

Mathematical Logic for Computer Science

Third Edition

Mordechai Ben-Ari

Mathematical Logic for Computer Science

Third Edition

 Springer

Mordechai Ben-Ari
Mathematical Logic for Computer Science
Third Edition

Mathematical Logic for Computer Science is a mathematics textbook with theorems and proofs, but the science of logic is here guided by the needs of students of computer science. The method of systematic tabular proof provides an elegant way to teach logic that is both theoretically sound and easy to understand. The sections on algorithmic-based techniques facilitate learning advanced logical systems based on what the student has learned from elementary systems.

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The third edition has been entirely rewritten and includes new chapters on central topics of modern computer science: SAT solvers and model checking.

There are 120 exercises with answers available to qualified instructors.

Documented, open-source, Prolog source code for the algorithms is available at <http://code.google.com/p/mlc/>.

Mordechai (Moti) Ben-Ari is with the Department of Science Teaching at the Weizmann Institute of Science. He is a Distinguished Educator of the ACM and has received the ACM/IEEE-CS Award for Outstanding Contributions to Computer Science Education. His other textbooks published by Springer are: *Ada for Software Engineers* (Second Edition) and *Principles of the Spin Model Checker*.

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Mathematical Logic for Computer Science Mordechai Ben-Ari, 2012-06-16 Mathematical Logic for Computer Science is a mathematics textbook with theorems and proofs but the choice of topics has been guided by the needs of students of computer science The method of semantic tableaux provides an elegant way to teach logic that is both theoretically sound and easy to understand The uniform use of tableaux based techniques facilitates learning advanced logical systems based on what the student has learned from elementary systems The logical systems presented are propositional logic first order logic resolution and its application to logic programming Hoare logic for the verification of sequential programs and linear temporal logic for the verification of concurrent programs The third edition has been entirely rewritten and includes new chapters on central topics of modern computer science SAT solvers and model checking Mathematical Logic For Computer Science (2nd Edition) Zhongwan Lu, 1998-08-22 Mathematical logic is essentially related to computer science This book describes the aspects of mathematical logic that are closely related to each other including classical logic constructive logic and modal logic This book is intended to attend to both the peculiarities of logical systems and the requirements of computer science In this edition the revisions essentially involve rewriting the proofs increasing the explanations and adopting new terms and notations *Logic for Computer Scientists* Uwe Schöning, 2008-01-11 This book introduces the notions and methods of formal logic from a computer science standpoint covering propositional logic predicate logic and foundations of logic programming The classic text is replete with illustrative examples and exercises It presents applications and themes of computer science research such as resolution automated deduction and logic programming in a rigorous but readable way The style and scope of the work rounded out by the inclusion of exercises make this an excellent textbook for an advanced undergraduate course in logic for computer scientists **Mathematical Logic for Computer Science** Zhongwan Lu, 1998 Mathematical logic is essentially related to computer science This book describes the aspects of mathematical logic that are closely related to each other including classical logic constructive logic and modal logic This book is intended to attend to both the peculiarities of logical systems and the requirements of computer science In this edition the revisions essentially involve rewriting the proofs increasing the explanations and adopting new terms and notations **Mathematical Logic For Computer Science, 2E** Ben-Ari, 2005-01-01 **Mathematical Logic for Computer Science** Dino Mandrioli, Paola Spoletini, 2010-02-01 In the recent decades mathematical logic has become more and more important in computer science and in general in system engineering In fact by definition it is the way of expressing our reasoning in terms of mathematical formalism thus supplying it with the typical rigor and precision of mathematics Not by chance automatic information processing is now pervasive and we find it practically in any human activity and artefact from embedded safety critical systems to e commerce to social networks etc Such a pervasiveness and the consequent heterogeneity of the involved systems mandate much more generality in the formalism supporting the engineering activity

than traditional specialized models such as e.g. those for electric circuits and mechanical engines mathematical logic paired with computer applications provides such generality **Mathematical Logic for Computer Science** M. Ben-Ari, 2003

