



INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

Dundigal, Hyderabad -500 043

COMPUTER SCIENCE AND ENGINEERING

COURSE HANDOUT

Course Name	PROBABILITY AND STATISTICS
Course Code	AHS010
Programme	B.Tech
Semester	II
Course Coordinator	Mr. J Suresh Goud
Course Faculty	Ms. P Srilatha
Lecture Number	42
Topics Covered	Testing hypothesis for single mean-1
Course Learning Outcome's	Understand the foundation for hypothesis testing.

Test of hypothesis for Single Mean:

Consider a Sample of size n with mean \bar{x} from the population with mean μ and standard deviation σ then the test statistic z is given as

$$z = \frac{\bar{x} - \mu}{\sigma / \sqrt{n}}$$

Note:

Confidence interval =
$$\left(\bar{x} - z_{\alpha} \frac{\sigma}{\sqrt{n}}, \bar{x} + z_{\alpha} \frac{\sigma}{\sqrt{n}} \right)$$

Problems:

1. A sample of 64 students have a mean weight of 70 kgs. Can this be regarded as a sample from a population with mean weight 56 kgs and standard deviation 25 kgs.

Solution:

Given $n=64$, $\sigma=25$, $\bar{x}=70$, $\mu=56$

Step 1: Null Hypothesis: $\mu = 56$

Step 2: Alternative Hypothesis: $\mu \neq 56$

Step 3: Level of Significance:

$$z_{\alpha} = 1.96 \quad \text{at} \quad \alpha = 0.05$$

Step4: Test Statistics: $Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$

$$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{70 - 56}{\frac{25}{\sqrt{64}}} = 4.48$$

$$|Z| = 4.48$$

Step 5: Conclusion

$$|Z| > Z_{\alpha}$$

∴ We reject the Null hypothesis.

2. According to the norms established for a mechanical aptitude test, persons who are 18 years old have an average height of 73.2 with a standard deviation of 8.6. If 40 randomly selected persons of that age averaged 76.7, test the hypothesis $\mu = 73.2$. Against the alternative hypothesis. $\mu < 73.2$ at 0.01 level of significance.

Solution:

Given $n=40$, $\sigma=8.6$, $\bar{x}=76.7$, $\mu=73.2$,

Step 1: Null Hypothesis: $\mu = 73.2$

Step 2: Alternative Hypothesis: $\mu > 73.2$

Step 3: Level of Significance:

$$z_{\alpha} = 2.33 \quad \text{at} \quad \alpha = 0.01$$

Step4: Test Statistics:
$$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$$

$$Z = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{76.7 - 73.2}{\frac{8.6}{\sqrt{40}}} = 0.814$$

$$|Z| = 0.814$$

Step 5: Conclusion

$$|Z| < Z_{\alpha}$$

∴ We accept the Null hypothesis.

Exercise:

1. An oceanographer wants to check whether the depth of the ocean in certain region is 57.4 fathoms as had previously recorded what he can conclude at level of significance 0.05. If the recordings taken at 40 random locations in the given region whose mean is 59.1 fathoms with standard deviation 5.2 fathoms.
2. In a random sample of 60 workers, the average time taken by them to get to work is 33.8 minutes with a standard deviation of 6.1 minutes. Can we reject the null hypothesis $\mu = 32.6$ minutes in favour of alternative null hypothesis $\mu > 32.6$ at 0.025 level of significance.