CAMBRIDGE

Statistics and Probability 2005

General Models and Methodologies

Selected Statistical Papers of Sir David Cox

D. J. Hand, *Imperial College London*

A. M. Herzberg, *Queen's University, Kingston*

Here Professor Cox reviews his most influential and interesting papers published before 1993. Each paper is the subject of a candid commentary written especially for this collection. In these he describes the context in which the papers arose and their subsequent influence. He also identifies avenues for future research. Organised in two volumes and grouped by theme, the papers and commentaries provide excellent coverage of many of the most significant advances in statistics in recent times. But this collection is more than a record of scientific achievement. Professor Cox's writing is characterised by clarity and wit, so these volumes can be read as much for enjoyment as for edification.

Volume 1: Design of Investigations, Statistical Methods and Applications
2005 247 x 174 mm 600 pages
0 521 84939 X Hardback c. £100.00

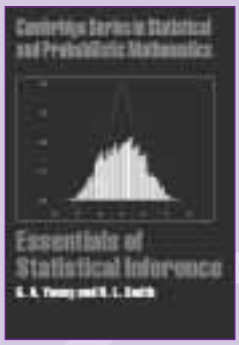
Volume 2: Foundations of Statistical Inference, Theoretical Statistics, Time Series and Stochastic Processes
2005 247 x 174 mm 550 pages
0 521 84940 3 Hardback c. £100.00

Essentials of Statistical Inference

TEXTBOOK

G. A. Young, *Imperial College of Science, Technology and Medicine, London*

and R. L. Smith, *University of North Carolina, Chapel Hill*



Explains the concepts and results underlying the Bayesian, frequentist and Fisherian approaches to statistical inference, with particular emphasis on the contrasts between them. Aimed at advanced undergraduates and graduate students in mathematics and related disciplines, it covers in a concise treatment both basic mathematical theory and more advanced material, including such contemporary topics as Bayesian computation, higher-order likelihood theory, predictive inference, bootstrap methods and conditional inference. It contains numerous extended examples of the application of formal inference techniques to real data, as well as historical commentary on the development of the subject.

Contents: Preface; Introduction; 1. Decision theory; 2. Bayesian methods; 3. Hypothesis testing; 4. Special models; 5. Sufficiency and completeness; 6. Two-sided tests and conditional inference; 7. Likelihood theory; 8. Higher-order theory; 9. Predictive inference; 10. Bootstrap methods; References; Index.

Cambridge Series in Statistical and Probabilistic Mathematics, 16

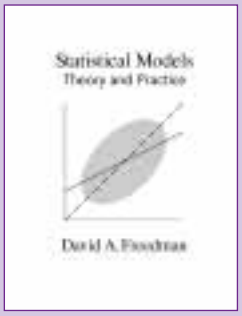
2005 262 x 182 mm 296pp 92 exercises
27 figures 40 worked examples
0 521 83971 8 Hardback c. £ 35.00

Statistical Models

TEXTBOOK

Theory and Practice

David Freedman, *University of California, Berkeley*



This lively and engaging textbook provides the knowledge required to read empirical papers in the social and health sciences, as well as the techniques needed to build statistical models. Careful attention is paid to the principles of statistical inference. There is background material on study design, bivariate regression, and matrix algebra. To develop technique, there are computer labs, with sample computer programs. The book's discussion is organized around published studies, as are the numerous exercises - many of which have answers included. Relevant papers reprinted at the back of the book are thoroughly appraised by the author.

Contents: 1. Observational studies and experiments; 2. The regression line; 3. Matrix algebra; 4. Multiple regression; 5. Path models; 6. Maximum likelihood; 7. The bootstrap; 8. Simultaneous equations; References; Answers to exercises; The computer labs; Appendix: sample MATLAB code; Reprints; Index.

2005 241 x 165 mm 400pp 22 tables 203 exercises
0 521 85483 0 Hardback c. £ 40.00
0 521 67105 1 Paperback c. £ 19.99

Elements of Distribution Theory

GRADUATE TEXTBOOK

Thomas A. Severini, *Northwestern University*

Distribution theory consists of those areas of probability theory that are useful in understanding the development of statistical methodology, with the focus on the calculation and approximation of probabilities and moments. This detailed introduction uses no measure theory, making it suitable for students in statistics and econometrics as well as for researchers who use statistical methods.

