Agile Business Rule Development
Process, Architecture, and JRules Examples

J. Boyer, ILOG Inc., Sunnyvale, CA, USA; H. Mili, UQAM, Montreal, Canada

Features

► Presentation covers all relevant aspects of the business rules approach: foundations, methodology, architecture, and implementation (based on IBM’s JRules)
► Agile business rule development is a low-risk methodology that produces immediate value to business stakeholders and avoids analysis paralysis
► Additional material, including all deliverables for the insurance case study, is available on www.agilebrdevelopment.com
► Authors combine for more than 25 years of business rule development in industry, in various capacities (project management, business analysis, architecture, and implementation)

Business rules are everywhere. Every enterprise process, task, activity, or function is governed by rules. However, some of these rules are implicit and thus poorly enforced, others are written but not enforced, and still others are perhaps poorly written and obscurely enforced. The business rule approach looks for ways to elicit, communicate, and manage business rules in a way that all stakeholders can understand, and to enforce them within the IT infrastructure in a way that supports their traceability and facilitates their maintenance. Boyer and Mili will help you to adopt the business rules approach effectively. While most business rule development methodologies put a heavy emphasis on up-front business modeling and analysis, agile business rule development (ABRD) as introduced in this book is incremental, iterative, and test-driven. Rather than spending weeks discovering and analyzing rules for a complete business function, ABRD puts the emphasis on producing executable, tested rule sets early in the project without jeopardizing the quality, longevity, and maintainability of the end result. The authors’ presentation covers all four aspects required for a successful application of the business rules approach: (1) foundations, to understand what business rules are (and are not) and what they can do for you; (2) methodology, to understand how to apply the business rules approach; (3) architecture, to understand how rule automation impacts your application; (4) implementation, to actually deliver the technical solution within the context of a particular business rule management system (BRMS). Throughout the book, the authors use an insurance case study that deals with claim processing. Boyer and Mili cater to different audiences: Project managers will find a pragmatic, proven methodology for delivering and maintaining business rule applications. Business analysts and rule authors will benefit from guidelines and best practices for rule discovery and analysis. Application architects and software developers will appreciate an exploration of the design space for business rule applications, proven architectural and design patterns, and coding guidelines for using JRules.

From the contents

3rd Edition

Human Resources in China

C. Devonshire-Ellis, A. Scott, S. Woollard, Dezan Shira & Associates / Asia Briefing Ltd, Hong Kong (Eds.)

Features

- Focuses on specifics of the recruitment process in China
- Covers the most important issues relating to managing a Chinese workforce
- Useful reference for local HR managers and investors looking to establish a presence in mainland China

Due to the rapidly changing nature of the labor market and the laws that govern it in China, it can be very difficult for foreign investors and managers to understand how to manage human resources on the mainland. Specifically designed to cover the most important issues relating to managing a Chinese workforce, this guide details the HR issues that both local managers in China and investors looking to establish a presence on the mainland should know. China Briefing’s guides are leaders in their field, providing practical and pragmatic legal and tax information to foreign investors in the People’s Republic of China. They will interest all business people, lawyers, accountants and academics working in the field.

From the contents

Planning Production and Inventories in the Extended Enterprise
A State-of-the-Art Handbook, Volume 2
K. G. Kempf, Intel Corporation, AZ, USA; P. Keskinocak, Georgia Institute of Technology, GA, USA; R. Uzsoy, North Carolina State University, Raleigh, NC, USA (Eds.)

Features

► Closes important gaps between theory and practice
► Offers a systematic, comprehensive examination of current production planning problems and methods and formulations for solving them
► Covers the entire range of "real world" production planning
Editors are well-respected in their fields

In two volumes, Planning Production and Inventories in the Extended Enterprise: A State of the Art Handbook examines production planning across the extended enterprise against a backdrop of important gaps between theory and practice. The early chapters describe the multifaceted nature of production planning problems and reveal many of the core complexities. The middle chapters describe recent research on theoretical techniques to manage these complexities. Accounts of production planning system currently in use in various industries are included in the later chapters. Throughout the two volumes there are suggestions on promising directions for future work focused on closing the gaps.

Included in Volume 1 are papers on the Historical Foundations of Manufacturing Planning and Control; Advanced Planning and Scheduling Systems; Sustainable Product Development and Manufacturing; Uncertainty and Production Planning; Demand Forecasting; Production Capacity; Data in Production and Supply Chain Planning; Financial Uncertainty in SC Models; Field Based Research in Production Control; Collaborative SCM; Sequencing and Coordination in Outsourcing and Subcontracting Operations; Inventory Management; Pricing, Variety and Inventory Decisions for Substitutable Items; Perishable and Aging Inventories; Optimization Models of Production Planning Problems; Aggregate Modeling of Manufacturing Systems; Robust Stability Analysis of Decentralized Supply Chains; Simulation in Production Planning; and Simulation-Optimization in Support of Tactical and Strategic Enterprise Decisions.

Included in Volume 2 are papers on Workload and Lead-Time Considerations under Uncertainty; Production Planning and Scheduling; Production Planning Effects on Dynamic Behavior of A Simple Supply Chain; Supply and Demand in Assemble-to-Order Supply Chains; quantitative Risk Assessment in Supply Chains; A Practical Multi-Echelon Inventory Model with Semiconductor Application; Supplier Managed Inventory for Custom Items with Long Lead Times; Decentralized Supply Chain Formation; A Cooperative Game Approach to Procurement Network Formation; Flexible SC Contracts with Options; Build-to-Order Meets Global Sourcing for the Auto Industry; Practical Modeling in Automotive Production; Discrete Event Simulation Models; Diagnosing and Tuning a Statistical Forecasting System; Enterprise-Wide SC Planning in Semiconductor and Package Operations; Production Planning in Plastics; SC Execution Using Predictive Control; Production Scheduling in The Pharmaceutical Industry; Computerized Scheduling for Continuous Casting in Steelmaking; and Multi-Model Production Planning and Scheduling in an Industrial Environment.
In-Memory Data Management
An Inflection Point for Enterprise Applications
H. Plattner, A. Zeier, Hasso Plattner Institute, Potsdam, Germany

Features
► In-memory computing
► Flexible, real-time reporting on current data Multi-core CPUs, large main memories, cloud computing and powerful mobile devices
► Analytical and transactional processing at the speed of thought
► Inflection Point for Enterprise Applications

In the last 50 years the world has been completely transformed through the use of IT. We have now reached a new inflection point. Here we present, for the first time, how in-memory computing is changing the way businesses are run. Today, enterprise data is split into separate databases for performance reasons. Analytical data resides in warehouses, synchronized periodically with transactional systems. This separation makes flexible, real-time reporting on current data impossible. Multi-core CPUs, large main memories, cloud computing and powerful mobile devices are serving as the foundation for the transition of enterprises away from this restrictive model. We describe techniques that allow analytical and transactional processing at the speed of thought and enable new ways of doing business. The book is intended for university students, IT-professionals and IT-managers, but also for senior management who wish to create new business processes by leveraging in-memory computing.

