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KEY=APPROACH - MILLER STEPHANIE

A COMPUTATIONAL APPROACH TO STATISTICAL LEARNING

CRC Press **A Computational Approach to Statistical Learning** gives a novel introduction to predictive modeling by focusing on the algorithmic and numeric motivations behind popular statistical methods. The text contains annotated code to over 80 original reference functions. These functions provide minimal working implementations of common statistical learning algorithms. Every chapter concludes with a fully worked out application that illustrates predictive modeling tasks using a real-world dataset. The text begins with a detailed analysis of linear models and ordinary least squares. Subsequent chapters explore extensions such as ridge regression, generalized linear models, and additive models. The second half focuses on the use of general-purpose algorithms for convex optimization and their application to tasks in statistical learning. Models covered include the elastic net, dense neural networks, convolutional neural networks (CNNs), and spectral clustering. A unifying theme throughout the text is the use of optimization theory in the description of predictive models, with a particular focus on the singular value decomposition (SVD). Through this theme, the computational approach motivates and clarifies the relationships between various predictive models. Taylor Arnold is an assistant professor of statistics at the University of Richmond. His work at the intersection of computer vision, natural language processing, and digital humanities has been supported by multiple grants from the National Endowment for the Humanities (NEH) and the American Council of Learned Societies (ACLS). His first book, *Humanities Data in R*, was published in 2015. Michael Kane is an assistant professor of biostatistics at Yale University. He is the recipient of grants from the National Institutes of Health (NIH), DARPA, and the Bill and Melinda Gates Foundation. His R package *bigmemory* won the Chamber's prize for statistical software in 2010. Bryan Lewis is an applied mathematician and author of many popular R packages, including *irlba*, *doRedis*, and *threejs*.

FUNDAMENTAL STATISTICAL INFERENCE

A COMPUTATIONAL APPROACH

John Wiley & Sons **A hands-on approach to statistical inference that addresses the latest developments in this ever-growing field** This clear and accessible book for beginning graduate students offers a practical and detailed approach to the field of statistical inference, providing complete derivations of results, discussions, and MATLAB programs for computation. It emphasizes details of the relevance of the material, intuition, and discussions with a view towards very modern statistical inference. In addition to classic subjects associated with mathematical statistics, topics include an intuitive presentation of the (single and double) bootstrap for confidence interval calculations, shrinkage estimation, tail (maximal moment) estimation, and a variety of methods of point estimation besides maximum likelihood, including use of characteristic functions, and indirect inference. Practical examples of all methods are given. Estimation issues associated with the discrete mixtures of normal distribution, and their solutions, are developed in detail. Much emphasis throughout is on non-Gaussian distributions, including details on working with the stable Paretian distribution and fast calculation of the noncentral Student's *t*. An entire chapter is dedicated to optimization, including development of Hessian-based methods, as well as heuristic/genetic algorithms that do not require continuity, with MATLAB codes provided. The book includes both theory and nontechnical discussions, along with a substantial reference to the literature, with an emphasis on alternative, more modern approaches. The recent literature on the misuse of hypothesis testing and *p*-values for model selection is discussed, and emphasis is given to alternative model selection methods, though hypothesis testing of distributional assumptions is covered in detail, notably for the normal distribution. Presented in three parts—Essential Concepts in Statistics; Further Fundamental Concepts in Statistics; and Additional Topics—**Fundamental Statistical Inference: A Computational Approach** offers comprehensive chapters on: Introducing Point and Interval Estimation; Goodness of Fit and Hypothesis Testing; Likelihood; Numerical Optimization; Methods of Point Estimation; Q-Q Plots and Distribution Testing; Unbiased Point Estimation and Bias Reduction; Analytic Interval Estimation; Inference in a Heavy-Tailed Context; The Method of Indirect Inference; and, as an appendix, A Review of Fundamental Concepts in Probability Theory, the latter to keep the book self-contained, and giving material on some advanced subjects such as saddlepoint approximations, expected shortfall in finance, calculation with the stable Paretian distribution, and convergence theorems and proofs.

