Information Theory And Reliable Communication

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A Quantum Leap In Information Theory

Information Theory: Coding Theorems for Discrete Memoryless Systems presents mathematical models that involve independent random variables with finite range. This three-chapter text specifically describes the characteristic phenomena of information theory. Chapter 1 deals with information measures in simple coding problems, with emphasis on some formal properties of Shannon's information and the non-block source coding. Chapter 2 describes the properties and practical aspects of the two-terminal systems. This chapter also examines the noisy channel coding problem, the computation of channel capacity, and the arbitrarily varying channels. Chapter 3 looks into the theory and practicality of multi-terminal systems. This book is intended primarily for graduate students and research workers in mathematics, electrical engineering, and computer science.

The Mathematical Theory of Information

Providing the underlying principles of digital communication and the design techniques of real-world systems, this textbook prepares senior undergraduate and graduate students for the engineering practices required in industry. Covering the core concepts, including modulation, demodulation, equalization, and channel

coding, it provides step-by-step mathematical derivations to aid understanding of background material. In addition to describing the basic theory, the principles of system and subsystem design are introduced, enabling students to visualize the intricate connections between subsystems and understand how each aspect of the design supports the overall goal of achieving reliable communications. Throughout the book, theories are linked to practical applications with over 250 real-world examples, whilst 370 varied homework problems in three levels of difficulty enhance and extend the text material. With this textbook, students can understand how digital communication systems operate in the real world, learn how to design subsystems, and evaluate end-to-end performance with ease and confidence.

Elements of Information Theory

Scientific knowledge grows at a phenomenal pace--but few books have had as lasting an impact or played as important a role in our modern world as The Mathematical Theory of Communication, published originally as a paper on communication theory more than fifty years ago. Republished in book form shortly thereafter, it has since gone through four hardcover and sixteen paperback printings. It is a revolutionary work, astounding in its foresight and contemporaneity. The University of Illinois Press is pleased and honored to issue this commemorative reprinting of a classic.

Introduction to Biosemiotics

This highly readable text provides a clear exposition of the implications and interpretations of the fundamentals of discrete information theory and coding. Focusing on the results of practical applications, the authors cover information measures, Shannon's channel capacity/coding theorems, and source and channel coding concepts. The clear, accessible text will serve as an introduction to the field for professionals and students in communication systems, computer science, and electrical systems science.

Network Information Theory

Numerical Methods for Conservation Laws

This definitive textbook provides a solid introduction to discrete and continuous stochastic processes, tackling a complex field in a way that instils a deep understanding of the relevant mathematical principles, and develops an intuitive grasp of the way these principles can be applied to modelling real-world systems. It includes a careful review of elementary probability and detailed coverage of Poisson, Gaussian and Markov processes with richly varied queuing applications.

The theory and applications of inference, hypothesis testing, estimation, random walks, large deviations, martingales and investments are developed. Written by one of the world's leading information theorists, evolving over twenty years of graduate classroom teaching and enriched by over 300 exercises, this is an exceptional resource for anyone looking to develop their understanding of stochastic processes.

Markovian Decision Processes

Wireless networking technologies are witnessed to become the integral part of industry, business, entertainment and daily life. Encyclopedia of Wireless Networks is expected to provide comprehensive references to key concepts of wireless networks, including research results of historical significance, areas of current interests, and growing directions in the future wireless networks. It can serve as a valuable and authoritative literature for students, researchers, engineers, and practitioners who need a quick reference to the subjects of wireless network technology and its relevant applications. Areas covered: 5G Network | Editors: Rahim Tafazolli, Rose Hu Ad hoc Network | Editor: Cheng Li Big Data for Networking | Editor: Song Guo Cellular Network, 2G/3G Network, 4G/LTE Network | Editor: Hsiao-hwa Chen Cognitive Radio Network | Editor: Ning Zhang Cooperative Communications | Editor: Kaoru Ota Cyber Physical Systems | Editor: Shiyan Hu Data Center Network | Editor: Lei Lei Delay Tolerant and Opportunistic Network |

