Assignment 2
[20 points]

Instructions

1. A pdf should be submitted with typed answers.

Submission date and time

September 12, 2019, by 23:00

1. A sample of size n = 200 produced the sample mean of $\overline{X}$ = 16. Assuming the population standard deviation σ = 2.9, compute a 95% confidence interval for the population mean μ.

2. The operations manager of a large production plant would like to estimate the mean amount of time a worker takes to assemble a new electronic component. Assume that the standard deviation of this assembly time is 4.6 minutes. ?

a) After observing 220 workers assembling similar devices, the manager noticed that their average time was 16.2 minutes. Construct a 92% confidence interval for the mean assembly time.

b) How many workers should be involved in this study in order to have the mean assembly time estimated up to ±10 seconds with 92% confidence?

3. Suppose an online retailer would like to conduct a survey on Survey Monkey to find the proportion p of consumers who bought the newest generation of a smart-phone were happy with their purchase.

a) How large a sample n should they take to estimate p with 2% margin of error and 80% confidence?

b) The online retailer took a random sample of 10000 consumers who recently purchased this smart-phone and found that 400 were happy with their purchase. Find a 95% confidence interval for p.

4: Probability mass function of discrete random variable X is given below, where θ is a parameter s.t. $0 \leq \theta \leq 1$.
The following 20 independent observations

X	0	1	2	3
$P(X)$	$2\theta/3$	$\theta/3$	$2(1-\theta)/3$	$(1-\theta)/3$

were taken from such a distribution: (3,0,2,1,3,2,1,0,2,1,3,0,2,1,3,2,1,0,2,1). What is the maximum likelihood estimate of θ?

5. Suppose X_1, X_2, $\cdots$, X_n are i.i.d. random variables with density function f(x|σ) = (1/2σ) * exp (− |x| /σ) , please find the maximum likelihood estimate of σ.

6. Suppose that X_1, X_2, $\cdots$, X_n form a random sample from a uniform distribution on the interval (0, θ), where of the parameter θ > 0 but is unknown. Please find MLE of θ.

7. Find the singular values of the matrix

$$A = \begin{bmatrix} 1 & 1 & 0 & 1 \\ 0 & 0 & 0 & 1 \\ 1 & 1 & 0 & 0 \end{bmatrix}.$$

8. Find the SVD of the matrix

$$A = \begin{bmatrix} 1 & 0 & 1 & 0 \\ 0 & 1 & 0 & 1 \end{bmatrix}.$$

9. : Find the eigenvalues and eigenvectors of the matrix

$$A = \begin{pmatrix} 1 & -3 & 3 \\ 3 & -5 & 3 \\ 6 & -6 & 4 \end{pmatrix}.$$