Cambridge Series in Statistical and Probabilistic Mathematics, 17

2005 253 x 177 mm 480 pages 354 exercises 10 tables
0 521 84472 X Hardback c. £35.00

Statistics and Probability for Finance, Economics and Social Science

Social Choice and the Mathematics of Manipulation

Alan D. Taylor, *Union College, New York*

Honesty in voting, it turns out, is not always the best policy. Indeed, in the early 1970s, Allan Gibbard and Mark Satterthwaite, building on the seminal work of Nobel laureate Kenneth Arrow, proved that with three or more alternatives there is no reasonable voting system that is non-manipulable; voters will always have an opportunity to benefit by submitting a disingenuous ballot. The ensuing decades produced a number of theorems of striking mathematical naturality that dealt with the manipulability of voting systems. The presentation is almost completely self-contained, and requires no prerequisites except a willingness to follow rigorous mathematical arguments. Mathematics students, as well as mathematicians, political scientists, economists and philosophers will learn why it is impossible to devise a completely unmanipulable voting system.

Outlooks

2005 228 x 152 mm 192pp 3 line diagrams 80 exercises
0 521 81052 3 Hardback £ 40.00
0 521 00883 2 Paperback £ 14.99

Models and Methods in Social Network Analysis

Edited by Peter Carrington, *University of Waterloo*
John Scott, *University of Essex*
and Stanley Wasserman, *Indiana University*

Original review articles by leading methodologists, all commissioned exclusively for this volume. The book will complement the classic text by Wasserman and Faust, Social Network Analysis: Methods and Applications (also available from Cambridge University Press).

Structural Analysis in the Social Sciences, 28

0 521 80959 2 Hardback £ 40.00 344pp
0 521 60097 9 Paperback £ 18.99

Introduction to the Mathematical and Statistical Foundations of Econometrics

Herman J. Bierens, *Pennsylvania State University*

Intended for use in a rigorous introductory PhD level course in econometrics, or a field course in econometric theory, this book covers the measure-theoretical foundation of probability theory, the multivariate normal distribution with its application to classical linear regression analysis, various laws of large numbers, and more.

Themes in Modern Econometrics

0 521 83431 7 Hardback £ 50.00 344pp
0 521 54224 3 Paperback £ 22.99

Actuarial and Financial Risk through Simulation

An Introduction

Eric Bølviken, *University of Oslo*

An introduction to the basic skills for the computational actuarial science: specifically, basic stochastic modeling, problem solving through simulation and how simulation techniques are implemented.

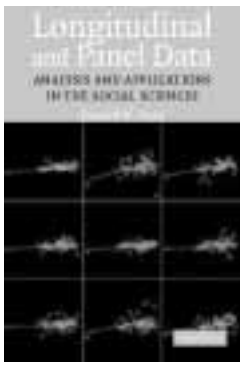
International Series on Actuarial Science

2005 247 x 174 mm 350 pages 50 line diagrams 120 exercises 20 tables 30 worked examples
0 521 83048 6 Hardback c.£40.00

Longitudinal and Panel Data

Analysis and Applications in the Social Sciences

Edward W. Frees, *University of Wisconsin, Madison*



Examined here are models and data that arise from repeated observations of a cross-section of individuals, households or companies. These models have found important applications within business, economics, education, political science and other social science disciplines. The author introduces the foundations of longitudinal and panel data analysis at a level suitable for quantitatively oriented graduate social science students as well as individual researchers. The applications are covered enhanced by real-world data sets and software programs in SAS and Stata.

2004 228 x 152 mm 484pp
0 521 82828 7 Hardback £ 50.00
0 521 53538 7 Paperback £ 23.99

Insurance Risk and Ruin

David C. M. Dickson, *University of Melbourne*

Based on the author's experience of teaching final-year actuarial students in Britain and Australia, and suitable for a first course in insurance risk theory, this book focuses on the two major areas of risk theory - aggregate claims distributions and ruin theory. Care has been taken to make the book accessible to readers who have a solid understanding of the basic tools of probability theory. Numerous worked examples are included in the text and each chapter concludes with exercises, which have answers in the book and full solutions available for instructors from www.cambridge.org.