Editor: Yuanguo Bi Equalization, Synchronization and Channel Estimation | Editor: Yingying Chen Future Network Architecture | Editor: Wei Quan Game Theory in Wireless Network | Editor: Dusit Niyato Interference Characterization and Mitigation | Editor: Lin Cai Internet of Things | Editors: Xiuzhen Cheng, Wei Cheng Internet of Things and its Applications | Editor: Phone Lin Interworking Heterogeneous Wireless Network | Editor: Ping Wang Medium Access Control | Editors: Hassan Omar, Qiang Ye Millimeter-wave Communications | Editor: Ming Xiao MIMO-based Network | Editor: Prof. Wei Zhang Mobility Management and Models | Editors: Sandra Cespedes, Sangheon Pack Molecular, Biological and Multi-scale Communications | Editor: Adam Noel Network Economics and pricing | Editors: Jianwei Huang, Yuan Luo Network Forensics and surveillance, Fault Tolerance and Reliability | Editor: Hongwei Li Network Measurement and Virtualization | Editor: Yusheng Ji Quality of Service, Quality of Experience and Quality of Protection | Editors: Rui Luis Aguiar, Yu Cheng Resource Allocation and Management | Editors: Junshan Zhang, Nan Cheng Routing and Multi-cast, Router and Switch Design | Editor: Richard Yu Scaling Laws and Fundamental Limits | Editor: Ning Lu Security, Privacy and Trust | Editor: Kui Ren Short Range Communications, RFID and NFC | Editor: Zhiguo Shi Smart Grid Communications | Editor: Vincent W. S. Wong Vehicular Network | Editors: Lian Zhao, Qing Yang Video Streaming | Editor: Zhi Liu Wireless Body Area Network and e-healthcare | Editor: Honggang Wang Wireless Security | Editors: Haojin Zhu, Jian Shen Wireless Sensor Network | Editors: Jiming Chen, Ruilong Deng WLAN and OFDM | Editor: Xianbin Wang

A First Course in Information Theory

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Topics in Multi-User Information Theory

An introduction to the theories of information and codes. The authors exploit the connection to give a self-contained treatment relating the probabilistic and algebraic viewpoints. A background in discrete probability theory is required; the necessary Galois theory is developed as needed.

Analysis of Lumped Electrical Systems

Combining research approaches from biology, philosophy and linguistics, the field of Biosemiotics proposes that animals, plants and single cells all engage in semiosis – the conversion of objective signals into conventional signs. This has important implications and applications for issues ranging from natural selection to animal behavior and human psychology, leaving biosemiotics at the cutting edge of the research on the fundamentals of life. Drawing on an international expertise, the book details the history and study of biosemiotics, and provides a state-of-the-art summary of the current work in this new field. And, with relevance to a wide

range of disciplines – from linguistics and semiotics to evolutionary phenomena and the philosophy of biology – the book provides an important text for both students and established researchers, while marking a vital step in the evolution of a new biological paradigm.

Encyclopedia of Wireless Networks

A self-contained, graduate-level textbook that develops from scratch classical results as well as advances of the past decade.

Information Theory for Electrical Engineers

Statistical Physics and Information Theory is a succinct in-depth review and tutorial of a subject that promises to lead to major advances in computer and communication security

