



SEMESTER-III
COURSE 8: INFERENCE STATISTICS

Theory

Credits: 3

3 hrs/week

I. Learning Outcomes

After successful completion of the course students will be able to:

1. To acquaint with estimator, estimates, estimation techniques and its properties.
2. To acquire knowledge of testing the hypothesis of different distributions.
3. To learn about the large sample techniques by using various tools.
4. To learn about the small sample techniques by using various tools.
5. To deal with the situation where there is no parameters to the distributions.

II. Syllabus

Unit – 1: Theory of estimation

Estimation of a parameter, criteria of a good estimator – unbiasedness, consistency, efficiency, & sufficiency. Statement of Neyman's factorization theorem. Estimation of parameters by the method of moments and maximum likelihood (M.L), properties of MLE's. Rao – Cramer Inequality, properties. Binomial, Poisson & Normal Population parameters estimate by MLE method. Confidence Intervals.

Unit – 2: Testing of Hypothesis

Concepts of statistical hypotheses, null and alternative hypothesis, critical region, two types of errors, level of significance and power of a test. One and two tailed tests. Neyman-Pearson's lemma. Examples in case of Binomial, Poisson, Exponential and Normal distributions.

Unit – 3: Large sample Tests

Large sample test for single mean and difference of two means, confidence intervals for mean(s). Large sample test for single proportion, difference of proportions. standard deviation(s) and correlation coefficient(s).

Unit – 4: Small Sample tests

Assumptions and t-test for single mean, difference of means and paired t-test. χ^2 test for goodness of fit and independence of attributes. χ^2 test for single variance, F-test for equality of variances.

Unit – 5: Non-parametric tests

Advantages and disadvantages, comparison with parametric tests. One sample runs test, sign test and Wilcoxon – signed rank tests (single and paired samples). Two independent sample tests: Median test, Wilcoxon – Mann – Whitney U test, Wald Wolfowitz's runs test.



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Practical

Credits: 1

2 hrs/week

Practical Syllabus

1. Large sample test for single mean
2. Large sample test for difference of means
3. Large sample test for single proportion
4. Large sample test for difference of proportions
5. Large sample test for difference of standard deviations
6. Large sample test for correlation coefficient
7. Small sample test for single mean
8. Small sample test for difference of means
9. Small sample test for correlation coefficient
10. Paired t-test (paired samples).
11. Small sample test for single variance (χ^2 test)
12. Small sample test for difference of variances (F test)
13. χ^2 test for goodness of fit and independence of attributes
14. Nonparametric tests for single sample (run test, sign test and Wilcoxon signed rank test)
15. Nonparametric tests for related samples (sign test and Wilcoxon signed rank test)
16. Nonparametric tests for two independent samples (Median test, Wilcoxon –Mann- Whitney - U test, Wald - Wolfowitz's runs test)

Note: Training shall be on establishing formulae in Excel cells and derive the results. The excel output shall be exported to MS word for writing inference.

III. References

1. S. C. Gupta & V. K. Kapoor: Fundamentals of Mathematical Statistics, Sultan Chand & Sons, New Delhi.
2. O. P. Gupta: Mathematical Statistics, Kedar nath Ram nath & Co.
3. P. N. Arora & S. Arora: Quantitative Aptitude Statistics – Vol II, S. Chand & Company Ltd.
4. K. Rohatgi & Ehsanes Saleh: An Introduction to Probability and Statistics, John Wiley & Sons.

IV. Suggested Co-curricular Activities:

1. Training of students by related industrial experts
2. Assignments including technical assignments if any.
3. Seminars, Group Discussions, Quiz, Debates etc on related topics.
4. Preparation of audio and videos on tools of diagrammatic and graphical representations.
5. Collection of material/figures/photos/author photoes of related topics.
6. Invited lectures and presentations of stalwarts to those topics.
7. Visits/field trips of firms, research organizations etc.