
Nonparametric Techniques in Statistical Inference

Edited by MADAN LAL PURI

When applied to measurable characteristics, the use of nonparametric techniques often saves considerable calculation as compared with more formal methods, with only a slight loss of accuracy.

These proceedings of the first international symposium on the subject, held at Indiana University in 1969, survey the current status of nonparametric theory. The book contains thirty-five papers with discussions by some of the world's most eminent authorities. Subjects covered include testing and estimation, order statistics and allied problems, ranking and selection procedures, general theory, problems relating to goodness-of-fit, decision theoretic and empirical Bayes procedures, and nonparametric methods in elementary statistics. \$32.50



CAMBRIDGE UNIVERSITY PRESS

32 East 57th Street
New York, N.Y. 10022

STATISTICAL THEORY AND METHOD ABSTRACTS

A Journal of the International Statistical Institute

The object of this abstracting service is to cover published papers concerned with statistical theory, including relevant aspects of probability and mathematical methods, and new contributions to statistical method. These abstracts provide valuable information on new developments for studying problems in many fields: such as frequency distributions, estimating and testing problems, sampling and experimental designs, variance analysis, spectral theory and other methods in time-series analysis, queueing theory, reliability and acceptance inspection. Journals appearing in all parts of the world, on mathematics and statistics, or on other fields and possible contribution of interest are regularly scanned for suitable papers. Abstracts are also prepared from collections of papers such as reports of conferences, symposia and seminars; technical reports of experiment and research stations are covered.

The abstracts do not exceed 400 words, with occasional "double abstracts" for papers where this size is not sufficient to represent the paper. The language is English; the language of the original paper is indicated. The headings give the name and address of the author together with the Journal in which the paper is published; moreover, a note is added on the number of references, tables and figures.

The classification scheme which is used in this Journal supplies a division of all abstracts in twelve main sections. The pages of the Journal are colour-tinted in accordance with these main sections. Each section is further sub-divided to indicate the main topic of the paper; a secondary number denotes the most important additional topic referred to by the author. A special index in each part links together these two classifications. This scheme is arranged to facilitate transfer to punch cards. Papers containing new statistical tables are listed in a separate index.

The abstracts are numbered serially, the volume number being inserted as a prefix. The Journal is published four times a year and contains approximately 1,000 abstracts. An author index, the secondary classification index and the new statistical tables index are published in each issue and combined in a yearly supplement which also contains a list of all Journals represented in the volume by one or more abstracts.

<i>Annual Subscription</i>	£10.00 (U.S. \$30.00)
<i>Single Number</i>	£ 3.50 (U.S. \$ 9.00)
<i>Loose Leaf Binders for Single Abstract Sheets</i>	£ 1.00 including postage and packing.

OLIVER AND BOYD

33 Montgomery Street, Edinburgh, EH 75. JX. Scotland

ESTADÍSTICA

Journal of the Inter-American Statistical Institute

Vol. XXVII, No. 102

CONTENTS

March 1969

- Estadística: Teoría y Aplicación F. Yates
- Estandarización de Procedimientos para Evaluación de Datos: Los Errores de Medición y los Estándares Estadísticos en la Dirección del Censo de los Estados Unidos
Morris H. Hansen, William N. Hurwitz, y Leon Pritzker
- Comparison of Two Methods of Probability Plotting on Ordinary Graph Paper A. G. Phatak
- Integración de la Información Estadística Ingvar Ohlsson
- El Uso del Muestreo en las Encuestas Demográficas y de Morbilidad en Africa C. Scott
- Special Features. International Resolutions Relating to Statistics. Legal Provisions. Institute Affairs. Statistical News. Publications.

Published quarterly Annual subscription price \$3.00 (U.S.)

