Programming Languages For Mathematicians

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Not Even Wrong

CABRERA CARLSON

Multiset Processing
Springer Science & Business Media
This volume is the proceedings of the 3rd Workshop on the Mathematical Foundations of Programming Language Semantics held at Tulane University, New Orleans, Louisiana, April 8-10, 1987. The 1st Workshop was at Kansas State University, Manhattan, Kansas in April, 1985 (see LNCS 239), and the 2nd Workshop with a limited number of participants was at Kansas State in April, 1986. It was the intention of the organizers that the 3rd Workshop survey as many areas of the Mathematical Foundations of Programming Language Semantics as reasonably possible. The Workshop attracted 49 submitted papers, from which 28 papers were chosen for presentation. The papers ranged in subject from category theory and Lambda-calculus to the structure theory of domains and power domains, to implementation issues surrounding semantics.
The Little LISPer
Springer Science & Business Media
Discover easy-to-follow solutions and techniques to help you to implement applied mathematical concepts such as probability, calculus, and equations using Python's numeric and scientific libraries Key FeaturesCompute complex mathematical problems using programming logic with the help of step-by-step recipesLearn how to utilize Python's libraries for computation, mathematical modeling, and statisticsDiscover simple yet effective techniques for solving mathematical equations and apply them in real-world statisticsBook Description Python, one of the world's most popular programming languages, has a number of powerful packages to help you tackle complex mathematical problems in a simple and efficient way. These core capabilities help programmers pave the way for building exciting applications in various domains, such as machine learning and data science, using knowledge in the computational mathematics domain. The book teaches you how to solve problems faced in a wide variety of mathematical fields, including calculus, probability, statistics and data science, graph theory, optimization, and geometry. You'll start by developing core skills and learning about packages covered in Python's scientific stack, including NumPy, SciPy, and Matplotlib. As you advance, you'll get to grips with more advanced topics of calculus, probability, and networks (graph theory). After you gain a solid understanding of these topics, you'll discover Python's applications in data science and statistics, forecasting, geometry, and optimization. The final chapters will take you through a collection of miscellaneous problems, including working with specific data formats and accelerating code. By the end of this book, you'll have an arsenal of practical coding solutions that can be used and modified to solve a wide range of practical problems in computational mathematics and data science. What you will learnGet familiar with basic packages, tools, and libraries in Python for solving mathematical problemsExplore various

techniques that will help you to solve computational mathematical problemsUnderstand the core concepts of applied mathematics and how you can apply them in computer scienceDiscover how to choose the most suitable package, tool, or technique to solve a certain problemImplement basic mathematical plotting, change plot styles, and add labels to the plots using MatplotlibGet to grips with probability theory with the Bayesian inference and Markov Chain Monte Carlo (MCMC) methodsWho this book is for This book is for professional programmers and students looking to solve mathematical problems computationally using Python. Advanced mathematics knowledge is not a requirement, but a basic knowledge of mathematics will help you to get the most out of this book. The book assumes familiarity with Python concepts of data structures.

Mathematical Logic and Programming Languages Springer Science & Business Media

This book offers an introduction to computer programming, numerical analysis, and other mathematical ideas that extend the basic topics learned in calculus. It illustrates how mathematicians and scientists write computer programs, covering the general building blocks of programming languages and a description of how these concepts fit together to allow computers to produce the results they do. Topics explored here include binary arithmetic, algorithms for rendering graphics, the smooth interpolation of discrete data, and the numerical approximation of non-elementary integrals. The book uses an open-source computer algebra system called Maxima. Using Maxima, first-time programmers can perform familiar tasks, such as graphing functions or solving equations, and learn the basic structures of programming before moving on to other popular programming languages. The epilogue provides some simple examples of how this process works in practice. The book will particularly appeal to students who have finished their calculus sequence.