From the contents
Foreword by Prof. John L. Hennessy (Stanford University, California, USA) and Prof. David A. Patterson (University of California at Berkeley, USA). - Preface. – Introduction. - PART I – An Inflection Point for Enterprise Applications. - 1 Desirability, Feasibility, Viability – The Impact of In-Memory. - 2 Why Are Enterprise Applications So Diverse? - 3 SanssouciDB – Blueprint for an In-Memory Enterprise Database System. - PART II – SanssouciDB – A Single Source of Truth through In-Memory. - 4 The Technical Foundations of SanssouciDB. - 5 Organizing and Accessing Data in SanssouciDB. - PART III – How In-Memory Changes the Game. - 6 Application Development. - 7 Finally, a Real Business Intelligence System Is at Hand. - 8 Scaling SanssouciDB in the Cloud. - 9 The In-Memory Revolution Has Begun. - References. - Glossary. - Abbreviations. - Index
2nd Edition

Spirituality and Ethics in Management

L. Zsolnai, Corvinus University of Budapest, Hungary (Ed.)

Features

► Provides a pluralistic approach to spirituality and management
► Balances Eastern (Hindu) and Western (Christian) management views and models
► Gives advises to improve the ethical quality of organizations

The book - which was originally published by Kluwer in 2004 - is a collection of scholarly papers focusing on the role of spirituality and ethics in renewing the contemporary management praxis. The basic argument is that a more inclusive, holistic and peaceful approach to management is needed if business and political leaders are to uplift the environmentally degrading and socially disintegrating world of our age. The book uses diverse value-per-spectives (Hindu, Catholic, Buddhist, and Humanist) and a variety of disciplines (philosophy, ethics, management studies, psychology, and organizational sciences) to extend traditional reflections on corporate purpose and focuses on a self-referential organizational-existential search for meaning, identity and success.

From the contents

Social Network Data Analytics

C. C. Aggarwal, IBM T.J. Watson Research Center, Hawthorne, NY, USA (Ed.)

Features

▶ Spans a wide range of topics in social network data mining including Structural Properties of Social Networks, Algorithms for Structural Discovery of Social Networks and Content Analysis in Social Networks
▶ Emphasis is placed on simplifying the content for maximum benefit to advanced students and practitioners
▶ Includes case studies

Social network analysis applications have experienced tremendous advances within the last few years due in part to increasing trends towards users interacting with each other on the internet. Social networks are organized as graphs, and the data on social networks takes on the form of massive streams, which are mined for a variety of purposes. Social Network Data Analytics covers an important niche in the social network analytics field. This edited volume, contributed by prominent researchers in this field, presents a wide selection of topics on social network data mining such as Structural Properties of Social Networks, Algorithms for Structural Discovery of Social Networks and Content Analysis in Social Networks. This book is also unique in focussing on the data analytical aspects of social networks in the internet scenario, rather than the traditional sociology-driven emphasis prevalent in the existing books, which do not focus on the unique data-intensive characteristics of online social networks. Emphasis is placed on simplifying the content so that students and practitioners benefit from this book. This book targets advanced level students and researchers concentrating on computer science as a secondary text or reference book. Data mining, database, information security, electronic commerce and machine learning professionals will find this book a valuable asset, as well as primary associations such as ACM, IEEE and Management Science.

From the contents

Handbook of Semantic Web Technologies

J. Domingue, The Open University, Milton Keynes, UK; D. Fensel, STI Innsbruck, Austria; J. A. Hendler, Rensselaer Polytechnic Institute, Troy, NY, USA (Eds.)

Features

► The only comprehensive reference work about the Semantic Web currently available
► Describes both fundamental research and major applications areas like bioinformatics, life sciences, business, education, and others
► Ideal for researchers who need in-depth introduction into all areas related to Semantic Web research and applications
► Contributions written and edited by main authorities in this field

After years of mostly theoretical research, Semantic Web Technologies are now emerging into application areas like bioinformatics, eCommerce, eGovernment and Social Webs. The Handbook of Semantic Web Technologies, compiled by three leading authorities in the field, and supported by an advisory board of highly reputed researchers, fulfils exactly this need. It is the first dedicated reference work in this field, collecting contributions about both the technical foundations of the Semantic Web as well as their main usage in other scientific fields like life sciences, engineering, business, or education.

From the contents

Introduction to Artificial Intelligence

W. Ertel, Hochschule Ravensburg-Weingarten, Weingarten, Germany
Translated by: N. T. Black, California Polytechnic State University, San Luis Obispo, CA, USA

Features

► An ideal, quick resource on A.I., excellent for self-study
► Presents an application-focused and hands-on approach to learning the subject
► Provides study exercises at the end of each chapter, in addition to highlighted examples, definitions, theorems, and illustrative cartoons

This concise and accessible textbook supports a foundation or module course on A.I., covering a broad selection of the subdisciplines within this field. The book presents concrete algorithms and applications in the areas of agents, logic, search, reasoning under uncertainty, machine learning, neural networks and reinforcement learning. Topics and features: presents an application-focused and hands-on approach to learning the subject; provides study exercises of varying degrees of difficulty at the end of each chapter, with solutions given at the end of the book; supports the text with highlighted examples, definitions, and theorems; includes chapters on predicate logic, PROLOG, heuristic search, probabilistic reasoning, machine learning and data mining, neural networks and reinforcement learning; contains an extensive bibliography for deeper reading on further topics; supplies additional teaching resources, including lecture slides and training data for learning algorithms, at an associated website.

