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Homework 1: Estimation,

Confidence Interval, Modes of

> Identifiability

1. Statistical Models and

Course > Unit 2 Foundation of Inference > Convergence

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1. Statistical Models and Identifiability

For each of the following examples, define a statistical model and check whether the parameter of interest is identifiable. Follow the definitions closely; it is helpful to consider the following: What is Θ and P_{θ} ? What would it mean for the model to be identifiable?

(a)

4/4 points (graded)

1. One observes n i.i.d. Poisson random variables with unknown parameter λ .



lacksquare λ identifiable



 λ not identifiable

2. One observes n i.i.d. exponential random variables with parameter λ , which is unknown but a priori known to be no larger than 10.

lacksquare λ identifiable

 λ not identifiable

~

3. One observes n i.i.d. uniform random variables in the interval $[0,\theta]$, where θ is unknown.

lacksquare heta identifiable

 θ not identifiable



4. One observes $\,n\,$ i.i.d. Gaussian random variables with unknown parameters $\,\mu,\sigma^2$.

ullet (μ,σ^2) identifiable

 (μ,σ^2) not identifiable



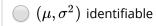
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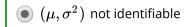
You have used 1 of 1 attempt

✓ Correct (4/4 points)

3/4 points (graded)

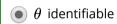
1. One observes the sign of n i.i.d. Gaussian random variables with unknown parameters μ, σ^2 .

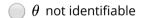






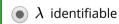
2. StatGen is a statistical procedure to test the relevance of genes. When well calibrated, it outputs the (random) proportion of active genes in a (random) cell. We want to estimate the distribution of this proportion. To that end, we take n iid cells and submit them to StatGen. We model the output of StatGen as n random variables S_1, \ldots, S_n that have uniform distribution on $[0, \theta]$ for some unknown theta.

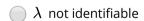






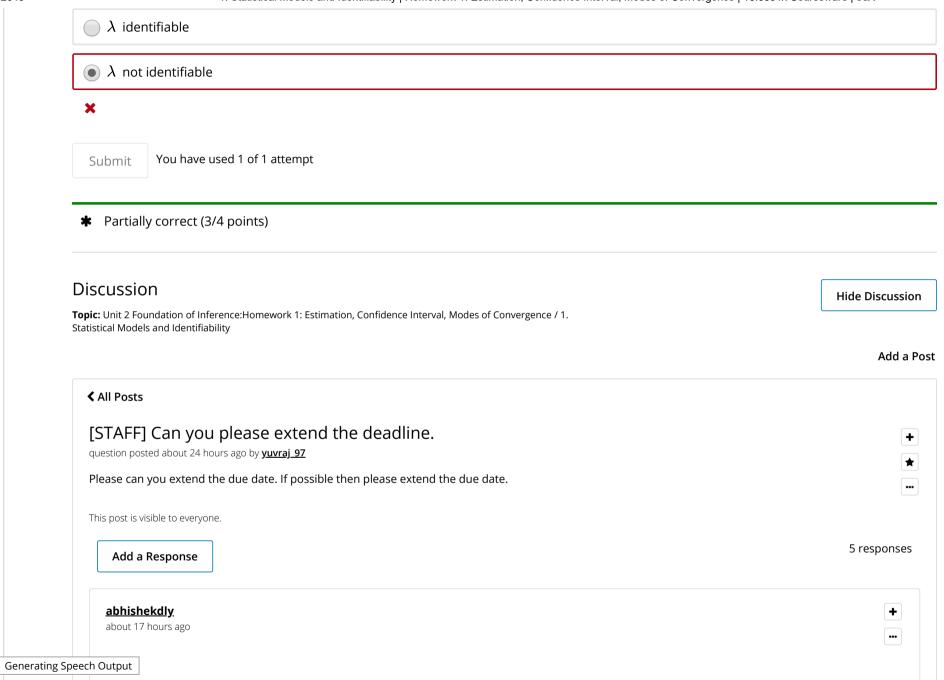
3. The US Census Bureau is interested in finding out the average commute time of Bostonians. To that end, it randomly selects n individuals, with replacement, among the people who work and live in the Boston area, and asks to each if their commute time is at least 20 minutes. The commute time of a random person is assumed to follow an exponential distribution with parameter λ .

