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Mathematical Foundations of Software Development

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Edited by Hartmut Ehrig, Christiane Floyd, Maurice Nivat and James Thatcher

Mathematical Foundations Of Software Development

Hartmut Ehrig,Christiane Floyd,Maurice Nivat

Mathematical Foundations Of Software Development:

Mathematical Foundations of Software Engineering Gerard O'Regan,2023-05-04 This textbook presents an introduction to the mathematical foundations of software engineering It presents the rich applications of mathematics in areas such as error correcting codes cryptography the safety and security critical fields the banking and insurance fields as well as traditional engineering applications Topics and features Addresses core mathematics for critical thinking and problem solving Discusses propositional and predicate logic and various proof techniques to demonstrate the correctness of a logical argument Examines number theory and its applications to cryptography Considers the underlying mathematics of error correcting codes Discusses graph theory and its applications to modelling networks Reviews tools to support software engineering mathematics including automated and interactive theorem provers and model checking Discusses financial software engineering including simple and compound interest probability and statistics and operations research Discusses software reliability and dependability and explains formal methods used to derive a program from its specification Discusses calculus matrices vectors complex numbers and quaternions as well as applications to graphics and robotics Includes key learning topics summaries and review questions in each chapter together with a useful glossary This practical and easy to follow textbook reference is ideal for computer science students seeking to learn how mathematics can assist them in building high quality and reliable software on time and on budget The text also serves as an excellent self study primer for software engineers quality professionals and software managers   Mathematical Foundations of Software Development Hartmut Ehrig,1985   **Mathematical Foundations of Software Development. Proceedings of the International Joint Conference on Theory and Practice of Software Development (TAPSOFT), Berlin, March 25-29, 1985** Hartmut Ehrig,Christiane Floyd,Maurice Nivat,James Thatcher,1985-03   **Mathematical Foundations of Software Development** Hartmut Ehrig,1985   Mathematical Foundations of Software Engineering Gerard O'Regan,2023   Mathematical Foundations of Software Development. Proceedings of the International Joint Conference on Theory and Practice of Software Development (TAPSOFT), Berlin, March 25-29, 1985 Hartmut Ehrig,Christiane Floyd,Maurice Nivat,James Thatcher,1985-03-01   Mathematical Foundations of Software Development Hartmut Ehrig,Christiane Floyd,Maurice Nivat,   Foundations of Algebraic Specification and Formal Software Development Donald Sannella,Andrzej Tarlecki,2012-01-05 This book provides foundations for software specification and formal software development from the perspective of work on algebraic specification concentrating on developing basic concepts and studying their fundamental properties These foundations are built on a solid mathematical basis using elements of universal algebra category theory and logic and this mathematical toolbox provides a convenient language for precisely formulating the concepts involved in software specification and development Once formally defined these notions become subject to mathematical investigation and this interplay between mathematics and software engineering yields results that are mathematically interesting