International Series on Actuarial Science

2005 228 x 152 mm 242pp 50 line diagrams 95 exercises 40 figures 105 worked examples
0 521 84640 4 Hardback £ 35.00

The Commercial and Political Atlas and Statistical Breviary

William Playfair

Introduced and edited by

Howard Wainer, *National Board of Medical Examiners*

and Ian Spence, *University of Toronto*

A scientific revolution began at the end of the 18th century with the invention and popularization of the graphic display of data by the remarkable Scot William Playfair. His marvellous Atlas showed how much could be learned if one plotted data atheoretically and looked for suggestive patterns. Those patterns provide evidence, albeit circumstantial, on which to build new science. Playfair's work has much to teach us, but finding a copy has been almost impossible. Until now. This full colour reproduction of two of his classic works, with new explanatory material, makes Playfair's wisdom widely available for the first time in two centuries.

2005 228 x 152 mm 200 pages
0 521 85554 3 Hardback c. £25.00

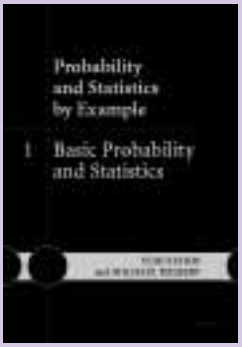
Probability and Statistics by Example

TEXTBOOK

Volume 1: Basic Probability and Statistics,

Yuri Suhov, *University of Cambridge*

and Michael Kelbert, *University of Wales, Swansea*



Probability and Statistics are as much about intuition and problem solving, as they are about theorem proving. Because of this, students can find it very difficult to make a successful transition from lectures to examinations to practice, since the problems involved can vary so much in nature. The subject is critical in many modern applications such as mathematical finance, quantitative management, telecommunications, signal processing, bioinformatics, as well as traditional ones such as insurance, social science and engineering, and so the authors have rectified deficiencies in traditional lecture-based methods by collecting together a wealth of exercises for which they have supplied complete solutions. These solutions are adapted to needs and skills of students. To make it of broad value, the authors supply basic mathematical facts as and when they are needed, and have sprinkled some historical information throughout the text.

Contents: Introduction; Part A. Probability: A1. Discrete outcomes; A2. Continuous outcomes; A3. Index of problems for Part A; Part B. Statistics: B1. Parameter estimation; B2. Hypothesis testing; B3. Tripos exam questions in IB statistics 1992?2004 ; Tables of random variables and probability distributions; Glossary.

2005 247 x 174 mm 500pp 43 line diagrams 2 tables 43 figures
0 521 84766 4 Hardback c. £ 60.00
0 521 61233 0 Paperback c. £ 28.00

Statistics for Real-Life Sample Surveys

COMING IN 2006

Non-Simple-Random Samples and Weighted Data

Sergey Dorofeev, *Roy Morgan International*

Peter Grant, *Roy Morgan Research*

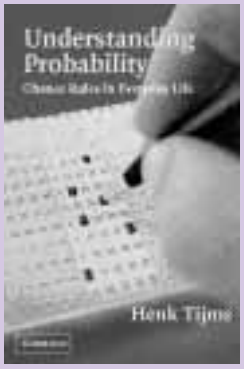
What they didn't tell you in Stats 101... Samples used in social and commercial surveys are usually less random than many people using them realise ... or have been taught to analyse. This book introduces the challenges posed by less-than-perfect samples, giving background knowledge and practical guidance for those who have to deal with them.

January 2006 247 x 174 mm 350 pages
10 line diagrams
0 521 85803 8 Hardback c. £65.00
0 521 67465 4 Paperback c. £25.00

Understanding Probability

Chance Rules in Everyday Life

Henk Tijms, *Vrije Universiteit, Amsterdam*



Like it or not, chance plays a big part in our lives. Every day we face situations where the result is uncertain, and, perhaps without realizing it, we guess about the likelihood of one outcome or another. Fortunately, mastering the concepts of probability can cast new light on situations where randomness and chance appear to rule. In this book, which uses lotteries and casino games to provide the many illustrative examples, the reader can learn about the world of probability. The author demystifies the law of large numbers, betting systems, random walks, the bootstrap, rare events, the central limit theorem, the Bayesian approach and more. Written with wit and clarity, this book can be read easily by anyone who is not put off by a few numbers and some high-school algebra. It is also ideally suited to students of all disciplines taking their first course in probability.