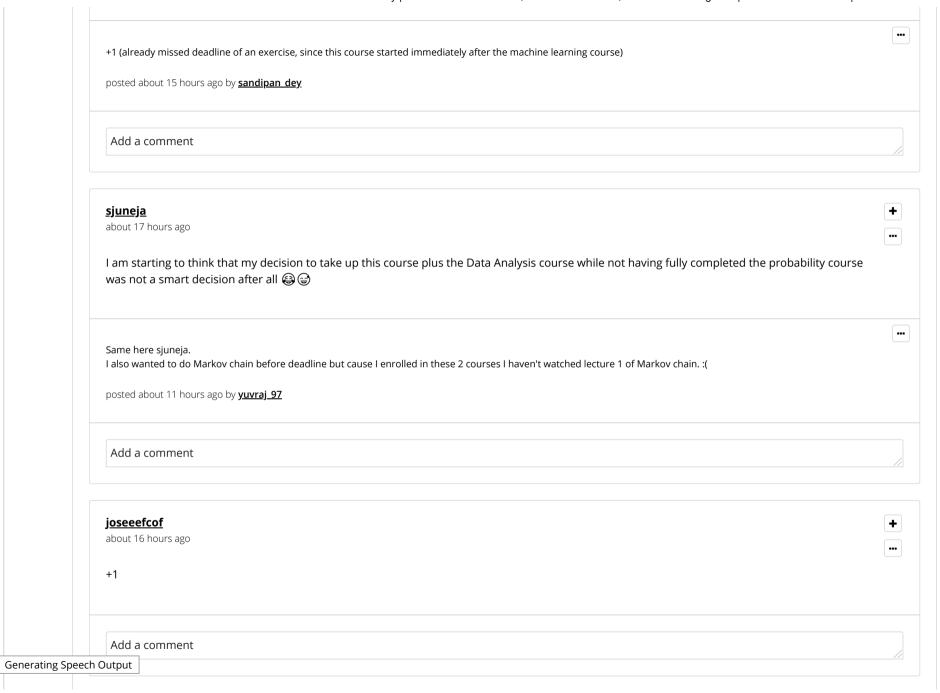


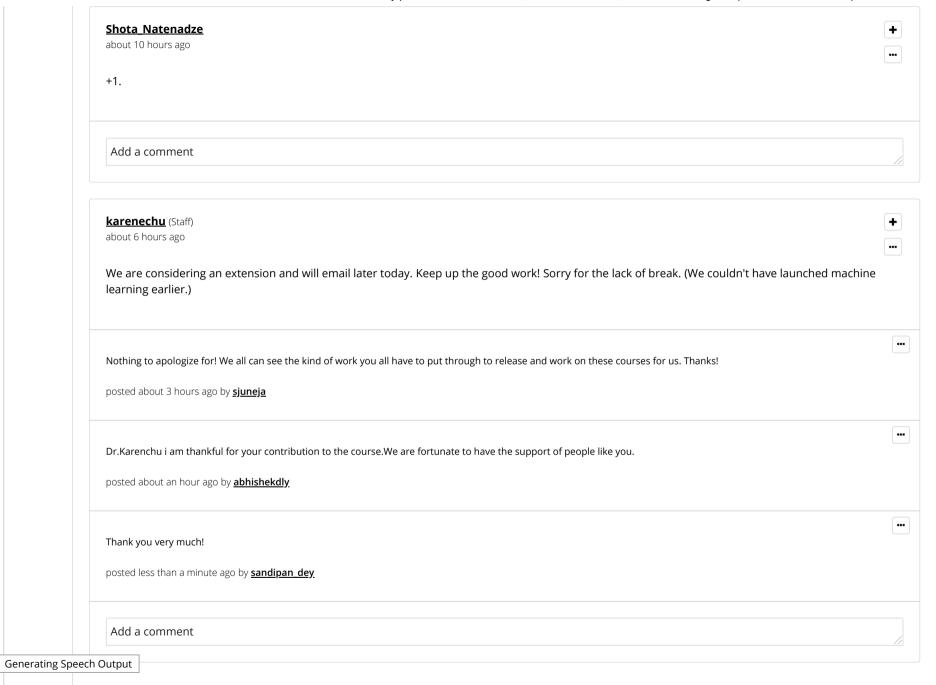




4. Willy Wonka's contains $\,67\,$ identical machines. Each machine has a lifetime that is modeled as an exponential random variable with some unknown parameter $\,\lambda$. After a certain time $\,T=500\,$ days, one has observed the lifetimes of all machines that have stopped working before $\,T_{\rm mach}$ peter of interest is $\,\lambda$.







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