

Fundamentals Of Information Theory 2nd Solution Manual

Elements of Information Theory John Wiley & Sons
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.

Publisher Description

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.

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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.

This book is about the definition of the Shannon measure of Information, and some derived quantities such as conditional information and mutual information. Unlike many books, which refer to the Shannon's Measure of information (SMI) as "Entropy," this book makes a clear distinction between the SMI and Entropy. In the last chapter, Entropy is derived as a special case of SMI. Ample examples are provided which help the reader in understanding the different concepts discussed in this book. As with previous books by the author, this book aims at a clear and mystery-free presentation of the central concept in Information theory — the Shannon's Measure of Information. This book presents the fundamental concepts of Information theory in a friendly-simple language and is devoid of all kinds of fancy and pompous statements made by authors of popular science books who write on this subject. It is unique in its presentation of Shannon's measure of information, and the clear distinction between this concept and the thermodynamic entropy. Although some mathematical knowledge is required by the reader, the emphasis is on the concepts and their meaning rather on the

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mathematical details of the theory.

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 field of its own in information science. With its root in information theory, network coding has not only brought about a paradigm shift in network communications at large, but also had significant influence on such specific research fields as coding theory, networking, switching, wireless communications, distributed data storage, cryptography, and optimization theory. While new applications of network coding keep emerging, the fundamental results 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 differential 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.

An effective blend of carefully explained theory and practical applications, this text imparts the

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fundamentals of both information theory and data compression. Although the two topics are related, this unique text allows either topic to be presented independently, and it was specifically designed so that the data compression section requires no prior knowledge of information theory. The treatment of information theory, while theoretical and abstract, is quite elementary, making this text less daunting than many others. After presenting the fundamental definitions and results of the theory, the authors then apply the theory to memoryless, discrete channels with zeroth-order, one-state sources. The chapters on data compression acquaint students with a myriad of lossless compression methods and then introduce two lossy compression methods. Students emerge from this study competent in a wide range of techniques. The authors' presentation is highly practical but includes some important proofs, either in the text or in the exercises, so instructors can, if they choose, place more emphasis on the mathematics. Introduction to Information Theory and Data Compression, Second Edition is ideally suited for an upper-level or graduate course for students in mathematics, engineering, and computer science. Features: Expanded discussion of the historical and theoretical basis of information theory that builds a firm, intuitive grasp of the subject Reorganization of theoretical results along with new exercises, ranging from the routine to the more difficult, that reinforce

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students' ability to apply the definitions and results in specific situations. Simplified treatment of the algorithm(s) of Gallager and Knuth Discussion of the information rate of a code and the trade-off between error correction and information rate Treatment of probabilistic finite state source automata, including basic results, examples, references, and exercises Octave and MATLAB image compression codes included in an appendix for use with the exercises and projects involving transform methods Supplementary materials, including software, available for download from the authors' Web site at www.dms.auburn.edu/compression

This fundamental monograph introduces both the probabilistic and algebraic aspects of information theory and coding. It has evolved from the authors' years of experience teaching at the undergraduate level, including several Cambridge Maths Tripos courses. The book provides relevant background material, a wide range of worked examples and clear solutions to problems from real exam papers. It is a valuable teaching aid for undergraduate and graduate students, or for researchers and engineers who want to grasp the basic principles.

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

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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.

This book presents a succinct and mathematically rigorous treatment of the main pillars of Shannon's information theory, discussing the fundamental concepts and indispensable results of Shannon's mathematical theory of communications. It includes five meticulously written core chapters (with accompanying problems), emphasizing the key topics of information measures; lossless and lossy data compression; channel coding; and joint source-channel coding for single-user (point-to-point)

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communications systems. It also features two appendices covering necessary background material in real analysis and in probability theory and stochastic processes. The book is ideal for a one-semester foundational course on information theory for senior undergraduate and entry-level graduate students in mathematics, statistics, engineering, and computing and information sciences. A comprehensive instructor's solutions manual is available.

