BRSM Assignment

22.01.26

Due: 04.02.26

QUESTION 1 (sampling distributions):

    a. Assume that your population distribution is N(100,15).

    b. Sample 10 random numbers (i.e., your sample size) from N(100,15) and calculate the mean and standard deviation of those numbers.

    c. Repeat this for 1000 trials, and plot the frequency distribution of the obtained means and standard deviations separately.

    d. Repeat steps b and c for 50, 100, 500, and 1500 numbers.

    e. State and explain the observations and inferences you make regarding the above-produced histograms w.r.t to central limit theorem. Hint: The goal of obtaining a sample is to get an estimate that is your best guess about the population mean, which you already know is 100.

QUESTION 2 (sampling distributions): Repeat the above for a population distribution that is a Beta distribution with shape parameters 2 and 5. What do you observe now that is different from Question 2, w.r.t to the central limit theorem. Do you need a larger or smaller sample size now so that your sample estimate of the population mean is accurate?

OPTIONAL QUESTION 3 (confidence intervals and sample size):

    a. Sample 30 points from each of the normal distributions of mean 0 and SD 1, mean 2 and SD 0.5, and mean 3 and SD 2.

    b. Plot the means and distributions of the three groups using the appropriate visualization tools. Include an error bar for each group indicating the confidence interval.

    c. Repeat the above two steps by sampling 70 and 100 points.

    d. How does the confidence interval change along with the increase in the number of sampled points?

    e. Write down your interpretation of the obtained confidence intervals.