From the contents
Introduction.- Propositional Logic.- First-order Predicate Logic.- Limitations of Logic.- Logic Programming with PROLOG.- Search, Games and Problem Solving.- Reasoning with Uncertainty.- Machine Learning and Data Mining.- Neural Networks.- Reinforcement Learning.- Solutions for the Exercises.
Real-Time Systems
Design Principles for Distributed Embedded Applications
H. Kopetz, Technische Universität Wien, Austria

Features
► Revised and updated version of the best-selling 1997 first edition from key researcher in the field
► New developments addressed, such as energy and power management, dependability, security, internet functions, scheduling
► A standard text in real-time embedded systems or cyber-physical systems, including summary exercises for readers of all levels
► Useful as a reference for students, researchers and practitioners alike

“This book is a comprehensive text for the design of safety critical, hard real-time embedded systems. It offers a splendid example for the balanced, integrated treatment of systems and software engineering, helping readers tackle the hardest problems of advanced real-time system design, such as determinism, compositionality, timing and fault management. This book is an essential reading for advanced undergraduates and graduate students in a wide range of disciplines impacted by embedded computing and software. Its conceptual clarity, the style of explanations and the examples make the abstract concepts accessible for a wide audience.”

Janos Sztipanovits, Director of Software Integrated Systems InstituteE. Bronson Ingram Distinguished Professor of EngineeringVanderbilt University

Real-Time Systems focuses on hard real-time systems, which are computing systems that must meet their temporal specification in all anticipated load and fault scenarios. The book stresses the system aspects of distributed real-time applications, treating the issues of real-time, distribution and fault-tolerance from an integral point of view. A unique cross-fertilization of ideas and concepts between the academic and industrial worlds has led to the inclusion of many insightful examples from industry to explain the fundamental scientific concepts in a real-world setting. Compared to the first edition, new developments in complexity management, energy and power management, dependability, security, and the internet of things, are addressed. The book is written as a standard textbook for a high-level undergraduate or graduate course on real-time embedded systems or cyber-physical systems. Its practical approach to solving real-time problems, along with numerous summary exercises, makes it an excellent choice for researchers and practitioners alike.

From the contents
E-Librarian Service
User-Friendly Semantic Search in Digital Libraries
S. Linckels, C. Meinel, Hasso-Plattner-Institut (HPI), Potsdam, Germany

Features
► Offers an overview of several related and current research topics in computer-science, including Semantic Web technologies, natural language processing, and information retrieval
► Provides a solution to current problems in digital libraries, including how to retrieve, in a reliable and user friendly way, pertinent documents from a multimedia knowledge base
► Explains complex subjects, like information retrieval, semantic technologies or descriptive logics, with multiple examples and illustrations

This book introduces a new approach to designing E-Librarian Services. With the help of this system, users will be able to retrieve multimedia resources from digital libraries more efficiently than they would by browsing through an index or by using a simple keyword search. E-Librarian Services combine recent advances in multimedia information retrieval with aspects of human-machine interfaces, such as the ability to ask questions in natural language; they simulate a human librarian by finding and delivering the most relevant documents that offer users potential answers to their queries. The premise is that more pertinent results can be retrieved if the search engine understands the meaning of the query; the returned results are therefore logical consequences of an inference rather than of keyword matches. Moreover, E-Librarian Services always provide users with a solution, even in situations where they are unable to offer a comprehensive answer.

From the contents
Pattern Recognition
An Algorithmic Approach
M. N. Murty, V. S. Devi, Indian Institute of Science, Bangalore, India

Features
► Contains numerous exercises, as well as learning objectives and summaries for each chapter
► Explains the hidden Markov model for speech and speaker recognition tasks
► Discusses support vector machines, with suitable examples

Observing the environment and recognising patterns for the purpose of decision making is fundamental to human nature. This book deals with the scientific discipline that enables similar perception in machines through pattern recognition (PR), which has application in diverse technology areas. This book is an exposition of principal topics in PR using an algorithmic approach. It provides a thorough introduction to the concepts of PR and a systematic account of the major topics in PR besides reviewing the vast progress made in the field in recent times. It includes basic techniques of PR, neural networks, support vector machines and decision trees. While theoretical aspects have been given due coverage, the emphasis is more on the practical. The book is replete with examples and illustrations and includes chapter-end exercises. It is designed to meet the needs of senior undergraduate and postgraduate students of computer science and allied disciplines.

From the contents
Analysis for Computer Scientists
Foundations, Methods, and Algorithms
M. Oberguggenberger, A. Ostermann, University of Innsbruck, Austria

Features
- Presents an algorithmic approach to mathematical analysis, with a focus on modelling and on the applications of analysis
- Makes thorough use of examples and explanations using MATLAB, Maple, and Java applets
- Describes mathematical theory alongside the basic concepts and methods of numerical analysis, supported by computer experiments and programming exercises

This textbook presents an algorithmic approach to mathematical analysis, with a focus on modelling and on the applications of analysis. Fully integrating mathematical software into the text as an important component of analysis, the book makes thorough use of examples and explanations using MATLAB, Maple, and Java applets. Mathematical theory is described alongside the basic concepts and methods of numerical analysis, supported by computer experiments and programming exercises, and an extensive use of figure illustrations. Features: thoroughly describes the essential concepts of analysis; provides summaries and exercises in each chapter, as well as computer experiments; discusses important applications and advanced topics; presents tools from vector and matrix algebra in the appendices, together with further information on continuity; includes definitions, propositions and examples throughout the text; supplementary software can be downloaded from the book's webpage.

From the contents
3rd Edition

Principles of Distributed Database Systems, Third Edition

M. T. Özsu, University of Waterloo, Waterloo, Ontario, Canada; P. Valduriez, Montpellier, France

Features

► Third edition of leading textbook on the topic
► Distributed data management re-emerging as key topic with increasing growth of web, cloud, cluster computing
► Covers both traditional material and emerging areas
► Ancillary teaching materials available

This third edition of a classic textbook can be used to teach at the senior undergraduate and graduate levels. The material concentrates on fundamental theories as well as techniques and algorithms.

The advent of the Internet and the World Wide Web, and, more recently, the emergence of cloud computing and streaming data applications, has forced a renewal of interest in distributed and parallel data management, while, at the same time, requiring a rethinking of some of the traditional techniques. This book covers the breadth and depth of this re-emerging field.