2004 228 x 152 mm 390pp 41 line diagrams
22 tables 279 exercises
0 521 83329 9 Hardback £ 40.00
0 521 54036 4 Paperback £ 18.99

Large Deviations and Metastability

Enzo Olivieri, *Università degli Studi di Roma 'Tor Vergata'*

and Maria Eulalia Vares, *Centro Brasileiro de Pesquisas Fisicas, Brasil*

The book provides a general introduction to the theory of large deviations and a wide overview of the metastable behaviour of stochastic dynamics. With only minimal prerequisites, the book covers all the main results and brings the reader to the most recent developments. Written to be accessible to graduate students, this book provides an excellent route into contemporary research.

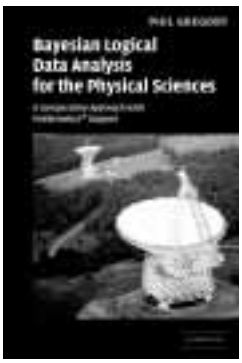
Encyclopedia of Mathematics and its Applications, 100

2005 228 x 152 mm 528pp 37 line diagrams
0 521 59163 5 Hardback £ 80.00

Bayesian Logical Data Analysis for the Physical Sciences

GRADUATE TEXTBOOK

Phil Gregory, *University of British Columbia, Vancouver*



Bayesian analysis can improve model parameter estimates by many orders of magnitude. It provides a simple and unified approach to all data analysis problems, allowing the experimenter to assign probabilities to competing hypotheses of interest, on the basis of the current state of knowledge. This book provides a clear exposition of the underlying concepts with large numbers of worked examples and problem sets. The book also discusses numerical techniques for implementing the Bayesian calculations, including an introduction to Markov Chain Monte-Carlo integration and linear and nonlinear least-squares analysis seen from a Bayesian perspective. In addition, background material is provided in appendices and supporting Mathematica notebooks are available. Ideal for upper-undergraduates, graduate students, or any serious researcher in physical sciences or engineering.

2005 247 x 174 mm 486pp 128 line diagrams 4 half-tones
74 exercises 132 figures 55 worked examples
0 521 84150 X Hardback £ 45.00

An Introduction to Statistical Signal Processing

Robert M. Gray, *Stanford University, California*

and Lee D. Davisson, *University of Maryland, College Park*

Describes the essential tools and techniques of statistical signal processing. At every stage theoretical ideas are linked to specific applications in communications and signal processing using a range of carefully chosen examples. Specific applications to the analysis of random signals and systems for communicating, estimating, detecting, modulating, and other processing of signals are interspersed throughout the book. Hundreds of homework problems are included and the book is ideal for graduate students of electrical engineering and applied mathematics. It is also a useful reference for researchers in signal processing and communications.

Contents: Preface; 1. Introduction; 2. Probability; 3. Random objects; 4. Expectation and averages; 5. Second-order theory; 6. A menagerie of processes; Appendices.

2004 247 x 174 mm 478pp 261 exercises 16 figures
0 521 83860 6 Hardback £ 40.00

Probability and Computing

Randomized Algorithms and Probabilistic Analysis

Michael Mitzenmacher, *Harvard University, Massachusetts*

and Eli Upfal, *Brown University, Rhode Island*

Randomization and probabilistic techniques play an important role in modern computer science, with applications ranging from combinatorial optimization and machine learning to communication networks and secure protocols. This textbook is designed to accompany a one- or two-semester course for advanced undergraduates or beginning graduate students in computer science and applied mathematics. It gives an excellent introduction to the probabilistic techniques and paradigms used in the development of probabilistic algorithms and analyses. It assumes only an elementary background in discrete mathematics and gives a rigorous yet accessible treatment of the material, with numerous examples and applications. With its comprehensive selection of topics, along with many examples and exercises, this book is an indispensable teaching tool.

Contents: Preface; 1. Events and probability; 2. Discrete random variables and expectation; 3. Moments and deviations; 4. Chernoff bounds; 5. Balls, bins and random graphs; 6. The probabilistic method; 7. Markov chains and random walks; 8. Continuous distributions and the Poisson process; 9. Entropy, randomness, and information; 10. The Monte Carlo method; 11. Coupling of Markov chains; 12. Martingales; 13. Pairwise independence and universal hash functions; 14. Balanced allocations; References.

