Started on	Sunday, 28 January 2024, 2:01 PM
State	Finished
Completed on	Sunday, 28 January 2024, 2:14 PM
Time taken	13 mins 57 secs
Grade	**10.00** out of 10.00 (**100**%)

Question **1**

Correct

Mark 1.00 out of 1.00

Consider the ML example below for prediction of sales based on advertising

Year	Sales (Million Euro)	Advertising (Million Euro)
1	651	23
2	762	26
3	856	30
4	1,063	34
5	1,190	43
6	1,298	48
7	1,421	52
8	1,440	57
9	1.518	58

In this example, Advertising is the

- Response
- Regressor ✔
- Regression coefficient
- Model error

Your answer is correct.

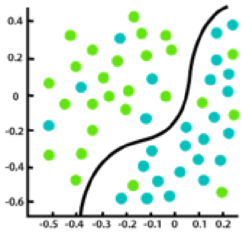
The correct answer is: Regressor

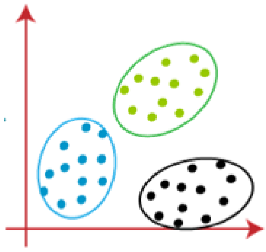
Question **2**

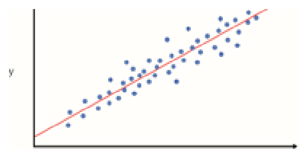
Correct

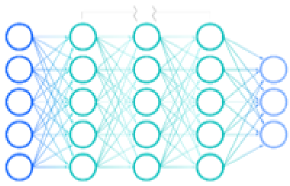
Mark 1.00 out of 1.00

Which figure below represents linear regression



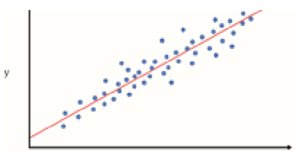






Your answer is correct.

The correct answer is:



Question **3**

Correct

Mark 1.00 out of 1.00

Consider the linear regression model below

$$y(k) = h_0 + h_1 x_1(k) + \cdots + h_n x_n(k) + \epsilon(k)$$

The quantities h_i are

- Regressor
- Response
- Model error
- Regression coefficient ✔

Your answer is correct.

The correct answer is: Regression coefficient

Question **4**

Correct

Mark 1.00 out of 1.00

The learning model for the linear regression problem described in class is

- $\underbrace{\begin{bmatrix} y(1) \\ y(2) \\ \vdots \\ y(M) \end{bmatrix}}_{\bar{\mathbf{y}}} = \underbrace{\begin{bmatrix} \bar{\mathbf{x}}(1) \\ \bar{\mathbf{x}}(2) \\ \vdots \\ \bar{\mathbf{x}}(M) \end{bmatrix}}_{\mathbf{X}} \bar{\mathbf{h}} + \underbrace{\begin{bmatrix} \epsilon(1) \\ \epsilon(2) \\ \vdots \\ \epsilon(M) \end{bmatrix}}_{\bar{\epsilon}}$
- $\underbrace{\begin{bmatrix} y(1) \\ y(2) \\ \vdots \\ y(M) \end{bmatrix}}_{\bar{\mathbf{y}}} = \underbrace{\begin{bmatrix} \bar{\mathbf{x}}^T(1) \\ \bar{\mathbf{x}}^T(2) \\ \vdots \\ \bar{\mathbf{x}}^T(M) \end{bmatrix}}_{\mathbf{X}} \bar{\mathbf{h}} + \underbrace{\begin{bmatrix} \epsilon(1) \\ \epsilon(2) \\ \vdots \\ \epsilon(M) \end{bmatrix}}_{\bar{\epsilon}}$ ✔
- $\underbrace{\begin{bmatrix} y(1) \\ y(2) \\ \vdots \\ y(M) \end{bmatrix}}_{\bar{\mathbf{y}}} = \underbrace{\begin{bmatrix} \bar{\mathbf{x}}(1) \\ \bar{\mathbf{x}}(2) \\ \vdots \\ \bar{\mathbf{x}}(M) \end{bmatrix}}_{\mathbf{X}} \bar{\mathbf{h}}^T + \underbrace{\begin{bmatrix} \epsilon(1) \\ \epsilon(2) \\ \vdots \\ \epsilon(M) \end{bmatrix}}_{\bar{\epsilon}}$
- $\underbrace{\begin{bmatrix} y(1) \\ y(2) \\ \vdots \\ y(M) \end{bmatrix}}_{\bar{\mathbf{y}}} = \underbrace{\begin{bmatrix} \bar{\mathbf{x}}^T(1) \\ \bar{\mathbf{x}}^T(2) \\ \vdots \\ \bar{\mathbf{x}}^T(M) \end{bmatrix}}_{\mathbf{X}} \bar{\mathbf{h}}^T + \underbrace{\begin{bmatrix} \epsilon(1) \\ \epsilon(2) \\ \vdots \\ \epsilon(M) \end{bmatrix}}_{\bar{\epsilon}}$

Your answer is correct.

