IMS LECTURE NOTES — MONOGRAPH SERIES

This series provides an avenue for the rapid, but carefully refereed, publication of important research results in comprehensive form and expository style. These volumes should be of great value to researchers and advanced students in statistics, probability, and related fields. The series editor is Shanti S. Gupta, Purdue University.

4

ZONAL POLYNOMIALS

by Akimichi Takemura

A self-contained development of zonal polynomials in the framework of standard multivariate analysis.

Zonal polynomials have been used extensively in the study of noncentral multivariate distributions. This easily understood treatment uses only the standard tools of linear algebra and multivariate normal distribution theory.

110 pages List price \$15 IMS members \$9

5

INEQUALITIES IN STATISTICS AND PROBABILITY

edited by Y. L. Tong

Proceedings of the Symposium on Inequalities in Statistics and Probability held in Lincoln, Nebraska during October 1982.

This volume reports on the recent rapid growth in the field of inequalities due, in part, to widespread applications in reliability theory, in multivariate nonnormal analysis, and in optimization and constraint problems. The volume contains thirty expository and research papers by leaders in the field.

263 pages List price \$25 IMS members \$15

6

THE LIKELIHOOD PRINCIPLE

by James Berger and Robert Wolpert

A comprehensive presentation and criticism of the likelihood principle and its generalizations.

This book provides a non-technical development of the likelihood principle with attention to some of its surprising implications for such areas as randomization analysis, censoring, significance testing, and sequential analysis. The authors also discuss generalizations and implementations of the likelihood principle.

217 pages List price \$25 IMS members \$15



ADDITIONAL TITLES

Previously published: Volume 1, Essays on the Prediction Process by Frank Knight (\$15/members \$9); Volume 2, Survival Analysis edited by John Crowley and Richard A. Johnson (\$25/members \$15); Volume 3, Empirical Processes by Peter Gaenssler (\$20/members \$12). Forthcoming: Fundamentals of Statistical Exponential Families by L. Brown, Approximate Computations of Expectations by C. Stein, Adaptive Statistical Procedures and Related Topics edited by T. L. Lai and J. Van Ryzin, Differential Geometry in Statistical Inference by S. Amari, O. Barndorff-Nielsen, R. Kass, S. Lauritzen, and C. R. Rao, and Group Theory in Statistics by P. Diaconis.

Prepaid orders for individual volumes and requests for standing order enrollment (eligible for 20% prepublication discounts from list prices) should be sent to

Institute of Mathematical Statistics 3401 Investment Blvd. #7 Hayward, CA 94545 (USA)

IMS Lecture Notes-Monograph Series

This series provides an avenue for the rapid, but carefully refereed, publication of important research results in comprehensive form and expository style. These volumes should be of great value to researchers and advanced students in statistics, probability, and related fields. The series editor is Shanti S. Gupta, Purdue University.

7 APPROXIMATE COMPUTATION OF EXPECTATIONS by Charles Stein

An abstract approach to the approximate computation of expectations.

One aim of the theory of probability is the effective computation of probabilities that are given in principle. This volume presents an abstract approach to this issue keeping in mind the interaction of theoretical ideas and concrete problems.

164 pages List price \$20 IMS members \$12

8 ADAPTIVE STATISTICAL PROCEDURES AND RELATED TOPICS edited by John Van Ryzin

Proceedings of the Symposium on Adaptive Statistical Procedures and Related Topics, Brookhaven National Laboratory, June 1985.

This symposium was held in honor of the 70th birthday of Herbert Robbins and covers the broad range of topics to which he has made fundamental contributions including stochastic approximation, empirical Bayes and sequential analysis. This volume contains 36 papers (five in abstract form) by students and/or colleagues of Robbins.

476 pages List price \$40 IMS members \$24

9 FUNDAMENTALS OF STATISTICAL EXPONENTIAL FAMILIES by Lawrence D. Brown

A systematic treatment of the analytical and probabilistic properties of exponential families.

Many if not most of the successful mathematical formulations of statistical questions involve specific exponential families of distributions. This volume examines these mathematical formulations from the perspective of general exponential families with a variety of statistical applications in mind.

283 pages List price \$25 IMS members \$15

&

ADDITIONAL TITLES

Volume 1, Essays on the Prediction Process by Frank Knight (\$15/members \$9); Volume 2, Survival Analysis edited by John Crowley and Richard A. Johnson (\$25/members \$15); Volume 3, Empirical Processes by Peter Gaenssler (\$20/members \$12); Volume 4, Zonal Polynomials by Akimichi Takemura (\$15/members \$9); Volume 5, Inequalities in Statistics and Probability edited by Y. L. Tong (\$25/members \$15); Volume 6, The Likelihood Principle by James Berger and Robert Wolpert (\$25/members \$15).

Prepaid orders for individual volumes and requests for standing order enrollment (eligible for 20% prepublication discounts from list prices) should be sent to:

Institute of Mathematical Statistics 3401 Investment Boulevard, Suite 7 Hayward, California 94545 (USA)

INSTITUTE OF MATHEMATICAL STATISTICS

(Organized September 12, 1935)

The purpose of the Institute is to foster the development and dissemination of the theory and applications of statistics and probability.