The coverage consists of two parts. The first part discusses the fundamental principles of distributed data management and includes distribution design, data integration, distributed query processing and optimization, distributed transaction management, and replication. The second part focuses on more advanced topics and includes discussion of parallel database systems, distributed object management, peer-to-peer data management, web data management, data stream systems, and cloud computing.

New in this Edition:
New chapters, covering database replication, database integration, multidatabase query processing, peer-to-peer data management, and web data management; Coverage of emerging topics such as data streams and cloud computing; Extensive revisions and updates based on years of class testing and feedback; Ancillary teaching materials are available.

From the contents

Encyclopedia of Parallel Computing

D. Padua, University of Illinois at Urbana-Champaign, Urbana, IL, USA (Ed.)

Features

► Definitive coverage of Parallel Programming
► A point of quick entry into the field for researchers of all levels
► The Editor-in-Chief is a leader in the field, supported by an internationally recognized Editorial Board
► The corresponding Springer premium journal is the International Journal of Parallel Programming

The Encyclopedia of Parallel Computing covers machine organization, programming, algorithms, and applications. Within each topic area, the Encyclopedia covers concepts, designs, and specific implementations.

The Algorithms area covers concepts such as cache-oblivious algorithms and systolic algorithms; specific numerical and non-numerical algorithms such as parallel matrix-matrix multiplication and graph algorithms; and implementations of algorithms in the form of widely used libraries such as LAPACK. In the area of Architectures, the Encyclopedia reviews sequential consistency and cache coherency; machine classes such as shared-memory multiprocessors and dataflow machines; and specific machines such as IBM’s cell processor and Intel’s multicore machines. The Software area covers concepts such as races and autoparallelization; and designs in the form of parallel programming languages, library interfaces, and operating systems. The Encyclopedia also covers application issues, emphasizing the type of parallel computation involved and the magnitude in terms of computational requirements of the applications.

From the contents

Process Mining
Discovery, Conformance and Enhancement of Business Processes
W. M. van der Aalst, Eindhoven University of Technology, The Netherlands

Features
► First book on process mining, bridging the gap between business process modeling and business intelligence
► Written by one of the most influential and most-cited computer scientists and the best-known BPM researcher
► Self-contained and comprehensive overview for a broad audience in academia and industry
► The reader can put process mining into practice immediately due to the applicability of the techniques and the availability of the open-source process mining software ProM

More and more information about business processes is recorded by information systems in the form of so-called “event logs”. Despite the omnipresence of such data, most organizations diagnose problems based on fiction rather than facts. Process mining is an emerging discipline based on process model-driven approaches and data mining. It not only allows organizations to fully benefit from the information stored in their systems, but it can also be used to check the conformance of processes, detect bottlenecks, and predict execution problems.

Wil van der Aalst delivers the first book on process mining. It aims to be self-contained while covering the entire process mining spectrum from process discovery to operational support. In Part I, the author provides the basics of business process modeling and data mining necessary to understand the remainder of the book. Part II focuses on process discovery as the most important process mining task. Part III moves beyond discovering the control flow of processes and highlights conformance checking, and organizational and time perspectives. Part IV guides the reader in successfully applying process mining in practice, including an introduction to the widely used open-source tool ProM. Finally, Part V takes a step back, reflecting on the material presented and the key open challenges.

Overall, this book provides a comprehensive overview of the state of the art in process mining. It is intended for business process analysts, business consultants, process managers, graduate students, and BPM researchers.

From the contents
Macroeconomics from the Bottom-up

D. Delli Gatti, S. Desiderio, Università Cattolica di Milano, Italy; E. Gaffeo, Università di Trento, Italy; P. Cirillo, University of Bern, Switzerland; M. Gallegati, Università Politecnica delle Marche, Ancona, Italy

Features

► Two foundational chapters on Bottom-up Adaptive Macroeconomics
► First complete analysis of an agent-based macroeconomic model, from theoretical foundation to empirical testing
► Chapter on agent-based models’ validation

This book arose from our conviction that the NNS-DSGE approach to the analysis of aggregate market outcomes is fundamentally flawed. The practice of overcoming the SMD result by recurring to a fictitious RA leads to insurmountable methodological problems and lies at the root of DSGE models’ failure to satisfactorily explain real world features, like exchange rate and banking crises, bubbles and herding in financial markets, swings in the sentiment of consumers and entrepreneurs, asymmetries and persistence in aggregate variables, and so on. At odds with this view, our critique rests on the premise that any modern macroeconomy should be modeled instead as a complex system of heterogeneous interacting individuals, acting adaptively and autonomously according to simple and empirically validated rules of thumb.

We call our proposed approach Bottom-up Adaptive Macroeconomics (BAM). The reason why we claim that the contents of this book can be inscribed in the realm of macroeconomics is threefold:

i) We are looking for a framework that helps us to think coherently about the interrelationships among two or more markets. In what follows, in particular, three markets will be considered: the markets for goods, labor and loanable funds. In this respect, real time matters: what happens in one market depends on what has happened, on what is happening, or on what will happen in other markets. This implies that intertemporal coordination issues cannot be ignored.

ii) Eventually, it’s all about prices and quantities. However, we are mostly interested in aggregate prices and quantities, that is indexes built from the dispersed outcomes of the decentralized transactions of a large population of heterogeneous individuals. Each individual acts purposefully, but she knows anything about the levels of prices and quantities which clear markets in the aggregate.

iii) In the hope of being allowed to purport scientific claims, BAM relies on the assumption that individual purposeful behaviours aggregates into regularities. Macro behaviour, however, can depart radically from what the individual units are trying to accomplish. It is in this sense that aggregate outcomes emerge from individual actions and interactions.
3rd Edition

Innovations in Macroeconomics

P. J. Welfens, University of Wuppertal, Germany

Features

► Novel approaches to innovation dynamics and growth in open economies
► New monetary and non-monetary growth models
► Discussion of rational innovation policies in OECD countries

Modern macroeconomics suffers from an unclear link between short-term Keynesian analysis and long-term growth modelling. This book presents a new link between monetary analysis and growth modelling in open economies. Structural change, innovations and growth are considered from a new perspective. With respect to economic policy - in particular innovation policy - the analysis implies major changes, concerning both EU countries and other leading OECD economies.

