

# True-False

A discrete random variable takes a finite number of values, while a continuous random variable can only take infinite number of values.

Answer: False

# True-False

This question is related to the understanding of modelling assumptions.  $f(x) = 5x - 3$  is a linear function

Answer: False

# MCQ

This question is related to the understanding of linear systems and partial derivatives.  
Which of the following statements below is correct?

Answer: (b)

- a) In over-determined linear systems, the number of parameters is greater than the number of unknown equations.
- b) The system  $\begin{bmatrix} 1 & 4 \\ 2 & 7 \\ -3 & 11 \end{bmatrix} \begin{bmatrix} w_1 \\ w_2 \end{bmatrix} = \begin{bmatrix} 1 \\ -2.5 \\ 4 \end{bmatrix}$  has no *exact* solution but an approximated solution is available using the left inverse.
- c) If  $\mathbf{f}(\mathbf{x})$  is a vector-valued function of *size*  $p \times 1$  and  $\mathbf{x}$  is an  $m \times 1$  vector, then differentiation of  $\mathbf{f}(\mathbf{x})$  with respect to  $\mathbf{x}$  is an  $m \times p$  matrix.
- d) A linear function needs to satisfy the properties of homogeneity only.
- e) None of the other options.

# MCQ

A set of linear equations is written as  $\mathbf{w}^T \mathbf{X} = \mathbf{y}^T$

where  $\mathbf{X} \in \mathcal{R}^{3 \times 2}$  and  $\mathbf{y} \in \mathcal{R}^{2 \times 1}$ .

How many simultaneous equations are there in this set of equations?

- a) 1
- b) 2
- c) 3
- d) 4
- e) 5

Answer: (b)

# MCQ

The values of feature  $x$  and their corresponding values of target  $y$  are shown in the table below.

$x$	3	4	5	6	7
$y$	5	4	3	2	1

Find the least square regression line  $y = a x + b$  and then estimate the value of  $y$  when  $x = 8$ .

- a)  $y=8$
- b)  $y=+1$
- c)  $y=0$
- d)  $y=-1$
- e) None of the above

Answer: (c)

# MCQ

- Which of the following task is likely to be achieved via supervised learning?
  - a) Using historical data for weather forecast.
  - b) Grouping together users with similar viewing patterns in order to recommend similar content.
  - c) Grouping a number of oranges by their size.
  - d) None of the rest.

Answer: a)

# MCQ

A person draws 2 cards from a deck of 52 cards, one after another without replacing the previous card back. WhUsing historical data for weather forecast.

- a)  $2/52$
- b)  $4/52$
- c)  $1/221$
- d)  $3/51$

Answer: c)

# MCQ

A machine learning algorithm takes the temperature as one of its input features. The temperature is measured in Celsius. Please select the correct option.

- a) The temperature in Celsius is considered as interval data.
- b) We can calculate the mean and standard deviation of temperature.
- c) The temperature in Celsius is considered as ratio data.
- d) None of the rest.
- e) (a), and (b)
- f) (a), and (c)

Answer: e)



# MCQ

Three balls are drawn from three urns sequentially, one ball from each urn. The first urn contains 1 blue and 7 red balls, the second urn contains 2 blue and 6 red balls, and the third urn contains 3 red and 5 green balls. Find the probability that 2 red balls are chosen.

- a)  $226/64$
- b)  $226/512$
- c)  $270/512$
- d)  $270/1024$
- e) None of the rest

Answer: c)

# FIB

You are given a collection of 5 training data points of two features  $(x_1, x_2)$  and their target output ( $y$ ) which are packed as follows:

$$\text{Feature matrix: } \mathbf{X} = \begin{bmatrix} 1 & 2 \\ 0 & 6 \\ 1 & 0 \\ 0 & 5 \\ 1 & 7 \end{bmatrix}, \text{ Target output: } \mathbf{y} = \begin{bmatrix} 1 \\ 2 \\ 3 \\ 4 \\ 5 \end{bmatrix}.$$

Predict the output (up to 4 decimal places) of  $(x_1, x_2) = (1, 3)$  using the linear regression model. (4 marks)

My prediction for  $y$  is .

Answer: 3

# FIB

Suppose the random variable  $X$  has a probability mass function (pmf) given in the table below.

$X$	1	2	3	4	5
$\Pr[X]$	0.1	0.1	0.2	0.4	(BLANK1)

1) What is the probability of  $\Pr[X=5]$ ? 1      Answer: 0.2

2) What is the probability of  $\Pr[X \leq 2]$ ? 2      Answer: 0.2

3) is the mean of the random variable  $X$ ? 3      Answer: 3.5