

Mathematical Foundations Of Information Theory A Ya Khinchin

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The first comprehensive introduction to information theory, this text explores the work begun by Shannon and continued by McMillan, Feinstein, and Khinchin. Its rigorous treatment addresses the entropy concept in probability theory and fundamental theorems as well as ergodic sources, the martingale concept, anticipation and memory, and other subjects. 1957 edition.

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Mathematical Foundations of Information Theory (Dover ...
Foundations of Information Theory M. Burgin Department of Mathematics University of California, Los Angeles 405 Hilgard Ave. Los Angeles, CA 90095 Abstract. Information has become the most precious resource of society. At the same time, there is no consensus on the meaning of the term

Foundations of Information Theory - arXiv
This little book is an exposition on the mathematics behind information theory as understood by Khinchin himself. Contains a wealth of material in this area, with original insights from one of the main contributors.

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Information theory studies the quantification, storage, and communication of information. It was originally proposed by Claude Shannon in 1948 to find fundamental limits on signal processing and communication operations such as data compression, in a landmark paper titled "A Mathematical Theory of Communication". Its impact has been crucial to the success of the Voyager missions to deep space, the invention of the compact disc, the feasibility of mobile phones, the development of the Internet, t

Information theory - Wikipedia
Partial Contents: I. The Entropy Concept in Probability Theory — Entropy of Finite Schemes. The Uniqueness Theorem. Entropy of Markov chains. Application to Coding Theory. II. On the Fundamental Theorems of Information Theory — Two generalizations of Shannon's inequality. Three inequalities of Feinstein. Concept of a source. Stationarity. Entropy.

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In theoretical computer science and mathematics, the theory of computation is the branch that deals with what problems can be solved on a model of computation, using an algorithm, how efficiently they can be solved or to what degree (e.g., approximate solutions versus precise ones). The field is divided into three major branches: automata theory and formal languages, computability theory, and ...

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.

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 book offers a comprehensive and consistent mathematical approach to information retrieval (IR) without which no implementation is possible, and sheds an entirely new light upon the structure of IR models. It contains the descriptions of all IR models in a unified formal style and language, along with examples for each, thus offering a comprehensive overview of them. The book also creates mathematical foundations and a consistent mathematical theory (including all mathematical results achieved so far) of IR as a stand-alone mathematical discipline, which thus can be read and taught independently. Also, the book contains all necessary mathematical knowledge on which IR relies, to help the reader avoid searching different sources. Audience: The book will be of interest to computer or information scientists, librarians, mathematicians, undergraduate students and researchers whose work involves information retrieval.

This monograph provides a mathematical foundation to the theory of quantum information and computation, with applications to various open systems including nano and bio systems. It includes introductory material on algorithm, functional analysis, probability theory, information theory, quantum mechanics and quantum field theory. Apart from standard material on quantum information like quantum algorithm and teleportation, the authors discuss findings on the theory of entropy in C^{*}-dynamical systems, space-time dependence of quantum entangled states, entangling operators, adaptive dynamics, relativistic quantum information, and a new paradigm for quantum computation beyond the usual quantum Turing machine. Also, some important applications of information theory to genetics and life sciences, as well as recent experimental and theoretical discoveries in quantum photosynthesis are described.

This book provides the reader with the mathematical framework required to fully explore the potential of small quantum information processing devices. As decoherence will continue to limit their size, it is essential to master the conceptual tools which make such investigations possible. A strong emphasis is given to information measures that are essential for the study of devices of finite size, including Rényi entropies and smooth entropies. The presentation is self-contained and includes rigorous and concise proofs of the most important properties of these measures. The first chapters will introduce the formalism of quantum mechanics, with particular emphasis on norms and metrics for quantum states. This is necessary to explore quantum generalizations of Rényi divergence and conditional entropy, information measures that lie at the core of information theory. The smooth entropy framework is discussed next and provides a natural means to lift many arguments from information theory to the quantum setting. Finally selected applications of the theory to statistics and cryptography are discussed. The book is aimed at graduate students in Physics and Information Theory. Mathematical fluency is necessary, but no prior knowledge of quantum theory is required.