Principles of Digital Communication

Reference Data for Engineers is the most respected, reliable, and indispensable reference tool for technical professionals around the globe. Written by professionals for professionals, this book is a complete reference for engineers,

covering a broad range of topics. It is the combined effort of 96 engineers, scientists, educators, and other recognized specialists in the fields of electronics, radio, computer, and communications technology. By providing an abundance of information on essential, need-to-know topics without heavy emphasis on complicated mathematics, Reference Data for Engineers is an absolute "must-have" for every engineer who requires comprehensive electrical, electronics, and communications data at his or her fingertips. Featured in the Ninth Edition is updated coverage on intellectual property and patents, probability and design, antennas, power electronics, rectifiers, power supplies, and properties of materials. Useful information on units, constants and conversion factors, active filter design, antennas, integrated circuits, surface acoustic wave design, and digital signal processing is also included. The Ninth Edition also offers new knowledge in the fields of satellite technology, space communication, microwave science, telecommunication, global positioning systems, frequency data, and radar. * Widely acclaimed as the most practical reference ever published for a wide range of electronics and computer professionals, from technicians through post-graduate engineers. * Provides a great way to learn or review the basics of various technologies, with a minimum of tables, equations, and other heavy math.

Information Theory, Coding and Cryptography

Markovian decision processes with discounting; Markovian decision processes with

no discouting; Dynamic programming viewpoint of markovian decision processes; Semi-markovian decision processes; Generalized markovian decision processes; The principle of contraction mappings in markovian decision processes.

The Mathematical Theory of Communication

The primary goal of this book is to provide a self-contained, comprehensive study of the main ?rst-order methods that are frequently used in solving large-scale problems. First-order methods exploit information on values and gradients/subgradients (but not Hessians) of the functions composing the model under consideration. With the increase in the number of applications that can be modeled as large or even huge-scale optimization problems, there has been a revived interest in using simple methods that require low iteration cost as well as low memory storage. The author has gathered, reorganized, and synthesized (in a unified manner) many results that are currently scattered throughout the literature, many of which cannot be typically found in optimization books. First-Order Methods in Optimization offers comprehensive study of first-order methods with the theoretical foundations; provides plentiful examples and illustrations; emphasizes rates of convergence and complexity analysis of the main first-order methods used to solve large-scale problems; and covers both variables and functional decomposition methods.

Fundamentals of Information Theory and Coding Design

The Information

Communication Theory

A concise, easy-to-read guide, introducing beginners to the engineering background of modern communication systems, from mobile phones to data storage. Assuming only basic knowledge of high-school mathematics and including many practical examples and exercises to aid understanding, this is ideal for anyone who needs a quick introduction to the subject.

Information Theory, Inference and Learning Algorithms

Solutions manual

This text is an elementary introduction to information and coding theory. The first part focuses on information theory, covering uniquely decodable and

instantaneous codes, Huffman coding, entropy, information channels, and Shannon's Fundamental Theorem. In the second part, linear algebra is used to construct examples of such codes, such as the Hamming, Hadamard, Golay and Reed-Muller codes. Contains proofs, worked examples, and exercises.

Information Theory and Reliable Communication

A New York Times Notable Book A Los Angeles Times and Cleveland Plain Dealer Best Book of the Year Winner of the PEN/E. O. Wilson Literary Science Writing Award From the bestselling author of the acclaimed Chaos and Genius comes a thoughtful and provocative exploration of the big ideas of the modern era: Information, communication, and information theory. Acclaimed science writer James Gleick presents an eye-opening vision of how our relationship to information has transformed the very nature of human consciousness. A fascinating intellectual journey through the history of communication and information, from the language of Africa's talking drums to the invention of written alphabets; from the electronic transmission of code to the origins of information theory, into the new information age and the current deluge of news, tweets, images, and blogs. Along the way, Gleick profiles key innovators, including Charles Babbage, Ada Lovelace, Samuel Morse, and Claude Shannon, and reveals how our understanding of information is transforming not only how we look at the world, but how we live.

Discrete Stochastic Processes

This book is an evolution from my book A First Course in Information Theory published in 2002 when network coding was still at its infancy. The last few years have witnessed the rapid development of network coding into a research ?eld of its own in information science. With its root in infor- tion theory, network coding has not only brought about a paradigm shift in network communications at large, but also had signi?cant in?uence on such speci?c research ?elds as coding theory, networking, switching, wireless c-munications,distributeddatastorage,cryptography,andoptimizationtheory. While new applications of network coding keep emerging, the fundamental - sults that lay the foundation of the subject are more or less mature. One of the main goals of this book therefore is to present these results in a unifying and coherent manner. While the previous book focused only on information theory for discrete random variables, the current book contains two new chapters on information theory for continuous random variables, namely the chapter on di?erential entropy and the chapter on continuous-valued channels. With these topics included, the book becomes more comprehensive and is more suitable to be used as a textbook for a course in an electrical engineering department.