SYSTEMS BIOLOGY AND BIOINFORMATICS

A COMPUTATIONAL APPROACH

CRC Press **The availability of molecular imaging and measurement systems enables today's biologists to swiftly monitor thousands of genes involved in a host of diseases, a critical factor in specialized drug development.** *Systems Biology and Bioinformatics: A Computational Approach* provides students with a comprehensive collection of the computational methods

RAILROAD VEHICLE DYNAMICS

A COMPUTATIONAL APPROACH

CRC Press **The methods of computational mechanics have been used extensively in modeling many physical systems. The use of multibody-system techniques, in particular, has been applied successfully in the study of various, fundamentally different applications.** *Railroad Vehicle Dynamics: A Computational Approach* presents a computational multibody-system approach that can be used to develop complex models of railroad vehicle systems. The book examines several computational multibody-system formulations and discusses their computer implementation. The computational algorithms based on these general formulations can be used to develop general- and special-purpose railroad vehicle computer programs for use in the analysis of railroad vehicle systems, including the study of derailment and accident scenarios, design issues, and performance evaluation. The authors focus on the development of fully nonlinear formulations, supported by an explanation of the limitations of the linearized formulations that are frequently used in the analysis of railroad vehicle systems. The chapters of the book are organized to guide readers from basic concepts and definitions through a final understanding of the utility of fully nonlinear multibody-system formulations in the analysis of railroad vehicle systems. *Railroad Vehicle Dynamics: A Computational Approach* is a valuable reference for researchers and practicing engineers who commonly use general-purpose, multibody-system computer programs in the analysis, design, and performance evaluation of railroad vehicle systems.

MODULAR FORMS, A COMPUTATIONAL APPROACH

American Mathematical Soc. **This marvellous and highly original book fills a significant gap in the extensive literature on classical modular forms. This is not just yet another introductory text to this theory, though it could certainly be used as such in conjunction with more traditional treatments. Its novelty lies in its computational emphasis throughout: Stein not only defines what modular forms are, but shows in illuminating detail how one can compute everything about them in practice. This is illustrated throughout the book with examples from his own (entirely free) software package SAGE, which really bring the subject to life while not detracting in any way from its theoretical beauty. The author is the leading expert in computations with modular forms, and what he says on this subject is all tried and tested and based on his extensive experience. As well as being an invaluable companion to those learning the theory in a more traditional way, this book will be a great help to those who wish to use modular forms in applications, such as in the explicit solution of Diophantine equations. There is also a useful Appendix by Gunnells on extensions to more general modular forms, which has enough in it to inspire many PhD theses for years to come. While the book's main readership will be graduate students in number theory, it will also be accessible to advanced undergraduates and useful to both specialists and non-specialists in number theory.** --John E. Cremona, University of Nottingham William Stein is an associate professor of mathematics at the University of Washington at Seattle. He earned a PhD in mathematics from UC Berkeley and has held positions at Harvard University and UC San Diego. His current research interests lie in modular forms, elliptic curves, and computational mathematics.

TIME & LOGIC

A COMPUTATIONAL APPROACH

Routledge **Originally published in 1995** *Time and Logic* examines understanding and application of temporal logic, presented in computational terms. The emphasis in the book is on presenting a broad range of approaches to computational applications. The techniques used will also be applicable in many cases to formalisms beyond temporal logic alone, and it is hoped that adaptation to many different logics of program will be facilitated. Throughout, the authors have kept implementation-orientated solutions in mind. The book begins with an introduction to the basic ideas of temporal logic. Successive chapters examine particular aspects of the temporal theoretical computing domain, relating their applications to familiar areas of research, such as stochastic process theory, automata theory, established proof systems, model checking, relational logic and classical predicate logic. This is an essential addition to the library of all theoretical computer scientists. It is an authoritative work which will meet the needs both of those familiar with the field and newcomers to it.

