

Basic Category Theory for Computer Scientists



Benjamin C. Pierce



Basic Category Theory For Computer Scientists Foundations Of Computing

Geoffrey Burn, Simon Gay, Mark Ryan



Basic Category Theory For Computer Scientists Foundations Of Computing:

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Generic Programming Roland Backhouse, Jeremy Gibbons, 2003-11-25 Generic programming attempts to make programming more efficient by making it more general This book is devoted to a novel form of genericity in programs based on parameterizing programs by the structure of the data they manipulate The book presents the following four revised and extended chapters first given as lectures at the Generic Programming Summer School held at the University of Oxford UK in August 2002 Generic Haskell Practice and Theory Generic Haskell Applications Generic Properties of Datatypes Basic Category Theory for Models of Syntax

Practical Foundations of Mathematics Paul Taylor, 1999-05-13 Practical Foundations collects the methods of construction of the objects of twentieth century mathematics Although it is mainly concerned with a framework essentially equivalent to intuitionistic Zermelo Fraenkel logic the book looks forward to more subtle bases in categorical type theory and the machine representation of mathematics Each idea is illustrated by wide ranging examples and followed critically along its natural path transcending disciplinary

boundaries between universal algebra type theory category theory set theory sheaf theory topology and programming Students and teachers of computing mathematics and philosophy will find this book both readable and of lasting value as a reference work

Monoidal Category Theory Noson S. Yanofsky, 2024-11-05 A comprehensive cutting edge and highly readable textbook that makes category theory and monoidal category theory accessible to students across the sciences Category theory is a powerful framework that began in mathematics but has since expanded to encompass several areas of computing and science with broad applications in many fields In this comprehensive text Noson Yanofsky makes category theory accessible to those without a background in advanced mathematics Monoidal Category Theory demonstrates the expansive uses of categories and in particular monoidal categories throughout the sciences The textbook starts from the basics of category theory and progresses to cutting edge research Each idea is defined in simple terms and then brought alive by many real world examples before progressing to theorems and uncomplicated proofs Richly guided exercises ground readers in concrete computation and application The result is a highly readable and engaging textbook that will open the world of category theory to many Makes category theory accessible to non math majors Uses easy to understand language and emphasizes diagrams over equations Incremental iterative approach eases students into advanced concepts A series of embedded mini courses cover such popular topics as quantum computing categorical logic self referential paradoxes databases and scheduling and knot theory Extensive exercises and examples demonstrate the broad range of applications of categorical structures Modular structure allows instructors to fit text to the needs of different courses Instructor resources include slides

Concept Invention Roberto Confalonieri, Alison Pease, Marco Schorlemmer, Tarek R. Besold, Oliver Kutz, Ewen Maclean, Maximos Kaliakatsos-Papakostas, 2018-10-05 This book introduces a computationally feasible cognitively inspired formal model of concept invention drawing on Fauconnier and Turner's theory of conceptual blending a fundamental cognitive operation The chapters present the mathematical and computational foundations of concept invention discuss cognitive and social aspects and further describe concrete implementations and applications in the fields of musical and mathematical creativity Featuring contributions from leading researchers in formal systems cognitive science artificial intelligence computational creativity mathematical reasoning and cognitive musicology the book will appeal to readers interested in how conceptual blending can be precisely characterized and implemented for the development of creative computational systems

Theory and Formal Methods 1993 Geoffrey Burn, Simon Gay, Mark Ryan, 2012-12-06 This volume contains the proceedings of the first workshop held by the Theory and Formal Methods Section of the Imperial College Department of Computing It contains papers from almost every member of the Section from our long term academic visitors and from those who have recently left us The papers fall into four broad areas semantics concurrency logic specification with some papers spanning a number of disciplines The subject material varies from work on mathematical foundations to practical applications of this theory expressing the Section's commitment to both the foundations of computer

science and the application of theory to real computing problems In preparing the workshop and these proceedings care was taken to ensure that there were papers overviewing a field as well as ones whose primary aim was to present new scientific results This had a dual purpose to bring our Section members up to speed in some of the areas being worked on by the Section and to provide the reader of the proceedings not only with a good introduction to many of the specific areas being investigated by the Section but also with details of some of our latest results All the papers presented at the workshop were revised following comments made by the workshop participants and all were subsequently reviewed by at least two people before producing the final versions contained in this volume

Algebraic and Coalgebraic Methods in the Mathematics of Program Construction Roland Backhouse, Roy Crole, Jeremy Gibbons, 2003-07-31 Program construction is about turning specifications of computer software into implementations Recent research aimed at improving the process of program construction exploits insights from abstract algebraic tools such as lattice theory fixpoint calculus universal algebra category theory and allegory theory This textbook like tutorial presents besides an introduction eight coherently written chapters by leading authorities on ordered sets and complete lattices algebras and coalgebras Galois connections and fixed point calculus calculating functional programs algebra of program termination exercises in coalgebraic specification algebraic methods for optimization problems and temporal algebra

Dewey, Pragmatism and Economic Methodology Elias Khalil, 2004-02-05 This book brings together for the first time philosophers of pragmatism and economists interested in methodological questions The main theoretical thrust of Dewey is to unite inquiry with behavior and this book's contributions assess this insight in the light of developments in modern American philosophy social and legal theories and the theor

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