Information Theory

This comprehensive guide, by pioneers in the field, brings together, for the first time, everything a new researcher, graduate student or industry practitioner needs to get started in molecular communication. Written with accessibility in mind, it requires little background knowledge, and provides a detailed introduction to the relevant aspects of biology and information theory, as well as coverage of practical systems. The authors start by describing biological nanomachines, the basics of biological molecular communication and the microorganisms that use it. They then proceed to engineered molecular communication and the molecular communication paradigm, with mathematical models of various types of molecular communication and a description of the information and communication theory of molecular communication. Finally, the practical aspects of designing molecular communication systems are presented, including a review of the key applications. Ideal for engineers and biologists looking to get up to speed on the current practice in this growing field.

Stochastic Processes

This comprehensive treatment of network information theory and its applications provides the first unified coverage of both classical and recent results. With an approach that balances the introduction of new models and new coding techniques, readers are guided through Shannon's point-to-point information theory, single-hop networks, multihop networks, and extensions to distributed

computing, secrecy, wireless communication, and networking. Elementary mathematical tools and techniques are used throughout, requiring only basic knowledge of probability, whilst unified proofs of coding theorems are based on a few simple lemmas, making the text accessible to newcomers. Key topics covered include successive cancellation and superposition coding, MIMO wireless communication, network coding, and cooperative relaying. Also covered are feedback and interactive communication, capacity approximations and scaling laws, and asynchronous and random access channels. This book is ideal for use in the classroom, for self-study, and as a reference for researchers and engineers in industry and academia.

Reference Data for Engineers

The latest edition of this classic is updated with new problem sets and material The Second Edition of this fundamental textbook maintains the book's tradition of clear, thought-provoking instruction. Readers are provided once again with an instructive mix of mathematics, physics, statistics, and information theory. All the essential topics in information theory are covered in detail, including entropy, data compression, channel capacity, rate distortion, network information theory, and hypothesis testing. The authors provide readers with a solid understanding of the underlying theory and applications. Problem sets and a telegraphic summary at the end of each chapter further assist readers. The historical notes that follow each

chapter recap the main points. The Second Edition features: * Chapters reorganized to improve teaching * 200 new problems * New material on source coding, portfolio theory, and feedback capacity * Updated references Now current and enhanced, the Second Edition of Elements of Information Theory remains the ideal textbook for upper-level undergraduate and graduate courses in electrical engineering, statistics, and telecommunications.

Communications and Cryptography

The latest edition of this classic is updated with new problem sets and material The Second Edition of this fundamental textbook maintains the book's tradition of clear, thought-provoking instruction. Readers are provided once again with an instructive mix of mathematics, physics, statistics, and information theory. All the essential topics in information theory are covered in detail, including entropy, data compression, channel capacity, rate distortion, network information theory, and hypothesis testing. The authors provide readers with a solid understanding of the underlying theory and applications. Problem sets and a telegraphic summary at the end of each chapter further assist readers. The historical notes that follow each chapter recap the main points. The Second Edition features: * Chapters reorganized to improve teaching * 200 new problems * New material on source coding, portfolio theory, and feedback capacity * Updated references Now current and enhanced, the Second Edition of Elements of Information Theory remains the

ideal textbook for upper-level undergraduate and graduate courses in electrical engineering, statistics, and telecommunications.

Information Theory and Reliable Communication

Reliability Criteria in Information Theory and Statistical Hypothesis Testing briefly formulates fundamental notions and results of Shannon theory on reliable transmission via coding and gives a survey of results obtained in last two-three decades by the authors, their colleagues and other researchers. It is essential reading for students, researchers and professionals working in Information Theory.

