Source Coding Theory

J. S. Chitode

Source Coding Theory:

Source Coding Theory Robert M. Gray,2012-12-06 Source coding theory has as its goal the characterization of the optimal performance achievable in idealized communication systems which must code an information source for transmission over a digital communication or storage channel for transmission to a user The user must decode the information into a form that is a good approximation to the original A code is optimal within some class if it achieves the best possible fidelity given whatever constraints are imposed on the code by the available channel In theory the primary constraint imposed on a code by the channel is its rate or resolution the number of bits per second or per input symbol that it can transmit from sender to receiver In the real world complexity may be as important as rate The origins and the basic form of much of the theory date from Shan non s classical development of noiseless source coding and source coding subject to a fidelity criterion also called rate distortion theory 73 74 Shannon combined a probabilistic notion of information with limit theo rems from ergodic theory and a random coding technique to describe the optimal performance of systems with a constrained rate but with uncon strained complexity and delay An alternative approach called asymptotic or high rate quantization theory based on different techniques and approx imations was introduced by Bennett at approximately the same time 4 This approach constrained the delay but allowed the rate to grow large   **Source Coding Theory** Robert M Gray,1989-10-31   Distributed Source Coding Shuang Wang,Yong Fang,Samuel Cheng,2017-03-20 Distributed source coding is one of the key enablers for efficient cooperative communication The potential applications range from wireless sensor networks ad hoc networks and surveillance networks to robust low complexity video coding stereo Multiview video coding HDTV hyper spectral and multispectral imaging and biometrics The book is divided into three sections theory algorithms and applications Part one covers the background of information theory with an emphasis on DSC part two discusses designs of algorithmic solutions for DSC problems covering the three most important DSC problems Slepian Wolf Wyner Ziv and MT source coding and part three is dedicated to a variety of potential DSC applications Key features Clear explanation of distributed source coding theory and algorithms including both lossless and lossy designs Rich applications of distributed source coding which covers multimedia communication and data security applications Self contained content for beginners from basic information theory to practical code implementation The book provides fundamental knowledge for engineers and computer scientists to access the topic of distributed source coding It is also suitable for senior undergraduate and first year graduate students in electrical engineering computer engineering signal processing image video processing and information theory and communications

Source Coding Theory Giuseppe Longo,2014-05-04   *Recursive Source Coding* G. Gabor,Z. Györfi,2012-12-06 The spreading of digital technology has resulted in a dramatic increase in the demand for data compression DC methods At the same time the appearance of highly integrated elements has made more and more com plicated algorithms feasible It is in the fields of speech and image trans mission and the transmission and storage of biological signals e g ECG Body Surface

Mapping where the demand for DC algorithms is greatest There is however a substantial gap between the theory and the practice of DC an essentially nonconstructive information theoretical attitude and the attractive mathematics of source coding theory are contrasted with a mixture of ad hoc engineering methods The classical Shannonian infor mation theory is fundamentally different from the world of practical pro cedures Theory places great emphasis on block coding while practice is overwhelmingly dominated by theoretically intractable mostly differential predictive coding DPC algorithms A dialogue between theory and practice has been hindered by two pro foundly different conceptions of a data source practice mostly because of speech compression considerations favors non stationary models while the theory deals mostly with stationary ones   Source Coding Theory Giuseppe Longo,2014-09-01   **Advances in Source Coding** Toby Berger,Lee D. Davisson,2014-05-04   **Information Theory And Coding** J. S. Chitode,2007 Information Theory and Channel CapacityMeasure of Information Average Information Content of Symbols in Long Independent Sequences Average Information Content of Symbols in Long Dependent Sequences Mark off Statistical Model for Information Sources Entropy and Information Rate of Mark off Sources Encoding of the Source Output Shannon s Encoding Algorithm Communication Channels Discrete Communication Channels Rate of Information Transmission Over a Discrete Channel Capacity of a Discrete Memoryless Channel Discrete Channels with Memory Continuous Channels Shannon Hartley Law and its Implications Fundamental Limits on PerformanceSome Properties of Entropy Extension of a DMS Prefix Coding Source Coding Theorem Huffman Coding Mutual Information Properties of Mutual Information Differential Entropy and Mutual Information for Continuous Ensembles Error Control CodingRationale for Coding and Types of Codes Discrete Memory less Channels Examples of Error Control Coding Methods of Controlling Errors Types of Errors Types of Codes Linear Block Codes Matrix Description of Linear Block Codes Error Detection and Error Correction Capabilities of Linear Block Codes Single Error Correcting Hamming Codes Lookup Table or Syndrome Decoding using Standard Array Binary Cyclic Codes Algebraic Structures of Cyclic Codes Encoding using and n k Bit Shift Register Syndrome Calculation Error Detection and Error Correction BCH Codes RS Codes Golay Codes Shortened Cyclic Codes Burst Error Correcting Codes Convolution Codes Time Domain Approach Transfer Domain Approach State Tree and Trellis diagrams Encoders and Decoders using Viterbi algorithm only for n k 1 Convolution Codes   **Source Coding** Thomas Wiegand,Heiko Schwarz,2011-01-05 Emphasizes source coding techniques that have become relevant for video coding in recent years For illustrating the concepts and efficiency of the basic sources coding techniques the authors provide numerous examples and experimental results for simple model sources   **Network Source Coding** Qian Zhao,California Institute of Technology. Division of Engineering and Applied Science,2003   *Digital Communications 1* Didier Le Ruyet,Mylène Pischella,2015-10-02 The communication chain is constituted by a source and a recipient separated by a transmission channel which may represent a portion of cable an optical fiber a radio channel or a satellite link Whatever the channel the processing blocks implemented in the