INTER-AMERICAN STATISTICAL INSTITUTE

Pan American Union

Washington, D. C. 20006

REVIEW OF THE INTERNATIONAL STATISTICAL INSTITUTE

Contents of Vol. 39, No. 2, 1971

Articles

- Lellouch, J., Schwartz, D.—L'essai thérapeutique: éthique individuelle ou éthique collective?
- David, H. A.—Ranking the players in a round robin tournament.
- Gart, J. J.—The comparisons of proportions: a review of significance tests, confidence intervals and adjustments for stratification.
- Bithell, J. F.—Some generalized Markov chain occupancy processes and their application to hospital admission systems.
- Sheps, M. C.—A review of models for population change.
- Sengupta, J. K., Tintner, G.—A review of stochastic linear programming.

Communications

- Statistical organization and administration
- Statistical training and research
- Statistical societies

Calendar of meetings

Book reviews

The REVIEW OF THE ISI is published three times per year. The annual subscription is \$14 post free.

Orders should be sent to: *International Statistical Institute, 2 Oostduinlaan, The Hague, Netherlands*

TECHNOMETRICS

A Journal of Statistics
for the Physical, Chemical and Engineering Sciences

CONTENTS

TECHNOMETRICS, Vol. 13, No. 1, FEBRUARY 1971

A New Analysis of Variance Model for Non-additive Data	J. Mandel
Simplified Experimental Design	M. J. Box
The Analysis of Multidimensional Contingency Tables: Stepwise Procedures and Direct Estimation Methods for Building Models for Multiple Classifications	L. A. Goodman
An Improved Marquardt Procedure for Nonlinear Regression	F. B. Smith, Jr. and D. F. Shanno
Tests for One or Two Outliers in Normal Samples with Known Variance	R. G. McMillan and H. A. David
Tests for One or Two Outliers in Normal Samples with Unknown Variance	R. G. McMillan
Investigation of Rules for Dealing with Outliers in Small Samples from the Normal Distribution II: Estimation of the Variance	I. Guttman and D. E. Smith
The Effect of the Two Extremes in Estimating the Best Linear Unbiased Estimates (BLUE) of the Parameters of the Exponential Distribution	A. E. Sarhan and B. G. Greenberg
On the Student's Test Based on Sample Percentiles from the Normal, Logistic and Cauchy Distributions	L. K. Chan and S. W. H. Cheng
Optimum Age Replacement Policies with an Increasing Cost Factor	R. L. Scheaffer
Estimation from Accelerated Life Tests	R. E. Barlow and E. M. Scheuer
Inference from Accelerated Life Tests When Observations are Obtained from Censored Samples	N. D. Singpurwalla
Linear Estimation of the Weibull Parameters	R. B. D'Agostino
A Test for the Comparison of Two Exponential Distributions	S. Kumar and H. I. Patel
A Comparative Power Study of the Bivariate Rank Sum Test and T^2	G. K. Bhattacharyya, R. A. Johnson and H. R. Neave
NOTES	
A Remark on the Barlow-Scheuer Reliability Growth Estimation Scheme	R. R. Read
An Inequality on the Mean Time of Faultless Operation of a Parallel System I	P. C. C. Wang
The Distribution of the Identified Minimum of a Normal Pair Determines the Distribution of the Pair	A. Nadas
More Percentage Points of the Pearson Type III Distribution	H. L. Harter
Addendum to 'On Sequential Tests of the Binomial Distribution'	A. H. Corneliussen and D. W. Ladd
QUERY	
BOOK REVIEWS	
LETTER TO THE EDITOR	
NOTICES	

The purpose of TECHNOMETRICS is to contribute to the development and use of statistical methods in the physical, chemical and engineering sciences. This objective places a high premium on succinct communication among the physical scientist, engineer, statistician and mathematician. The journal will accept for publication papers describing new statistical techniques expected to be useful in these sciences, papers illustrating the application of known statistical methods to new or novel environments, expository or tutorial papers on particular statistical methods, and papers dealing with the philosophy and problems of applying statistical methods to research, development, design and performance. Brief descriptions of problems requiring solution and short technical notes will also be accepted for publication.

For further information please contact TECHNOMETRICS Post Office Box 587 Benjamin Franklin Station Washington, D. C. 20004.

