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Courses » Applied Time-Series Analysis

Announcements

Course

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Progress



Unit 14 - Week 9: Estimation Theory

Course outline

R-based Exam

How to access the portal?

Assignment 0

R Tutorials

Week 1: Introduction & Overview

Week 2: Review of Probability & Statistics

Week 3: Introduction to Random Processes, Auto- and Cross-Correlation Functions

Week 4: Auto- and cross-correlation functions (contd.), Models for Linear Stationary Processes

Week 5: Models for Linear Stationary & Non-Stationary Processes

Week 6: Models for Linear Non-Stationary Processes (contd.), Fourier Transforms

Week 7: Fourier Transforms, DFT and Periodogram

Week 8: Spectral Representations & Estimation Theory

Week 9: Estimation Theory

 Course Notes for Week 9 Lecture 37C: Goodness of Estimators 1 -4 Lecture 38A: Goodness of Estimators 2 -1 Lecture 38B: Goodness of Estimators 2 -2 Lecture 38C: Goodness of Estimators 2 -3 Lecture 39A: Goodness of Estimators 2 -4 Lecture 39B: Goodness of Estimators 2 -5 with R demonstrations Lecture 39C: Goodness of Estimators 2 -6 Lecture 40A: Goodness of Estimators 2 -7 Lecture 40B: Goodness of Estimators 2 -8 Lecture 41A: Estimation Methods 1 -1 Lecture 41B : Estimation Methods 1 -2

Week 9 Assignment

The due date for submitting this assignment has passed.
As per our records you have not submitted this assignment.

Due on 2018-03-31, 23:59 IST

1)

1 point

1. If $v[k] = c + e[k]$, where $e[k] \sim \mathcal{N}(0, \sigma_e^2)$ then the statistically *unbiased* least estimate of the variance of $v[k]$ with N is _____

a. $\frac{1}{N^2} \sum_{k=1}^N (v[k] - \frac{1}{N} \sum_{k=1}^N v[k])^2$

b. $\frac{1}{N} \sum_{k=1}^N (v[k] - \frac{1}{N} \sum_{k=1}^N v[k])^2$

c. $\frac{1}{N-1} \sum_{k=1}^N (v[k] - \frac{1}{N} \sum_{k=1}^N v[k])^2$

d. $\frac{1}{N+1} \sum_{k=1}^N (v[k] - \frac{1}{N} \sum_{k=1}^N v[k])^2$

- a
 b
 c
 d

No, the answer is incorrect.**Score: 0****Accepted Answers:**

c

2)

1 point

2. The standard deviation for two different Gaussian, independent random processes $e_1[k]$ and $e_2[k]$ are known to be σ_1 and σ_2 respectively. In order to obtain equal amount of information about mean for both the processes the ratio of the data points $\frac{N_1}{N_2}$ should be _____.

a. $\frac{\sigma_1}{\sigma_2}$

b. $\frac{\sigma_1^2}{\sigma_2^2}$

c. $\frac{\sigma_1 \sigma_2}{\sigma_2^2}$

d. $\frac{\sigma_1 \sigma_2}{\sigma_1^2}$

- a
 b
 c
 d

No, the answer is incorrect.**Score: 0****Accepted Answers:**

b

3)

1 point

- Lecture 42A: Estimation Methods 1-3
- Quiz : Week 9 Assignment
- Dataset
- Solutions to Week-9 Assignment
- Week 9 Feedback

Week 10: Estimation Methods

Week 11: Estimation methods (contd.)

Week 12: Estimation of Power Spectral Density & Time Series Models

Case Studies on Modelling

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Interactive Session

3. If $v[k]$ is a white noise process with exponential distribution $f(v[k] = x) = \lambda e^{-\lambda x}$ and N observations of $v[k]$ choose the right option(s).

- a. There exists a $\tilde{\lambda}$ s.t. $\sigma_{\tilde{\lambda}}^2 = I^{-1}(\tilde{\lambda})$, $\tilde{\lambda} = \frac{1}{N} \sum_{k=1}^N v[k]$
- b. There exists a $\tilde{\lambda} \frac{1}{\lambda}$ s.t. $\sigma_{\frac{1}{\lambda}}^2 = I^{-1}(\frac{1}{\lambda})$, $\frac{1}{\lambda} = \frac{1}{N} \sum_{k=1}^N v[k]$
- c. There exists a $\tilde{\lambda} \tilde{\lambda}$ s.t. $\sigma_{\tilde{\lambda}}^2 = I^{-1}(\tilde{\lambda})$, $\tilde{\lambda} = \frac{N}{\sum_{k=1}^N v[k]}$
- d. None of these.

where $I(\theta)$ and $\tilde{\theta}$ are the Fisher's Information and estimator of θ respectively.