A COMPUTATIONAL APPROACH TO STATISTICAL ARGUMENTS IN ECOLOGY AND EVOLUTION

Cambridge University Press **Scientists need statistics. Increasingly this is accomplished using computational approaches. Freeing readers from the constraints, mysterious formulas and sophisticated mathematics of classical statistics, this book is ideal for researchers who want to take control of their own statistical arguments. It demonstrates how to use spreadsheet macros to calculate the probability distribution predicted for any statistic by any hypothesis. This enables readers to use anything that can be calculated (or observed)**

from their data as a test statistic and hypothesize any probabilistic mechanism that can generate data sets similar in structure to the one observed. A wide range of natural examples drawn from ecology, evolution, anthropology, palaeontology and related fields give valuable insights into the application of the described techniques, while complete example macros and useful procedures demonstrate the methods in action and provide starting points for readers to use or modify in their own research.

ATTRIBUTION

A COMPUTATIONAL APPROACH

NUMERICAL METHODS FOR DIFFERENTIAL EQUATIONS

A COMPUTATIONAL APPROACH

CRC Press With emphasis on modern techniques, *Numerical Methods for Differential Equations: A Computational Approach* covers the development and application of methods for the numerical solution of ordinary differential equations. Some of the methods are extended to cover partial differential equations. All techniques covered in the text are on a program disk included with the book, and are written in Fortran 90. These programs are ideal for students, researchers, and practitioners because they allow for straightforward application of the numerical methods described in the text. The code is easily modified to solve new systems of equations. *Numerical Methods for Differential Equations: A Computational Approach* also contains a reliable and inexpensive global error code for those interested in global error estimation. This is a valuable text for students, who will find the derivations of the numerical methods extremely helpful and the programs themselves easy to use. It is also an excellent reference and source of software for researchers and practitioners who need computer solutions to differential equations.

ELEMENTS OF STOCHASTIC PROCESSES

A COMPUTATIONAL APPROACH

STOCHASTIC MODELLING AND ANALYSIS

A COMPUTATIONAL APPROACH

FUNDAMENTAL PROBABILITY

A COMPUTATIONAL APPROACH

John Wiley & Sons Incorporated This publication provides an introduction to the theory and techniques of probability and grew from a set of notes written by the author to accompany a two semester course consisting of senior undergraduate and first year graduate students from quantitative business (50%), economics (40%) and mathematics (10%).

SENTENCE COMPREHENSION AS A COGNITIVE PROCESS

A COMPUTATIONAL APPROACH

Cambridge University Press Presents a computational model of sentence processing that is grounded in decades of research in cognitive psychology and AI.

RETRIAL QUEUEING SYSTEMS

A COMPUTATIONAL APPROACH

Springer Science & Business Media The application of auto-repeat facilities in telephone systems, as well as the use of random access protocols in computer networks, have led to growing interest in retrial queueing models. Since much of the theory of retrial queues is complex from an analytical viewpoint, with this book the authors give a comprehensive and updated text focusing on approximate techniques and algorithmic methods for solving the analytically intractable models. *Retrial Queueing Systems: A Computational Approach* also Presents motivating examples in telephone and computer networks. Establishes a comparative analysis of the retrial queues versus standard queues with waiting lines and queues with losses. Integrates a wide range of techniques applied to the main M/G/1 and M/M/c retrial queues, and variants with general retrial times, finite population and the discrete-time case. Surveys basic results of the matrix-analytic formalism and emphasizes the related tools employed in retrial queues. Discusses a few selected retrial queues with QBD, GI/M/1 and M/G/1 structures. Features an abundance of numerical examples, and updates the existing literature. The book is intended for an audience ranging from advanced undergraduates to researchers interested not only in queueing theory, but also in applied probability, stochastic models of the operations research, and engineering. The prerequisite is a graduate course in stochastic processes, and a positive attitude to the algorithmic probability.