SANKHYĀ

The Indian Journal of Statistics

CONTENTS OF SERIES A, VOL. 32, PART 3, 1970

On Two-Parameter Family of BIB Designs	M. Bhaskar Rao
A Characterization of the Double Poisson Distribution	Sheela Talwalkar
On a Class of Rank Order Tests for Independence in Multivariate Distributions	M. L. Puri, P. K. Sen and D. V. Gokhale
A Note on a Commutative g -Inverse of a Matrix	C. G. Khatri
A Note on Mitra's Paper "A Density Free Approach to the Matrix Variate Beta Distribution"	C. G. Khatri
Relations Between Pitman Efficiency and Fisher Information	M. H. Degroot and M. Raghavachari
Characterization of the Distribution of a Random Matrix by Rotational Invariance	W. H. Olson and V. R. Rao Uppuluri
On Symmetry of the Product of Two Random Variables and Their Independence	D. V. Gokhale
Bivariate Moments of Sampling Moments When the Population is Finite and of Size N	N. N. Mikhail
A Characteristic Property of the Yule Distribution	N. Krishnaji
A Note on the Maximum of the Time Distribution of Standard Brownian Motion	W. G. Dobledey and M. T. Wasan
On the Characteristic Functions of the F and T Distributions	Adnan F. Irfan
Some Results on Idempotent Matrices and a Matrix Equation Connected with the Distribution of Quadratic Forms	Sujit K. Mitra and P. Bhimasankaram
Book Reviews	
Abstracts of Technical Reports	

Orders for the Journal for distribution outside India are to be sent to:

Pergamon Press Ltd., Headington Hill Hall, Oxford, England	Pergamon Press Inc., 122 East 57th Street, New York 22, USA
--	---

Orders for the Journal for distribution within India are to be sent to:

Statistical Publishing Society,
204/1 Barrackpore Trunk Road,
Calcutta-35, India

JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION

Volume 65

December 1970

Number 332

Applications

- Empirical Evidence on the Formation of Price Expectations.....*Stephen J. Turnovsky*
Developments in Trading Patterns in the Common Market and EFTA.....*M. K. Carney*
Determinants of Retail Sales in Large Metropolitan Areas, 1954 and 1963.....*Ben-chieh Liu*
A Stochastic Model for Occupancy-Related Random Variables in General-Acute Hospitals.. *William Shonick*

Theory and Methods

- Practical Solutions of the Behrens-Fisher Problem.....*Henry Scheffé*
Distribution of Residual Autocorrelations in Autoregressive-Integrated Moving Average Time Series Models
G. E. P. Box and David A. Pierce
Applied Regression of Variance for Stationary Time Series.....*Robert H. Shumway*
Estimation of Stationary Stochastic Regression Parameters.....*Thomas D. Burnett and Donald Guthrie*
A Sequential Signed-Rank Test.....*Rupert Miller*
On the Loss of Information in Combined Inter- and Intra-Block Estimation.....*K. R. Shah*
Pooling Mean Squares.....*J. Singh*
A Design Criterion for Minimum Bias Estimation of Response Surfaces.....*M. J. Karson*
Independent Stepwise Residuals for Testing Homoscedasticity.....*A. Hedayat and D. S. Robson*
Conditions Under which Mean Square Ratios in Repeated Measurements Designs Have Exact F Distributions.....
Huynh Huynh and Leonard S. Feldt
Hypothesis Testing Incorporating a Preliminary Test of Significance.....*Barry C. Arnold*
An Optimum Test Property of Two Well-Known Statistics.....*Vincent A. Uthoff*
Inferential Procedures for the Generalized Gamma Distribution.....*Harold W. Hager and Lee J. Bain*
Quasi-Independence and Maximum Likelihood Estimation in Incomplete Contingency Tables
Stephen E. Fienberg
A Comparison of Minimum Logit Chi-Square Estimation and Maximum Likelihood Estimation in $2 \times 2 \times 2$
and $3 \times 2 \times 2$ Contingency Tables: Tests for Interaction.....*Charles L. Odoroff*
Maximizing the Correlation of Grouped Observations.....*Eve Bofinger*
Power of Bivariate Studentized Maximum and Minimum Modulus Tests.....*F. E. Steffens*
An Empirical Study of Estimators and Variance Estimators in Unequal Probability Sampling ($n = 3$ or 4)
D. L. Bayless and J. N. K. Rao
Additional Factors for Calculating Prediction Intervals for Samples from a Normal Distribution
Gerald J. Hahn