conceptually revealing and practically useful The theory presented by the authors has its origins in work on algebraic specifications that started in the early 1970s and their treatment is comprehensive This book contains five kinds of material the requisite mathematical foundations traditional algebraic specifications elements of the theory of institutions formal specification and development and proof methods While the book is self contained mathematical maturity and familiarity with the problems of software engineering is required and in the examples that directly relate to programming the authors assume acquaintance with the concepts of functional programming The book will be of value to researchers and advanced graduate students in the areas of programming and theoretical computer science   *Software Engineering Foundations* Yingxu Wang,2007-08-09 A groundbreaking book in this field Software Engineering Foundations A Software Science Perspective integrates the latest research methodologies and their applications into a unified theoretical framework Based on the author s 30 years of experience it examines a wide range of underlying theories from philosophy cognitive informatics denota   *Software Engineering Processes* Yingxu Wang,Graham King,2000-04-21 Software engineering is playing an increasingly significant role in computing and informatics necessitated by the complexities inherent in large scale software development To deal with these difficulties the conventional life cycle approaches to software engineering are now giving way to the process system approach encompassing development methods infrastructure organization and management Until now however no book fully addressed process based software engineering or set forth a fundamental theory and framework of software engineering processes Software Engineering Processes Principles and Applications does just that Within a unified framework this book presents a comparative analysis of current process models and formally describes their algorithms It systematically enables comparison between current models avoidance of ambiguity in application and simplification of manipulation for practitioners The authors address a broad range of topics within process based software engineering and the fundamental theories and philosophies behind them They develop a software engineering process reference model SEPRM to show how to solve the problems of different process domains orientations structures taxonomies and methods They derive a set of process benchmarks based on a series of international surveys that support validation of the SEPRM model Based on their SEPRM model and the unified process theory they demonstrate that current process models can be integrated and their assessment results can be transformed between each other Software development is no longer just a black art or laboratory activity It is an industrialized process that requires the skills not just of programmers but of organization and project managers and quality assurance specialists Software Engineering Processes Principles and Applications is the key to understanding using and improving upon effective engineering procedures for software development   Cleanroom Software Engineering Stacy J. Prowell,Carmen J. Trammell,Richard C. Linger,Jesse H. Poore,1999-03-09 Cleanroom software engineering is a process for developing and certifying high reliability software Combining theory based engineering technologies in project management incremental development software specification

and design correctness verification and statistical quality certification the Cleanroom process answers today s call for more reliable software and provides methods for more cost effective software development Cleanroom originated with Harlan D Mills an IBM Fellow and a visionary in software engineering Written by colleagues of Mills and some of the most experienced developers and practitioners of Cleanroom Cleanroom Software Engineering provides a roadmap for software management development and testing as disciplined engineering practices This book serves both as an introduction for those new to Cleanroom and as a reference guide for the growing practitioner community Readers will discover a proven way to raise both quality and productivity in their software intensive products while reducing costs Highlights Explains basic Cleanroom theory Introduces the sequence based specification method Elaborates the full management development and certification process in a Cleanroom Reference Model CRM Shows how the Cleanroom process dovetails with the SEI s Capability Maturity Model for Software CMM Includes a large case study to illustrate how Cleanroom methods scale up to large projects

Fundamentals of Software Engineering Farhad Arbab,Marjan Sirjani,2010-01-27 The present volume contains the proceedings of the Third IPM International Conference on Fundamentals of Software Engineering FSEN Kish Iran April 15 17 2009 FSEN 2009 was organized by the School of Computer Science at the Institute for Studies in Fundamental Sciences IPM in Iran in cooperation with the ACM SIGSOFT and IFIP WG 2 2 This conference brought together around 100 researchers and practitioners working on di erent aspects of formal methods in software engineering from 15 di erentcountries ThetopicsofinterestinFSENspanoverallaspects offormal methods especiallythoserelatedtoadvancingtheapplicationofformalmethods in software industry and promoting their integration with practical engineering techniques The Program Committee of FSEN 2009 consisted of top researchers from 24 di erent academic institutes in 11 countries We received a total of 88 submissions from 25 countries out of which the Program Committee selected 22 as regular papers 5 as short papers and 7 as poster presentations in the conferenceprogram Eachsubmissionwasreviewedbyatleastthreeindependent referees for its quality originality contribution clarity of presentation and its relevance to the conference topics This volume contains the revised versions of the regular and short papers presented at FSEN 2009 Three distinguished keynote speakers delivered their lectures at FSEN 2009 on models of computation automata and processes Jos Baeten veri cation performanceanalysisandcontrollersynthesisforreal timesystems KimLarsen and theory and tool for component based model driven development in rCOS Zhiming Liu Our invited speakers also contributed to this volume by s mitting their keynote papers which were accepted after they were reviewed by independent referees **Software Engineering: Effective Teaching and Learning Approaches and Practices** Ellis, Heidi J.C.,Demurjian, Steven A.,Naveda, J. Fernando,2008-10-31 Over the past decade software engineering has developed into a highly respected field Though computing and software engineering education continues to emerge as a prominent interest area of study few books specifically focus on software engineering education itself Software Engineering Effective

