

Key Papers in
**The Development of
Coding Theory**

Edited by
Elwyn R. Berlekamp



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Key Papers In The Development Of Coding Theory

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Algebraic Coding Theory (Revised Edition) Elwyn R. Berlekamp, 2015-03-26 This is the revised edition of Berlekamp's famous book *Algebraic Coding Theory* originally published in 1968 wherein he introduced several algorithms which have subsequently dominated engineering practice in this field. One of these is an algorithm for decoding Reed Solomon and Bose Chaudhuri Hocquenghem codes that subsequently became known as the Berlekamp Massey Algorithm. Another is the Berlekamp algorithm for factoring polynomials over finite fields whose later extensions and embellishments became widely used in symbolic manipulation systems. Other novel algorithms improved the basic methods for doing various arithmetic operations in finite fields of characteristic two. Other major research contributions in this book included a new class of Lee metric codes and precise asymptotic results on the number of information symbols in long binary BCH codes. Selected chapters of the book became a standard graduate textbook. Both practicing engineers and scholars will find this book to be of great value. *Introduction to Coding and Information Theory* Steven Roman, 1996-11-26 This book is intended to introduce coding theory and information theory to undergraduate students of mathematics and computer science. It begins with a review of probability theory as applied to finite sample spaces and a general introduction to the nature and types of codes. The two subsequent chapters discuss information theory, efficiency of codes, the entropy of information sources, and Shannon's Noiseless Coding Theorem. The remaining three chapters deal with coding theory, communication channels, decoding in the presence of errors, the general theory of linear codes, and such specific codes as Hamming codes, the simplex codes, and many others.

The Theory of Information and Coding R. J. McEliece, 2004-07-15 Student edition of the classic text in information and coding theory. *Coding and Information Theory* Steven Roman, 1992-06-04 This book is an introduction to information and coding theory at the graduate or advanced undergraduate level. It assumes a basic knowledge of probability and modern algebra but is otherwise self-contained. The intent is to describe as clearly as possible the fundamental issues involved in these subjects rather than covering all aspects in an encyclopedic fashion. The first quarter of the book is devoted to information theory, including a proof of Shannon's famous Noisy Coding Theorem. The remainder of the book is devoted to coding theory and is independent of the information theory portion of the book. After a brief discussion of general families of codes, the author discusses linear codes, including the Hamming, Golay, the Reed Muller codes, finite fields, and cyclic codes, including the BCH, Reed Solomon, Justesen, Goppa, and Quadratic Residue codes. An appendix reviews relevant topics from modern algebra. **Information and Coding Theory** Gareth A. Jones, J. Mary Jones, 2012-12-06 As this Preface is being

written the twentieth century is coming to an end Historians may perhaps come to refer to it as the century of information just as its predecessor is associated with the process of industrialisation Successive technological developments such as the telephone radio television computers and the Internet have had profound effects on the way we live We can see pictures of the surface of Mars or the early shape of the Universe The contents of a whole shelf load of library books can be compressed onto an almost weightless piece of plastic Billions of people can watch the same football match or can keep in instant touch with friends around the world without leaving home In short massive amounts of information can now be stored transmitted and processed with surprising speed accuracy and economy Of course these developments do not happen without some theoretical basis and as is so often the case much of this is provided by mathematics Many of the first mathematical advances in this area were made in the mid twentieth century by engineers often relying on intuition and experience rather than a deep theoretical knowledge to lead them to their discoveries Soon the mathematicians delighted to see new applications for their subject joined in and developed the engineers practical examples into wide ranging theories complete with definitions theorems and proofs

The Art of Error Correcting Coding Robert H. Morelos-Zaragoza, 2006-07-11 Building on the success of the first edition which offered a practical introductory approach to the techniques of error concealment this book now fully revised and updated provides a comprehensive treatment of the subject and includes a wealth of additional features The Art of Error Correcting Coding Second Edition explores intermediate and advanced level concepts as well as those which will appeal to the novice All key topics are discussed including Reed Solomon codes Viterbi decoding soft output decoding algorithms MAP log MAP and MAX log MAP Reliability based algorithms GMD and Chase are examined as are turbo codes both serially and parallel concatenated as well as low density parity check LDPC codes and their iterative decoders Features additional problems at the end of each chapter and an instructor's solutions manual Updated companion website offers new C C programs and MATLAB scripts to help with the understanding and implementation of basic ECC techniques Easy to follow examples illustrate the fundamental concepts of error correcting codes Basic analysis tools are provided throughout to help in the assessment of the error performance block and convolutional codes of a particular error correcting coding ECC scheme for a selection of the basic channel models This edition provides an essential resource to engineers computer scientists and graduate students alike for understanding and applying ECC techniques in the transmission and storage of digital information