Highly useful text studies logarithmic measures of information and their application to testing statistical hypotheses. Includes numerous worked examples and problems. References. Glossary. Appendix. 1968 2nd, revised edition.

This book gives a concise presentation of the mathematical foundations of Game Theory, with an emphasis on strategic analysis linked to information and dynamics. It is largely self-contained, with all of the key tools and concepts defined in the text. Combining the basics of Game Theory, such as value existence theorems in zero-sum games and equilibrium existence theorems for non-zero-sum games, with a selection of important and more recent topics such as the equilibrium manifold and learning dynamics, the book quickly takes the reader close to the state of the art. Applications to economics, biology, and learning are included, and the exercises, which often contain noteworthy results, provide an important complement to the text. Based on lectures given in Paris over several years, this textbook will be useful for rigorous, up-to-date courses on the subject. Apart from an interest in strategic thinking and a taste for mathematical formalism, the only prerequisite for reading the book is a solid knowledge of mathematics at the undergraduate level, including basic analysis, linear algebra, and probability.

This graduate textbook provides a unified view of quantum information theory. Clearly explaining the necessary mathematical basis, it merges key topics from both information-theoretic and quantum- mechanical viewpoints and provides lucid explanations of the basic results. Thanks to this unified approach, it makes accessible such advanced topics in quantum communication as quantum teleportation, superdense coding, quantum state transmission (quantum error-correction) and quantum encryption. Since the publication of the preceding book Quantum Information: An Introduction, there have been tremendous strides in the field of quantum information. In particular, the following topics – all of which are addressed here – made seen major advances: quantum state discrimination, quantum channel capacity, bipartite and multipartite entanglement, security analysis on quantum communication, reverse Shannon theorem and uncertainty relation. With regard to the analysis of quantum security, the present book employs an improved method for the evaluation of leaked information and identifies a remarkable relation between quantum security and quantum coherence. Taken together, these two improvements allow a better analysis of quantum state transmission. In addition, various types of the newly discovered uncertainty relation are explained. Presenting a wealth of new developments, the book introduces readers to the latest advances and challenges in quantum information. To aid in understanding, each chapter is accompanied by a set of exercises and solutions.

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.

"To design future networks that are worthy of society's trust, we must put the 'discipline' of computer networking on a much stronger foundation. This book rises above the considerable minutiae of today's networking technologies to emphasize the long-standing mathematical underpinnings of the field." -Professor Jennifer Rexford, Department of Computer Science, Princeton University "This book is exactly the one I have been waiting for the last couple of years. Recently, I decided most students were already very familiar with the way the net works but were not being taught the fundamentals-the math. This book contains the knowledge for people who will create and understand future communications systems." -Professor Jon Crowcroft, The Computer Laboratory, University of Cambridge The Essential Mathematical Principles Required to Design, Implement, or Evaluate Advanced Computer Networks Students, researchers, and professionals in computer networking require a firm conceptual understanding of its foundations. Mathematical Foundations of Computer Networking provides an intuitive yet rigorous introduction to these essential mathematical principles and techniques. Assuming a basic grasp of calculus, this book offers sufficient detail to serve as the only reference many readers will need. Each concept is described in four ways: intuitively; using appropriate mathematical notation; with a numerical example carefully chosen for its relevance to networking; and with a numerical exercise for the reader. The first part of the text presents basic concepts, and the second part introduces four theories in a progression that has been designed to gradually deepen readers' understanding. Within each part, chapters are as self-contained as possible. The first part covers probability; statistics; linear algebra; optimization; and signals, systems, and transforms. Topics range from Bayesian networks to hypothesis testing, and eigenvalue computation to Fourier transforms. These preliminary chapters establish a basis for the four theories covered in the second part of the book: queueing theory, game theory, control theory, and information theory. The second part also demonstrates how mathematical concepts can be applied to issues such as contention for limited resources, and the optimization of network responsiveness, stability, and throughput.

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