PLANNING AND UNDERSTANDING

A COMPUTATIONAL APPROACH TO HUMAN REASONING

""From Day to Day, a World War II concentration camp diary, one of the very few to survive, records the author's struggle, not only to survive, but to maintain his humanity, amidst the casual brutality and random terror that was the fate of a camp prisoner"--Provided by publisher"--

REPRESENTATIONS OF GROUPS

A COMPUTATIONAL APPROACH

Cambridge University Press The representation theory of finite groups has seen rapid growth in recent years with the development of efficient algorithms and computer algebra systems. This is the first book to provide an introduction to the ordinary and modular representation theory of finite groups with special emphasis on the computational aspects of the subject. Evolving from courses taught at Aachen University, this well-paced text is ideal for graduate-level study. The authors provide over 200 exercises, both theoretical and computational, and include worked examples using the computer algebra system GAP. These make the abstract theory tangible and engage students in real hands-on work. GAP is freely available from www.gap-system.org and readers can download source code and solutions to selected exercises from the book's web page.

ANTENNA ARRAYS

A COMPUTATIONAL APPROACH

John Wiley & Sons A comprehensive tutorial on the design and practical applications of antenna arrays An antenna array is an assembly of antenna elements that maximizes a received or transmitted signal in a desired direction. This practical book covers a wide range of antenna array topics that are becoming increasingly important in wireless applications, with emphasis on array design, applications, and computer modeling. Each chapter in *Antenna Arrays* builds upon the previous chapter, progressively addressing more difficult material. Beginning with basic electromagnetics/antennas/antenna systems information, the book then deals with the analysis and synthesis of arrays of point sources and their associated array factors. It presents a sampling of different antenna elements that replace these point sources, then presents element configurations that do not have to lie along a line or in a plane. The complex and difficult-to-predict interactions of elements and electromagnetic waves are introduced, along with computer modeling and experiments that are necessary for predicting the performance of arrays where mutual coupling is important. Then, various approaches to getting signals to and from the array elements to a computer where the signal detection takes place are explored, as are the numerical techniques behind smart antennas. The book emphasizes the computational methods used in the design and analysis of array antennas. Also featured are signal processing and numerical modeling algorithms, as well as pictures of antenna arrays and components provided by industry and government sources, with explanations of how they operate. Fully course-tested, *Antenna Arrays* serves as a complete text in phased array design and theory for advanced undergraduate- and graduate-level courses in electronics and communications, as well as a reference for practicing engineers and scientists in wireless communications, radar, and remote sensing.

COMPUTATIONAL COGNITIVE NEUROSCIENCE

Independently Published Introduction to computer modeling of the brain, to understand how people think. Networks of interacting neurons produce complex emergent behavior including perception, attention, motor control, learning, memory, language, and executive functions (motivation, decision making, planning, etc).

MATHEMATICS OF DATA SCIENCE: A COMPUTATIONAL APPROACH TO CLUSTERING AND CLASSIFICATION

SIAM This textbook provides a solid mathematical basis for understanding popular data science algorithms for clustering and classification and shows that an in-depth understanding of the mathematics powering these algorithms gives insight into the underlying data. It presents a step-by-step derivation of these algorithms, outlining their implementation from scratch in a computationally sound way. *Mathematics of Data Science: A Computational Approach to Clustering and Classification* proposes different ways of visualizing high-dimensional data to unveil hidden internal structures, and nearly every chapter includes graphical explanations and computed examples using publicly available data sets to highlight similarities and differences among the algorithms. This self-contained book is geared toward advanced undergraduate and beginning graduate students in the mathematical sciences, engineering, and computer science and can be used as the main text in a semester course. Researchers in any application area where data science methods

are used will also find the book of interest. No advanced mathematical or statistical background is assumed.