Types and Programming Languages Springer Science & Business Media

In Math for Programmers you'll explore important mathematical concepts through hands-on coding. Filled with graphics and more than 300 exercises and mini-projects, this book unlocks the door to interesting–and lucrative!–careers in some of today's hottest fields. As you tackle the basics of linear algebra, calculus, and machine learning, you'll master the key Python libraries used to turn them into real-world software applications. Summary To score a job in data science, machine learning, computer graphics, and cryptography, you need to bring strong math skills to the party. Math for Programmers teaches the math you need for these hot careers, concentrating on what you need to know as a developer. Filled with lots of helpful graphics and more than 200 exercises and mini-projects, this book unlocks the door to interesting–and lucrative!–careers in some of today's hottest programming fields. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the technology Skip the mathematical jargon: This one-of-a-kind book uses

Python to teach the math you need to build games, simulations, 3D graphics, and machine learning algorithms. Discover how algebra and calculus come alive when you see them in code! About the book In Math for Programmers you'll explore important mathematical concepts through hands-on coding. Filled with graphics and more than 300 exercises and mini-projects, this book unlocks the door to interesting–and lucrative!–careers in some of today's hottest fields. As you tackle the basics of linear algebra, calculus, and machine learning, you'll master the key Python libraries used to turn them into real-world software applications. What's inside Vector geometry for computer graphics Matrices and linear transformations Core concepts from calculus Simulation and optimization Image and audio processing Machine learning algorithms for regression and classification About the reader For programmers with basic skills in algebra. About the author Paul Orland is a programmer, software entrepreneur, and math enthusiast. He is co-founder of Tachyus, a start-up building predictive analytics software for the energy industry. You can find him online at www.paulor.land. Table of Contents 1 Learning math with code PART I - VECTORS AND GRAPHICS 2 Drawing with 2D vectors 3 Ascending to the 3D world 4 Transforming vectors and graphics 5 Computing transformations with matrices 6 Generalizing to higher dimensions 7 Solving systems of linear equations PART 2 - CALCULUS AND PHYSICAL SIMULATION 8 Understanding rates of change 9 Simulating moving objects 10 Working with symbolic expressions 11 Simulating force fields 12 Optimizing a physical system 13 Analyzing sound waves with a Fourier series PART 3 - MACHINE LEARNING APPLICATIONS 14 Fitting functions to data 15 Classifying data with logistic regression 16 Training neural networks

Introduction to Formal Languages Courier Corporation

The Mathematica Programmer covers the fundamental programming paradigms and applications of programming languages. This book is organized into two parts encompassing 10 chapters. Part 1 begins with an overview of the programming paradigms. This part also treats abstract data types, polymorphism and message passing, object-oriented programming, and relational databases. Part 2 looks into the practical aspects of programming languages, including in lists and power series, fractal curves, and minimal surfaces. This book will prove useful to mathematicians and computer scientists.

Introduction to the Tools of Scientific Computing Cambridge University Press

The topics covered in this text are those usually covered in a full year's course in finite mathematics or mathematics for liberal arts students. They correspond very closely to the topics I have taught at Western New England College to freshmen business and liberal arts students. They include set theory, logic, matrices and determinants, functions and graph ing, basic differential and integral calculus, probability and statistics, and trigonometry. Because this is an

introductory text, none of these topics is dealt with in great depth. The idea is to introduce the student to some of the basic concepts in mathematics along with some of their applications. I believe that this text is self-contained and can be used successfully by any college student who has completed at least two years of high school mathematics including one year of algebra. In addition, no previous knowledge of any programming language is necessary. The distinguishing feature of this text is that the student is given the opportunity to learn the mathematical concepts via A Programming Lan guage (APL). APL was developed by Kenneth E. Iverson while he was at Harvard University and was presented in a book by Dr. Iverson entitled A i Programming Language in 1962. He invented APL for educational purpo ses. That is, APL was designed to be a consistent, unambiguous, and powerful notation for communicating mathematical ideas. In 1966, APL became available on a time-sharing system at IBM.

