Covariance matrix of a two-dimensional dataset

4/5 points (80.00%)

Practice Quiz, 5 questions

✔ **Congratulations! You passed!**

<div>Next Item</div>

✔ 1 / 1 points

1.

Compute the covariance matrix for the following dataset

$$\mathcal{D} = \left\{ \begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 5 \\ 4 \end{bmatrix} \right\}$$

Do the exercise using pen and paper.

○ $\begin{bmatrix} 2 & 2 \\ 4 & 1 \end{bmatrix}$

◉ $\begin{bmatrix} 4 & 2 \\ 2 & 1 \end{bmatrix}$

Correct
Good job!

○ $\begin{bmatrix} 1 & 2 \\ 2 & 4 \end{bmatrix}$

✔ 1 / 1 points

2.

Consider a data set $\mathcal{D}$ with covariance matrix $\begin{bmatrix} 3 & 2 \\ 2 & 4 \end{bmatrix}$.

What is the covariance matrix if we multiply every vector in $\mathcal{D}$ by 2?

○ $\begin{bmatrix} 4 & 2 \\ 2 & 3 \end{bmatrix}$

○

$\begin{bmatrix} 3 & 2 \\ 2 & 4 \end{bmatrix}$

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$\begin{bmatrix} 12 & 8 \\ 8 & 16 \end{bmatrix}$

Correct

Yes, every element in the covariance matrix is multiplied by 4.

○ $\begin{bmatrix} 16 & 8 \\ 8 & 12 \end{bmatrix}$

✔   1 / 1
points

3.

Consider the data set $\mathcal{D} = \left\{ \begin{bmatrix} 1 \\ 2 \end{bmatrix}, \begin{bmatrix} 7 \\ 4 \end{bmatrix} \right\}$ with covariance matrix $\begin{bmatrix} 9 & 3 \\ 3 & 1 \end{bmatrix}$.
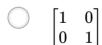
Compute the new covariance matrix when we add $\begin{bmatrix} 2 \\ 2 \end{bmatrix}$ to each element in $\mathcal{D}$.

◉ $\begin{bmatrix} 9 & 3 \\ 3 & 1 \end{bmatrix}$

Correct

Well done. The covariance will not change.

○ $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

○ $\begin{bmatrix} 11 & 5 \\ 5 & 3 \end{bmatrix}$

✖   0 / 1
points

4.

Provide a valid 2x2 covariance matrix by replacing the -1 entries in the code below.

```
1   def covariance_matrix():
2       """Return a valid 2x2 covariance matrix"""
3       covariance_matrix = np.array([[2, 4],
```

```
4                                      [10, 8]])
5      return covariance_matrix
```

Covariance matrix of a two-dimensional dataset

```
7   print(covariance_matrix())
```

Run

Reset

4/5 points (80.00%)

Practice Quiz, 5 questions

Incorrect Response
[[2 4]
 [10 8]] is not symmetric

✔   1 / 1
         points

5.

We are looking at a data set D where every element in D consists of an x and y coordinate. The data covariance matrix is given by

$$\begin{bmatrix} 1 & 0.8 \\ 0.8 & 1 \end{bmatrix}$$

Which of the following statements is correct?

○ x and y are positively correlated, i.e., when x increases then y increases on average, and vice versa.

Correct
Well done!

○ x and y are negatively correlated, i.e., when x increases then y decreases on average, and vice versa.

○ x and y are uncorrelated, i.e., when x increases then y does not change on average (and vice versa).

👍   👎   🏳