Mathematical Logic in Computer Science B. Dömölki, Tamás Gergely, 1981 *Computer Science Logic* Leszek Pacholski, Jerzy Tiuryn, 1995-07-18 This volume contains revised refereed versions of the best papers presented during the CSL 94 conference held in Kazimierz Poland in September 1994 CSL 94 is the eighth event in the series of workshops held for the third time as the Annual Conference of the European Association for Computer Science Logic The 38 papers presented were selected from a total of 151 submissions All important aspects of the methods of mathematical logic in computer science are addressed lambda calculus proof theory finite model theory logic programming semantics category theory and other logical systems Together these papers give a representative snapshot of the area of logical foundations of computer science

Mathematical Logic for Computer Science Zhongwan Lu, 1989 This book describes the aspects of mathematical logic related to computer sciences The materials adopted in this book are intended to attend to both the peculiarities of logical systems and the requirements of computer science

Handbook of Logic and Proof Techniques for Computer Science Steven G. Krantz, 2012-12-06 Logic is and should be the core subject area of modern mathematics The blueprint for twentieth century mathematical thought thanks to Hilbert and Bourbaki is the axiomatic development of the subject As a result logic plays a central conceptual role At the same time mathematical logic has grown into one of the most recondite areas of mathematics Most of modern logic is inaccessible to all but the specialist Yet there is a need for many mathematical scientists not just those engaged in mathematical research to become conversant with the key ideas of logic The Handbook of Mathematical Logic edited by Jon Barwise is in point of fact a handbook written by logicians for other mathematicians It was at the time of its writing encyclopedic authoritative and up to the moment But it was and remains a comprehensive and authoritative book for the cognoscenti The encyclopedic Handbook of Logic in Computer Science by Abramsky Gabbay and Maibaum is a wonderful resource for the professional But it is overwhelming for the casual user There is need for a book that introduces important logic terminology and concepts to the working mathematical scientist who has only a passing acquaintance with logic Thus the present work has a different target audience The intent of this handbook is to present the elements of modern logic including many current topics to the reader having only basic mathematical literacy

Introduction to Mathematical Logic, Fourth Edition Elliott Mendelson, 1997-06-01 The Fourth Edition of this long established text retains all the key features of the previous editions covering the basic topics of a solid first course in mathematical logic This edition includes an extensive appendix on second order logic a section on set theory with urllements and a section on the logic that results when we allow models with empty domains The text contains numerous exercises and an appendix furnishes answers to many of them Introduction to Mathematical Logic includes propositional logic first order logic first order number theory and the incompleteness and undecidability theorems of Gödel Rosser Church and Tarski

axiomatic set theory theory of computability The study of mathematical logic axiomatic set theory and computability theory provides an understanding of the fundamental assumptions and proof techniques that form basis of mathematics Logic and computability theory have also become indispensable tools in theoretical computer science including artificial intelligence Introduction to Mathematical Logic covers these topics in a clear reader friendly style that will be valued by anyone working in computer science as well as lecturers and researchers in mathematics philosophy and related fields Mathematical Logic and Theoretical Computer Science David Kueker,2020-12-22 Mathematical Logic and Theoretical Computer Science covers various topics ranging from recursion theory to Zariski topoi Leading international authorities discuss selected topics in a number of areas including denotational semantics recursion theoretic aspects of computer science model theory and algebra Automath and automated reasoning stability theory topoi and mathematics and topoi and logic The most up to date review available in its field Mathematical Logic and Theoretical Computer Science will be of interest to mathematical logicians computer scientists algebraists algebraic geometers differential geometers differential topologists and graduate students in mathematics and computer science **Logic and Computer Science** Steven Homer,Anil Nerode,Richard A. Platek,Gerald E. Sacks,Andre Scedrov,2006-11-14 The courses given at the 1st C I M E Summer School of 1988 dealt with the main areas on the borderline between applied logic and theoretical computer science These courses are recorded here in five expository papers S Homer The Isomorphism Conjecture and its Generalization A Nerode Some Lectures on Intuitionistic Logic R A Platek Making Computers Safe for the World An Introduction to Proofs of Programs Part I G E Sacks Prolog Programming A Scedrov A Guide to Polymorphic Types *Essential Logic for Computer Science* Rex Page,Ruben Gamboa,2019-01-08 An introduction to applying predicate logic to testing and verification of software and digital circuits that focuses on applications rather than theory Computer scientists use logic for testing and verification of software and digital circuits but many computer science students study logic only in the context of traditional mathematics encountering the subject in a few lectures and a handful of problem sets in a discrete math course This book offers a more substantive and rigorous approach to logic that focuses on applications in computer science Topics covered include predicate logic equation based software automated testing and theorem proving and large scale computation Formalism is emphasized and the book employs three formal notations traditional algebraic formulas of propositional and predicate logic digital circuit diagrams and the widely used partially automated theorem prover ACL2 which provides an accessible introduction to mechanized formalism For readers who want to see formalization in action the text presents examples using Proof Pad a lightweight ACL2 environment Readers will not become ACL2 experts but will learn how mechanized logic can benefit software and hardware engineers In addition 180 exercises some of them extremely challenging offer opportunities for problem solving There are no prerequisites beyond high school algebra Programming experience is not required to understand the book's equation based approach The book can be used in undergraduate courses in logic for computer science and introduction to

