Practice Assignment: Bootstrap Confidence Interval

Questions 1–4 revisit the frog jump data introduced in the corequisite support activity and the in-class activity.

Every year, bullfrogs compete in a jumping contest at the Calaveras County Jumping Frog Jubilee (a contest inspired by a short story by Mark Twain). One year, researchers recorded the jump distances of frogs entered in the contest.[1] The following are the jump distances (in meters) for a sample of 15 bullfrogs.

0.1	0.4	0.6	0.8	1.3	1.5	1.6	1.7
1.8	1.8	1.9	1.9	1.9	2.0	2.2	

1) Suppose that you are interested in learning about variability in the jump distances for frogs entered in the Calaveras County Jumping Frog Jubilee. What is the value of the standard deviation for this sample?

2) Confidence interval estimates for the population standard deviation have not been covered in this course, but you can create a bootstrap distribution that would allow you to construct a bootstrap confidence interval. Describe the process that could be used to do this.

3) Go to https://istats.shinyapps.io/Boot1samp/ to calculate a 90% confidence interval for the population standard deviation.

4) Suppose someone claimed that the standard deviation of jump distances for frogs entered in the Calaveras County Jumping Frog Jubilee was 1 meter. Does the confidence interval you calculated in Question 3 support this claim? Explain.

Questions 5 and 6 use data on rental prices from samples of Airbnb rentals in Boston and Seattle. Go to https://istats.shinyapps.io/Boot2samp/ to begin. For the "Enter Data" option, select “From Textbook.” For the “Choose Dataset” option, select “Airbnb Boston vs. Seattle.”

5) Explain why it would not be appropriate to use the two-sample t confidence interval to estimate the difference in mean rental prices for Airbnb rentals in Boston and Seattle.

[1] Astley, H. C., Abbott, E. M., Azizi, E., Marsh, R. L., & Roberts, T. J. (2013). Chasing maximal performance: A cautionary tale from the celebrated jumping frogs of Calaveras County. *The Journal of Experimental Biology*, *216*(21), 3947–3953.

6) Calculate and interpret a 95% bootstrap confidence interval for the difference in mean rental prices for Airbnb rentals in Boston and Seattle.

Questions 7 and 8 use the dog interaction times data from the preview assignment and the in-class activity.

In the in-class activity, you found a confidence interval for the difference in mean interaction time for dogs that were offered petting and dogs that were offered verbal praise. However, it also makes sense to think about using the median as the measure of center that is being compared for the two conditions.

7) Go to https://istats.shinyapps.io/Boot2samp/ to calculate a 95% bootstrap confidence interval for the population difference in median interaction time. Recall that the dataset can be found by choosing “From Textbook” and then selecting “Petting vs. Vocal Praise.”

8) Interpret the confidence interval from Question 7.

Questions 9 and 10 use data on time spent exercising by college athletes and students who are not athletes. Go to https://istats.shinyapps.io/Boot2samp/ and select the "Hours of Exercise Per Week” dataset.

9) Calculate a 95% bootstrap confidence interval for the difference in mean time spent exercising for college athletes and students who are not athletes.

10) A 95% two-sample t confidence interval for the difference in mean time spent exercising for college athletes and students who are not athletes is (6.5, 9.3). Does it surprise you that this interval is very close to what you got for your bootstrap confidence interval? Explain. (Hint: Are the conditions for the two-sample t confidence interval met?)

