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ROCHESTER UNIV NY DEPT OF STATISTICS F/8 12/1
PROBLEMS IN MULTIVARIATE ANALYSIS AND NONPARAMETRIC STATISTICS--ETC(U)
APR 82 @ 5 MUDHOLKAR AFOSR-77-3360

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FINAL SCIENTIFIC REPORT

to the

Air Force Office of Scientific Research

Grant No. ^{AFOSR-}77-3360

Title: Problems in Multivariate Analysis and Nonparametric Statistics: Applications of the Theory of Combining Tests.

Principal Investigator: Govind S. Mudholkar
Professor of Statistics
and of Biostatistics
University of Rochester

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Final Scientific Report

Research Grant AF 77-3360 was awarded on 6/1/77 for a period of one year and continued to 9/30/81, i.e. in effect for a period of 52 months.

The problems investigated with the support of this grant, somewhat broad in nature, were presented in the original proposal under two major headings with a number of subheadings in each, as follows:

- I. Multivariate Analysis: (1) Stepwise procedures, (2) Approximations to multivariate distributions, (3) Classification, (4) Covariance structure problems.
- II. Nonparametric Methods: (1) Goodness-of-fit problem, (2) Two-sample problem, (3) Multivariate methods.

A total of 28 technical reports were prepared and submitted to Dr. I. Shimi, the Project Monitor of the Grant. Most of the technical reports were modified in a manner suitable for publication in professional journals. Many of these have undergone peer review by referees, revised a few times and have been published. Many are in Press. The copies of published articles have also been submitted to the office of Dr. Shimi.

The titles of the technical reports and the dates of submission are given in Appendix I. The published articles and the references are listed in Appendix II. The copies of articles in press will be submitted to Dr. Shimi as they appear in print.

In summary, the Air Force Grant No. ^{AFOSR} 77-3360 has been of great assistance to the principal investigator and his associates in their search to understand the problems described in the original proposal. In the judgement of the principal investigator the work has substantially advanced the frontiers

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Chief, Technical Information Division

of knowledge and facilities in these areas. The published or the semi-published work touches upon most of the areas we intended to research. Some of the work done under the grant is only partially complete. However we expect to continue our work.

The Air Force assistance is greatly appreciated.

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APPENDIX I

Technical Reports Prepared Under
Air Force Office of Scientific Research
Grant No. 77-3360

1. A Simple Test for Normality. (June '77)
2. Testing Significance of a Mean Vector--A Possible Alternative to Hotelling's T^2 . (July '77)
3. On the Convolution of Logistic Random Variables. (October '77)
4. A Remark on the Shape of the Logistic Distribution. (October '77)
5. A Comparison of Two Tests for the Significance of a Mean Vector. (March '78)
6. Manova Multiple Comparisons Associated with Finite Intersection Tests. (June '78)
7. A Test of Exponentiality Based on the Bivariate F Distribution. (August '78)
8. Asymptotic Behavior of the Z-Test for Normality. (August '78)
9. Control Procedures for Residuals Associated with Principal Component Analysis. (December '78)
10. A Gaussian Approximation to the Distribution of Sample Variance for Nonnormal Populations. (March '78)
11. Some Remarks on Two Quick Estimators of Locations. (May '79)
12. The Logit Method for Combining Tests. (June '79)
13. The Logit Statistic for Combining Probabilities--An Overview. (July '79)
14. On a Multivariate Analogue of Studentized Range Test. (November '79)
15. MANOVA Multiple Comparisons Using Generalized Step-Down Procedure. (November '79)
16. An Approximation to the Distribution of Likelihood Ratio for Complete Independence. (December '79)
17. A Normal Approximation for the Distribution of Likelihood Ratio Statistics in Multivariate Analysis of Variance. (December '79)
18. Simultaneous Test Procedures for Mean Vectors and Covariance Matrices. (February '80)

19. A Review of Step-Down Procedures for Multivariate Analysis of Variance. (March '80)
20. Inequalities for Strongly Unimodal Distributions with Applications to Comparison of Two Regression Lines. (March '80)
21. A Likelihood-Ratio-Based Normal Approximation for Multiple Correlation Coefficient. (April '80)
22. On a Characterization of the Logistic Distribution. (April '80)
23. A Structural Analysis of Generalized Tukey-lambda Distributions. (November '80)
24. A Normal Approximation for the Multivariate Likelihood Ratio Statistics. (January '81)
25. Complete Independence in the Multivariate Normal Distributions. (January '81)
26. On Characterizing the Logistic Distribution. (May '81)
27. A Characterization of the Logistic Distribution by a Sample Median. (May '81)
28. Robustness of Studentized Trimmed Means. (May '81)

APPENDIX II

The Articles Published. Research Supported by AF 77-3360.

1. A comparison of two tests for the significance of a mean vector. JASA (1978), Volume 73, 414-418.
2. The logit statistic for combining probabilities--an overview. Proc. Int. Symp. Statistics and Optimization (J.S. Rustagi, Ed.), Academic Press, New York, 345-366.
3. MANOVA multiple comparisons associated with finite intersection tests. Proc. V Int. Symp. on Multivariate Analy. (P.R. Krishnaiah, Ed.), Academic Press, New York, 1980, 467-482.
4. A new approximation for Fisher's Z. Austral. J. Statist. (1978), Volume 20, 250-256.
5. A remark on the shape of the logistic distribution. Biometrika (1978), 65, 667-668.
6. Control procedures for residuals associated with principal component analysis. Technometrics. (1979), 21, 341-349.
7. A test of exponentiality based on the bivariate F distribution. Technometrics (1980) 22 79-82.
8. Some remarks on two quick estimators of location. J. Ind. Stat. Assn. (1979) 17, 197-209.
9. Testing significance of a mean-vector - A possible alternative to Hotelling's T^2 . Ann. Inst. Stat. Math (1980) 32, 43-52.
10. A simple test for normality against asymmetric alternatives. Biometrika (1980) 67, 455-461.
11. A normal approximation for the distribution of the likelihood ratio statistic in multivariate analysis of variance. Biometrika (1980) 67, 485-488.
12. A review of the stepdown procedures for MANOVA. Multivariate Statistical Analysis (R.P. Gupta Editor) 161-178.
13. Some relationships between the logistic and the exponential distributions. Stat. Dist. in Sci. Work (1981), Vol. 4, 401-411.
14. Simultaneous test procedures for mean vectors and covariance matrices. Handbook of Statistics (1980), Vol. 1, 631-671.

15. A Gaussian approximation to the distribution of sample variance for nonnormal populations. JASA (1981), 76.
16. A normal approximation for the multivariate likelihood ratio statistics. Stat. Dist. in Sci. Work (1981), Vol. 5, 219-231.
17. A characterization of the logistic distribution by a sample median. Ann. Inst. Statist. Math (1981) 33, 125-129.
18. On a multivariate analogue of the studentized range test. JASA (1981), 725-29.

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