SYMMETRY AND CONDENSED MATTER PHYSICS

A COMPUTATIONAL APPROACH

Cambridge University Press Unlike existing texts, this book blends for the first time three topics in physics - symmetry, condensed matter physics and computational methods - into one pedagogical textbook. It includes new concepts in mathematical crystallography; experimental methods capitalizing on symmetry aspects; non-conventional applications such as Fourier crystallography, color groups, quasicrystals and incommensurate systems; as well as concepts and techniques behind the Landau theory of phase transitions. Adopting a computational approach to the application of group theoretical techniques to solving symmetry related problems, it dramatically alleviates the need for intensive calculations usually found in the presentation of symmetry. Writing computer programs helps the student achieve a firm understanding of the underlying concepts, and sample programs, based on Mathematica, are presented throughout the book. Containing over 150 exercises, this textbook is ideal for graduate students in condensed matter physics, materials science, and chemistry. Solutions and computer programs are available online at www.cambridge.org/9780521828451.

GRÖBNER BASES

A COMPUTATIONAL APPROACH TO COMMUTATIVE ALGEBRA

Springer Science & Business Media The origins of the mathematics in this book date back more than two thousand years, as can be seen from the fact that one of the most important algorithms presented here bears the name of the Greek mathematician Euclid. The word "algorithm" as well as the key word "algebra" in the title of this book come from the name and the work of the ninth-century scientist Mohammed ibn Musa al-Khwarizmi, who was born in what is now Uzbekistan and worked in Baghdad at the court of Harun al-Rashid's son. The word "algorithm" is actually a westernization of al-Khwarizmi's name, while "algebra" derives from "al-jabr," a term that appears in the title of his book *Kitab al-jabr wa'l muqabala*, where he discusses symbolic methods for the solution of equations. This close connection between algebra and algorithms lasted roughly up to the beginning of this century; until then, the primary goal of algebra was the design of constructive methods for solving equations by means of symbolic transformations. During the second half of the nineteenth century, a new line of thought began to enter algebra from the realm of geometry, where it had been successful since Euclid's time, namely, the axiomatic method.

INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS

A COMPUTATIONAL APPROACH

Springer Science & Business Media Combining both the classical theory and numerical techniques for partial differential equations, this thoroughly modern approach shows the significance of computations in PDEs and illustrates the strong interaction between mathematical theory and the development of numerical methods. Great care has been taken throughout the book to seek a sound balance between these techniques. The authors present the material at an easy pace and exercises ranging from the straightforward to the challenging have been included. In addition there are some "projects" suggested, either to refresh the students' memory of results needed in this course, or to extend the theories developed in the text. Suitable for undergraduate and graduate students in mathematics and engineering.

CLASSICAL MECHANICS

A COMPUTATIONAL APPROACH WITH EXAMPLES USING MATHEMATICA AND PYTHON

CRC Press *Classical Mechanics: A Computational Approach with Examples using Python and Mathematica* provides a unique, contemporary introduction to classical mechanics, with a focus on computational methods. In addition to providing clear and thorough coverage of key topics, this textbook includes integrated instructions and treatments of computation. Full of pedagogy, it contains both analytical and computational example problems within the body of each chapter. The example problems teach readers both analytical methods and how to use computer algebra systems and computer programming to solve problems in classical mechanics. End-of-chapter problems allow students to hone their skills in problem solving with and without the use of a computer. The methods presented in this book can then be used by students when solving problems in other fields both within and outside of physics. It is an ideal textbook for undergraduate students in physics, mathematics, and engineering studying classical mechanics. Features: Gives readers the "big picture" of classical mechanics and the importance of computation in the solution of problems in physics. Numerous example problems using both analytical and computational methods, as well as explanations as to how and why specific techniques were used. Online resources containing specific example codes to help students learn computational methods and write their own algorithms. A solutions manual is available via the Routledge Instructor Hub and extra code is available via the Support Material tab.

