STAT 342: QUIZ 2

5/17/2021

Name: _____

There are two questions on this quiz. Take care to show your work including stating any assumptions. We have to be able to follow along and understand what you are doing and why.

1. Quiz 2 is open book and expected to take 50 minutes. You will get 75 minutes to work on it though. I will give you an additional 10 minutes before to download the test and 15 minutes after to scan and upload your test in CANVAS.

2. Shortly before 11:20 am PST on Monday 4/17, I will publish the test on CANVAS. I will also send an announcement in CANVAS at the start of the test. You can access the test via either the announcement, or from the second module.

3. The exam will run from 11:30 AM - 12:45 PM PST. If you have any questions during the test, you can email me at grover4@uw.edu. I will respond via a CANVAS announcement so everyone has equal access to the information.

4. You can take the exam in one of two ways: you can download the PDF and write in the spaces provided. Or you can view the PDF on your computer and write your answers on a blank sheet of paper. Please number the problems clearly and write neatly otherwise we will not be able to grade your work.

5. Whichever method you choose, you will have 15 minutes to convert your exam into a PDF and submit the file to gradescope. Any part of your exam that is not submitted by 1:00 PM PST will not be graded. **I will announce the end of the test at 12:45 pm PST. This is your cue to start uploading your test.**

6. Students must follow a reasonable code of conduct. **Cheating or other dishonest practices will not be tolerated and will result in a a quiz grade of zero.** Such practices include, but are not limited to:

   - use of external tutoring sites, using Google, forums, or getting any help of any kind

   - communicating with other students' during the test,

   - use of any unauthorized material.

7. **Students: please follow the honor code religiously. I do not use Proctorio or other monitoring software out of an abundance of respect for you and your privacy.**

8. **Write neatly and box final answers where appropriate.**

9. **Show your work - the final answers are not the only things that have points attached to them.**

1. The maximum height of waves (in feet) during one year on the coast of Oregon is assumed to follow the PDF
$$f_\theta(x) = \frac{x}{\theta} exp\left(-\frac{x^2}{2\theta}\right), \ x > 0$$
where $\theta > 0$ is an unknown parameter.

a. **Develop** a likelihood ratio test for $H_0 : \theta = \theta_0$ versus $\theta \neq \theta_0$ assuming a sample of n i.i.d. observations from the PDF above.

Your answer must clearly indicate/develop the following. Put boxes around them so they are easy to find.

- log likelihood function
- calculation of MLE (don't forget second derivative test)
- likelihood ratio
- expression for p-value

b. Apply this test to the data below for $\theta_0 = 9$ at the 1% level of significance.

$$5.0, 5.8, 3.6, 1.8, 3.4, 4.2, 4.4, 5.6$$

Note: you may use R **as a calculator** for this problem. You don't need to make any plots using maxLik or anything else. Just do calculations and give your conclusion.

2. The numbers 4711 and 69 may be modeled as observations of independent Poisson random variables with parameters $600(\lambda_B + 0.181\lambda)$ and $60\lambda_B$ respectively.Both λ and λ_B are unknown.

    a. Write the likelihood function $L(\lambda, \lambda_B)$.

    b. Find the mle of λ_B. (You do not need to do the second derivative check)

c. Is the MLE of λ_B unbiased? Support your answer.

d. Find the standard error of the MLE of λ_B?