BOOK REVIEWS

PUBLICATIONS RECEIVED

CORRIGENDA

EDITORIAL COLLABORATORS

INDEX TO VOLUME 65

For further information, please contact:

AMERICAN STATISTICAL ASSOCIATION

806 15th Street, N.W.

Washington, D. C. 20005

JOURNAL OF THE ROYAL STATISTICAL SOCIETY

THE JOURNAL OF THE ROYAL STATISTICAL SOCIETY is published in three series, **SERIES A (GENERAL)**, four issues a year, annual subscription, post free, £5 4s. U. S. \$15; price each part £2; **SERIES B (METHODOLOGICAL)**, three issues a year, annual subscription post free, £4.15.0 U. S. \$12; price each part £2; **SERIES C (APPLIED STATISTICS)**, three issues a year, annual subscription £2; U. S. \$5, price each part 15s.

Reviews; Current Notes; Library Accessions

Contents of SERIES B (METHODOLOGICAL), Vol. 33, No. 3, 1970

A method of discriminating between models (with Discussion) A. C. ATKINSON
 Time continuous Markov chain estimation techniques in demographic models J. M. HOEM
 On a regenerative phenomenon occurring in a storage model N. U. PRABHU AND M. RUBINOVITCH
 Estimating the parameters of a linear function of a random variable S. L. SLOVE AND J. VAN RYZIN
 Spectral analysis with randomly missing observations P. BLOOMFIELD
 Further consideration of the distribution of the multiple correlation coefficient J. GURLAND AND R. MILTON
 The measurement of association in a contingency table: three extensions of the cross-ratios and metrics methods P. ALTHAM
 Bivariate distributions of reliability theory F. DOWNTON
 Transformation of a birth process into a Poisson process W. A. O'N. WAUGH
 Comments and Queries
 Comment on the saddle point of the likelihood surface for a linear functional relationship P. SPRENT

The Royal Statistical Society 21, Bentinck Street, London, W. 1

BIOMETRICS

Journal of the Biometric Society

Vol. 27, No.1

CONTENTS

March 1971

Topics in variance component estimation (Invited Paper)	S. R. Searle
Stochastic compartmental analysis: model and least squares estimation from time series data (with discussion by M. E. Wise)	J. H. Matis and H. O. Hartley
A test for differences between treatment means when several dose levels are compared with a zero dose control	D. A. Williams
Use of the generalized variance and the gradient projection method in multivariate stratified sampling	L. G. Arvanitis and B. Afonja
Two-sample randomization tests for space-time clustering	M. R. Klauber
A method of cluster analysis when there exist multiple indicators of a theoretic concept	L. S. Mayer
The analysis of categorical data from mixed models	G. G. Koch and D. W. Reinfort
Analysis of information—an alternative approach to the detection of a correlation between the sexes of adjacent sibs in human families	H. H. Ku
Estimation of heritability from experiments with inbred and related individuals	K. Hinkelmann
The simulation, fitting, and testing of a stochastic cellular proliferation model	D. G. Hoel and T. J. Mitchell
The practical psychology of biostatistical consultation	L. Hyams
Notes	
Disadvantages of the generalized variance as a measure of variability	R. R. Kowal
On the Edwards and Cavalli-Sforza method of cluster analysis	A. J. Scott and M. J. Symons
The probability of disease transmission	J. D. Kerr
Estimating the ratio of two marginal probabilities in a contingency table	E. Peritz
Testing for equal slopes in a randomized block design with covariances	J. L. Fleiss
Confounded asymmetrical factorial designs	B. N. Tyagi
Buffon's problem for non-random directions	F. H. C. Marriott

