Started on	Saturday, 24 February 2024, 3:30 PM
State	Finished
Completed on	Saturday, 24 February 2024, 4:10 PM
Time taken	40 mins 18 secs
Grade	**9.00** out of 10.00 (**90**%)

Question **1**

Correct

Mark 1.00 out of 1.00

1. Consider the table below

	$x_2 = 0$	$x_2 = 1$
$y = 0$	4	16
$y = 1$	12	8

The quantity $p(x_2 = 0|y = 0)$ is given as

- $\frac{3}{4}$
- $\frac{1}{5}$ ✔
- \(\frac{2}{5} \)
- \(\frac{1}{4} \)

Your answer is correct.

The correct answer is:
\(\frac{1}{5} \)

Question **2**

Correct

Mark 1.00 out of 1.00

The K −means algorithm is a/an

- Unsupervised learning algorithm ✔
- Supervised learning algorithm
- Reinforcement learning algorithm
- Deep learning algorithm

Your answer is correct.

The correct answer is:
Unsupervised learning algorithm

Question **3**

Correct

Mark 1.00 out of 1.00

Unsupervised learning

- Both data and labels
- Neither data nor labels
- Labels but not data
- Requires data, but NO labels ✔

Your answer is correct.

The correct answer is:
Requires data, but NO labels

Question **4**

Correct

Mark 1.00 out of 1.00

The cluster assignment indicator α_3 (2)

- Equals 0 when $\overline{\mathbf{x}}(3)$ belongs to $\mathcal{C}_2$ and 1 otherwise
- Equals 1 when $\overline{\mathbf{x}}(2)$ belongs to $\mathcal{C}_3$ and 0 otherwise ✔
- Equals 0 when $\overline{\mathbf{x}}(2)$ belongs to $\mathcal{C}_3$ and 1 otherwise
- Equals 1 when $\overline{\mathbf{x}}(3)$ belongs to $\mathcal{C}_2$ and 0 otherwise

Your answer is correct.

The correct answer is:
Equals 1 when $\overline{\mathbf{x}}(2)$ belongs to $\mathcal{C}_3$ and 0 otherwise

Question **5**

Correct

Mark 1.00 out of 1.00

The centroids for the given clusters can be determined as

- $\frac{\sum_{j=1}^{M} \alpha_i^{(l)}(j)\bar{\mathbf{x}}(j)}{\sum_{j=1}^{M} \alpha_i^{(l)}(j)}$
- $\frac{\sum_{i=1}^{K} \alpha_i^{(l)}(j)\bar{\mathbf{x}}(j)}{K}$
- $\frac{\sum_{i=1}^{K} \alpha_i^{(l)}(j)\bar{\mathbf{x}}(j)}{\sum_{i=1}^{K} \alpha_i^{(l)}(j)}$
- $\frac{\sum_{i=1}^{K} \alpha_i^{(l)}(j)\bar{\mathbf{x}}(j)}{M}$

Your answer is correct.

The correct answer is: $\frac{\sum_{j=1}^{M} \alpha_i^{(l)}(j)\bar{\mathbf{x}}(j)}{\sum_{j=1}^{M} \alpha_i^{(l)}(j)}$

Question **6**

Incorrect

Mark 0.00 out of 1.00

The mean and covariance matrix of the multivariate Gaussian are defined as

- $E\{\bar{\mathbf{x}}\}, E\{\bar{\mathbf{x}}\bar{\mathbf{x}}^T\} + \bar{\boldsymbol{\mu}}\bar{\boldsymbol{\mu}}^T$
- $E\{\bar{\mathbf{x}}\}, E\{\bar{\mathbf{x}}\bar{\mathbf{x}}^T\} - \bar{\boldsymbol{\mu}}\bar{\boldsymbol{\mu}}^T$
- $E\{\bar{\mathbf{x}}\}, E\{(\bar{\mathbf{x}} - \bar{\boldsymbol{\mu}})^T(\bar{\mathbf{x}} - \bar{\boldsymbol{\mu}})\}$
- $E\{\bar{\mathbf{x}}\}, E\{\bar{\mathbf{x}}\bar{\mathbf{x}}^T\}$

Your answer is incorrect.

The correct answer is:
$E\{\bar{\mathbf{x}}\}, E\{\bar{\mathbf{x}}\bar{\mathbf{x}}^T\} - \bar{\boldsymbol{\mu}}\bar{\boldsymbol{\mu}}^T$

Question **7**

Correct

Mark 1.00 out of 1.00

The multivariate Gaussian PDF for parameters below is

$$\bar{\boldsymbol{\mu}} = \begin{bmatrix} 1 \\ 1 \end{bmatrix}, \mathbf{R} = \begin{bmatrix} 2 & 1 \\ 1 & 2 \end{bmatrix}$$

- $\frac{1}{\sqrt{12\pi}} e^{-\frac{1}{3}(x_1^2+x_2^2+x_1+x_2-2x_1x_2)}$
- $\frac{1}{\sqrt{12\pi}} e^{-\frac{2}{3}(x_1^2+x_2^2-2x_1-2x_2+x_1x_2)}$
- $\frac{1}{\sqrt{12\pi}} e^{-\frac{1}{3}(2x_1^2+2x_2^2-x_1-x_2-2x_1x_2)}$
- $\frac{1}{\sqrt{12\pi}} e^{-\frac{1}{3}(x_1^2+x_2^2-x_1-x_2-x_1x_2+1)}$ ✔

Your answer is correct.