From the contents

2nd Edition

Vector-valued Laplace Transforms and Cauchy Problems

Second Edition

W. Arendt, University of Ulm, Germany; C. J. Batty, St. Johns College, Oxford, UK; M. Hieber, TU Darmstadt, Germany; F. Neubrander, Louisiana State University, Baton Rouge, USA

Features

- Standard reference on Laplace transforms
- Includes the nontrivial applications of functional analysis
- Accessible and self-contained text

This monograph gives a systematic account of the theory of vector-valued Laplace transforms, ranging from representation theory to Tauberian theorems. In parallel, the theory of linear Cauchy problems and semigroups of operators is developed completely in the spirit of Laplace transforms. Existence and uniqueness, regularity, approximation and above all asymptotic behaviour of solutions are studied. Diverse applications to partial differential equations are given. The book contains an introduction to the Bochner integral and several appendices on background material. It is addressed to students and researchers interested in evolution equations, Laplace and Fourier transforms, and functional analysis. The second edition contains detailed notes on the developments in the last decade. They include, for instance, a new characterization of well-posedness of abstract wave equations in Hilbert space due to M. Crouzeix. Moreover new quantitative results on asymptotic behaviour of Laplace transforms have been added. The references are updated and some errors have been corrected.

From the contents

Proofs and Fundamentals
A First Course in Abstract Mathematics
E. D. Bloch, Department of Mathematics, Bard College, Annandale-on-Hudson, NY, USA

Features
- Motivation and informal discussion play a key role
- The material is presented in the way that mathematicians actually use it; good mathematical taste is preferred to overly clever pedagogy
- There is an important section devoted to the proper writing of proofs

“Proofs and Fundamentals: A First Course in Abstract Mathematics” 2nd edition is designed as a "transition" course to introduce undergraduates to the writing of rigorous mathematical proofs, and to such fundamental mathematical ideas as sets, functions, relations, and cardinality. The text serves as a bridge between computational courses such as calculus, and more theoretical, proofs-oriented courses such as linear algebra, abstract algebra and real analysis. This 3-part work carefully balances Proofs, Fundamentals, and Extras. Part 1 presents logic and basic proof techniques; Part 2 thoroughly covers fundamental material such as sets, functions and relations; and Part 3 introduces a variety of extra topics such as groups, combinatorics and sequences. A gentle, friendly style is used, in which motivation and informal discussion play a key role, and yet high standards in rigor and in writing are never compromised.

New to the second edition:
1) A new section about the foundations of set theory has been added at the end of the chapter about sets. This section includes a very informal discussion of the Zermelo–Fraenkel Axioms for set theory. We do not make use of these axioms subsequently in the text, but it is valuable for any mathematician to be aware that an axiomatic basis for set theory exists. Also included in this new section is a slightly expanded discussion of the Axiom of Choice, and new discussion of Zorn’s Lemma, which is used later in the text.
2) The chapter about the cardinality of sets has been rearranged and expanded. There is a new section at the start of the chapter that summarizes various properties of the set of natural numbers; these properties play important roles subsequently in the chapter. The sections on induction and recursion have been slightly expanded, and have been relocated to an earlier place in the chapter (following the new section), both because they are more concrete than the material found in the other sections of the chapter, and because ideas from the sections on induction and recursion are used in the other sections. Next comes the section on the cardinality of sets (which was originally the first section of the chapter); this section gained proofs of the Schroeder–Bernstein theorem and the Trichotomy Law for Sets, and lost most of the material about finite and countable sets, which has now been moved to a new section devoted to those two types of sets. The chapter concludes with the section on the cardinality of the number systems.
The Structure of the Real Line

L. Bukovský, University P. J. Šafárik, Košice, Slovakia

Features

- Study of the real line taking into account recent results of set theory
- Self-contained, all necessary results being revisited
- Includes appendix with concise explanation of the metamathematics behind set theory
- Exercises with additional results at the end of each section

The rapid development of set theory in the last fifty years, mainly by obtaining plenty of independence results, strongly influenced an understanding of the structure of the real line. This book is devoted to the study of the real line and its subsets taking into account the recent results of set theory. Whenever possible the presentation is done without the full axiom of choice. Since the book is intended to be self-contained, all necessary results of set theory, topology, measure theory, and descriptive set theory are revisited with the purpose of eliminating superfluous use of an axiom of choice. The duality of measure and category is studied in a detailed manner. Several statements pertaining to properties of the real line are shown to be undecidable in set theory. The metamathematics behind set theory is shortly explained in the appendix. Each section contains a series of exercises with additional results.

From the contents

Preface.- 1 Introduction.- 2 The Real Line.- 3 Topology of Euclidean Spaces.- 4 Measure Theory.- 5 Useful Tools and Technologies.- 6 Descriptive Set Theory.- 7 Decline and Fall of the Duality.- 8 Special Sets of Reals.- 9 Additional Axioms.- 10 Undecidable Statements.- 11 Appendix.- Bibliography.- Index of Notation.- Index.
Probability and Stochastics

E. Çinlar, Operations Research and Financial Engineering, Princeton University, Princeton, NJ, USA

Features
- Includes high quality exercises
- Written with clear explanations
- Provides a nice balance of theory and applications

This text is an introduction to the modern theory and applications of probability and stochastics. The style and coverage is geared towards the theory of stochastic processes, but with some attention to the applications. In many instances the gist of the problem is introduced in practical, everyday language and then is made precise in mathematical form. The first four chapters are on probability theory: measure and integration, probability spaces, conditional expectations, and the classical limit theorems. There follows chapters on martingales, Poisson random measures, Levy Processes, Brownian motion, and Markov Processes. Special attention is paid to Poisson random measures and their roles in regulating the excursions of Brownian motion and the jumps of Levy and Markov processes. Each chapter has a large number of varied examples and exercises. The book is based on the author's lecture notes in courses offered over the years at Princeton University. These courses attracted graduate students from engineering, economics, physics, computer sciences, and mathematics. Erhan Cinlar has received many awards for excellence in teaching, including the President's Award for Distinguished Teaching at Princeton University. His research interests include theories of Markov processes, point processes, stochastic calculus, and stochastic flows. The book is full of insights and observations that only a lifetime researcher in probability can have, all told in a lucid yet precise style.

