An Introduction To Error Correcting Codes With Applications

An Introduction to Error Correcting Codes with ApplicationsAn Introduction to Error-correcting CodesError Correcting CodesError-correcting CodesFundamentals of Error-Correcting CodesA Commonsense Approach to the Theory of Error Correcting CodesError-correcting CodesThe Theory of Error-correcting CodesA Short Course on Error Correcting CodesThe Art of Error Correcting CodingIntroduction to the Theory of Error-Correcting CodesQuantum Error Correction and Fault Tolerant Quantum ComputingThe Theory of Error-Correcting CodesError-Correction Coding for Digital CommunicationsError Correction CodingA Short Course on Error Correcting CodesIntroduction to Error-correcting CodesQuantum Error CorrectionCodes for Error DetectionA New Approach to Error-correcting Codes Scott A. Vanstone Shu Lin D J. Baylis William Wesley Peterson W. Cary Huffman Benjamin Arazi John Baylis Neil James Alexander Sloane Robert H. Morelos-Zaragoza Frank Gaitan Florence Jessie MacWilliams George C. Clark Jr. Todd K. Moon N. J. A. Sloane Michael Purser Daniel A. Lidar Torleiv Kl?ve A. Lempel

assuming little previous mathematical knowledge error correcting codes provides a sound introduction to key areas of the subject topics have been chosen for their importance and practical significance which baylis demonstrates in a rigorous but gentle mathematical style coverage includes optimal codes linear and non linear codes general techniques of decoding errors and erasures error detection syndrome decoding and much more error correcting codes contains not only straight maths but also exercises on more investigational problem solving chapters on number theory and polynomial algebra are included to support linear codes and cyclic codes and an extensive reminder of relevant topics in linear algebra is given exercises are placed within the main body of the text to encourage active participation by the reader with comprehensive solutions provided error correcting codes will appeal to undergraduate students in pure and applied mathematical fields software engineering communications engineering computer science and information technology and to organizations with substantial research and development in those areas

the coding problem introduction to algebra linear codes error correction capabilities of linear codes important linear block codes polynomial rings and galois fields linear switching circuits cyclic codes bose chaudhuri hocquenghem codes arithmetic codes

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

teaching the theory of error correcting codes on an introductory level is a difficulttask the theory which has immediate hardware applications also concerns highly abstractmathematical concepts this text explains the basic circuits in a refreshingly practical way thatwill appeal to undergraduate electrical engineering students as well as to engineers and techniciansworking in industry arazi s truly commonsense approach provides a solid grounding in the subject explaining principles intuitively from a hardware perspective he fully covers error correctiontechniques from basic parity check and single error correction cyclic codes to burst errorcorrecting codes and convolutional codes all this he presents before introducing galois fieldtheory the basic algebraic treatment and theoretical basis of the subject which usually appearsin the opening chapters of standard textbooks one entire chapter is devoted to specific practicalissues such as reed solomon codes used in compact disc equipment and maximum length sequences used in various fields of communications the

basic circuits explained throughout the book areredrawn and analyzed from a theoretical point of view for readers who are interested in tackling themathematics at a more advanced level benjamin arazi is an associate professor in the department ofelectrical and computer engineering at the ben gurion university of the negev his book is includedin the computer systems series edited by herb schwetman

this text provides introductory material offering examples of decoding algorithms of practical classes of error correcting codes implemented in c language and provides examples of the most popular decoding algorithms

it was once widely believed that quantum computation would never become a reality however the discovery of quantum error correction and the proof of the accuracy threshold theorem nearly ten years ago gave rise to extensive development and research aimed at creating a working scalable quantum computer over a decade has passed since this monumental accomplishment yet no book length pedagogical presentation of this important theory exists quantum error correction and fault tolerant quantum computing offers the first full length exposition on the realization of a theory once thought impossible it provides in depth coverage on the most important class of codes discovered to date quantum stabilizer codes it brings together the central themes of quantum error correction and fault tolerant procedures to prove the accuracy threshold theorem for a particular noise error model the author also includes a derivation of well known bounds on the parameters of quantum error correcting code packed with over 40 real world problems 35 field exercises and 17 worked out examples this book is the essential resource for any researcher interested in entering the quantum field as well as for those who want to understand how the unexpected realization of quantum computing is possible