ABSTRACT ALGEBRA

A COMPUTATIONAL APPROACH

John Wiley & Sons

PLANNING AND UNDERSTANDING

A COMPUTATIONAL APPROACH TO HUMAN REASONING

"From Day to Day, a World War II concentration camp diary, one of the very few to survive, records the author's struggle, not only to survive, but to maintain his humanity, amidst the casual brutality and random terror that was the fate of a camp prisoner"--Provided by publisher"--

MECHANISMS IN CLASSICAL CONDITIONING

A COMPUTATIONAL APPROACH

Cambridge University Press "What mechanisms are involved in enabling us to generate predictions of what will happen in the near future? Although we use associative mechanisms as the basis to predict future events, such as using cues from our surrounding environment, timing, attentional, and configural mechanisms are also needed to improve this function. Timing mechanisms allow us to determine when those events will take place. ... Written for graduates and researchers in neuroscience, computer science, biomedical engineering and psychology, the author presents neural network models that incorporate these mechanisms and shows, through computer simulations, how they explain the multiple properties of associative learning"--Provided by publisher.

FINANCIAL MATHEMATICS

A COMPUTATIONAL APPROACH

Juta and Company Ltd This text indicates where a financial calculator can be effectively used. It also points out how (in a non-technical sense) the calculator is able to solve equations numerically when algebraic methods fail.

ADVANCING WOOD ARCHITECTURE

A COMPUTATIONAL APPROACH

Routledge In light of environmental challenges architecture is facing, wood is no longer regarded as outmoded, nostalgic, and rooted in the past, but increasingly recognized as one of the most promising building materials for the future. Recent years have seen unprecedented innovation of new technologies for advancing wood architecture. *Advancing Wood Architecture* offers a comprehensive overview of the new architectural possibilities that are enabled by cutting-edge computational technologies in wood construction. It provides both an overarching architectural understanding and in-depth technological information through built projects and the works of four leading design research groups in Europe. The projects presented include large scale, permanent buildings such as the ETH Arch-Tec Lab Building in Zurich, the Landesgartenschau Exhibition Hall near Stuttgart and the Boiler House in Hooke Park, UK, as well as, built research prototypes investigating additive robotic fabrication, folded plate structures and meteorosensitive building skins. Illustrated in full colour, the book showcases the latest technological developments in design computation, simulation and digital fabrication together with an architectural, engineering and manufacturing perspective, offering an outlook towards novel spatial and constructional opportunities of a material with unrivalled ecological virtues.

STOCHASTIC MODELING AND ANALYSIS

A COMPUTATIONAL APPROACH

John Wiley & Sons Incorporated An integrated treatment of models and computational methods for stochastic design and stochastic optimization problems. Through many realistic examples, stochastic models and algorithmic solution methods are explored in a wide variety of application areas. These include inventory/production control, reliability, maintenance, queueing, and computer and communication systems. Includes many problems, a significant number of which require the writing of a computer program.

INTERMEDIATE PROBABILITY

A COMPUTATIONAL APPROACH

John Wiley & Sons **Intermediate Probability** is the natural extension of the author's *Fundamental Probability*. It details several highly important topics, from standard ones such as order statistics, multivariate normal, and convergence concepts, to more advanced ones which are usually not addressed at this mathematical level, or have never previously appeared in textbook form. The author adopts a computational approach throughout, allowing the reader to directly implement the methods, thus greatly enhancing the learning experience and clearly illustrating the applicability, strengths, and weaknesses of the theory. The book: Places great emphasis on the numeric computation of convolutions of random variables, via numeric integration, inversion theorems, fast Fourier transforms, saddlepoint approximations, and simulation. Provides introductory material to required mathematical topics such as complex numbers, Laplace and Fourier transforms, matrix algebra, confluent hypergeometric functions, digamma functions, and Bessel functions. Presents full derivation and numerous computational methods of the stable Pareto and the singly and doubly non-central distributions. A whole chapter is dedicated to mean-variance mixtures, NIG, GIG, generalized hyperbolic and numerous related distributions. A whole chapter is dedicated to nesting, generalizing, and asymmetric extensions of popular distributions, as have become popular in empirical finance and other applications. Provides all essential programming code in Matlab and R. The user-friendly style of writing and attention to detail means that self-study is easily possible, making the book ideal for senior undergraduate and graduate students of mathematics, statistics, econometrics, finance, insurance, and computer science, as well as researchers and professional statisticians working in these fields.