From the contents
Lattice Theory: Foundation

G. Grätzer, University of Manitoba, Winnipeg, Canada

Features
► Authoritative introduction to lattice theory for graduate students
► Standard reference work for researchers in this area
► First of two volumes of the substantially revised and enlarged third edition


The First Edition set out to introduce and survey lattice theory. Some 12,000 papers have been published in the field since then; so Lattice Theory: Foundation focuses on introducing the field, laying the foundation for special topics and applications.

Lattice Theory: Foundation, based on the previous three books, covers the fundamental concepts and results. The main topics are distributivity, congruences, constructions, modularity and semimodularity, varieties, and free products. The chapter on constructions is new, all the other chapters are revised and expanded versions from the earlier volumes.

Almost 40 "diamond sections", many written by leading specialists in these fields, provide a brief glimpse into special topics beyond the basics.

“Lattice theory has come a long way... For those who appreciate lattice theory, or who are curious about its techniques and intriguing internal problems, Professor Grätzer’s lucid new book provides a most valuable guide to many recent developments. Even a cursory reading should provide those few who may still believe that lattice theory is superficial or naive, with convincing evidence of its technical depth and sophistication.”
Bulletin of the American Mathematical Society

“Grätzer’s book General Lattice Theory has become the lattice theorist’s bible.”
Mathematical Reviews

From the contents
3rd Edition

Introduction to Calculus and Classical Analysis

O. Hijab, Department of Mathematics, Temple University, Philadelphia, PA 19122 USA

Features

- Approaches calculus and introductory analysis in a nonstandard way
- New edition extensively revised and updated
- Completely self-contained text

This text is intended for an honors calculus course or for an introduction to analysis. Involving rigorous analysis, computational dexterity, and a breadth of applications, it is ideal for undergraduate majors. This third edition includes corrections as well as some additional material. Some features of the text: The text is completely self-contained and starts with the real number axioms; The integral is defined as the area under the graph, while the area is defined for every subset of the plane; There is a heavy emphasis on computational problems, from the high-school quadratic formula to the formula for the derivative of the zeta function at zero; There are applications from many parts of analysis, e.g., convexity, the Cantor set, continued fractions, the AGM, the theta and zeta functions, transcendental numbers, the Bessel and gamma functions, and many more; Traditionally transcendently presented material, such as infinite products, the Bernoulli series, and the zeta functional equation, is developed over the reals; There are 385 problems with all the solutions at the back of the text.

Review from first edition

This is a very intriguing, decidedly unusual, and very satisfying treatment of calculus and introductory analysis. It’s full of quirky little approaches to standard topics that make one wonder over and over again, ‘Why is it never done like this?’ John Allen Paulos, A Mathematician Reads the Newspaper

From the contents

Preface - 1 The Set of Real Numbers - 2 Continuity - 3 Differentiation - 4 Integration - 5 Applications - A Solutions - References - Index
2nd Edition
An Introduction to the Mathematical Theory of Inverse Problems

A. Kirsch, Universität (TH) Karlsruhe, Germany

Features
► Offers a good mixture of general results and particular cases
► Covers electrical impedance tomography and the Factorization Method
► New edition features new chapters

This book introduces the reader to the area of inverse problems. The study of inverse problems is of vital interest to many areas of science and technology such as geophysical exploration, system identification, nondestructive testing and ultrasonic tomography. The aim of this book is twofold: in the first part, the reader is exposed to the basic notions and difficulties encountered with ill-posed problems. Basic properties of regularization methods for linear ill-posed problems are studied by means of several simple analytical and numerical examples. The second part of the book presents two special nonlinear inverse problems in detail - the inverse spectral problem and the inverse scattering problem. The corresponding direct problems are studied with respect to existence, uniqueness and continuous dependence on parameters. Then some theoretical results as well as numerical procedures for the inverse problems are discussed. The choice of material and its presentation in the book are new, thus making it particularly suitable for graduate students. Basic knowledge of real analysis is assumed. In this new edition, the Factorization Method is included as one of the prominent members in this monograph. Since the Factorization Method is particularly simple for the problem of EIT and this field has attracted a lot of attention during the past decade a chapter on EIT has been added in this monograph as Chapter 5 while the chapter on inverse scattering theory is now Chapter 6. The main changes of this second edition compared to the first edition concern only Chapters 5 and 6 and the Appendix A. Chapter 5 introduces the reader to the inverse problem of electrical impedance tomography.

From the contents
Introduction and Basic Concepts.- Regularization Theory for Equations of the First Kind.- Regularization by Discretization.- Inverse Eigenvalue Problems.- An Inverse Problem in Electrical Impedance Tomography.- An Inverse Scattering Problem.- References.- Index.
The Elements of Operator Theory
C. S. Kubrusly, Catholic University of Rio de Janeiro, Rio de Janeiro, Brazil

Features
- Second edition of popular textbook
- Includes more than 300 fully rigorous proofs, specially tailored to the presentation
- Features as many as 150 examples, and several interesting counterexamples, that demonstrate the frontiers of an important theorem

Elements of Operator Theory is largely self-contained and geared towards graduate students, mathematicians and scientists who need to apply operator theory to their field. Written in a user-friendly, motivating style, fundamental topics are presented systematically, i.e., set theory, algebraic structures, topological structures, Banach spaces, Hilbert Spaces, culminating with the Spectral Theorem. The exposition is concept-driven and avoids the formula-computational approach. Key features: * presents required background material to each chapter * offers 300 rigorous proofs * more than 100 examples and interesting counterexamples * over 300 problems, many with hints.

From the contents
Forthcoming
Due April 2011

2nd Edition
A Primer on Scientific Programming with Python
H. P. Langtangen, Simula Research Laboratory, Lysaker, Norway

Features
► Example-oriented text with all applications taken from science and engineering
► Aimed at newcomers to programming and Python, but many of the examples are useful for professionals too
► All examples are accompanied by complete program codes, which can be modified to the reader's needs
► Covers both Matlab-style "simple" programming and object-oriented programming
► Demonstrates how Python can be an alternative to Matlab in scientific computing

The book serves as a first introduction to computer programming of scientific applications, using the high-level Python language. The exposition is example- and problem-oriented, where the applications are taken from mathematics, numerical calculus, statistics, physics, biology, and finance. The book teaches "Matlab-style" and procedural programming as well as object-oriented programming. High school mathematics is a required background, and it is advantageous to study classical and numerical one-variable calculus in parallel with reading this book. Besides learning how to program computers, the reader will also learn how to solve mathematical problems, arising in various branches of science and engineering, with the aid of numerical methods and programming. By blending programming, mathematics and scientific applications, the book lays a solid foundation for practicing computational science.

