Started on	Saturday, 27 January 2024, 7:04 PM
State	Finished
Completed on	Saturday, 27 January 2024, 7:13 PM
Time taken	8 mins 56 secs
Grade	**9.00** out of 10.00 (**90**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Image segmentation refers to

- ○ Separation of pixels belonging to different colors
- ◉ Separation of pixels into background and foreground components ✔
- ○ Detection of faces and non-faces
- ○ Generation of artificial colors for a B/W image

Your answer is correct.

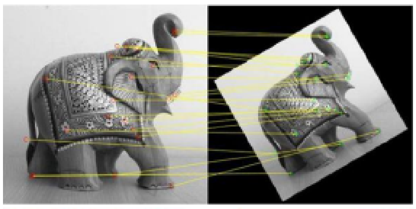
The correct answer is:
Separation of pixels into background and foreground components

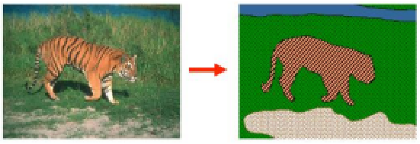
Question **2**

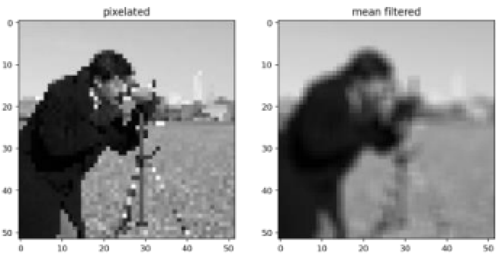
Correct

Mark 1.00 out of 1.00

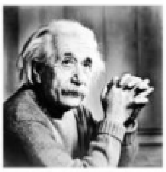
Which for the following shows image segmentation



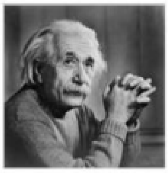




New Image

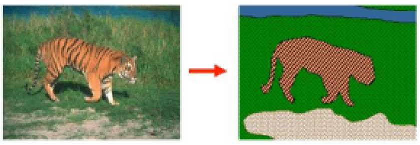


Old image



Your answer is correct.

The correct answer is:



Question **3**

Correct

Mark 1.00 out of 1.00

General structure of a linear classifier is

- ○ $C_0: \bar{\mathbf{x}}^T \bar{\mathbf{x}} \geq b$
  $C_1: \bar{\mathbf{x}}^T \bar{\mathbf{x}} < b$
- ○ $C_0: \bar{\mathbf{x}} \geq b$
  $C_1: \bar{\mathbf{x}} < b$
- ○ $C_0: \|\bar{\mathbf{x}}\| \geq b$
  $C_1: \|\bar{\mathbf{x}}\| < b$
- ◉ $C_0: \bar{\mathbf{a}}^T \bar{\mathbf{x}} \geq b$
  $C_1: \bar{\mathbf{a}}^T \bar{\mathbf{x}} < b$ ✔

Your answer is correct.

The correct answer is:

$C_0: \bar{\mathbf{a}}^T \bar{\mathbf{x}} \geq b$

$C_1: \bar{\mathbf{a}}^T \bar{\mathbf{x}} < b$

Question **4**

Correct

Mark 1.00 out of 1.00

What is the modified optimization problem for linear classification

- ◉ $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq 1,\ 1 \leq i \leq M$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq -1,\ M+1 \leq i \leq 2M$ ✔
- ○ $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq 0,\ 1 \leq i \leq M$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq \mathbf{0},\ M+1 \leq i \leq 2M$
- ○ $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b = 1,\ 1 \leq i \leq M$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b = -1,\ M+1 \leq i \leq 2M$
- ○ $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq -1,\ 1 \leq i \leq M$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq 1,\ M+1 \leq i \leq 2M$

Your answer is correct.

The correct answer is:

$\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq 1,\ 1 \leq i \leq M$

$\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq -1,\ M+1 \leq i \leq 2M$

Question **5**

Incorrect

Mark 0.00 out of 1.00

The modified optimization problem for linear classification

- Separates both classes by a **sphere**
- Separates both classes by a **slab**
- Separates both classes by a **ellipsoid**
- Separates both classes by a **hyperplane**

Your answer is incorrect.

The correct answer is:
Separates both classes by a **slab**

Question **6**

Correct

Mark 1.00 out of 1.00

What is the **margin** between two hyperplanes?

$$\bar{\mathbf{a}}^T\bar{\mathbf{x}} = c_1$$
$$\bar{\mathbf{a}}^T\bar{\mathbf{x}} = c_2$$

- $\dfrac{\|\bar{\mathbf{a}}\|}{|c_1 - c_2|}$
- $\dfrac{|c_1^2 - c_2^2|}{\|\bar{\mathbf{a}}\|}$
- $\dfrac{|c_1 - c_2|}{\|\bar{\mathbf{a}}\|}$
- $\dfrac{|c_1 - c_2|}{\|\bar{\mathbf{a}}\|^2}$

Your answer is correct.