The correct answer is:

$\frac{1}{\sqrt{12\pi}} e^{-\frac{1}{3}(x_1^2+x_2^2-x_1-x_2-x_1x_2+1)}$

Question **8**

Correct

Mark 1.00 out of 1.00

The Gaussian discriminant classifier can be simplified as Choose $\mathcal{C}_0$ if

- $\bar{\mathbf{h}}^T(\bar{\mathbf{x}} - \tilde{\boldsymbol{\mu}}) < 0, \tilde{\boldsymbol{\mu}} = \frac{1}{2}(\bar{\boldsymbol{\mu}}_0 - \bar{\boldsymbol{\mu}}_1), \bar{\mathbf{h}} = \mathbf{R}^{-1}(\bar{\boldsymbol{\mu}}_0 - \bar{\boldsymbol{\mu}}_1)$
- $\bar{\mathbf{h}}^T(\bar{\mathbf{x}} - \tilde{\boldsymbol{\mu}}) \geq 0, \tilde{\boldsymbol{\mu}} = \frac{1}{2}(\bar{\boldsymbol{\mu}}_0 - \bar{\boldsymbol{\mu}}_1), \bar{\mathbf{h}} = (\bar{\boldsymbol{\mu}}_0 - \bar{\boldsymbol{\mu}}_1)$
- $\bar{\mathbf{h}}^T(\bar{\mathbf{x}} - \tilde{\boldsymbol{\mu}}) \geq 0, \tilde{\boldsymbol{\mu}} = \frac{1}{2}(\bar{\boldsymbol{\mu}}_0 + \bar{\boldsymbol{\mu}}_1), \bar{\mathbf{h}} = (\bar{\boldsymbol{\mu}}_0 - \bar{\boldsymbol{\mu}}_1)$
- $\bar{\mathbf{h}}^T(\bar{\mathbf{x}} - \tilde{\boldsymbol{\mu}}) \geq 0, \tilde{\boldsymbol{\mu}} = \frac{1}{2}(\bar{\boldsymbol{\mu}}_0 + \bar{\boldsymbol{\mu}}_1), \bar{\mathbf{h}} = \mathbf{R}^{-1}(\bar{\boldsymbol{\mu}}_0 - \bar{\boldsymbol{\mu}}_1)$ ✔

Your answer is correct.

The correct answer is:

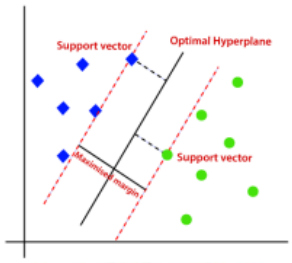
$\bar{\mathbf{h}}^T(\bar{\mathbf{x}} - \tilde{\boldsymbol{\mu}}) \geq 0, \tilde{\boldsymbol{\mu}} = \frac{1}{2}(\bar{\boldsymbol{\mu}}_0 + \bar{\boldsymbol{\mu}}_1), \bar{\mathbf{h}} = \mathbf{R}^{-1}(\bar{\boldsymbol{\mu}}_0 - \bar{\boldsymbol{\mu}}_1)$

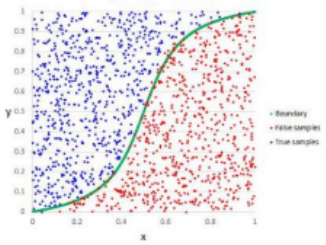
Question **9**

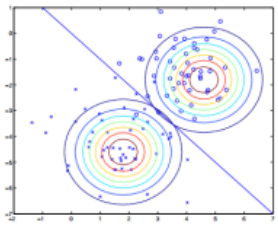
Correct

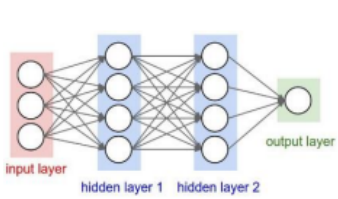
Mark 1.00 out of 1.00

Gaussian discriminant classifier is shown by the picture



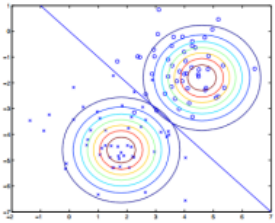






Your answer is correct.

The correct answer is:



Question **10**

Correct

Mark 1.00 out of 1.00

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

$$C_0 \sim N\left(\begin{bmatrix}-8\\2\end{bmatrix}, \begin{bmatrix}\frac{1}{2} & 0\\0 & \frac{1}{8}\end{bmatrix}\right), C_1 \sim N\left(\begin{bmatrix}2\\-8\end{bmatrix}, \begin{bmatrix}\frac{1}{2} & 0\\0 & \frac{1}{8}\end{bmatrix}\right)$$

- $x_1 + 2x_2 \geq -5$
- $x_1 + 2x_2 \geq 1$
- $x_1 - 4x_2 \leq 9$ ✔
- $2x_1 - x_2 \leq 5$

Your answer is correct.

The correct answer is:
$x_1 - 4x_2 \leq 9$