Mathematical Foundations of Programming Semantics Springer Science & Business Media

Discrete mathematics is fundamental to computer science, and this up-to-date text assists undergraduates in mastering the ideas and mathematical language to address problems that arise in the field's many applications. It consists of 4 units of study: counting and listing, functions, decision trees and recursion, and basic concepts of graph theory.

The Haskell Road to Logic, Maths and Programming Pragmatic Bookshelf

Long ago, when Alexander the Great asked the mathematician Menaechmus for a crash course in geometry, he got the famous reply ``There is no royal road to mathematics.'' Where there was no shortcut for Alexander, there is no shortcut for us. Still, the fact that we have access to computers and mature programming languages means that there are avenues for us that were denied to the kings and emperors of yore. The purpose of this book is to teach logic and mathematical reasoning in practice, and to connect logical reasoning with computer programming in Haskell. Haskell emerged in the 1990s as a standard for lazy functional programming, a programming style where arguments are evaluated only when the value is actually needed. Haskell is a marvelous demonstration tool for logic and maths because its functional character allows implementations to remain very close to the concepts that get implemented, while the laziness permits smooth handling of infinite data structures. This book does not assume the reader to have previous experience with either programming or construction of formal proofs, but acquaintance with mathematical notation, at the level of secondary school mathematics is presumed. Everything one needs to know about mathematical reasoning or programming is explained as we go along. After proper digestion of the material in this book, the reader will be able to write interesting programs, reason about their correctness, and document them in a clear fashion. The reader will also have learned how to set up mathematical proofs in a structured way, and how to read and digest mathematical proofs written by others.

This is the updated, expanded, and corrected second edition of a much-acclaimed textbook. Praise for the first edition: 'Doets and van Eijck's ``The Haskell Road to Logic, Maths and Programming'' is an astonishingly extensive and accessible textbook on logic, maths, and Haskell.' Ralf Laemmel, Professor of Computer Science, University of Koblenz-Landau

C++ for Mathematicians
CRC Press
This volume presents a unique combination of modeling and solving real world optimization problems. It is the only book which treats systematically the major modeling languages and systems used to solve mathematical optimization problems, and it also provides a useful overview and orientation of today's modeling languages in mathematical optimization. It demonstrates the strengths and characteristic features of such languages and provides a bridge for researchers, practitioners and students into a new world: solving real optimization problems with the most advances modeling systems.

Introduction to Scientific Programming with Python
MIT Press
Powerful, flexible, easy to use-small wonder that the use of MAPLE® continues to increase, particularly since the latest releases of MAPLE. The built-in nature of its numerical and graphical facilities gives MAPLE a distinct advantage over traditional programming languages, yet to date, no textbook has used that advantage to introduce programming concepts. Moreover, few books based on MAPLE's latest versions even exist. Computing with MAPLE presents general programming principles using MAPLE as a concrete example of a programming language. The author first addresses the basic MAPLE functions accessible for interactive use then moves to actual programming, discussing all of the programming facilities that MAPLE provides, including control structures, data types, graphics, spreadsheets, text processing, and object oriented programming. Reflecting MAPLE's primary function as a computational tool, the book's emphasis is on mathematical examples, and it includes a full chapter devoted to algebraic programming. Classroom tested since 1995, the material in Computing with MAPLE is particularly appropriate for an intermediate-level introductory course in programming for both mathematics and computing students. It includes numerous exercises and test questions, with MAPLE worksheets, contact information, and supplementary material available on the Internet.

From Mathematics to Generic Programming
Manning Publications
Doing Math with Python shows you how to use Python to delve into high school–level math topics like statistics, geometry, probability, and calculus. You'll start with simple projects, like a factoring program and a quadratic-equation solver, and then create more complex projects once you've gotten the hang of things. Along the way, you'll discover new ways to explore math and gain valuable programming skills that you'll use throughout your study of math and computer science. Learn how to: –Describe your data with statistics, and visualize it with line graphs, bar charts, and scatter plots –Explore set theory and probability with programs

