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Warming up

1.1 What is the Problem?

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Assessment

Graded Assignment due Feb 8, 2017 17:30 IST 

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Exercises: Precision and covariance matrix

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Covariance matrix

1/1 point (ungraded)

Which of the following matrices cannot be a covariance matrix?

☒
$$\begin{bmatrix} -3 & 0 & -2 \\ 0 & 2 & 0 \\ -2 & 0 & 2 \end{bmatrix}$$

☐
$$\begin{bmatrix} 2 & 0 & 0 \\ 0 & 2 & 0 \\ 0 & 0 & 2 \end{bmatrix}$$

☒
$$\begin{bmatrix} 2 & -1 & 0 \\ -1 & 2 & 1 \\ 0 & 3 & 2 \end{bmatrix}$$

- ▶ 3. Least Squares Estimation (LSE)
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☐
$$\begin{bmatrix} 2 & -1 & 3 \\ -1 & 2 & 1 \\ 3 & 1 & 2 \end{bmatrix}$$



Explanation

Variances cannot be negative, hence all diagonal elements should be larger than 0; Covariance matrices are always symmetric.

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✓ Correct (1/1 point)

Calibration campaign: covariance matrix

1/1 point (ungraded)

Suppose the following standard deviations are given:

$$\sigma_{\text{Laser}} = 0.002$$

$$\sigma_{\text{Rope}} = 0.06$$

$$\sigma_{\text{BoyScout}} = 0.1$$

What is the covariance matrix if we take the following measurements of an unknown distance: 2 with the laser, 1 with rope and 2 with boy scout? Note: $4e-6 = 4 \times 10^{-6}$

A)
$$\begin{bmatrix} 4e-6 & 0 & 0 \\ 0 & 3.6e-3 & 0 \\ 0 & 0 & 0.01 \end{bmatrix}$$

B)
$$\begin{bmatrix} 4e-6 & 0 & 0 & 0 & 0 \\ 0 & 4e-6 & 0 & 0 & 0 \\ 0 & 0 & 3.6e-3 & 0 & 0 \\ 0 & 0 & 0 & 0.01 & 0 \\ 0 & 0 & 0 & 0 & 0.01 \end{bmatrix}$$

C)
$$\begin{bmatrix} 0.002 & 0 & 0 \\ 0 & 0.06 & 0 \\ 0 & 0 & 0.1 \end{bmatrix}$$

D)
$$\begin{bmatrix} 0.002 & 0 & 0 & 0 & 0 \\ 0 & 0.002 & 0 & 0 & 0 \\ 0 & 0 & 0.06 & 0 & 0 \\ 0 & 0 & 0 & 0.1 & 0 \\ 0 & 0 & 0 & 0 & 0.1 \end{bmatrix}$$

Which covariance matrix is correct?

B

✓ Answer: B

Explanation

The variances are on the diagonal and are equal to the square of the given standard deviations.

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✓ Correct (1/1 point)

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