computer science and in math courses for computer science students

Handbook of Logic and Proof Techniques for Computer Science Steven George Krantz, 2002

Logicism Renewed Paul C. Gilmore, 2005-11-18

Logicism as put forward by Bertrand Russell was predicated on a belief that all of mathematics can be deduced from a very small number of fundamental logical principles In *Logicism Renewed* the author revisits this concept in light of advances in mathematical logic and the need for languages that can be understood by both humans and computers

Logic for Applications Anil Nerode, Richard Shore, 1997-01-17

In writing this book our goal was to produce a text suitable for a first course in mathematical logic more attuned than the traditional textbooks to the recent dramatic growth in the applications of logic to computer science Thus our choice of topics has been heavily influenced by such applications Of course we cover the basic traditional topics syntax semantics soundness completeness and compactness as well as a few more advanced results such as the theorems of Skolem Lowenheim and Herbrand Much of our book however deals with other less traditional topics

Resolution theorem proving plays a major role in our treatment of logic especially in its application to Logic Programming and PROLOG We deal extensively with the mathematical foundations of all three of these subjects In addition we include two chapters on nonclassical logics modal and intuitionistic that are becoming increasingly important in computer science We develop the basic material on the syntax and semantics via Kripke frames for each of these logics In both cases our approach to formal proofs soundness and completeness uses modifications of the same tableau method introduced for classical logic We indicate how it can easily be adapted to various other special types of modal logics A number of more advanced topics including nonmonotonic logic are also briefly introduced both in the nonclassical logic chapters and in the material on Logic Programming and PROLOG

Mathematical Logic and Theoretical Computer Science Kueker, 1986-12-22

This book includes articles on denotational semantics recursion theoretic aspects of computer science model theory and algebra automata and automated reasoning stability theory topology and mathematics and topology and logic It is intended for mathematical logicians and computer scientists

A Concise Introduction to Mathematical Logic Wolfgang Rautenberg, 2006

This book is unique in treating mathematical logic in a concise and streamlined fashion This allows many important topics to be covered in a one semester course Although the book is intended for use as a graduate text the first three chapters can be understood by undergraduates interested in mathematical logic The remaining chapters contain material on logic programming for computer scientists model theory recursion theory Godel's Incompleteness Theorems and applications of mathematical logic Philosophical and foundational problems of mathematics are discussed throughout the text and the author has provided exercises for each chapter as well as hints to selected exercises

Traditional logic as a part of philosophy is one of the oldest scientific disciplines Mathematical logic however is a relatively young discipline and arose from the endeavors of Peano Frege Russell and others to create a logical foundation for mathematics

The Enigmatic Realm of **Mathematical Logic For Computer Science Mathematical Logic For Computer Science**: Unleashing the Language is Inner Magic

In a fast-paced digital era where connections and knowledge intertwine, the enigmatic realm of language reveals its inherent magic. Its capacity to stir emotions, ignite contemplation, and catalyze profound transformations is nothing lacking extraordinary. Within the captivating pages of **Mathematical Logic For Computer Science Mathematical Logic For Computer Science** a literary masterpiece penned by a renowned author, readers set about a transformative journey, unlocking the secrets and untapped potential embedded within each word. In this evaluation, we shall explore the book is core themes, assess its distinct writing style, and delve into its lasting impact on the hearts and minds of those that partake in its reading experience.

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