Algebraic Coding Theory and Applications Carlos R. P. Hartmann, Giuseppe Longo, 2013-12-19

Fundamentals of Convolutional Coding Rolf Johannesson, Kamil Sh. Zigangirov, 2015-07-07 Fundamentals of Convolutional Coding Second Edition regarded as a bible of convolutional coding brings you a clear and comprehensive discussion of the basic principles of this field Two new chapters on low density parity check LDPC convolutional codes and iterative coding Viterbi BCJR BEAST list and sequential decoding of convolutional codes Distance properties of convolutional codes Includes a downloadable solutions manual

Arithmetic, Geometry, and

Coding Theory R. Pellikaan, M. Perret, S.G. Vladut, 2011-07-20 The series is aimed specifically at publishing peer reviewed reviews and contributions presented at workshops and conferences Each volume is associated with a particular conference symposium or workshop These events cover various topics within pure and applied mathematics and provide up to date coverage of new developments methods and applications

Fundamentals of Error-Correcting Codes W. Cary Huffman, Vera Pless, 2010-02-18 Fundamentals of Error Correcting Codes is an in depth introduction to coding theory from both an engineering and mathematical viewpoint As well as covering classical topics there is much coverage of techniques which could only be found in specialist journals and book publications Numerous exercises and examples and an accessible writing style make this a lucid and effective introduction to coding theory for advanced undergraduate and graduate students researchers and engineers whether approaching the subject from a mathematical engineering or computer science background

Entropy and Information Theory Robert M. Gray, 2013-03-14 This book is devoted to the theory of probabilistic information measures and their application to coding 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

Sphere Packings, Lattices and Groups John Conway, Neil J. A. Sloane, 2013-06-29 We now apply the algorithm above to find the 121 orbits of norm 2 vectors from the known norm 0 vectors and then apply it again to find the 665 orbits of norm 4 vectors from the vectors of norm 0 and 2 The neighbors of a strictly 24 dimensional odd unimodular lattice can be found as follows If a norm 4 vector $v \in \Lambda$ corresponds to the sum $25 \cdot 1$ of a strictly 24 dimensional odd unimodular lattice A and a dimensional lattice then there are exactly two norm 0 vectors of Λ having inner product 2 with v and these norm 0 vectors correspond to the two even neighbors of A The enumeration of the odd 24 dimensional lattices Figure 17.1 shows the neighborhood graph for the Niemeier lattices which has a node for each Niemeier lattice If A and B are neighboring Niemeier lattices there are three integral lattices containing $A \cap B$ namely $A \cup B$ and an odd unimodular lattice C of rank 4 An edge is drawn between nodes A and B in Fig 17.1 for each strictly 24 dimensional unimodular lattice arising in this way Thus there is a one to one correspondence between the strictly 24 dimensional odd unimodular lattices and the edges of our neighborhood graph The 156 lattices are shown in Table 17.1 Figure 17.1 also shows the corresponding graphs for dimensions 8 and 16

Fault-Tolerant Systems Israel Koren, C. Mani Krishna, 2010-07-19 Fault Tolerant Systems is the

first book on fault tolerance design with a systems approach to both hardware and software No other text on the market takes this approach nor offers the comprehensive and up to date treatment that Koren and Krishna provide This book incorporates case studies that highlight six different computer systems with fault tolerance techniques implemented in their design A complete ancillary package is available to lecturers including online solutions manual for instructors and PowerPoint slides Students designers and architects of high performance processors will value this comprehensive overview of the field The first book on fault tolerance design with a systems approach Comprehensive coverage of both hardware and software fault tolerance as well as information and time redundancy Incorporated case studies highlight six different computer systems with fault tolerance techniques implemented in their design Available to lecturers is a complete ancillary package including online solutions manual for instructors and PowerPoint slides

Covering Codes G. Cohen, I. Honkala, S. Litsyn, A. Lobstein, 1997-04-14 The problems of constructing covering codes and of estimating their parameters are the main concern of this book It provides a unified account of the most recent theory of covering codes and shows how a number of mathematical and engineering issues are related to covering problems Scientists involved in discrete mathematics combinatorics computer science information theory geometry algebra or number theory will find the book of particular significance It is designed both as an introductory textbook for the beginner and as a reference book for the expert mathematician and engineer A number of unsolved problems suitable for research projects are also discussed

Communications and Cryptography Richard E. Blahut, Daniel J. Costello Jr., Ueli Maurer, Thomas Mittelholzer, 2012-12-06 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

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