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

4)

1 point

4. Given the data generating process

$$v[k] = 0.6e[k-1] + e[k]$$

use Monte-Carlo simulations and report the variance of the sample variance estimator. Use $R = 10^5$ realizations with $N = 100$ observations per realization and round your answer to 2 decimal places.

- a. 0.5
- b. 0.05
- c. 1
- d. None of these.

- a
- b
- c
- d

No, the answer is incorrect.

Score: 0

Accepted Answers:

b

5)

1 point

5. You are the visiting quality inspector of a sport equipment manufacturer. The manufacturer has developed a new, synthetic fishing line that they claim has a mean breaking strength of 8 kg, with a standard deviation of 0.5. You decide to test this claim by randomly sampling 50 fishing lines. You find that the mean breaking strength calculated from this sample is 7.85 kg. At a level of 0.05, would you reject the claim that the manufacturer has a mean breaking strength of 8 kg?

- a. Yes
- b. No

- a
- b

No, the answer is incorrect.

Score: 0

Accepted Answers:

a

6)

1 point



6. The lower bound for the variance of an unbiased estimator of $f(\theta)$: a function of a parameter θ is

- a. $\frac{(f'(\theta))^2}{I(\theta)}$
 b. $\frac{(f(\theta))^2}{I(\theta)}$
 c. $\frac{I(\theta)}{(f'(\theta))^2}$
 d. $\frac{I(\theta)}{(f(\theta))^2}$

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a

7)

1 point

7. If the point estimates of mean for a random process $v[k]$ using two different estimators from an N point dataset are obtained as $\bar{v}_1 = \frac{1}{N} \sum_{k=1}^N v[k]$ and $\bar{v}_2 = \frac{1}{N-p} \sum_{k=1}^N v[k]$ respectively, where $p > 0$ choose the correct option(s).

- a. \bar{v}_1 is statistically and asymptotically unbiased, \bar{v}_2 is asymptotically unbiased.
 b. \bar{v}_1 is asymptotically unbiased, \bar{v}_2 is statistically biased.
 c. \bar{v}_1 is asymptotically unbiased, \bar{v}_2 is statistically unbiased.
 d. \bar{v}_1 is statistically biased, \bar{v}_2 is asymptotically unbiased.

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a

b

8)

1 point

8. Given three observations $v[1]$, $v[2]$ and $v[3]$ of a series, the maximum order p of process of the form $v[k] = \sum_{i=1}^p d_i v[k-i] + e[k]$ that can be fit and the least square estimates of the corresponding parameters are obtained as _____.

- a. $p = 1, d_1 = \frac{v[1]}{v[2]}$
 b. $p = 2, d_1 = \frac{v[1]}{v[2]}, d_2 = \frac{v[3]}{v[2]}$
 c. $p = 2, d_1 = -\frac{v[1]^2}{v[2]}, d_2 = \frac{v[3]}{v[2]}$
 d. $p = 1, d_1 = \frac{v[1]v[2] + v[2]v[3]}{v^2[1] + v^2[2]}$

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0



Accepted Answers:

d

9)

1 point

9. Consider the data in the table given below:

y	198.97	243.02	296.83	362.54	442.81	540.85	660.60	806.8
x	2.3	2.4	2.5	2.6	2.7	2.8	2.9	3

Suppose you are given the predictor expression for y as

$$\hat{y} = ae^{bx}$$

obtain an estimate of a using linear least squares (round off your answer to 2 decimal places)_____.

- a. 2.26
- b. 1.5
- c. 1.65
- d. 1.83

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

d

10)

1 point

10. The data given in w9_q10.RData is generated by mixing deterministic and random with the model structure given below:

$$y[k] = ax[k] + w[k]$$

$$w[k] = be[k - 1] + e[k]$$

where $e[k] \sim \mathcal{N}(0, \sigma_e^2)$. Using R, find the values of \hat{a} and \hat{b} .

- a. $\hat{a} = 0.5570, \hat{b} = 0.5864$
- b. $\hat{a} = 0.5714, \hat{b} = 0.5544$
- c. $\hat{a} = 0.5874, \hat{b} = 0.5138$
- d. $\hat{a} = 0.5930, \hat{b} = 0.5064$

- a
 b
 c
 d

No, the answer is incorrect.

Score: 0

Accepted Answers:

a

[Previous Page](#)
[End](#)

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