communication chain have the same foundation This book aims to itemize In this first volume after having presented the base of the information theory we will study the source coding techniques with and without loss Then we analyze the correcting codes for block errors convutional and concatenated used in current systems   *Distributed Source Coding* Pier Luigi Dragotti,Michael Gastpar,2009-02-24 The advent of wireless sensor technology and ad hoc networks has made DSC a major field of interest Edited and written by the leading players in the field this book presents the latest theory algorithms and applications making it the definitive reference on DSC for systems designers and implementers researchers and graduate students This book gives a clear understanding of the performance limits of distributed source coders for specific classes of sources and presents the design and application of practical algorithms for realistic scenarios Material covered includes the use of standard channel codes such as LDPC and Turbo codes to DSC and discussion of the suitability of compressed sensing for distributed compression of sparse signals Extensive applications are presented and include distributed video coding microphone arrays and securing biometric data Clear explanation of the principles of distributed source coding DSC a technology that has applications in sensor networks ad hoc networks and distributed wireless video systems for surveillance Edited and written by the leading players in the field providing a complete and authoritative reference Contains all the latest theory practical algorithms for DSC design and the most recently developed applications   **Mathematics of Information and Coding** Te Sun Han,Kingo Kobayashi,2002 This book is intended to provide engineering and or statistics students communications engineers and mathematicians with the firm theoretic basis of source coding or data compression in information theory Although information theory consists of two main areas source coding and channel coding the authors choose here to focus only on source coding The reason is that in a sense it is more basic than channel coding and also because of recent achievements in source coding and compression An important feature of the book is that whenever possible the authors describe universal coding methods i e the methods that can be used without prior knowledge of the statistical properties of the data The authors approach the subject of source coding from the very basics to the top frontiers in an intuitively transparent but mathematically sound manner The book serves as a theoretical reference for communication professionals and statisticians specializing in information theory It will also serve as an excellent introductory text for advanced level and graduate students taking elementary or advanced courses in telecommunications electrical engineering statistics mathematics and computer science   *An Introduction to Source Coding* Raymond Veldhuis,Marcel Breeuwer,1993 This book provides an introductory survey of current research in the broad discipline of source coding Part one is mainly theoretical and provides the background to source coding part two then discusses extensive examples of source coding systems for sound signals and images at all times relating these back to the key theory presented in part one Key features of the text include a unifying approach to source coding a systematic introduction and explanation close relation of theory with applications and extensive examples illustrations and exercises An Introduction to Source Coding will be an invaluable

textbook for those on university courses and also a valuable reference work for post graduates and researchers **Selected Topics in Information and Coding Theory** Isaac Woungang,Sudip Misra,Subhas Chandra Misra,2010 The last few years have witnessed rapid advancements in information and coding theory research and applications This book provides a comprehensive guide to selected topics both ongoing and emerging in information and coding theory Consisting of contributions from well known and high profile researchers in their respective specialties topics that are covered include source coding channel capacity linear complexity code construction existence and analysis bounds on codes and designs space time coding LDPC codes and codes and cryptography All of the chapters are integrated in a manner that renders the book as a supplementary reference volume or textbook for use in both undergraduate and graduate courses on information and coding theory As such it will be a valuable text for students at both undergraduate and graduate levels as well as instructors researchers engineers and practitioners in these fields Supporting Powerpoint Slides are available upon request for all instructors who adopt this book as a course text *Source and Channel Coding* John B. Anderson,Seshadri Mohan,2012-12-06 oW should coded communication be approached Is it about prob H ability theorems and bounds or about algorithms and structures The traditional course in information theory and coding teaches these together in one course in which the Shannon theory a probabilistic the ory of information dominates The theory s predictions and bounds to performance are valuable to the coding engineer but coding today is mostly about structures and algorithms and their size speed and error performance While coding has a theoretical basis it has a practical side as well an engineering side in which costs and benefits matter It is safe to say that most of the recent advances in information theory and coding are in the engineering of coding These thoughts motivate the present text book A coded communication book based on methods and algorithms with information theory in a necessary but supporting role There has been muchrecent progress in coding both inthe theory and the practice and these pages report many new advances Chapter 2 cov ers traditional source coding but also the coding ofreal one dimensional sources like speech and new techniques like vector quantization Chapter 4 is a unified treatment of trellis codes beginning with binary convolu tional codes and passing to the new trellis modulation codes **Source Coding Theory** Giuseppe Longo,1972 Information Theory and Network Coding Raymond W. Yeung,2008-09-10 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   <u>Channel Coding in the Presence of Side Information</u> Guy Keshet,Yossef Steinberg,Neri Merhav,2008 Channel Coding in the Presence of Side Information reviews the concepts and methods of communication systems equipped with side information both from the theoretical and practical points of view It is a comprehensive review that gives the reader an insightful introduction to one of the most important topics in modern communications systems   *Universal and Adaptive Source Coding* Michelle Effros,1994

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