STA 2404 Non-parametric methods

Contact hours: 45 Hours

1. Purpose

To equip students with non-parametric statistical data analysis skills

2. Objectives

At the end of this course, the student should be able to: -

1. Describe the concepts of nonparametric estimation
2. Perform goodness of fit tests
3. Perform tests for randomness.
4. Describe one sample tests.
5. Describe rank-based tests on two sample tests.
6. Describe measures of association.

3. Course Description

Concepts of non-parametric estimation. Tests for randomness and symmetry in one sample. Goodness of fit problems: chi-square and Kolmogorov-Smirnov tests. Independence in bivariate sample: Kendall's and Spearman's rank correlation coefficients. Comparison of two populations. U-statistics and their limiting distributions. Sign, run, median and Wilcoxon tests. Use of computer packages.

4. Course outline

Week	Content	Method
1	Introduction Concepts of non-parametric estimation	Theory and practical
2	Sign-test for mean and median	Theory and practical
3	Sign-rank test (Wilcoxon-sign rank test) for mean Sign rank test for paired data – difference in mean	Theory and practical
4	Rank sum test (U-test) – Wilcoxon test/Mann-Whitney test for difference in mean	Theory and practical
5	Cat 1	
6	Rank sum test (H-test) - Kruskal-Walli's test	Theory and practical
7	Runs test	Theory and practical
8	Rank correlation coefficient	Theory and practical
9	Testing for goodness-of-fit	Theory and practical
10	Contingency tables test	Theory and practical
11	Kolmogorov-Smirnov test Confidence intervals for quantiles	Theory and practical
12	Cat 2	

5. Learning and Teaching Methodologies

Teaching is by lecture method consisting of two lecture hours and one hour of tutorials/two laboratory hours = 1 lecture hour weekly for fourteen weeks.

Assessment

Continuous Assessment	30%
Examination	70%
Total	**100%**

6. Course textbooks

1. RV Hogg, JW McKean & AT Craig *Introduction to Mathematical Statistics,* 6th ed., Prentice Hall, 2003 ISBN 0-13-177698-3
2. Lehmann, E. L. *Nonparametric Methods: Statistical Methods Based on Ranks.* Prentice-Hall, Inc. 1998

7. Course Journals

1. *Journal of Nonparametric Statistics (J. Nonparametric Stat.) [1048-5252; 1029-0311]*
2. *Journal of the Royal Statistical Society: Series A (Statistics in Society)*
3. *Statistical Modelling (Stat. Model.) [1471-082X]*
4. *Biometrical (Biometrical) [0006-3444; 1464-3510]*

8. Reference Textbooks

1. Dennis Wackerly, William Mendenhall, and Richard L. Scheaffer. *Mathematical Statistics with Applications.* P W S Publishers 2007 ISBN: 9780495110811 ISBN-10: 0495110817.
2. Huber, P.J. *Robust Statistics.* NY: John Wiley,1981
3. Silverman, B.W. *Density Estimation.* London: Chapman and Hall, 1986
4. Wand, M.P. and Jones, M.C. *Kernel Smoothing*. London: Chapman and Hall, 1995

9. Reference Journals

1. *Journal of Statistics Education*
2. *Austrian Journal of Statistics*
3. *Journal of the Royal Statistical Society, Series B: Statistical Methodology*