OFFICERS AND EDITORS

President:

Bradley Efron, Department of Statistics, Sequoia Hall, Stanford University, Stanford, California 94305

President-Elect:

Ram Gnanadesikan, Morris Research and Engineering Center, Bell Communications Research, 435 South Street, Morristown, New Jersey 07960-1961

Past President:

Ronald Pyke, Department of Mathematics GN-50, University of Washington, Seattle, Washington 98195

Executive Secretary:

Peter Purdue, Department of Operations Research, Code 55, Naval Postgraduate School, Monterey, California 93943

Treasurer:

Nicholas P. Jewell, Group in Biostatistics, University of California, Berkeley. *Please send correspondence to*: IMS Business Office, 3401 Investment Boulevard #7, Hayward, California 94545

Program Secretary:

Lynne Billard, Department of Statistics, University of Georgia, Athens, Georgia 30602

Editor: The Annals of Statistics

Willem R. van Zwet, Department of Mathematics, University of Leiden, P.O. Box 9512, 2300 RA Leiden, The Netherlands

Editor: The Annals of Probability

Thomas M. Liggett, Department of Mathematics, University of California, Los Angeles, California 90024

Executive Editor: Statistical Science

Morris H. DeGroot, Department of Statistics, Carnegie Mellon University, Pittsburgh, Pennsylvania 15213

Editor: The IMS Bulletin

George P. H. Styan, Department of Mathematics and Statistics, Burnside Hall, McGill University, 805 Sherbrooke Street West, Montreal PQ, Canada H3A 2K6

Editor: The IMS Lecture Notes—Monograph Series

Shanti S. Gupta, Department of Statistics, Purdue University, West Lafayette, Indiana 47907

Managing Editor:

Paul Shaman, Department of Statistics, University of Pennsylvania, Philadelphia, Pennsylvania 19104

Journals. The scientific journals of the Institute are The Annals of Statistics, The Annals of Probability, and Statistical Science. The news organ of the Institute is The Institute of Mathematical Statistics Bulletin.

Individual, Institutional, and Corporate Memberships. All individual members receive Statistical Science and The IMS Bulletin for a basic annual dues rate of \$30. Individual members may elect to receive one Annals for an additional \$10 or both Annals for an additional \$20. Dues allocations to each journal are set by Council resolution. Of the total dues paid, \$8 is allocated to The IMS Bulletin and the remaining amount is allocated equally among the scientific journals received. Memberships are available at a reduced rate (40% of regular rates) for full-time students, permanent residents of developing countries, and retired members. Retired members may also elect to receive the Bulletin only for \$10. Institutional memberships are available to nonprofit organizations at \$230 per year and corporate memberships are available to other organizations at \$500 per year. Institutional and corporate memberships include two multiple-readership copies of all IMS journals in addition to other benefits specified for each category (details available from the IMS Business Office).

Individual and General Subscriptions. Subscriptions are available on a calendar-year basis. For 1987, all subscriptions to one or both Annals automatically include one subscription to Statistical Science. Individual subscriptions are for the personal use of the subscriber and must be in the name of, paid directly by, and mailed to an individual. Individual subscriptions for 1987 are available to both Annals and Statistical Science (\$79), one Annals and Statistical Science (\$52), Statistical Science only (\$25), and The IMS Bulletin (\$15). General subscriptions are for libraries, institutions, and any multiple-readership use. General subscriptions for 1987 are available to both Annals and Statistical Science (\$160), one Annals and Statistical Science (\$85), Statistical Science only (\$40), and The IMS Bulletin (\$20). Air mail rates for overseas delivery of general subscriptions are \$40 per title.

Correspondence. Mail to IMS should be sent to the IMS Business Office (membership, subscriptions, claims, copyright permissions, advertising, back issues), the Editor of the appropriate journal (submissions, editorial content), or the Managing Editor (production).

IMS Lecture Notes-Monograph Series Series Editor, Shanti S. Gupta

Differential Geometry in Statistical Inference

by S.-I. Amari, O. E. Barndorff-Nielsen, R. E. Kass, S. L. Lauritzen, and C. R. Rao

The papers collected here present, in a concise yet comprehensive form, several major developments of recent research on differential geometry in statistics.

Contents

Introduction by R. E. Kass

Differential Geometrical Theory of Statistics—Towards New Developments by S.-I. Amari

Introduction; Geometrical Structure of Statistical Models; Higher-Order Asymptotic Theory of Statistical Inference in Curved Exponential Family; Information, Sufficiency and Ancillarity Higher Order Theory; Fibre-Bundle Theory of Statistical Models; Estimation of Structural Parameter in the Presence of Infinitely Many Nuisance Parameters; Parametric Models of Stationary Gaussian Time Series; References

Differential and Integral Geometry in Statistical Inference by O. E. Barndorff-Nielsen Introduction; Review and Preliminaries; Transformation Models; Transformation Submodels; Maximum Estimation and Transformation Models; Observed Geometries; Expansion of c|j|^{1/2}L; Exponential Transformation Models; Appendices and References

Statistical Manifolds by S. L. Lauritzen

Introduction; Some Differential Geometric Background; The Differential Geometry of Statistical Models; Statistical Manifolds; The Univariate Gaussian Manifold; The Inverse Gaussian Manifold; The Gamma Manifold; Two Special Manifolds; Discussion and Unsolved Problems; References

Differential Metrics in Probability Spaces by C. R. Rao

Introduction; Jensen Difference and Entropy Differential Metric; The Quadratic Entropy; Metrics Based on Divergence Measures; Other Divergence Measures; Geodesic Distances; References

List price \$25 IMS member price \$15

Order prepaid from:

Institute of Mathematical Statistics 3401 Investment Boulevard, Suite 7 Hayward, California 94545 (USA)