Biometrics is published quarterly. Its objects are to describe and exemplify the use of mathematical and statistical methods in biological and related sciences in a form assimilable by experimenters. The annual non-member subscription rate is \$15.00. Inquiries, non-member subscriptions, and orders for back issues, should be addressed to: Biometrics Business Office, Department of Experimental Statistics, North Carolina State University, Raleigh, North Carolina 27607 U.S.A. Editorial correspondence should be directed to: Biometrics Editorial Office, Department of Biostatistics, School of Public Health, University of North Carolina, Chapel Hill, North Carolina 27514 U.S.A.

THE INSTITUTE OF MATHEMATICAL STATISTICS

APPLICATION FOR MEMBERSHIP

I hereby apply for membership in the Institute of Mathematical Statistics.

Date..... Signature.....

Members admitted during any calendar year receive *The Annals of Mathematical Statistics* for that calendar year. They are liable for dues for that year and all succeeding years until they die or resign.

Information to be used in future directories of the Institute if application is accepted.

Please type or print entire application.

Name
Surname Given Name Middle Initial or Maiden Name

In case the initial word of the surname is not to be used in placing your name in the alphabetical sequence, please underline the first letter of that part of your name which is to be used. If you are a married woman, you may wish to enter in parentheses following your given names the abbreviation Mrs. followed by the initials of your husband's name.

Highest academic degree received, name of institution conferring the degree, date conferred.....

Other degrees, institutions, and dates.....

Present position or title.....

Name of institution or organization in which position is held

Address of institution or organization.....

Mail address (if different from above)

All students, whether full or part-time, are eligible for student rates. In order to claim these rates, the certification below must be completed and signed by a member of the faculty of the student's institution. A member can qualify as a student no longer than four years.

CERTIFICATION OF STUDENT STATUS

This is to certify that..... is a student in good

(Name of Applicant)

standing at

(School or Institution Attended by Applicant)

Date..... Signature

Title

Send completed form to: George J. Resnikoff, Treasurer, Institute of Mathematical Statistics,
Department of Statistics, California State College at Hayward
Hayward, California 94542

THE INSTITUTE OF MATHEMATICAL STATISTICS

(Organized September 12, 1935)

OFFICERS

President:

William Kruskal, Department of Statistics, University of Chicago, Chicago, Illinois 60637

President-Elect:

R. C. Bose, Department of Statistics, University of North Carolina, Chapel Hill, North Carolina 27514

Executive Secretary:

Leo Katz, Statistical Laboratory, Michigan State University, East Lansing, Michigan 48823

Program Secretary:

R. V. Hogg, Department of Statistics, University of Iowa, Iowa City, Iowa 52240

Treasurer:

George J. Resnikoff, Department of Statistics, California State College, Hayward, California 94542

Editor:

Ingram Olkin, Department of Statistics, Stanford University, Stanford, California 94305

Managing Editor:

K. J. C. Smith, Department of Statistics, University of North Carolina, Chapel Hill, North Carolina 27514

The purpose of the Institute of Mathematical Statistics is to encourage the development, dissemination, and application of mathematical statistics.

Membership dues including a subscription to the ANNALS of MATHEMATICAL STATISTICS are \$20.00 per year for residents of the United States or Canada and \$12.00 per year for residents of other countries. Special student rates of \$10.00 per year are available to students. Inquiries regarding membership in the Institute should be sent to the Treasurer of the Institute.

(Membership in the Institute of Mathematical Statistics is not required of author of papers in the *Annals of Mathematical Statistics* and the fact of membership or non-membership is given no weight in the consideration of submitted manuscripts.)