2005 253 x 177 mm 368pp 50 line diagrams
80 exercises
0 521 83540 2 Hardback £ 30.00

A Guide to Monte Carlo Simulations in Statistical Physics

GRADUATE TEXTBOOK

Second edition

David Landau, *University of Georgia*

and Kurt Binder, *Johannes Gutenberg University Mainz, Germany*

From the first edition:

'This book will serve as a useful introduction to those entering the field, while for those already versed in the subject it provides a timely survey of what has been achieved.'

Journal of Statistical Physics

2005 247 x 174 mm 450pp 136 line diagrams
7 half-tones 6 tables
0 521 84238 7 Hardback c.£ 40.00

Statistics Explained, An Introductory Guide for Life Scientists

TEXTBOOK

Steve McKillup, *Central Queensland University*

Statistics Explained is a reader-friendly introduction to experimental design and statistics for undergraduate students in the life sciences, particularly those who do not have a strong mathematical background.

Contents: Preface; 1. Introduction; 2. 'Doing Science' - hypotheses, experiments and disproof; 3. Collecting and displaying data; 4. Introductory concepts of experimental design; 5. Probability helps you make a decision about your results; 6. Working from samples - data, populations and statistics; 7. Normal distributions - test for comparing the means of one or two samples; 8. Type 1 and Type 2 error, power and sample size; 9. Single factor analysis of variance; 10. Multiple comparisons after ANOVA; 11. Two factor analysis of variance; 12. Important assumptions of analysis of variance: transformations and a test for equality of variances; 13. Two factor analysis of variance without replication, and nested analysis of variance; 14. Relationships between variables: linear correlation and linear regression; 15. Simple linear regression; 16. Non-parametric statistics; 17. Non-parametric tests for nominal scale data; 18. Non-parametric tests for ratio, interval or ordinal scale data; 19. Choosing a test; 20. Doing science responsibly and ethically.

2005 228 x 152 mm 200pp 96 line diagrams
0 521 83550 X Hardback c. £ 45.00
0 521 54316 9 Paperback c. £ 19.99

Multivariable Analysis

NEW EDITION

A Practical Guide for Clinicians

Second edition

Mitchell H. Katz, *University of California, San Francisco*

This new edition now includes new features introduced by readers' requests including a new chapter on propensity score, more detail on clustered data and Poisson regression and a new section on analysis of variance. As before it describes how to perform and interpret multivariable analysis, using plain language rather than complex derivations and mathematical formulae. It is the perfect introduction for all clinical researchers. Numerous tables, graphs and tips help to simplify and explain the process of performing multivariable analysis. The text is illustrated with many up-to-date examples from the medical literature on how to use multivariable analysis in clinical practice and in research.

2005 246 x 189 mm 208pp 26 line diagrams 15 tables
0 521 84051 1 Hardback c. £ 50.00
0 521 54985 X Paperback c. £ 26.00

DNA, Words and Models

S. Robin, *Institut National de la Recherche Agronomique, France*
F. Rodolphe, *Institut National de la Recherche Agronomique, France*
and S. Schbath, *Institut National de la Recherche Agronomique, France*

An important problem in computational biology is identifying short DNA sequences mathematically,'words', associated to a biological function. One approach consists in determining whether a particular word is simply random or is of statistical significance, for example, because of its frequency or location. This book introduces the mathematical and statistical ideas used in solving this so-called exceptional word problem.

2002 228 x 152 mm 200pp 21 line diagrams
7 half-tones 14 tables 28 figures 50 worked examples
0 521 84729 X Hardback c.£ 30.00

Essential Epidemiology

TEXTBOOK

An Introduction for Students and Health Professionals

Penny Margaret Webb, *University of Queensland*
Christopher James Bain, *University of Queensland*
and Sandi Lynn Pirozzo, *University of Queensland*

This is an accessible, easily readable, and thoroughly modern introduction to epidemiology for students of medicine and public health. It combines a strong public health perspective and rationale with modern methodological insights in a coherent and accessible way. The basic messages are reinforced through numerous examples and questions, with answers provided.