An introduction to a broad range of topics in deep learning, covering mathematical and conceptual background, deep learning techniques used in industry, and research perspectives. "Written by three experts in the field, Deep Learning is the only comprehensive book on the subject." —Elon Musk, cochair of OpenAI; cofounder and CEO of Tesla and SpaceX Deep learning is a form of machine learning that enables computers to learn from experience and understand the world in terms of a hierarchy of concepts. Because the computer gathers knowledge from experience, there is no need for a human computer operator to formally specify all the knowledge that the computer needs. The hierarchy of concepts allows the computer to learn complicated concepts by building them out of simpler ones; a graph of these hierarchies would be many layers deep. This book introduces a broad range of topics in deep learning. The text offers mathematical

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and conceptual background, covering relevant concepts in linear algebra, probability theory and information theory, numerical computation, and machine learning. It describes deep learning techniques used by practitioners in industry, including deep feedforward networks, regularization, optimization algorithms, convolutional networks, sequence modeling, and practical methodology; and it surveys such applications as natural language processing, speech recognition, computer vision, online recommendation systems, bioinformatics, and videogames. Finally, the book offers research perspectives, covering such theoretical topics as linear factor models, autoencoders, representation learning, structured probabilistic models, Monte Carlo methods, the partition function, approximate inference, and deep generative models. Deep Learning can be used by undergraduate or graduate students planning careers in either industry or research, and by software engineers who want to begin using deep learning in their products or platforms. A website offers supplementary material for both readers and instructors.

Thomas M. Cover and B. Gopinath The papers in this volume are the contributions to a special workshop on problems in communication and computation conducted in the summers of 1984 and 1985 in Morristown, New Jersey, and the summer of 1986 in Palo Alto, California. The structure of this

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workshop was unique: no recent results. no surveys. Instead. we asked for outstanding open problems in the field. There are many famous open problems, including the question $P = NP?$, the simplex conjecture in communication theory, the capacity region of the broadcast channel. and the two-helper problem in information theory. Beyond these well-defined problems are certain grand research goals. What is the general theory of information flow in stochastic networks? What is a comprehensive theory of computational complexity? What about a unification of algorithmic complexity and computational complexity? Is there a notion of energy-free computation? And if so, where do information theory, communication theory, computer science, and physics meet at the atomic level? Is there a duality between computation and communication? Finally. what is the ultimate impact of algorithmic complexity on probability theory? And what is its relationship to information theory? The idea was to present problems on the first day. try to solve them on the second day, and present the solutions on the third day. In actual fact, only one problem was solved during the meeting -- El Gamal's problem on noisy communication over a common line.

Complete, easy-to-follow guide for managing your scoliosis during pregnancy! "An Essential Guide for Scoliosis and a Healthy Pregnancy" is a month-by-

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month guide on covering everything you need to know about taking care of your spine and your baby. The book supports your feelings and empathizes with you throughout your amazing journey towards delivering a healthy baby. By reading, you gain: - In-depth and up-to-date information on scoliosis and how it can affect your pregnancy. Week-by-week information on what to expect during your pregnancy. - Information that is suitable for all types of post-operative scoliosis cases and those that, to date, have not yet been operated on. - Clear, compassionate and comprehensive answers to the common questions about scoliosis and pregnancy. - Crucial decision making tools decisions for important issues including epidurals, birthing procedures, changes to the spine due to hormones, and more to protect your baby. - Tips to help you minimize unnecessary weight gain and keep your nutrient intake high. - The latest nutritional research that debunks pregnancy food myths and uncovers a number of surprising superfood choices. - Expert advice on staying fit and eating right during each trimester of pregnancy. Self-care tips for side effects including nausea and back pain. - Fun, fast, and safe scoliosis exercises during the month of pregnancy and postpartum. Tips for strengthening your pelvic floor, easing back pain, and losing belly fat postpartum. - Relaxation tips to reduce pain and increase your comfort. This book provides answers

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and expert advice for pregnant women suffering from scoliosis. Full of information to cope with the physical and emotional upheavals of pregnancy during scoliosis. From conception to birth and beyond, this guide will hold your hand until you become a happy and proud mother of a healthy newborn baby.

This book aims at presenting the field of Quantum Information Theory in an intuitive, didactic and self-contained way, taking into account several multidisciplinary aspects. Therefore, this book is particularly suited to students and researchers willing to grasp fundamental concepts in Quantum Computation and Quantum Information areas. The field of Quantum Information Theory has increased significantly over the last three decades. Many results from classical information theory were translated and extended to a scenario where quantum effects become important. Most of the results in this area allow for an asymptotically small probability of error to represent and transmit information efficiently. Claude E. Shannon was the first scientist to realize that error-free classical information transmission can be accomplished under certain conditions. More recently, the concept of error-free classical communication was translated to the quantum context. The so-called Quantum Zero-Error Information Theory completes and extends the Shannon Zero-Error Information Theory.