The correct answer is:
$\dfrac{|c_1 - c_2|}{\|\bar{\mathbf{a}}\|}$

Question **7**

Correct

Mark 1.00 out of 1.00

What is the distance between the two hyperplanes given below

$$x_1 + 2x_2 + 3x_3 + \cdots + Nx_N = 1$$
$$x_1 + 2x_2 + 3x_3 + \cdots + Nx_N = -1$$

- $\frac{2}{\sqrt{N(N+1)}}$
- $\frac{\sqrt{2}}{\sqrt{N(N+1)}}$
- $\frac{2}{\sqrt{\frac{N(N+1)(2N+1)}{6}}}$ ✔
- $\frac{1}{2\sqrt{\frac{N(N+1)(2N+1)}{6}}}$

Your answer is correct.

The correct answer is:

$$\frac{2}{\sqrt{\frac{N(N+1)(2N+1)}{6}}}$$

Question **8**

Correct

Mark 1.00 out of 1.00

The optimization problem to determine the support vector classifier is

- $$\min \frac{1}{\|\bar{\mathbf{a}}\|_2}$$
  $$\mathcal{C}_0 : \bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq 1,\ 1 \leq i \leq M$$
  $$\mathcal{C}_1 : \bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq -1,\ M+1 \leq i \leq 2M$$
- $$\min \|\bar{\mathbf{a}}\|_2$$
  $$\mathcal{C}_0 : \bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq 1,\ 1 \leq i \leq M$$
  $$\mathcal{C}_1 : \bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq -1,\ M+1 \leq i \leq 2M$$
- $$\min \frac{1}{\|\bar{\mathbf{a}}\|_2}$$
  $$\mathcal{C}_0 : \bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq 1,\ 1 \leq i \leq M$$
  $$\mathcal{C}_1 : \bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq -1,\ M+1 \leq i \leq 2M$$
- $$\min \|\bar{\mathbf{a}}\|_2$$
  $$\mathcal{C}_0 : \bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq 1,\ 1 \leq i \leq M$$
  $$\mathcal{C}_1 : \bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq -1,\ M+1 \leq i \leq 2M$$
  ✔

Your answer is correct.

The correct answer is:

$$\min \|\bar{\mathbf{a}}\|_2$$
$$\mathcal{C}_0 : \bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq 1,\ 1 \leq i \leq M$$
$$\mathcal{C}_1 : \bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq -1,\ M+1 \leq i \leq 2M$$

Question **9**

Correct

Mark 1.00 out of 1.00

The slack variables satisfy the property

- $u_i \geq 0,\ v_i < 0$
- $u_i \geq 0,\ v_i \geq 0$ ✔
- $u_i < 0,\ v_i \geq 0$
- $u_i < 0,\ v_i < 0$

Your answer is correct.

The correct answer is:
$u_i \geq 0,\ v_i \geq 0$

Question **10**

Correct

Mark 1.00 out of 1.00

The optimization problem to determine the soft classifier is given as

- $\min \sum_{i=1}^{N} u_i + \sum_{i=1}^{N} v_i$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq 1 - u_i, 1 \leq i \leq M$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq -1 + v_i,\ M+1 \leq i \leq 2M$
  $u_i \geq 0,\ v_i \geq 0$
- $\min \sum_{i=1}^{N} u_i + \sum_{i=1}^{N} v_i$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq 1 - u_i, 1 \leq i \leq M$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq -1 + v_i,\ M+1 \leq i \leq 2M$
  $u_i < 0,\ v_i < 0$
- $\min \|\bar{\mathbf{a}}\|$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq 1 - u_i, 1 \leq i \leq M$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq -1 + v_i,\ M+1 \leq i \leq 2M$
  $u_i \geq 0,\ v_i \geq 0$
- $\max \sum_{i=1}^{N} u_i + \sum_{i=1}^{N} v_i$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq 1 - u_i, 1 \leq i \leq M$
  $\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq -1 + v_i,\ M+1 \leq i \leq 2M$
  $u_i \geq 0,\ v_i \geq 0$

Your answer is correct.

The correct answer is:

$\min \sum_{i=1}^{N} u_i + \sum_{i=1}^{N} v_i$
$\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \geq 1 - u_i, 1 \leq i \leq M$
$\bar{\mathbf{a}}^T \bar{\mathbf{x}}_i + b \leq -1 + v_i,\ M+1 \leq i \leq 2M$
$u_i \geq 0,\ v_i \geq 0$