error correction coding is being used on an almost routine basis in most new communication systems not only is coding equipment being used to increase the energy efficiency of communication links but coding ideas are also providing innovative solutions to many related communication problems among these are the elimination of intersymbol interference caused by filtering and multipath and the improved demodulation of certain frequency modulated signals by taking advantage of the natural coding provided by a continuous phase although several books and nu merous articles have been written on coding theory there are still noticeable deficiencies first the practical aspects of translating a specific decoding algorithm into actual hardware have been largely ignored the information that is available is sketchy and is widely dispersed second the information required to evaluate a particular technique under situations that are en countered in practice is available for the most part only in private company reports this book is aimed at correcting both of these problems it is written for the design engineer who must build the coding and decoding equipment and for the communication system engineer who must incorporate this equipment into a system it is also suitable as a senior level or first year graduate text for an introductory one semester course in coding theory the book u ses a minimum of mathematics and entirely avoids the classical theorem proof approach that is often seen in coding texts

providing in depth treatment of error correction error correction coding mathematical methods and algorithms 2nd edition provides a comprehensive introduction to classical and modern methods of error correction the presentation provides a clear practical introduction to using a lab oriented approach readers are encouraged to implement the encoding and decoding algorithms with explicit algorithm statements and the mathematics used in error correction balanced with an algorithmic development on how to actually do the encoding and decoding both block and stream convolutional codes are discussed and the mathematics required to understand them are introduced on a just in time basis as the reader progresses through the book the second edition increases the impact and reach of the book updating it to discuss recent important technological advances new material includes extensive coverage of ldpc codes including a variety of decoding algorithms a comprehensive introduction to polar codes including systematic encoding decoding and list decoding an introduction to fountain codes modern applications to systems such as hdtv dvbt2 and cell phones error correction coding includes extensive program files for example c code for all ldpc decoders and polar code decoders laboratory materials for students to implement algorithms and an updated solutions manual all of which are perfect to help the reader understand and retain the content the book covers classical bch reed solomon golay reed muller hamming and convolutional codes which are still component codes in virtually every modern communication system there are also fulsome discussions of recently developed polar codes and fountain codes that serve to educate the reader on the newest developments in error correction

this title covers the fundamentals of error correcting codes for the non specialist user from general concepts through to the most common error correcting codes applied to bit transmission in packet switched networks and personal cellular systems it also includes sections on linear blockades bch codes and cyclic codes

quantum computation and information is one of the most exciting developments in science and technology of the last twenty years to achieve large scale quantum computers and communication networks it is essential not only to overcome noise in stored quantum information but also in general faulty quantum operations scalable quantum computers require a far reaching theory of fault tolerant quantum computation this comprehensive text written by leading experts in the field focuses on quantum error correction and thoroughly covers the theory as well as experimental and practical issues the book is not limited to a single approach but reviews many different methods to control quantum errors including topological codes dynamical decoupling and decoherence free subspaces basic subjects as well as advanced theory and a survey of topics from cutting edge research make this book invaluable both as a pedagogical introduction at the graduate level and as a reference for experts in quantum information science

there are two basic methods of error control for communication both involving coding of the messages with forward error correction the codes are used to detect and correct errors in a repeat request system the codes are used to detect errors and if there are errors request a

retransmission error detection is usually much simpler to implement than error correction and is widely used however it is given a very cursory treatment in almost all textbooks on coding theory only a few older books are devoted to error detecting codes this book begins with a short introduction to the theory of block codes with emphasis on the parts important for error detection the weight distribution is particularly important for this application and is treated in more detail than in most books on error correction a detailed account of the known results on the probability of undetected error on the q ary symmetric channel is also given

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