INTRODUCTION TO PARTIAL DIFFERENTIAL EQUATIONS

A COMPUTATIONAL APPROACH

Springer Science & Business Media **Mathematics** is playing an ever more important role in the physical and biological sciences, provoking a blurring of boundaries between scientific disciplines and a resurgence of interest in the modern as well as the classical techniques of applied mathematics. This renewal of interest, both in research and teaching, has led to the establishment of the series: *Texts in Applied Mathematics (TAM)*. The development of new courses is a natural consequence of a high level of excitement on the research frontier as newer techniques, such as numerical and symbolic computer systems, dynamical systems, and chaos mix with and reinforce the traditional methods of applied mathematics. Thus, the purpose of this textbook series is to meet the current and future needs of these advances and encourage the teaching of new courses. TAM will publish textbooks suitable for use in advanced undergraduate and beginning graduate courses, and will complement the *Applied Mathematical Sciences (AMS)* series, which will focus on advanced textbooks and research-level monographs. Preface "It is impossible to exaggerate the extent to which modern applied mathematics has been shaped and fueled by the general availability of fast computers with large memories. Their impact on mathematics, both applied and pure, is comparable to the role of the telescopes in astronomy and microscopes in biology." ? Peter Lax, *Siam Rev.* Vol. 31 No. 4 Congratulations! You have chosen to study partial differential equations.

NEURO-FUZZY AND SOFT COMPUTING

A COMPUTATIONAL APPROACH TO LEARNING AND MACHINE INTELLIGENCE

Pearson Education **Neuro-Fuzzy and Soft Computing** provides the first comprehensive treatment of the constituent methodologies underlying neuro-fuzzy and soft computing, an evolving branch of computational intelligence. The constituent methodologies include fuzzy set theory, neural networks, data clustering techniques, and several stochastic optimization methods that do not require gradient information. In particular, the authors put equal emphasis on theoretical aspects of covered methodologies, as well as empirical observations and verifications of various applications in practice. The book is well suited for use as a text for courses on computational intelligence and as a single reference source for this emerging field. To help readers understand the material the presentation includes more than 50 examples, more than 150 exercises, over 300 illustrations, and more than 150 Matlab scripts. In addition, Matlab is utilized to visualize the processes of fuzzy reasoning, neural-network learning, neuro-fuzzy integration and training, and gradient-free optimization (such as genetic algorithms, simulated annealing, random search, and downhill Simplex method). The presentation also makes use of SIMULINK for neuro-fuzzy control system simulations. All Matlab scripts used in the book are available on the free companion software disk that may be ordered by using the enclosed reply card. The book also contains an "Internet Resource Page" to point the reader to on-line neuro-fuzzy and soft computing home pages, publications, public-domain software, research institutes, news groups, etc. All the HTTP and FTP addresses are available as a bookmark file on the companion software disk.