This textbook integrates the most advanced topics of physical-

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layer security, cryptography, covert/stealth communications, quantum key distribution (QKD), and cyber security to tackle complex security issues. After introducing the reader to various concepts and practices, the author addresses how these can work together to target problems, rather than treating them as separate disciplines. This book offers students an in-depth exposition on: cryptography, information-theoretic approach to cryptography, physical-layer security, covert/stealth/low-probability of detection communications, quantum information theory, QKD, and cyber security; to mention few. The goal is to provide a unified description of the most advanced topics related to: (i) modern cryptography, (ii) physical-layer security, (iii) QKD, (iv) covert communications, and (v) cyber security. Each chapter is followed by a set of problems. Also, for readers to better understand the book, an appendix covers all needed background. Homework problems and lecture notes are available online. The book does not require any prior knowledge or prerequisite material.

In the ten years since the publication of the best-selling first edition, more than 1,000 graph theory papers have been published each year. Reflecting these advances, Handbook of Graph Theory, Second Edition provides comprehensive coverage of the main topics in pure and applied graph theory. This second edition—over 400 pages longer than its predecessor—incorporates 14 new sections. Each chapter includes lists of essential definitions and facts, accompanied by examples, tables, remarks, and, in some cases, conjectures and open problems. A bibliography at the end of each chapter provides an extensive guide to the research literature and pointers to monographs. In addition, a glossary is included in each chapter as well as at the end of each section. This edition also contains notes regarding terminology and notation. With 34 new contributors, this

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handbook is the most comprehensive single-source guide to graph theory. It emphasizes quick accessibility to topics for non-experts and enables easy cross-referencing among chapters.

As part of the Syngress Basics series, *The Basics of Information Security* provides you with fundamental knowledge of information security in both theoretical and practical aspects. Author Jason Andress gives you the basic knowledge needed to understand the key concepts of confidentiality, integrity, and availability, and then dives into practical applications of these ideas in the areas of operational, physical, network, application, and operating system security. *The Basics of Information Security* gives you clear-non-technical explanations of how infosec works and how to apply these principles whether you're in the IT field or want to understand how it affects your career and business. The new Second Edition has been updated for the latest trends and threats, including new material on many infosec subjects. Learn about information security without wading through a huge textbook Covers both theoretical and practical aspects of information security Provides a broad view of the information security field in a concise manner All-new Second Edition updated for the latest information security trends and threats, including material on incident response, social engineering, security awareness, risk management, and legal/regulatory issues

Table of contents

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.

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This monograph originated with a course of lectures on information theory which I gave at Cornell University during the academic year 1958-1959. It has no pretensions to exhaustiveness, and, indeed, no pretensions at all. Its purpose is to provide, for mathematicians of some maturity, an easy introduction to the ideas and principal known theorems of a certain body of coding theory. This purpose will be amply achieved if the reader is enabled, through his reading, to read the (sometimes obscurely written) literature and to obtain results of his own. The theory is obviously in a rapid stage of development; even while this monograph was in manuscript several of its readers obtained important new results. The first chapter is introductory and the subject matter of the monograph is described at the end of the chapter. There does not seem to be a uniquely determined logical order in which the material should be arranged. In determining the final arrangement I tried to obtain an order which makes reading easy and yet is not illogical. I can only hope that the resultant compromises do not earn me the criticism that I failed on both counts. There are a very few instances in the monograph where a stated theorem is proved by a method which is based on a result proved only later.

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.

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This two-volume set on Mathematical Principles of the Internet provides a comprehensive overview of the mathematical principles of Internet engineering. The books do not aim to provide all of the mathematical foundations upon which the Internet is based. Instead, they cover a partial panorama and the key principles. Volume 1 explores Internet engineering, while the supporting mathematics is covered in Volume 2. The chapters on mathematics complement those on the engineering episodes, and an effort has been made to make this work succinct, yet self-contained. Elements of information theory, algebraic coding theory, cryptography, Internet traffic, dynamics and control of Internet congestion, and queueing theory are discussed. In addition, stochastic networks, graph-theoretic algorithms, application of game theory to the Internet, Internet economics, data mining and knowledge discovery, and quantum computation, communication, and cryptography are also discussed. In order to study the structure and function of the Internet, only a basic knowledge of number theory, abstract algebra, matrices and determinants, graph theory, geometry, analysis, optimization theory, probability theory, and stochastic processes, is required. These mathematical disciplines are defined and developed in the books to the extent that is needed to develop and justify their application to Internet engineering.

First comprehensive introduction to information theory explores the work of Shannon, McMillan, Feinstein, and Khinchin. Topics include the entropy concept in probability theory, fundamental theorems, and other subjects. 1957 edition.