(Instructions for authors—continued)

Authors are asked to keep in mind the typographical difficulties and high cost of printing complicated mathematical formulas. The difference between capital and lower-case letters should be clearly shown; care should be taken to avoid confusion between such pairs as zero and the letter O, the numeral 1 and the letter l, numeral 1 used as superscript and prime ('), alpha and a, kappa and k, mu and u, nu and v, eta and n, etc. Bars above groups of letters (e.g., $\log \bar{x}$) and underlined letters (e.g., \underline{x}) are difficult to print and should be avoided; $\lim \inf$ and $\lim \sup$ are preferable to \lim and $\underline{\lim}$. Symbols are automatically italicized by the printer and should not be underlined on manuscripts. Boldface letters may be indicated by underlining with a wavy line on the manuscript; boldface subscripts and superscripts are not available. Unusual accents on letters should be avoided or replaced by superscripts or subscripts. Complicated exponentials should be represented with the symbol \exp . In writing square roots the fractional exponent is preferable to the radical sign. Fractions are preferably written with the solidus or negative exponent; thus $(a + b)/(c + d)$ rather than $\frac{a + b}{c + d}$, and $(2\pi)^{-1}$ rather than $\frac{1}{2\pi}$. In addition to decreasing the printing costs, a simple notation greatly improves the readability and appearance of a manuscript.

Authors will ordinarily receive only galley proofs. Fifty reprints without covers will be furnished free. Additional reprints and covers may be ordered at cost on forms which will be provided by the printer.

Contents (Continued)

Absorption probabilities for certain two-dimensional random walks	304
RICHARD W. MENSING AND H. T. DAVID	
Convergence of conditional expectations	315
P. GÄNSSLER AND J. PFANZAGL	
Asymptotic optimality and ARE of certain rank-order tests under contiguity	325
KONRAD BEHNEN	
T-minimax selection procedures in treatments versus control problems	330
H. RONALD RANGLES AND MYLES HOLLANDER	
Approximate confidence limits for complex systems with exponential component lives	342
J. M. MYHRE AND SAM C. SAUNDERS	
Notes	
A note on the multivariate t -ratio distribution	349
RUSSELL F. KAPPENMAN	
On universal measurability and perfect probability	352
R. B. DARST	
Unbiasedness of tests for homogeneity of variances	355
ARTHUR COHEN AND WILLIAM E. STRAWDERMAN	
Note on a characterizing property of the exponential distribution	361
N. KRISHNAJI	
Note on the characterization of certain association schemes	363
MARTIN AIGNER	
Simple proofs of some theorems on point processes	368
R. K. MILNE	
A counterexample to a lemma of L. D. Brown	373
J. PFANZAGL	
A functional central limit theorem for k -dimensional renewal theory	376
DOUGLAS P. KENNEDY	
Bernoulli flows with infinite entropy	381
J. FELDMAN AND M. SMORODINSKY	
Distribution of the sum of independent decapitated negative binomial variables	383
J. C. AHUJA	
Proper Bayés minimax estimators of the multivariate normal mean	385
WILLIAM E. STRAWDERMAN	
The discounted central limit theorem and its Berry-Esséen analogue	389
HANS U. GERBER	
The L_p -convergence for $n^{-1/p} S_n$, $0 < p < 2^*$	393
Y. S. CHOW	
A series of tournamental designs	395
C. C. YALAVIGI	
A note on first passages for $S_n/n^{1/2}$	398
A. RUIZ-MONCAYO	
Almost certain summability of independent, identically distributed random variables	401
Y. S. CHOW AND H. TEICHER	
A note on some ergodic theorems of A. Paz	405
RICHARD W. MADSEN	
On the nonexistence of a three series condition for series of nonindependent random variables	409
DAVID GILAT	
Superpositions and the continuity of infinitely divisible distributions	410
BARTHEL W. HUFF	
A short proof of Steck's result on two-sample Smirnov statistics	413
S. G. MOHANTY	
Correction Note	
Correction to "On the domains of definition of analytic functions"	415
R. CUPPENS AND E. LUKACS	
Abstracts	416
News and Notices	422
Reports of the Executive Officers	424
Minutes of Council and Business Meetings	432
Publications Received	438