Reliability Criteria in Information Theory and in Statistical Hypothesis Testing

Conservation laws are the mathematical expression of the principles of conservation and provide effective and accurate predictive models of our physical world. Although intense research activity during the last decades has led to substantial advances in the development of powerful computational methods for conservation laws, their solution remains a challenge and many questions are left open; thus it is an active and fruitful area of research. Numerical Methods for Conservation Laws: From Analysis to Algorithms offers the first comprehensive

introduction to modern computational methods and their analysis for hyperbolic conservation laws, building on intense research activities for more than four decades of development; discusses classic results on monotone and finite difference/finite volume schemes, but emphasizes the successful development of high-order accurate methods for hyperbolic conservation laws; addresses modern concepts of TVD and entropy stability, strongly stable Runge-Kutta schemes, and limiter-based methods before discussing essentially nonoscillatory schemes, discontinuous Galerkin methods, and spectral methods; explores algorithmic aspects of these methods, emphasizing one- and two-dimensional problems and the development and analysis of an extensive range of methods; includes MATLAB software with which all main methods and computational results in the book can be reproduced; and demonstrates the performance of many methods on a set of benchmark problems to allow direct comparisons. Code and other supplemental material will be available online at publication.

Statistical Physics and Information Theory

Presents a review of eleven of the fundamental issues in multi-user information theory. Each chapter is devoted to one particular issue and follows the same structure and starts with a problem description and then describes solutions to the problem for general and specific cases.

Information Theory and Network Coding

Information theory is an exceptional field in many ways. Technically, it is one of the rare fields in which mathematical results and insights have led directly to significant engineering payoffs. Professionally, it is a field that has sustained a remarkable degree of community, collegiality and high standards. James L. Massey, whose work in the field is honored here, embodies the highest standards of the profession in his own career. The book covers the latest work on: block coding, convolutional coding, cryptography, and information theory. The 44 contributions represent a cross-section of the world's leading scholars, scientists and researchers in information theory and communication. The book is rounded off with an index and a bibliography of publications by James Massey.

First-Order Methods in Optimization

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Elements of Information Theory

Information Theory, Inference and Learning Algorithms

The general concept of information is here, for the first time, defined mathematically by adding one single axiom to the probability theory. This Mathematical Theory of Information is explored in fourteen chapters: 1. Information can be measured in different units, in anything from bits to dollars. We will here argue that any measure is acceptable if it does not violate the Law of Diminishing Information. This law is supported by two independent arguments: one derived from the Bar-Hillel ideal receiver, the other is based on Shannon's noisy channel. The entropy in the 'classical information theory' is one of the measures conforming to the Law of Diminishing Information, but it has, however, properties such as being symmetric, which makes it unsuitable for some applications. The measure reliability is found to be a universal information measure. 2. For discrete and finite signals, the Law of Diminishing Information is defined mathematically, using probability theory and matrix algebra. 3. The Law of Diminishing Information is used as an axiom to derive essential properties of information. Byron's law: there is more information in a lie than in gibberish. Preservation: no information is lost in a reversible channel. Etc. The Mathematical Theory of Information supports colligation, i. e. the property to bind facts together making 'two plus two greater than four'. Colligation is a must when the information carries knowledge, or is a base for decisions. In such cases, reliability is always a useful information measure. Entropy does not allow colligation.

Quantum Information Theory

Stochastic processes are found in probabilistic systems that evolve with time. Discrete stochastic processes change by only integer time steps (for some time scale), or are characterized by discrete occurrences at arbitrary times. Discrete Stochastic Processes helps the reader develop the understanding and intuition necessary to apply stochastic process theory in engineering, science and operations research. The book approaches the subject via many simple examples which build insight into the structure of stochastic processes and the general effect of these phenomena in real systems. The book presents mathematical ideas without recourse to measure theory, using only minimal mathematical analysis. In the proofs and explanations, clarity is favored over formal rigor, and simplicity over generality. Numerous examples are given to show how results fail to hold when all the conditions are not satisfied. Audience: An excellent textbook for a graduate level course in engineering and operations research. Also an invaluable reference for all those requiring a deeper understanding of the subject.