THE REWIRING BRAIN

A COMPUTATIONAL APPROACH TO STRUCTURAL PLASTICITY IN THE ADULT BRAIN

Academic Press **The adult brain is not as hard-wired as traditionally thought. By modifying their small- or large-scale morphology, neurons can make new synaptic connections or break existing ones (structural plasticity). Structural changes accompany memory formation and learning, and are induced by neurogenesis, neurodegeneration and brain injury such as stroke. Exploring the role of structural plasticity in the brain can be greatly assisted by mathematical and computational models, as they enable us to bridge the gap between system-level dynamics and lower level cellular and molecular processes. However, most traditional neural network models have fixed neuronal morphologies and a static connectivity pattern, with plasticity merely arising from changes in the strength of existing synapses (synaptic plasticity). In *The Rewiring Brain*, the editors bring together for the first time contemporary modeling studies that investigate the implications of structural plasticity for brain function and pathology. Starting with an experimental background on structural plasticity in the adult brain, the book covers computational studies on homeostatic structural plasticity, the impact of structural plasticity on cognition and cortical connectivity, the interaction between synaptic and structural plasticity, neurogenesis-related structural plasticity, and structural plasticity in neurological disorders. Structural plasticity adds a whole new dimension to brain plasticity, and *The Rewiring Brain* shows how computational approaches may help to gain a better understanding of the full adaptive potential of the adult brain. The book is written for both computational and experimental neuroscientists. Reviews the current state of knowledge of structural plasticity in the adult brain Gives a comprehensive overview of computational studies on structural plasticity Provides insights into the potential driving forces of structural plasticity and the functional implications of structural plasticity for learning and memory Serves as inspiration for developing novel treatment strategies for stimulating functional repair after brain damage**

WAVEFORM DESIGN FOR ACTIVE SENSING SYSTEMS

A COMPUTATIONAL APPROACH

Cambridge University Press **Ideal for researchers and practitioners looking to develop and use computational algorithms for waveform design in diverse active sensing applications.**

ENDS OF GROUPS

A COMPUTATIONAL APPROACH

COMPUTATIONAL APPROACHES FOR AEROSPACE DESIGN

THE PURSUIT OF EXCELLENCE

John Wiley & Sons **Over the last fifty years, the ability to carry out analysis as a precursor to decision making in engineering design has increased dramatically. In particular, the advent of modern computing systems and the development of advanced numerical methods have made computational modelling a vital tool for producing optimized designs. This text explores how computer-aided analysis has revolutionized aerospace engineering, providing a comprehensive coverage of the latest technologies underpinning advanced computational design. Worked case studies and over 500 references to the primary research literature allow the reader to gain a full understanding of the technology, giving a valuable insight into the world's most complex engineering systems. Key Features: Includes background information on the history of aerospace design and established optimization, geometrical and mathematical modelling techniques, setting recent engineering developments in a relevant context. Examines the latest methods such as evolutionary and response surface based optimization, adjoint and numerically differentiated sensitivity codes, uncertainty analysis, and concurrent systems integration schemes using grid-based computing. Methods are illustrated with real-world applications of structural statics, dynamics and fluid mechanics to satellite, aircraft and aero-engine design problems. Senior undergraduate and postgraduate engineering students taking courses in aerospace, vehicle and engine design will find this a valuable resource. It will also be useful for practising engineers and researchers working on computational approaches to design.**

INFINITESIMAL SYMMETRIES

A COMPUTATIONAL APPROACH

STOCHASTIC MODELLING AND ANALYSIS

A COMPUTATIONAL APPROACH

BIOSTATISTICS: A COMPUTING APPROACH

CRC Press **The emergence of high-speed computing has facilitated the development of many exciting statistical and mathematical methods in the last 25 years, broadening the landscape of available tools in statistical investigations of complex data. *Biostatistics: A Computing Approach* focuses on visualization and computational approaches associated with both modern and classical techniques. Furthermore, it promotes computing as a tool for performing both analyses and simulations that can facilitate such understanding. As a**

practical matter, programs in R and SAS are presented throughout the text. In addition to these programs, appendices describing the basic use of SAS and R are provided. Teaching by example, this book emphasizes the importance of simulation and numerical exploration in a modern-day statistical investigation. A few statistical methods that can be implemented with simple calculations are also worked into the text to build insight about how the methods really work. Suitable for students who have an interest in the application of statistical methods but do not necessarily intend to become statisticians, this book has been developed from Introduction to Biostatistics II, which the author taught for more than a decade at the University of Pittsburgh.

REPLICABLE FUNCTIONS

A COMPUTATIONAL APPROACH