This monograph offers a new foundation for information theory that is based on the notion of information-as-distinctions, being directly measured by logical entropy, and on the re-quantification as Shannon entropy, which is the

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fundamental concept for the theory of coding and communications. Information is based on distinctions, differences, distinguishability, and diversity. Information sets are defined that express the distinctions made by a partition, e.g., the inverse-image of a random variable so they represent the pre-probability notion of information. Then logical entropy is a probability measure on the information sets, the probability that on two independent trials, a distinction or “dit” of the partition will be obtained. The formula for logical entropy is a new derivation of an old formula that goes back to the early twentieth century and has been re-derived many times in different contexts. As a probability measure, all the compound notions of joint, conditional, and mutual logical entropy are immediate. The Shannon entropy (which is not defined as a measure in the sense of measure theory) and its compound notions are then derived from a non-linear dit-to-bit transform that re-quantifies the distinctions of a random variable in terms of bits—so the Shannon entropy is the average number of binary distinctions or bits necessary to make all the distinctions of the random variable. And, using a linearization method, all the set concepts in this logical information theory naturally extend to vector spaces in general—and to Hilbert spaces in particular—for quantum logical information theory which provides the natural measure of the distinctions made in quantum measurement. Relatively short but dense in content, this work can be a reference to researchers and graduate students doing investigations in information theory, maximum entropy methods in physics, engineering, and statistics, and to all those with a special interest in a new approach to quantum information theory.

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

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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.

Containing data on number theory, encryption schemes, and cyclic codes, this highly successful textbook, proven by the authors in a popular two-quarter course, presents coding theory, construction, encoding, and decoding of specific code families in an "easy-to-use" manner appropriate for students with only a basic background in mathematics offerin
This two-volume set on Mathematical Principles of the Internet provides a comprehensive overview of the mathematical principles of Internet engineering. The books do not aim to provide all of the mathematical foundations upon which the Internet is based. Instead, these cover only a partial panorama and the key principles. Volume 1 explores Internet engineering, while the supporting mathematics is covered in Volume 2. The chapters on mathematics complement those on the engineering episodes, and an effort has been made to make this work succinct, yet self-contained. Elements of information theory, algebraic coding

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theory, cryptography, Internet traffic, dynamics and control of Internet congestion, and queueing theory are discussed. In addition, stochastic networks, graph-theoretic algorithms, application of game theory to the Internet, Internet economics, data mining and knowledge discovery, and quantum computation, communication, and cryptography are also discussed. In order to study the structure and function of the Internet, only a basic knowledge of number theory, abstract algebra, matrices and determinants, graph theory, geometry, analysis, optimization theory, probability theory, and stochastic processes, is required. These mathematical disciplines are defined and developed in the books to the extent that is needed to develop and justify their application to Internet engineering.

This book provides a self-contained presentation of the physical and mathematical laws governing complex systems. Complex systems arising in natural, engineering, environmental, life and social sciences are approached from a unifying point of view using an array of methodologies such as microscopic and macroscopic level formulations, deterministic and probabilistic tools, modeling and simulation. The book can be used as a textbook by graduate students, researchers and teachers in science, as well as non-experts who wish to have an overview of one of the most open, markedly interdisciplinary and fast-growing branches of present-day science. Contents: The Phenomenology of Complex Systems: Complexity, a New Paradigm Signatures of Complexity Onset of Complexity Four Case Studies Summing Up Deterministic View: Dynamical Systems, Phase Space, Stability Levels of Description Normal Forms The Limit of Universality Deterministic Chaos Emergence Coupling-Induced Complexity Modeling Complexity Beyond Physical Science Probabilistic Description: Need for a Probabilistic Approach Probability Distributions and Their Evolution

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LawsThe Retrieval of UniversalityComplexity in the Probabilistic DescriptionEmergence RevisitedTransitions Between StatesSimulating Complex SystemsDisorder-Generated ComplexityComplexity, Entropy and Information:Information EntropyDynamical EntropiesInformation Entropy ProductionLarge Deviations, Fluctuation Theorems and the Probabilistic Properties of Time SequencesAlgorithmic Complexity and ComputationDynamical Systems as Information Sources: Scaling Rules and SelectionFurther Information MeasuresSumming UpPrediction:Communicating with a Complex SystemClassical Approaches and Their LimitationsNonlinear Data AnalysisThe Monitoring of Complex FieldsThe Predictability HorizonRecurrenceExtreme EventsSelected Topics:The Arrow of TimeNanosystemsAtmospheric DynamicsClimate DynamicsNetworksPerspectives on Biological ComplexityEquilibrium Versus Nonequilibrium in Complexity and Self-OrganizationEpistemological Insights from Complex SystemsOutlook. The Future of Complexity Readership: Graduate students, researchers, academics and professionals interested in nonlinear science. Keywords:Nonlinear Dynamics;Chaos;Self-Organization;Emergence;Probability and Information;Predictability;Non-Equilibrium Systems;Irreversibility;Systems BiologyKey Features:A unique vision highlighting complexity as part of fundamental science and a clear, unifying presentation of the concepts and tools needed to analyze complex systemsIllustrates the interdisciplinary dimension of complexity research through representative examples pertaining to problems of current concernNew edition, including a large collection of exercises and problems with hints for solution and an updated survey of the literatureReviews: "The book can be used as a textbook

