Tutorial Sheet 6: Estimation, Sampling and ANOVA

Course: CSEG 2036P | *School of Computing Sciences, UPES*
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1. A social anthropologist conducted a survey of 20 adults. She wants to report the frequency distribution of the ages of the survey respondents. The respondents were the following ages in years: 52, 34, 32, 29, 63, 40, 46, 54, 36, 36, 24, 19, 45, 20, 28, 29, 38, 33, 49, 37. Plot any two frequency diagrams for this distribution.

2. What are the different kinds of sampling methods? Give an example for each.

3. A population consists of six numbers $4, 8, 12, 16, 20, 24$. Let us consider all samples of size two that can be drawn without replacement from this population. Find the population mean, the population standard deviation, the mean of the sampling distribution of means and the standard deviation of the sampling distribution of means.

4. Let's say $x_1, x_2, ..., x_n$ are independent and identically distributed samples from a (i) Gamma Distribution (ii) Beta Distribution. What is the MoM estimator of the population parameters in these cases? (*Hint:* For the Beta distribution, consider the following combinations of sample parameters: $\bar{x}(1-\bar{x})$ and s^2, with respect to each other).

5. An oceanographer wants to check whether the average depth of the ocean in a certain region is 57.4 fathoms, as had been previously recorded. What can be concluded at the level of significance $z = 0.05$ if soundings taken at 40 random locations in the given region yielded a mean of 59.1 fathoms with a standard deviation of 5.2 fathoms? Given: $Z_{\alpha/2} = 1.96$ for $\alpha = 0.05$ level of significance.

6. It is claimed that a random sample of 49 tyres has a mean life of 15,200 km. This sample was drawn from a population whose mean is 15,150 km and a standard deviation of 1,200 km. If $Z_{\alpha/2} = 1.96$ for $\alpha = 0.05$ level of significance, what can we say about the population mean?

7. A manufacturer claims that only 4% of his products are defective. A random sample was drawn of 500 products out of which 100 were found to be defective. Test the hypothesis for proportions, given $z_{\alpha/2} = 1.96$ for $\alpha = 0.05$ level of significance.

8. Specific treatments for blisters were randomly assigned to 20 patients. For treatment A, the assigned patients took 5, 8, 7, 7 and 8 days. For treament B, the assigned patients took 4, 6, 6, 3 and 5 days. For treament C, the assigned patients took 6, 4, 4, 5 and 4 days. For treament D, the assigned patients took 7, 4, 6, 6 and 5 days. Test the hypothesis, at 5% significance level, that there is no difference between the four treatments with respect to the mean time of healing, using ANOVA.

9. The temperature of three ovens sampled at different times are as follows: Oven A - 494 °C, 497 °C, 481 °C, 496 °C; Oven B - 489 °C, 494 °C, 479 °C, 478 °C; Oven C - 489 °C, 483 °C, 487 °C, 472 °C. Test the hypothesis that there are significant variations in mean temperature across these ovens, using ANOVA.