The correct answer is:

$$\underbrace{\begin{bmatrix} y(1) \\ y(2) \\ \vdots \\ y(M) \end{bmatrix}}_{\bar{\mathbf{y}}} = \underbrace{\begin{bmatrix} \bar{\mathbf{x}}^T(1) \\ \bar{\mathbf{x}}^T(2) \\ \vdots \\ \bar{\mathbf{x}}^T(M) \end{bmatrix}}_{\mathbf{X}} \bar{\mathbf{h}} + \underbrace{\begin{bmatrix} \epsilon(1) \\ \epsilon(2) \\ \vdots \\ \epsilon(M) \end{bmatrix}}_{\bar{\epsilon}}$$

Question **5**

Correct

Mark 1.00 out of 1.00

The regression coefficient vector from the training data is determined as

- $\bar{\mathbf{h}} = \mathbf{X}^T(\mathbf{X}^T\mathbf{X})^{-1}\bar{\mathbf{y}}$
- $\bar{\mathbf{h}} = (\mathbf{X}^T\mathbf{X})^{-1}\mathbf{X}\bar{\mathbf{y}}$
- $\bar{\mathbf{h}} = (\mathbf{X}\mathbf{X}^T)^{-1}\mathbf{X}^T\bar{\mathbf{y}}$
- $\bar{\mathbf{h}} = (\mathbf{X}^T\mathbf{X})^{-1}\mathbf{X}^T\bar{\mathbf{y}}$ ✔

Your answer is correct.

The correct answer is:

$$\bar{\mathbf{h}} = (\mathbf{X}^T\mathbf{X})^{-1}\mathbf{X}^T\bar{\mathbf{y}}$$

Question **6**

Correct

Mark 1.00 out of 1.00

Consider the linear regression problem with the design matrix ***X*** and response vector $\bar{\mathbf{y}}$ given below

$$\mathbf{X} = \begin{bmatrix} 1 & -1 \\ -1 & 1 \\ 1 & 1 \\ -1 & -1 \end{bmatrix}, \bar{\mathbf{y}} = \begin{bmatrix} -2 \\ 2 \\ -3 \\ -1 \end{bmatrix}$$

The vector of regression coefficients is

- ○ $\frac{1}{2}\begin{bmatrix} -2 \\ 1 \end{bmatrix}$
- ○ $\frac{1}{2}\begin{bmatrix} 2 \\ -3 \end{bmatrix}$
- ◉ $\frac{1}{2}\begin{bmatrix} -3 \\ 1 \end{bmatrix}$ ✔
- ○ $\frac{1}{2}\begin{bmatrix} -1 \\ 2 \end{bmatrix}$

Your answer is correct.

The correct answer is:

$\frac{1}{2}\begin{bmatrix} -3 \\ 1 \end{bmatrix}$

Question **7**

Correct

Mark 1.00 out of 1.00

Logistic regression can be used in which of the following applications

- ◉ Disease detection ✔
- ○ Stock price forecasting
- ○ Predicting the price of a home
- ○ Clustering of users based on shopping information

Your answer is correct.

The correct answer is: Disease detection

Question **8**

Correct

Mark 1.00 out of 1.00

As z→-∞, z→∞, the logistic function approaches the limits

- 1,0
- 0,1
- 0,∞
- ∞,0

Your answer is correct.

The correct answer is:
0,1

Question **9**

Correct

Mark 1.00 out of 1.00

The log-likelihood of the regression parameter $\bar{\mathbf{h}}$ in logistic regression can be written as

- $\sum_{k=1}^{M}(1-y(k))\ln g(\bar{\mathbf{x}}(k)) + y(k)\ln\left(1-g(\bar{\mathbf{x}}(k))\right)$
- $\prod_{k=1}^{M}\left(g(\bar{\mathbf{x}}(k))\right)^{y(k)}\left(1-g(\bar{\mathbf{x}}(k))\right)^{1-y(k)}$
- $\prod_{k=1}^{M}\left(g(\bar{\mathbf{x}}(k))\right)^{1-y(k)}\left(1-g(\bar{\mathbf{x}}(k))\right)^{y(k)}$
- $\sum_{k=1}^{M}y(k)\ln g(\bar{\mathbf{x}}(k)) + (1-y(k))\ln\left(1-g(\bar{\mathbf{x}}(k))\right)$

Your answer is correct.

The correct answer is:
$\sum_{k=1}^{M}y(k)\ln g(\bar{\mathbf{x}}(k)) + (1-y(k))\ln\left(1-g(\bar{\mathbf{x}}(k))\right)$

Question **10**

Correct

Mark 1.00 out of 1.00

The threshold function $g(\bar{\mathbf{x}})$ for the perceptron learning algorithm is given as

- -1 for $\bar{\mathbf{h}}^T\bar{\mathbf{x}} \leq 0$ and 0 otherwise
- 1 for $\bar{\mathbf{h}}^T\bar{\mathbf{x}} \geq 0$ and 0 otherwise
- $\frac{e^{-\bar{\mathbf{x}}^T\bar{\mathbf{h}}}}{1+e^{-\bar{\mathbf{x}}^T\bar{\mathbf{h}}}}$
- $\frac{1}{1+e^{-\bar{\mathbf{x}}^T\bar{\mathbf{h}}}}$

Your answer is correct.

The correct answer is:

1 for $\bar{\mathbf{h}}^T\bar{\mathbf{x}} \geq 0$ and 0 otherwise