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by graduate students, researchers and teachers in science, as well as non-experts who wish to have an overview of the field.” Zentralblatt MATH

The work introduces the fundamentals concerning the measure of discrete information, the modeling of discrete sources without and with a memory, as well as of channels and coding. The understanding of the theoretical matter is supported by many examples. One particular emphasis is put on the explanation of Genomic Coding. Many examples throughout the book are chosen from this particular area and several parts of the book are devoted to this exciting implication of coding.

This comprehensive textbook on the rapidly advancing field introduces readers to the fundamental concepts of information theory and quantum entanglement, taking into account the current state of research and development. It thus covers all current concepts in quantum computing, both theoretical and experimental, before moving on to the latest implementations of quantum computing and communication protocols. It contains problems and exercises and is therefore ideally suited for students and lecturers in physics and informatics, as well as experimental and theoretical physicists in academia and industry who work in the field of quantum information processing. The second edition incorporates important recent developments such as quantum metrology, quantum correlations beyond entanglement, and advances in quantum computing with solid state devices.

This book is devoted to the theory of probabilistic information measures and their application to coding

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theorems for information sources and noisy channels. The eventual goal is a general development of Shannon's mathematical theory of communication, but much of the space is devoted to the tools and methods required to prove the Shannon coding theorems. These tools form an area common to ergodic theory and information theory and comprise several quantitative notions of the information in random variables, random processes, and dynamical systems. Examples are entropy, mutual information, conditional entropy, conditional information, and discrimination or relative entropy, along with the limiting normalized versions of these quantities such as entropy rate and information rate. Much of the book is concerned with their properties, especially the long term asymptotic behavior of sample information and expected information. This is the only up-to-date treatment of traditional information theory emphasizing ergodic theory.

Information Theory, Coding & Cryptography has been designed as a comprehensive book for the students of engineering discussing Source Encoding, Error Control Codes & Cryptography. The book contains the recent developments of coded modulation, trellises for codes, turbo coding for reliable data and interleaving. The text balances the mathematical rigor with exhaustive amount of solved, unsolved questions along with a database of MCQs.

Originally developed by Claude Shannon in the 1940s, information theory laid the foundations for the digital revolution, and is now an essential tool in telecommunications, genetics, linguistics, brain sciences,

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and deep space communication. In this richly illustrated book, accessible examples are used to introduce information theory in terms of everyday games like '20 questions' before more advanced topics are explored. Online MatLab and Python computer programs provide hands-on experience of information theory in action, and PowerPoint slides give support for teaching. Written in an informal style, with a comprehensive glossary and tutorial appendices, this text is an ideal primer for novices who wish to learn the essential principles and applications of information theory.

This textbook takes a unified view of the fundamentals of wireless communication and explains cutting-edge concepts in a simple and intuitive way. An abundant supply of exercises make it ideal for graduate courses in electrical and computer engineering and it will also be of great interest to practising engineers.

This is the third edition of the European Workshop on Microelectronics Education (EWME). A steady-state regime has now been reached. An international community of university teachers is constituted; they exchange their experience and their pedagogical tools. They discuss the best ways to transfer the rapidly changing techniques to their students, and to introduce them to the new physical and mathematical concepts and models for the innovative techniques, devices, circuits and design methods. The number of abstracts submitted to EWME 2000 (about one hundred) enabled the scientific committee to proceed to a clear selection. EWME is a European meeting. Indeed, authors from 20 different European countries contribute to this volume.

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Nevertheless, the participation of authors from Brazil, Canada, China, New Zealand, and USA, shows that the workshop gradually attains an international dimension. The 20 century can be characterized as the "century of electron". The electron, as an elementary particle, was discovered by J.J. Thomson in 1897, and was rapidly used to transfer energy and information. Thanks to electron, universe and micro-cosmos could be explored. Electron became the omnipotent and omnipresent, almost immaterial, angel of our World. This was made possible thanks to electronics and, for the last 30 years, to microelectronics. Microelectronics not only modified and even radically transformed the industrial and the every-day landscapes, but it also led to the so-called "information revolution" with which begins the 21 st century.

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