Teaching and Learning Approaches and Practices presents the latest developments in software engineering education drawing contributions from over 20 software engineering educators from around the globe Encompassing areas such as student assessment and learning innovative teaching methods and educational technology this much needed book greatly enhances libraries with its unique research content   *Logic Programming '86* Eiiti Wada,1987-06-03 This volume contains the papers presented and subsequently submitted for publication at the 5th Logic Programming Conference held June 23 26 1986 in Tokyo Topics covered include Prolog machine architecture Prolog processors variations of Prolog language and applications of Prolog to natural language understanding and expert systems Most of the works reported in the volume are related to the Japanese Fifth Generation Computer Project allowing readers to compare results from this project with those from similar projects currently being conducted in other countries   **RIMS Symposium on Software Science and Engineering II** Eiichi Goto,Keijiro Araki,Taiichi Yuasa,1986   **Mathematics of Program Construction** Bernhard Möller,1995-07-10 This volume constitutes the proceedings of the Third International Conference on the Mathematics of Program Construction held at Kloster Irsee Germany in July 1995 Besides five invited lectures by distinguished researchers there are presented 19 full revised papers selected from a total of 58 submissions The general theme is the use of crisp clear mathematics in the discovery and design of algorithms and in the development of corresponding software and hardware among the topics addressed are program transformation program analysis program verification as well as convincing case studies   **Automata, Languages and Programming** Thomas Ottmann,1987-07-08 This volume contains the proceedings of the 14th International Colloquium on Automata Languages and Programming organized by the European Association for Theoretical Computer Science EATCS and held in Karlsruhe July 13 17 1987 The papers report on original research in theoretical computer science and cover topics such as algorithms and data structures automata and formal languages computability and complexity theory semantics of programming languages program specification transformation and verification theory of data bases logic programming theory of logical design and layout parallel and distributed computation theory of concurrency symbolic and algebraic computation term rewriting systems cryptography and theory of robotics The authors are young scientists and leading experts in these areas   *Mathematical Foundations of Computer Science 1988* Michal Chytil,Ladislav Janiga,Václav Koubek,1988 This volume contains 11 invited lectures and 42 communications presented at the 13th Conference on Mathematical Foundations of Computer Science MFCS 88 held at Carlsbad Czechoslovakia August 29 September 2 1988 Most of the papers present material from the following four fields complexity theory in particular structural complexity concurrency and parellelism formal language theory semantics Other areas treated in the proceedings include functional programming inductive syntactical synthesis unification algorithms relational databases and incremental attribute evaluation   Logics in AI Jan van Eijck,1991-02-26 The European Workshop on Logics in Artificial Intelligence was held at the Centre for Mathematics and Computer Science in Amsterdam September 10 14 1990 This

volume includes the 29 papers selected and presented at the workshop together with 7 invited papers The main themes are Logic programming and automated theorem proving Computational semantics for natural language Applications of non classical logics Partial and dynamic logics **Machine Learning - EWSL-91** Yves Kodratoff,1991-02-20 In this book contemporary knowledge of superconductivity is set against its historical background First the highlights of superconductivity research in the twentieth century are reviewed Further contributions then describe the basic phenomena resulting from the macroscopic quantum state of superconductivity such as zero resistivity the Meissner Ochsenfeld effect and flux quantization and review possible mechaniscs including the classical BCS theory and the more recent alternative theories The main categories of superconductors elements intermetallic phases chalcogenides oxides and organic compounds are described Common features and differences in their structure and electronic properties are pointed out This broad overview of superconductivity is completed by a discussion of properties related to the coherence length Newcomers to the field who seek an overall picture of research in superconductivity and of the cross links between its branches will find this volume especially useful

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