From the contents
2nd Edition

Topology, Geometry and Gauge fields
Interactions
G. L. Naber, Drexel University, Philadelphia, PA, USA

Features
► Detailed survey of Donaldson-Witten Theory and the Witten Conjecture
► Chapter and section summaries
► Detailed illustrations
► Exercises at the end of chapters

During the past two decades gauge theory has been the focus of intense mathematical scrutiny. This book, together with the author's earlier book, Topology, Geometry and Gauge Fields: Foundations, Springer 1997, provides a gentle introduction to the basics of the subject with the somewhat unique feature of picking out what students need to know from both the mathematics and physics of the subject. Extensive exercises are included to encourage readers to actively participate in the material.

From the contents
An Invitation to Mathematics
From Competitions to Research
D. Schleicher, M. Lackmann, Jacobs University Bremen, Germany (Eds.)

Features
► Many contributions by world’s leading mathematicians
Active editing with readers from target reader group; not only written for young readers, but actually accessible by them
► Helps bridge the gap between high school and university (for talented students!)

This Invitation to Mathematics consists of 14 contributions, many from the world’s leading mathematicians, which introduce the readers to exciting aspects of current mathematical research. The contributions are as varied as the personalities of active mathematicians, but together they show mathematics as a rich and lively field of research. The contributions are written for interested students at the age of transition between high school and university who know high school mathematics and perhaps competition mathematics and who want to find out what current research mathematics is about. We hope that it will also be of interest to teachers or more advanced mathematicians who would like to learn about exciting aspects of mathematics outside of their own work or specialization. Together with a team of young "test readers", editors and authors have taken great care, through a substantial "active editing" process, to make the contributions understandable by the intended readership.

From the contents
Neutral and Indifference Portfolio Pricing, Hedging and Investing

With applications in Equity and FX

S. Stojanovic, University of Cincinnati, OH, USA

Features

► The work is based on the optimal portfolio-based theory, and allows for a complete solution of problems
► Offers new qualitative financial insights and predictions that are out of reach for standard pricing theory
► Coverage includes the pricing of the remaining risk in incomplete markets

This book is written for quantitative finance professionals, students, educators, and mathematically inclined individual investors. It is about some of the latest developments in pricing, hedging, and investing in incomplete markets. With regard to pricing, two frameworks are fully elaborated: neutral and indifference pricing. With regard to hedging, the most conservative and relaxed hedging formulas are derived. With regard to investing, the neutral pricing methodology is also considered as a tool for connecting market asset prices with optimal positions in such assets. Srdjan D. Stojanovic is Professor in the Department of Mathematical Sciences at University of Cincinnati (USA) and Professor in the Center for Financial Engineering at Suzhou University (China).

From the contents

Elliptic Partial Differential Equations
Volume 1: Fredholm Theory of Elliptic Problems in Unbounded Domains

V. Volpert, Université Claude Bernard Lyon 1, France

Features
- Offers a systematic investigation of general elliptic problems applicable both for bounded and unbounded domains
- Includes a focus on unbounded domains, which has not been sufficiently presented in the existing literature
- Gives a mostly self-contained presentation of the results

The theory of elliptic partial differential equations has undergone an important development over the last two centuries. Together with electrostatics, heat and mass diffusion, hydrodynamics and many other applications, it has become one of the most richly enhanced fields of mathematics. This monograph undertakes a systematic presentation of the theory of general elliptic operators. The author discusses a priori estimates, normal solvability, the Fredholm property, the index of an elliptic operator, operators with a parameter, and nonlinear Fredholm operators. Particular attention is paid to elliptic problems in unbounded domains which have not yet been sufficiently treated in the literature and which require some special approaches. The book also contains an analysis of non-Fredholm operators and discrete operators as well as extensive historical and bibliographical comments. The selected topics and the author’s level of discourse will make this book a most useful resource for researchers and graduate students working in the broad field of partial differential equations and applications.

From the contents
2nd Edition

**Statistical Tools for Finance and Insurance**

P. Cizek, University of Tilburg, Tilburg, The Netherlands; W. K. Härdle, C.A.S.E. Centre for Applied Statistics and Economics, Humboldt-Universität zu Berlin, Germany; R. Weron, Wroclaw University of Technology, Poland (Eds.)

**Features**

► Offers insight into new methods and the applicability of the stochastic technology
► Provides the tools, instruments and (online) algorithms for recent techniques in quantitative finance and modern treatments in insurance calculations
► Presents extensive examples

From the contents

I Finance: Models for heavy-tailed asset returns (Szymon Borak, Adam Misiorek, and Rafał Weron).- Expected shortfall (Simon A. Broda and Marc S. Paolella).- Modelling conditional heteroscedasticity in nonstationary series (Pavel Cížek).- FX smile in the Heston model (Agnieszka Janek, Tino Kluge, Rafał Weron, and Uwe Wystup).- Pricing of Asian temperature risk (Fred Espen Benth, Wolfgang Karl Härdle, and Brenda Lopez Cabrera).- Variance swaps (Wolfgang Karl Härdle and Elena Silyakova).- Learning machines to help predict bankruptcy (Wolfgang Karl Härdle, Linda Hoffmann, and Rouslan Moro).- Distance matrix method for network structure analysis (Janusz Mískiewicz).- II Insurance: Building loss models (Krzysztof Burnecki, Joanna Janczura, and Rafał Weron).- Ruin probability in finite time (Krzysztof Burnecki and Marek Teuerle).- Property and casualty insurance pricing with GLMs (Jan Iwanik).- Pricing of catastrophe bonds (Krzysztof Burnecki, Grzegorz Kukla, and David Taylor).- Return distributions of equity-linked retirement plans (Nils Detering, Andreas Weber, and Uwe Wystup).- Index.
Probability for Statistics and Machine Learning
Fundamentals and Advanced Topics
A. DasGupta, Purdue University, West Lafayette, Indiana, USA

