

Titles in Knowledge Management and Information Processing

from Cambridge University Press

GRADUATE TEXTBOOK

Knowledge Representation, Reasoning and Declarative Problem Solving

Chitta Baral

Arizona State University

Knowledge management and knowledge-based intelligence are areas of importance in today's economy and society. In this book, Chitta Baral shows how to write programs that behave intelligently by giving them the ability to express knowledge and reason about it. He presents a language, AnsProlog, for both knowledge representation and reasoning, and declarative problem solving. Many of the results here have never appeared before in book form, and they have been organised here into a form that will appeal to practising and would-be knowledge engineers, either for courses or for self-teaching. A comprehensive bibliography rounds off the book.

2003 247 x 174 mm 544pp
0 521 81802 8 Hardback £60.00



An Introduction to Support Vector Machines and Other Kernel-based Learning Methods

Nello Cristianini
and John Shawe-Taylor

Both from Royal Holloway, University of London

'... the most accessible introduction to the area I have yet seen'.

D. J. Hand, *Short Book Reviews*

This is the first comprehensive introduction to Support Vector Machines (SVMs), a new generation learning system based on recent advances in statistical learning theory. SVMs deliver state-of-the-art performance in real-world applications such as text categorisation, hand-written character recognition, image classification and biosequences analysis. Students will find the book both stimulating and accessible, while practitioners will be guided smoothly through the material required for a good grasp of the theory and its applications. The concepts are introduced gradually in accessible and self-contained stages, while the presentation is rigorous and thorough. Pointers to relevant literature and web sites containing software ensure that it forms an ideal starting point for further study.

2000 247 x 174 mm 204pp
12 line diagrams 5 colour plates
25 exercises
0 521 78019 5 Hardback £32.50

The Description Logic Handbook

Theory, Implementation and Applications

Edited by Franz Baader

Aachen University of Technology

Diego Calvanese

Dipartimento di Informatica e Sistemistica "Antonio Ruberti"

Deborah McGuinness

Stanford University, California

Daniele Nardi

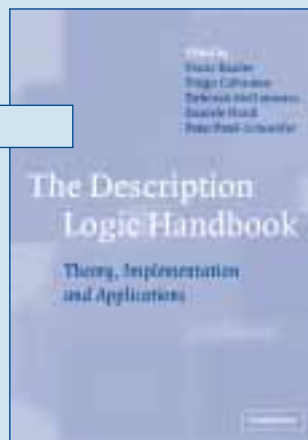
Università degli Studi di Roma 'La Sapienza'

Peter Patel-Schneider

AT&T Bell Laboratories, New Jersey

Description Logics are a family of knowledge representation languages that have been studied extensively in Artificial Intelligence over the last two decades. The book provides a thorough account of the subject, covering all aspects of research in this field, namely: theory, implementation, and applications. Its appeal will be broad, ranging from more theoretically-oriented readers, to those with more practically-oriented interests who need a sound and modern understanding of knowledge representation systems based on Description Logics. In summary, the book will serve as a unique reference for the subject, and can also be used for self-study or in conjunction with Knowledge Representation and Artificial Intelligence courses.

2003 247 x 174 mm 574pp 14 tables 53 figures
0 521 78176 0 Hardback £80.00



Kernel Methods for Pattern Analysis

John Shawe-Taylor and Nello Cristianini

Both from Royal Holloway, University of London

This book fulfils two major roles: firstly it provides practitioners with a large toolkit of algorithms, kernels and solutions ready to be implemented, suitable for standard pattern discovery problems in field such as bioinformatics, text analysis, image analysis. Secondly it provides an easy introduction for students and researchers to the growing field of kernel-based pattern analysis, demonstrating with examples how to handcraft an algorithm or a kernel for a new specific application, and covering all the necessary conceptual and mathematical tools to do so.

September 2003 247 x 174 mm 250 pp
0 521 81397 2 Hardback c. £30.00

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Flexible Pattern Matching in Strings

Practical On-Line Search Algorithms for Texts and Biological Sequences

Gonzalo Navarro

University of Chile

Mathieu Raffinot

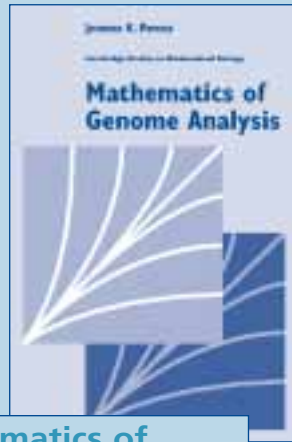
Centre National de la Recherche Scientifique (CNRS), Paris

'If you need efficient pattern matching for any kind of string then this is the only book I know that comes even close to providing you [with] the tools for the job.'