Contents: 1. Epidemiology is … ; 2. How long is a piece of string? Measuring disease frequency; 3. Who, what, where and when? Finding and using public health data; 4. Watching not waiting: surveillance and epidemiological intelligence; 5. Why? Linking exposure and disease; 6. Solid foundations: research designs for public health; 7. All that glitters is not gold: the problem of error; 8. Muddied waters: the challenge of confounding; 9. Bringing it together: reading and writing papers in practice; 10. Who sank the boat? Association and causation; 11. Assembling the building blocks: reviews and their uses; 12. Outbreaks, epidemics and clusters; 13. Prevention: better than cure?; 14. Early detection: what benefiits at what cost?; 15. A fiinal word …

2005 246 x 189 mm 348pp 79 line diagrams 49 tables
0 521 54661 3 Paperback c. £ 24.99

Algebraic Statistics for Computational Biology

GRADUATE TEXTBOOK

Lior Pachter, *University of California, Berkeley*
Bernd Sturmfels, *University of California, Berkeley*

The quantitative analysis of biological sequence data is based on methods from statistics coupled with efficient algorithms from computer science. These are applied to biological problems such as aligning genomes, finding genes and constructing phylogenies. As the first book in the exciting and dynamic area, it will be welcomed as a text for self-study or for course use.

2005 247 x 174 mm, 400 pages 50 figures
0 521 85700 7 Hardback c. £35.00

Branching Processes

Variation, Growth, and Extinction of Populations

Patsy Haccou, *Rijksuniversiteit Leiden, The Netherlands*
Peter Jagers, *Chalmers University of Technology, Gothenberg*
and Vladimir A. Vatutin, *Steklov Institute of Mathematics, Moscow*

Branching processes play an increasingly important role in models of genetics, molecular biology, microbiology, ecology, and evolutionary theory. This book presents this body of mathematical ideas for a biological audience, but should also be enjoyable for mathematicians.

Cambridge Studies in Adaptive Dynamics, 5

2005 228 x 152 mm 320pp 55 line diagrams
0 521 83220 9 Hardback £ 60.00
0 521 53985 4 Paperback

Please order from your local bookseller

Microeconometrics
Methods and Applications

A. Colin Cameron, *University of California, Davis*
and Pravin Trivedi, *Indiana University*

Thoughtful, intuitive, and careful in laying out central concepts of sophisticated econometric methodologies, it is not only an excellent textbook for students, but also an invaluable reference text for practitioners and researchers.'

Cheng Hsiao, University of Southern California

0 521 84805 9	Hardback	£ 45.00	1048pp

Quantile Regression

Roger Koenker, *University of Illinois, Urbana-Champaign*

Quantile regression offers a unified statistical methodology for studying how measures of diversity depend upon other influences.

Econometric Society Monographs

0 521 84573 4	Hardback	£ 45.00	368pp
0 521 60827 9	Paperback	£ 19.99	

Matrix Algebra

Karim M. Abadir, *University of York*
and Jan R. Magnus, *Tilburg University*

Contains exercises relating to course material in matrix algebra that students are expected to know while enrolled in an (advanced) course in econometrics or statistics. It contains a comprehensive collection of exercises, all with full answers.

Contents: 1. Vectors: 2. Matrices; 3. Vector spaces; 4. Rank, inverse, and determinant; 5. Partitioned matrices; 6. Systems of equations; 7. Eigenvalues, eigenvectors, and factorizations; 8. Positive (semi)defiinite and idempotent matrices; 9. Matrix functions; 10. Kronecker product, vec-operator, and Moore-Penrose inverse; 11. Patterned matrices, commutation and duplication matrix; 12. Matrix inequalities; 13. Matrix calculus

Econometric Exercises, 1

0 521 82289 0	Hardback	£ 50.00	488pp
0 521 53746 0	Paperback	£ 22.99	

Related Journals

Combinatorics, Probability and Computing
ISSN 0963-5483 www.journals.cambridge.org/jid_CPC

Probability in the Engineering and Informational Sciences
ISSN: 0269-9648 www.journals.cambridge.org/jid_PES

Journal of Pension Economics and Finance
ISSN: 1474-7472 www.journals.cambridge.org/jid_PEF

Epidemiology and Infection
ISSN: 0950-2688 www.journals.cambridge.org.jid_HYG

For more information on these journals please visit the websites above.

CAMBRIDGE UNIVERSITY PRESS
www.cambridge.org

ISBN 0-521-96397-4

May 2005

Printed in the United Kingdom at the University Press, Cambridge