right)$$

- $5x_1 + 3x_2 \geq -2$
- $2x_1 - 3x_2 \geq 2$
- $3x_1 + 5x_2 \leq 1$
- $3x_1 - 5x_2 \leq -1$

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Q6

1.0/1.0 point (graded)

The entropy $H(X)$ of an event is

- $-\sum_{i=1}^{n} p(x_i)\log_2\frac{1}{p(x_i)}$
- $-\sum_{i=1}^{n} p(x_i)\log_2 p(x_i)$
- $-\sum_{i=1}^{n} \frac{1}{p(x_i)}\log_2\frac{1}{p(x_i)}$
- $-\sum_{i=1}^{n} \log_2\frac{1}{p(x_i)}$

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Q7

0.0/1.0 point (graded)

0.0/1.0 point (graded)
Consider a source with 3 symbols x_1, x_2, x_3 such that $p(x_i) \propto i$. What is its entropy?

- ◯ 1.46
- ◯ 1.12
- ◯ 1.59
- ◯ 1.73

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Q8

1.0/1.0 point (graded)
The information gain is defined as

- ◯ IG$(X|Y) = H(X) + H(X|Y)$
- ◉ IG$(X|Y) = H(X) - H(X|Y)$
- ◯ IG$(X|Y) = H(Y) - H(X|Y)$
- ◯ IG$(X|Y) = H(Y) + H(X|Y)$

✔

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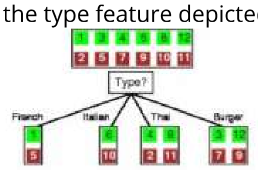
Q9

1.0/1.0 point (graded)
What is the conditional entropy for the type feature depicted in the figure below?



- ◯ 0
- ◯ ½
- ◉ 1
- ◯ 2

✔

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Q10

1.0/1.0 point (graded)
Which of the follow is not a type of IRIS flower

- [x] Azoricum
- [ ] Setosa
- [ ] Versicolour
- [ ] Virginica

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