Introduction to Computational Statistics INSH 5301

Homework 05

02/03/2020

PLEASE copy and paste the whole question number and text into submission so I can grade easily.
When I grade easier, you might get better grade!
For all problems, please show all your work. For any of the following calculations, feel free to mix calculations by hand with R calculations, but in most cases, you should try to do something by hand if it seems feasible, and only use R if the calculation is complex.

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1. You teacher has a friend, Dr. Huang, he thinks his maximum fastball velocity is faster than average adult. His max veloity is 52 miles per hour (True story). So you teacher measured 100 randomly selected adult, and obtain a mean velocity of 48 miles per hour, and standard deviation of 5 miles per hour(This part is fiction). Please answer the following questions, measure in miles per hour(mph) and show your work for each question.

1.a. Formalize the null hypothesis.

1.b. What's the alternative hypothesis?

1.c. What is test statistic can you use to test the hypothesis?

1.d. Do you prefer a one-tailed or two-tailed test in this case? Explain why

1.e. What is your and threshold (t-statistic) value or values for your rejection region? (Whatever you prefer is fine, just be sure to state it and explain why you chose it.)

1.f.Can you reject the null under a one-tailed test?

1.g.Can you reject the null under a two-tailed test?

1.h. What is the 95% confidence interval of the test?

1.i. What is the p-value of the test results?

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2. Your friend thinks that men and women have different skill levels in playing Tetris - for whatever reason -. To test this, you have 50 men and 50 women play the game in a controlled setting. The mean score of the men is 1,124 with a standard deviation of 200 and the mean score for the women is 1,245, also with a standard deviation of 200

2.a. Test if the male average is statistically greater than the female average.

2.b. Test if the female average is statistically greater than the male average.

2.c. Test if the two averages are different.

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3. You think drinking the night before an exam might help performance on the exam the next morning. To test this, you select 100 of your closest friends, and randomly get 50 of them drunk the night before the exam, which you denote the treatment group. The next day, the treatment group gets a mean of 78 with a standard deviation of 10 and the control group gets a 75 with a standard deviation of 5.

Does the evidence show that drinking helped exam performance?

4. Using data of your choosing use R to conduct the following tests, and explain (i.e. interpret) the results you get. You can download your own data from the internet - in such case provide a link to it - or data from R's built-in datasets as long as you are not using the class examples for this week:

4.a. A standard one-sample hypothesis test.

4.b. A difference-in-means test with independent samples.

4.c. A difference-in-means test with dependent samples (ie, a paired t-test).

4.d. Manually verify the results in (a) using the mean and sd as calculated by R (i.e, you don't have to manually calculate the mean or sd by hand!).