Started on	Tuesday, 16 January 2024, 7:42 PM
State	Finished
Completed on	Friday, 19 January 2024, 1:07 AM
Time taken	2 days 5 hours
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, Sales is the

- Response ✔
- Regressor
- Regression coefficient
- Model error

Your answer is correct.

The correct answer is:
Response

Question **2**

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
- ○ Regression coefficient
- ◉ Regressor ✔
- ○ Model error

Your answer is correct.

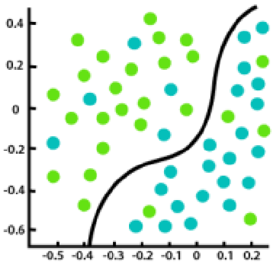
The correct answer is:
Regressor

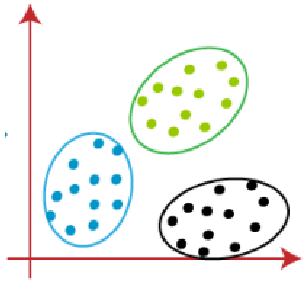
Question **3**

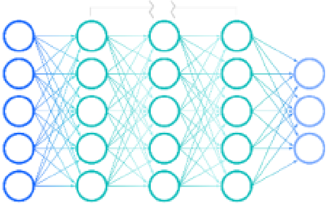
Correct

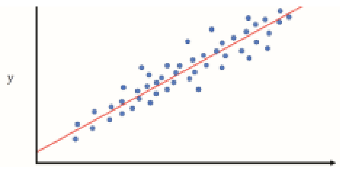
Mark 1.00 out of 1.00

Which figure below represents linear regression



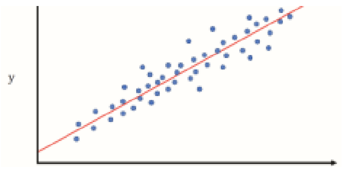






Your answer is correct.

The correct answer is:



Question **4**

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 quantity y(k) is

- ○ Regressor
- ○ Regression coefficient
- ○ Model error
- ◉ Response ✔

Your answer is correct.

The correct answer is:
Response

Question **5**

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 $x_i(k)$ are

- ○ Response
- ◉ Regressor ✔
- ○ Regression coefficient
- ○ Model error

Your answer is correct.

The correct answer is:
Regressor

Question **6**

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

- (selected) Regression coefficient ✔
- Regressor
- Response
- Model error

Your answer is correct.

The correct answer is:
Regression coefficient

Question **7**

Correct

Mark 1.00 out of 1.00

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

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

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

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

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

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 **8**

Correct

Mark 1.00 out of 1.00

The problem to determine the regression coefficient vector h̄ given as

$\min \bar{\mathbf{y}} - \mathbf{X}\,\bar{\mathbf{h}}$

$\min |\bar{\mathbf{y}} - \mathbf{X}\,\bar{\mathbf{h}}|$

$\min \left\| \bar{\mathbf{y}} - \mathbf{X}\,\bar{\mathbf{h}} \right\|^2$ ✔

$\min \left(\bar{\mathbf{y}} - \mathbf{X}\,\bar{\mathbf{h}} \right)^2$

Your answer is correct.

The correct answer is:

$$\min \left\| \bar{\mathbf{y}} - \mathbf{X}\,\bar{\mathbf{h}} \right\|^2$$

Question **9**

Correct

Mark 1.00 out of 1.00

The regression coefficient vector from the training data is determined as

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

Your answer is correct.

The correct answer is:

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

Question **10**

Correct

Mark 1.00 out of 1.00

The pseudo-inverse of the training or design matrix **X** is given as

- $(\mathbf{X}^T\mathbf{X})^{-1}\mathbf{X}^T$
- $\mathbf{X}^T(\mathbf{X}^T\mathbf{X})^{-1}$
- $(\mathbf{X}\mathbf{X}^T)^{-1}\mathbf{X}^T$
- $\mathbf{X}^T(\mathbf{X}\mathbf{X}^T)^{-1}$

Your answer is correct.

The correct answer is:

$(\mathbf{X}^T\mathbf{X})^{-1}\mathbf{X}^T$