Features
► Unification of probability, statistics, and machine learning tools
  provides a complete background for teaching and future research in multiple areas
► Lucid and encyclopedic coverage allows the user to find and
  conceptually understand numerous topics by using a single source
► 1225 worked out examples and exercises provide essential skills in
  problem solving and help in self-study

This book provides a versatile and lucid treatment of classic as well as modern probability
theory, while integrating them with core topics in statistical theory and also some key tools
in machine learning. It is written in an extremely accessible style, with elaborate motivating
discussions and numerous worked out examples and exercises. The book has 20 chapters
on a wide range of topics, 423 worked out examples, and 808 exercises. It is unique in its
unification of probability and statistics, its coverage and its superb exercise sets, detailed
bibliography, and in its substantive treatment of many topics of current importance. This
book can be used as a text for a year long graduate course in statistics, computer science, or
mathematics, for self-study, and as an invaluable research reference on probability and its
applications. Particularly worth mentioning are the treatments of distribution theory, asymp-
totics, simulation and Markov Chain Monte Carlo, Markov chains and martingales, Gaussian
processes, VC theory, probability metrics, large deviations, bootstrap, the EM algorithm,
confidence intervals, maximum likelihood and Bayes estimates, exponential families, kernels,
and Hilbert spaces, and a self contained complete review of univariate probability.

From the contents
Chapter 3. Multidimensional Densities.- Chapter 4. Advance Distribution Theory.-
Characteristic Functions and Applications.- Chapter 9. Asymptotics of Extremes and Order
Chapter 12. Brownian Motion and Gaussian Processes.- Chapter 13. Poisson Processes and Ap-
plications.- Chapter 14. Discrete Time Martingales and Concentration Inequalities.- Chapter
Simulation and Markov Chain Monte Carlo.- Chapter 20. Useful Tools for Statistics and Ma-
chine Learning.- Appendix A. Symbols, Useful Formulas, and Normal Table.
Handbook of Computational Finance

J. Duan, National University of Singapore, Singapore; W. K. Härdle, Centre for Applied Statistics and Economics, Berlin, Germany; J. E. Gentle, George Mason University, Fairfax, VA, USA (Eds.)

Features

► Latest volume in the Springer Handbooks of Computational Statistics series
► Addresses the broad application of computational statistics to the world of finance
► Covers Modern financial Tools; Computational efficient algorithms; Pricing of complex products; Risk behavior; Pricing kernels and more

Anything that is openly traded has a market price that may be more or less than its “fair” price. For shares of corporate stock, the fair price is likely to be some complicated function of the intrinsic current value (or “book” value) of identifiable assets owned by the company, the expected rate of growth, future dividends, and other factors. Some of these factors that affect the price can be measured at the time of a stock transaction, or at least within a relatively narrow time window that includes the time of the transaction. Most factors, however, relate to expectations about the future and to subjective issues, such as current management and corporate policies, that could affect the future financial performance of the corporation.

From the contents

Handbook of Statistical Bioinformatics

H. H. Lu, National Chiao Tung University, Hsinchu, Taiwan; B. Schölkopf, MPI for Biological Cybernetics, Tübingen, Germany; H. Zhao, Yale University, New Haven, CT, USA (Eds.)

Features

► Introduces the state-of-arts techniques for statistical bioinformatics
► Focuses on the interface between computational statistics and computational biology
► Covers key topics in modeling and analysis of massive data sets generated from high throughput biotechnology

Numerous fascinating breakthroughs in biotechnology have generated large volumes and diverse types of high throughput data that demand the development of efficient and appropriate tools in computational statistics integrated with biological knowledge and computational algorithms. This volume collects contributed chapters from leading researchers to survey the many active research topics and promote the visibility of this research area. This volume is intended to provide an introductory and reference book for students and researchers who are interested in the recent developments of computational statistics in computational biology.

From the contents


Dynamic Mixed Models for Familial Longitudinal Data

B. C. Sutradhar, Memorial University of Newfoundland, St. John’s, NL, Canada

Features

► Provides a clear direction for accurate familial and longitudinal data analysis by presenting differences between the familial and longitudinal correlation models
► Deals with non-stationary longitudinal correlations caused by time dependent covariates
► Offers an appropriate level of theoretical detail for graduate students, professors and other researchers, along with easy and interesting illustrations of real life data analysis

This book provides a theoretical foundation for the analysis of discrete data such as count and binary data in the longitudinal setup. Unlike the existing books, this book uses a class of auto-correlation structures to model the longitudinal correlations for the repeated discrete data that accommodates all possible Gaussian type auto-correlation models as special cases including the equi-correlation models. This new dynamic modelling approach is utilized to develop theoretically sound inference techniques such as the generalized quasi-likelihood (GQL) technique for consistent and efficient estimation of the underlying regression effects involved in the model, whereas the existing 'working' correlations based GEE (generalized estimating equations) approach has serious theoretical limitations both for consistent and efficient estimation, and the existing random effects based correlations approach is not suitable to model the longitudinal correlations. The book has exploited the random effects carefully only to model the correlations of the familial data. Subsequently, this book has modelled the correlations of the longitudinal data collected from the members of a large number of independent families by using the class of auto-correlation structures conditional on the random effects. The book also provides models and inferences for discrete longitudinal data in the adaptive clinical trial set up. The book is mathematically rigorous and provides details for the development of estimation approaches under selected familial and longitudinal models. Further, while the book provides special cares for mathematics behind the correlation models, it also presents the illustrations of the statistical analysis of various real life data. This book will be of interest to the researchers including graduate students in biostatistics and econometrics, among other applied statistics research areas. Brajendra Sutradhar is a University Research Professor at Memorial University in St. John’s, Canada. He is an elected member of the International Statistical Institute and a fellow of the American Statistical Association. He has published about 110 papers in statistics journals in the area of multivariate analysis, time series analysis including forecasting, sampling, survival analysis for correlated failure times, robust inferences in generalized linear mixed models with outliers, and generalized linear longitudinal mixed models with bio-statistical and econometric applications. He has served as an associate editor for six years for Canadian Journal of Statistics and for four years for the Journal of Environmental and Ecological Statistics. He has served for 3 years as a member of the advisory committee on statistical methods in Statistics Canada. Professor Sutradhar was awarded 2007 distinguished service award of Statistics Society of Canada for his many years of services to thesociety including his special services for society’s annual meetings.
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