CVu

Recent years have witnessed a dramatic increase of interest in sophisticated string matching problems, especially in information retrieval and computational biology. This book presents a practical approach to string matching problems, focusing on the algorithms and implementations that perform best in practice. It covers searching for simple, multiple and extended strings, as well as regular expressions, and exact and approximate searching. It includes all the most significant new developments in complex pattern searching. The book will enable researchers, professionals and students in bioinformatics, computer science, and software engineering to choose the most appropriate algorithms for their applications.

2002 253 x 177 mm 232pp
90 line diagrams
0 521 81307 7 Hardback £40.00



Mathematics of Genome Analysis

Jerome K. Percus

New York University

The massive research effort known as the Human Genome Project is an attempt to record the sequence of the three trillion nucleotides that make up the human genome and to identify individual genes within this sequence. While the basic effort is of course a biological one, the description and classification of sequences also lend themselves naturally to mathematical and statistical modeling. This short text on the mathematics of genome analysis presents a brief description of several ways in which mathematics and statistics are being used in genome analysis and sequencing. It will be of interest not only to students but also to professional mathematicians curious about the subject.

Cambridge Studies in Mathematical Biology, 17

2001 228 x 152 mm 150pp
0 521 58517 1 Hardback £40.00
0 521 58526 0 Paperback £14.95

Genomic Perl

From Bioinformatics Basics to Working Code

Rex A. Dwyer

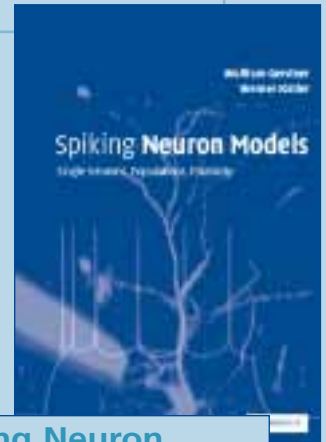
The BioAlgorithmic Consultancy

This introduction to computational molecular biology will help programmers learn the skills needed to start work in this important, expanding field. The author explains many of the basic computational problems and gives concise, working programs to solve them in the Perl language. With the programmer in mind, the author explains the biological background for each problem, develops a model for the solution, then introduces the Perl concepts needed to implement that solution. An accompanying CD includes all the Perl code in the book.

2003 253 x 177 mm 352pp
100 exercises
0 521 80177 X Hardback £ 45.00



GRADUATE TEXTBOOK



Spiking Neuron Models

Single Neurons, Populations, Plasticity

Wulfram Gerstner

École Polytechnique Fédérale, Lausanne

Werner M. Kistler

Erasmus Universiteit Rotterdam

Neurons in the brain communicate by short electrical pulses, the so-called action potentials or spikes. How can we understand the process of spike generation? How can we understand information transmission by neurons? What happens if thousands of neurons are coupled together in a seemingly random network? How does the network connectivity determine the activity patterns? And, vice versa, how does the spike activity influence the connectivity pattern? These questions are addressed in this introduction to spiking neurons aimed at those taking courses in computational neuroscience, theoretical biology, biophysics, or neural networks. The approach will suit students of physics, mathematics, or computer science; it will also be useful for biologists who are interested in mathematical modelling.

2002 247 x 174 mm 494pp
162 figures
0 521 81384 0 Hardback £65.00
0 521 89079 9 Paperback £24.95

The Brain-Shaped Mind

What the Brain Can Tell Us About the Mind

Naomi Goldblum

Bar-Ilan University, Israel

Neural networks are used to explore how the brain's structure influences the mind.

2001 228 x 152 mm 144pp
16 line diagrams 7 tables
0 521 56104 3 Hardback £40.00
0 521 00094 7 Paperback £14.95

GRADUATE TEXTBOOK



The Theory of Information and Coding

Second Edition

Robert McEliece

California Institute of Technology

This is a revised edition of McEliece's classic text. It is a self-contained introduction to all basic results in the theory of information and coding. There is a short and elementary overview introducing the reader to the concept of coding. Then, following the main results, the channel and source coding theorems, there is a study of specific coding schemes which can be used for channel and source coding. This volume can be used either for self-study, or for a taught course. It includes dozens of worked examples and several hundred problems for solution.

Encyclopedia of Mathematics and its Applications, 86

2002 234 x 156 mm 410pp
108 line diagrams 15 tables
0 521 00095 5 Hardback £60.00

GRADUATE TEXTBOOK

Information Theory

Jan C. A. van der Lubbe

Technische Universiteit Delft

Translated by Hendrik Jan Hoeve

The main aim of this book is to describe the basic ideas of information theory. These include Shannon's information measure, discrete and continuous information sources and information channels with or without memory, source and channel decoding, rate distortion theory, error correcting codes and the information theoretical approach to cryptology. Throughout the book special attention has been paid to multiterminal or network information theory. Aimed at advanced undergraduates and graduate students in electrical engineering and computer science.

