Department of Computational Mathematics, Faculty of Information Technology
University of Moratuwa

Honours Degree of Bachelor of science in Information Technology & Management

Batch 21 - Level 2 (Semester II)

CM 2111: Statistical Inference

Tutorial 05

01. State the null and alternative hypotheses.

    i. The mean GPA of students in American colleges is different from 2.0 (out of 4.0).
    ii. The mean height of eighth graders is 66 inches.
    iii. College students take less than five years to graduate from college, on the average.
    iv. A medical trial is conducted to test whether or not a new medicine reduces cholesterol by 25%.

02. The Brinell hardness scale is one of several definitions used in the field of materials science to quantify the hardness of a piece of metal. The Brinell hardness measurement of a certain type of rebar used for reinforcing concrete and masonry structures was assumed to be normally distributed with a standard deviation of 10 kilograms of force per square millimeter. Using a random sample of n=25 bars, an engineer is interested in performing the following hypothesis test:

- null hypothesis $H_0: \mu = 170$
- alternative hypothesis $H_1: \mu > 170$

    If the engineer decides to reject the null hypothesis if the sample mean is 172 or greater, that is, if $\bar{X} \geq 172$, what is the probability that the engineer commits a Type I error?

    If, unknown to engineer, the true population mean was $\mu = 173$, what is the probability that the engineer commits a Type II error?

03. A Telecom service provider claims that individual customers pay on an average 400 rs. per month with standard deviation of 25 rs. A random sample of 50 customers' bills during a given month is taken with a mean of 250 and standard deviation of 15. What to say with respect to the claim made by the service provider?

04. Suppose that the data is available, it is observed that 400 out of 850 customers purchased groceries online. Can we say that most of the customers are moving towards online shopping, even for groceries?

05. The average score on a test is 80 with a standard deviation of 10. With a new teaching curriculum introduced it is believed that this score will change. On random testing, the score of 38 students, the mean was found to be 88. With a 0.05 significance level, is there any evidence to support this claim?

06. The average weight of a dumbbell in a gym is 90lbs. However, a physical trainer believes that the average weight might be higher. A random sample of 5 dumbbells with an average weight of 110lbs and a standard deviation of 18lbs. Using hypothesis testing check if the physical trainer's claim can be supported for a 95% confidence level.

07. The average score of a class is 90. However, a teacher believes that the average score might be lower. The scores of 6 students were randomly measured. The mean was 82 with a standard deviation of 18. With a 0.05 significance level use hypothesis testing to check if this claim is true.