



Supervised Learning: DSVII End to End Data Science Course - Batch 7

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Confidence Interval Assignment

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1. Suppose we want to estimate the average weight of an adult male in Dekalb County, Georgia. We draw a random sample of 1,000 men from a population of 1,000,000 men and weigh them. We find that the average man in our sample weighs 180 pounds, and the standard deviation of the sample is 30 pounds. What is the 95% confidence interval?
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 3.6 minutes.
 - a) After observing 120 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 ± 15 seconds with 92% confidence?
3. Suppose a consumer advocacy group would like to conduct a survey to find the proportion p of consumers who bought the newest generation of an MP3 player were happy with their purchase.
 - a) How large a sample n should they take to estimate p with 2% margin of error and 90% confidence?
 - b) The advocacy group took a random sample of 1000 consumers who recently purchased this MP3 player and found that 400 were happy with their purchase. Find a 95% confidence interval for p .

4. To assess the accuracy of a laboratory scale, a standard weight that is known to weigh 1 gram is repeatedly weighed 4 times. The resulting measurements (in grams) are: 0.95, 1.02, 1.01, 0.98. Assume that the weighings by the scale when the true weight is 1 gram are normally distributed with mean μ .

a) Use these data to compute a 95% confidence interval for μ .

b) Do these data give evidence at 5% significance level that the scale is not accurate?

5. The time needed for college students to complete a certain maze follows a normal distribution with a mean of 45 seconds. To see if the mean time μ (in seconds) is changed by vigorous exercise, we have a group of nine college students exercise vigorously for 30 minutes and then complete the maze. The sample mean and standard deviation of the collected data is 49.2 seconds and 3.5 seconds respectively. Use these data to perform an appropriate test of hypothesis at 5% level of significance.

6. Installation of a certain hardware takes a random amount of time with a standard deviation of 5 minutes. A computer technician installs this hardware on 64 different computers, with the average installation time of 42 minutes. Compute a 95% confidence interval for the mean installation time.

7. A topic of interest in ophthalmology is whether spherical refraction differs between the left and right eye on average. In a study to investigate this, refraction was measured on the left and right eye of 17 patients. The differences (right - left) in diopters were d_1, d_2, \dots, d_{17} and elementary calculations gave $\sum d_i = -3.50$, $\sum d_i^2 = 19.13$. Provide a 90% confidence interval (to 2dp) for the average difference (right - left)

8. What is the smallest sample size required to provide a 95% confidence interval for a mean, if it is important that the interval be no longer than 1 cm? You may assume that the population is normal with variance 9 cm^2 .

9. The recommended retail price of a brand of designer jeans is \$150. The price of the jeans in a sample of 16 retailers is on average \$141 with a sample standard deviation of 4. If this is a 'random' sample and the prices can be assumed to be normally distributed, construct a 95% confidence interval for the average sale price.

10. Alcohol abuse has been described by college presidents as the number one problem on campus and is an important cause of death in young adults. A survey of 17,096 students in U.S four-year colleges collected information on drinking behavior and alcohol-

related problems. The researches defined 'frequent bringe-drinking' as having five or more drinks in a row three or more times in the past two weeks. According to their definition, 3,314 students were classified as frequent bringe-drinkers. Construct a 90% confidence interval around the true proportion of bringe-drinkers.

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