1997 228 x 152 mm 362pp
123 line diagrams 13 exercises
0 521 46198 7 Hardback £70.00
0 521 46760 8 Paperback £27.95

TEXTBOOK

Information Theory, Inference and Learning Algorithms

David MacKay

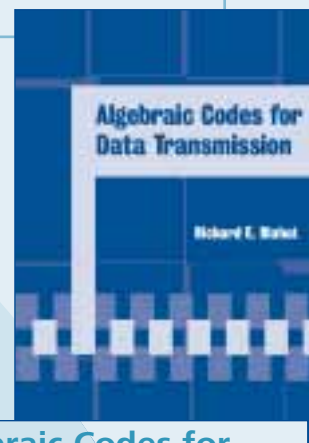
University of Cambridge

Information theory, probability, coding and algorithmics lie at the heart of some of the most exciting areas of contemporary science and engineering. David Mackay breaks new ground in this exciting and entertaining textbook by introducing mathematical technology in tandem with applications, providing simultaneously both motivation and hands-on guidance for problem-solving and modelling. For example, he covers the theoretical foundations of information theory, and practical methods for communication systems. Communication and machine learning are linked through data modelling and compression. Over 450 exercises, some with full solutions, and nearly 40 worked examples, extend the text and enhance technique and understanding. Enlivening and enlightening illustrations abound. In sum, this is a textbook for courses in information, communication and coding for a new generation of students, and an unparalleled entry point to these subjects for professionals working in areas as diverse as computational biology, data mining, financial engineering and machine learning.

Contents: 1. Introduction to information theory; 2. Probability, entropy, and inference; 3. More about inference; Part I. Data Compression: 4. The source coding theorem; 5. Symbol codes; 6. Stream codes; 7. Codes for integers; Part II. Noisy-Channel Coding: 8. Correlated random variables; 9. Communication over a noisy channel; 10. The noisy-channel coding theorem; 11. Error-correcting codes and real channels; Part III. Further Topics in Information Theory: 12. Hash codes: codes for efficient information retrieval; 13. Binary codes; 14. Very good linear codes exist; 15. Further exercises on information theory; 16. Message passing; 17. Communication over constrained noiseless channels; 18. An aside: crosswords and codebreaking; 19. Why have sex? Information acquisition and evolution; Part IV. Probabilities and Inference: 20. An example inference task: clustering; 21. Exact inference by complete enumeration; 22. Maximum likelihood and clustering; 23. Useful probability distributions; 24. Exact marginalization; 25. Exact marginalization in trellises; 26. Exact marginalization in graphs; 27. Laplace's method; 28. Model comparison and Occam's razor; 29. Monte Carlo methods; 30. Efficient Monte Carlo methods; 31. Ising models; 32. Exact Monte Carlo sampling; 33. Variational methods; 34. Independent component analysis and latent variable modelling; 35. Random inference topics; 36. Decision theory; 37. Bayesian inference and sampling theory; Part V. Neural Networks: 38. Introduction to neural networks; 39. The single neuron as a classifier; 40. Capacity of a single neuron; 41. Learning as inference; 42. Hopfield networks; 43. Boltzmann machines; 44. Supervised learning in multilayer networks; 45. Gaussian processes; 46. Deconvolution; Part VI. Sparse Graph Codes; 47. Low-density parity-check codes; 48. Convolutional codes and turbo codes; 49. Repeat-accumulate codes; 50. Digital fountain codes; Part VII. Appendices: A. Notation; B. Some physics; C. Some mathematics; Bibliography; Index

October 2003 247 x 174 mm
650pp
0 521 64298 1 Hardback c. £32.50

GRADUATE TEXTBOOK



Algebraic Codes for Data Transmission

Richard E. Blahut

University of Illinois, Urbana-Champaign

The need to transmit and store massive amounts of data reliably and without error is a vital part of modern communications systems. Error-correcting codes play a fundamental role in minimizing data corruption caused by defects such as noise, interference, crosstalk and packet loss. This book provides an accessible introduction to the basic elements of algebraic codes, and discusses their use in a variety of applications. The book is aimed at graduate students of electrical and computer engineering, and at practising engineers whose work involves communications or signal processing.

2003 247 x 174 mm 496pp
144 line diagrams 19 tables
0 521 55374 1 Hardback £40.00

GRADUATE TEXTBOOK

Fundamentals of Error Correcting Codes

W. Cary Huffman

Loyola University, Chicago

Vera Pless

University of Illinois, Chicago

An in-depth introduction to coding theory from both an engineering and mathematical viewpoint. As well as covering classical topics, much coverage is included of recent techniques which until now could only be found in specialist journals and book publications. Numerous exercises and examples and an accessible writing style make this a lucid and effective introduction to coding theory for advanced undergraduate and graduate students, researchers and engineers, whether approaching the subject from a mathematical, engineering or computer science background.

July 2003 247 x 174 mm 664pp
10 line diagrams 20 tables
0 521 78280 5 Hardback c.£ 50.00

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