



# Deep learning

# Assignment 1

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# Problem 7

$x_1, x_2, x_3$  are the linearly independent vectors. If  $x_1 = \begin{bmatrix} 1 \\ 3 \\ 0 \end{bmatrix}$ ,  $x_2 = \begin{bmatrix} -2 \\ 4 \\ -5 \end{bmatrix}$ , what is the possible value of  $x_3$ ?

- a.  $\begin{bmatrix} -1 \\ 7 \\ -5 \end{bmatrix}$
- b.  $\begin{bmatrix} 0 \\ 10 \\ -5 \end{bmatrix}$
- c.  $\begin{bmatrix} 3 \\ 4 \\ 5 \end{bmatrix}$
- d.  $\begin{bmatrix} 5 \\ -5 \\ 10 \end{bmatrix}$



## Problem 8

$$x + 2y - z = 1 \quad \dots\dots\dots (1)$$

$$-2x - 4y + 2z = -2 \quad \dots\dots\dots (2)$$

$$z = 2 \quad \dots\dots\dots (3)$$

What are the values of  $x, y, z$ ?

- a.  $x = 0, y = 0, z = 2$
- b.  $z = 2$  and infinitely possible  $x, y$
- c.  $z = 2$  and no possible  $x, y$
- d. None of the above

# Problem 9

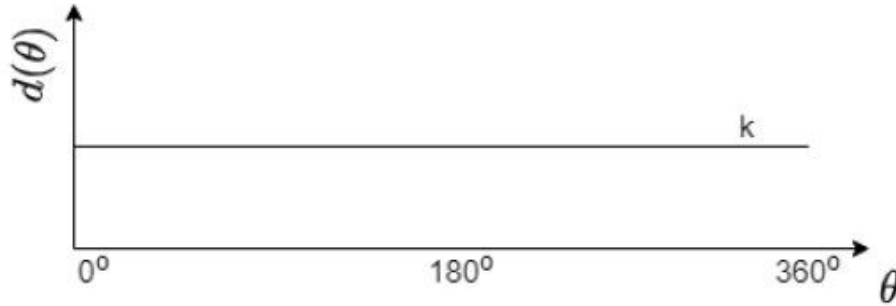
What are the eigen values of the matrix A?

$$A = \begin{bmatrix} 5 & 4 \\ -3 & -2 \end{bmatrix}$$

- a. 4, -3
- b. 5, -2
- c. -2, -1
- d. 2, 1

# Problem 1

Signature descriptor of an unknown shape is given in the figure, can you identify the unknown shape?



- a. Circle
- b. Square
- c. Straight line
- d. Cannot be predicted



## Problem 2

To measure the Smoothness, coarseness and regularity of a region we use which of the transformation to extract feature?

- Gabor Transformation
- Wavelet Transformation
- Both Gabor, and Wavelet Transformation.
- None of the Above.



## Problem 3

Suppose Fourier descriptor of a shape has  $K$  coefficient, and we remove last few coefficient and use only first  $m$  ( $m < K$ ) number of coefficient to reconstruct the shape. What will be effect of using truncated Fourier descriptor on the reconstructed shape?

- We will get a smoothed boundary version of the shape.
- We will get only the fine details of the boundary of the shape.
- Full shape will be reconstructed without any loss of information.
- Low frequency component of the boundary will be removed from contour of the shape.

# Problem 4

While computing polygonal descriptor of an arbitrary shape using splitting technique, which of the following we take as the starting guess?

- Vertex joining the two closet point above a threshold on the boundary.
- Vertex joining the two farthest point on the boundary.
- Vertex joining any two arbitrary point on the boundary.
- None of the above.



## Problem 5

Consider two class Bayes' Minimum Risk Classifier. Probability of classes  $W_1$  and  $W_2$  are,  $P(\omega_1) = 0.3$  and  $P(\omega_2) = 0.7$  respectively.  $P(x) = 0.545$ ,  $P(x | \omega_1) = 0.65$ ,  $P(x | \omega_2) = 0.5$  and the loss

matrix values are  $\begin{bmatrix} \lambda_{11} & \lambda_{12} \\ \lambda_{21} & \lambda_{22} \end{bmatrix}$

If the classifier assign  $x$  to class  $W_1$ , then which one of the following is true.

- a.  $\frac{\lambda_{21} - \lambda_{11}}{\lambda_{12} - \lambda_{22}} < 1.79$
- b.  $\frac{\lambda_{21} - \lambda_{11}}{\lambda_{12} - \lambda_{22}} > 1.79$
- c.  $\frac{\lambda_{21} - \lambda_{11}}{\lambda_{12} - \lambda_{22}} < 1.09$
- d.  $\frac{\lambda_{21} - \lambda_{11}}{\lambda_{12} - \lambda_{22}} > 1.09$

$$\begin{aligned} & \lambda_{11} P(\omega_1/x) + \lambda_{12} P(\omega_2/x) < \lambda_{21} P(\omega_1/x) + \lambda_{22} P(\omega_2/x) \\ \Rightarrow & (\lambda_{21} - \lambda_{11}) P(\omega_1/x) > (\lambda_{12} - \lambda_{22}) P(\omega_2/x) \\ \Rightarrow & \frac{P(\omega_1/x)}{P(\omega_2/x)} > \frac{\lambda_{12} - \lambda_{22}}{\lambda_{21} - \lambda_{11}} \end{aligned}$$

# Problem 6

The Fourier transformation of a complex sequence of number  $s(k)$  for  $k = 0, \dots, N - 1$  is given by:

- a.  $a(u) = \sum_{k=0}^{N-1} s(k)e^{j2\pi uk/N}$
- b.  $a(u) = \sum_{k=0}^N s(k)e^{j2\pi uk/N}$
- c.  $a(u) = \sum_{k=0}^{N-1} s(k)e^{-j2\pi uk/N}$
- d.  $a(u) = \sum_{k=-N/2}^{N/2} s(k)e^{-j2\pi uk/N}$



# Problem 7

The gray co-occurrence matrix  $C$  of an unknown image is given in below. What is the value of maximum probability descriptor?

1	2	2
2	1	2
2	3	2

**Fig 1: C**

- a.  $3/17$
- b.  $1/12$
- c.  $3/16$
- d.  $5/16$



# Problem 8

Which of the following is not a boundary descriptor.

- a. Polygonal Representation
- b. Fourier descriptor
- c. Signature
- d. Histogram.





# Problem 9

We use gray co-occurrence matrix to extract which type of information?

- a. Boundary
- b. Texture
- c. MFCC
- d. Zero Crossing rate.



# Problem 10

If the larger values of gray co-occurrence matrix are concentrated around the main diagonal, then which one of the following will be true?

- a. The value of element difference moment will be low.
- b. The value of inverse element difference moment will be low.
- c. The value of entropy will be very low.
- d. None of the above.