Theory and Design of Digital Communication Systems

This book explains the fundamental concepts of information theory, so as to help students better understand modern communication technologies. It was especially

written for electrical and communication engineers working on communication subjects. The book especially focuses on the understandability of the topics, and accordingly uses simple and detailed mathematics, together with a wealth of solved examples. The book consists of four chapters, the first of which explains the entropy and mutual information concept for discrete random variables. Chapter 2 introduces the concepts of entropy and mutual information for continuous random variables, along with the channel capacity. In turn, Chapter 3 is devoted to the typical sequences and data compression. One of Shannon's most important discoveries is the channel coding theorem, and it is critical for electrical and communication engineers to fully comprehend the theorem. As such, Chapter 4 solely focuses on it. To gain the most from the book, readers should have a fundamental grasp of probability and random variables; otherwise, they will find it nearly impossible to understand the topics discussed.

Basic Concepts in Information Theory and Coding

Books on information theory and coding have proliferated over the last few years, but few succeed in covering the fundamentals without losing students in mathematical abstraction. Even fewer build the essential theoretical framework when presenting algorithms and implementation details of modern coding systems. Without abandoning the theoret

Remote Sensing Digital Image Analysis

The renowned communications theorist Robert Gallager brings his lucid writing style to the study of the fundamental system aspects of digital communication for a one-semester course for graduate students. With the clarity and insight that have characterized his teaching and earlier textbooks, he develops a simple framework and then combines this with careful proofs to help the reader understand modern systems and simplified models in an intuitive yet precise way. A strong narrative and links between theory and practice reinforce this concise, practical presentation. The book begins with data compression for arbitrary sources. Gallager then describes how to modulate the resulting binary data for transmission over wires, cables, optical fibers, and wireless channels. Analysis and intuitive interpretations are developed for channel noise models, followed by coverage of the principles of detection, coding, and decoding. The various concepts covered are brought together in a description of wireless communication, using CDMA as a case study.

Molecular Communication

Information and Coding Theory

This book provides an up-to-date introduction to information theory. In addition to the classical topics discussed, it provides the first comprehensive treatment of the theory of I-Measure, network coding theory, Shannon and non-Shannon type information inequalities, and a relation between entropy and group theory. ITIP, a software package for proving information inequalities, is also included. With a large number of examples, illustrations, and original problems, this book is excellent as a textbook or reference book for a senior or graduate level course on the subject, as well as a reference for researchers in related fields.

A Student's Guide to Coding and Information Theory

With the widespread availability of satellite and aircraft remote sensing image data in digital form, and the ready access most remote sensing practitioners have to computing systems for image interpretation, there is a need to draw together the range of digital image processing procedures and methodologies commonly used in this field into a single treatment. It is the intention of this book to provide such a function, at a level meaningful to the non-specialist digital image analyst, but in sufficient detail that algorithm limitations, alternative procedures and current trends can be appreciated. Often the applications specialist in remote sensing wishing to make use of digital processing procedures has had to depend upon either the mathematically detailed treatments of image processing found in the electrical engineering and computer science literature, or the sometimes

necessarily superficial treatments given in general texts on remote sensing. This book seeks to redress that situation. Both image enhancement and classification techniques are covered making the material relevant in those applications in which photointerpretation is used for information extraction and in those wherein information is obtained by classification.

ROMANCE ACTION & ADVENTURE MYSTERY & THRILLER BIOGRAPHIES & HISTORY CHILDREN'S YOUNG ADULT FANTASY HISTORICAL FICTION HORROR LITERARY FICTION NON-FICTION SCIENCE FICTION