for coin flips, dicing, and other games of chance –Solve algebra problems using Python's symbolic math functions –Draw geometric shapes and explore fractals like the Barnsley fern, the Sierpinski triangle, and the Mandelbrot set –Write programs to find derivatives and integrate functions Creative coding challenges and applied examples help you see how you can put your new math and coding skills into practice. You'll write an inequality solver, plot gravity's effect on how far a bullet will travel, shuffle a deck of cards, estimate the area of a circle by throwing 100,000 "darts" at a board, explore the relationship between the Fibonacci sequence and the golden ratio, and more. Whether you're interested in math but have yet to dip into programming or you're a teacher looking to bring programming into the classroom, you'll find that Python makes programming easy and practical. Let Python handle the grunt work while you focus on the math. Uses Python 3

The Mathematica® Programmer Packt Publishing Ltd

The book provides an introduction to common programming tools and methods in numerical mathematics and scientific computing. Unlike standard approaches, it does not focus on any specific language, but aims to explain the underlying ideas. Typically, new concepts are first introduced in the particularly user-friendly Python language and then transferred and extended in various programming environments from C/C++, Julia and MATLAB to Maple and Mathematica. This includes various approaches to distributed computing. By examining and comparing different languages, the book is also helpful for mathematicians and practitioners in deciding which programming language to use for which purposes. At a more advanced level, special tools for the automated solution of partial differential equations using the finite element method are discussed. On a more experimental level, the basic methods of scientific machine learning in artificial neural networks are explained and illustrated.

A Programmer's Introduction to Mathematics No Starch Press

Several areas of mathematics find application throughout computer science, and all students of computer science need a practical working understanding of them. These core subjects are centred on logic, sets, recursion, induction, relations and functions. The material is often called discrete mathematics, to distinguish it from the traditional topics of continuous mathematics such as integration and differential equations. The central theme of this book is the connection between computing and discrete mathematics. This connection is useful in both directions: • Mathematics is used in many branches of computer science, in applica tions including program specification, datastructures,design and analysis of algorithms, database systems, hardware design, reasoning about the correctness of implementations, and much more; • Computers can help to make the mathematics easier to learn and use, by making mathematical terms executable, making abstract concepts more concrete, and through the

use of software tools such as proof checkers. These connections are emphasised throughout the book. Software tools (see Appendix A) enable the computer to serve as a calculator, but instead of just doing arithmetic and trigonometric functions, it will be used to calculate with sets, relations, functions, predicates and inferences. There are also special software tools, for example a proof checker for logical proofs using natural deduction.

Domains and Lambda-Calculi Texts in Computing

Metamath is a computer language and an associated computer program for archiving, verifying, and studying mathematical proofs. The Metamath language is simple and robust, with an almost total absence of hard-wired syntax, and we believe that it provides about the simplest possible framework that allows essentially all of mathematics to be expressed with absolute rigor. While simple, it is also powerful; the Metamath Proof Explorer (MPE) database has over 23,000 proven theorems and is one of the top systems in the "Formalizing 100 Theorems" challenge. This book explains the Metamath language and program, with specific emphasis on the fundamentals of the MPE database.

Modeling Languages in Mathematical Optimization Springer Nature

Mathematical Logic and Programming LanguagesPrentice HallC++ for MathematiciansCRC Press

Scala for the Impatient Prentice Hall

First published in 1998, this textbook is a broad but rigourous survey of the theoretical basis for the design, definition and implementation of programming languages and of systems for specifying and proving programme behaviour. Both imperative and functional programming are covered, as well as the ways of integrating these aspects into more general languages. Recognising a unity of technique beneath the diversity of research in programming languages, the author presents an integrated treatment of the basic principles of the subject. He identifies the relatively small number of concepts, such as compositional semantics, binding structure, domains, transition systems and inference rules, that serve as the foundation of the field. Assuming only knowledge of elementary programming and mathematics, this text is perfect for advanced undergraduate and beginning graduate courses in programming language theory and also will appeal to researchers and professionals in designing or implementing computer languages.

Doing Math with Python Skylight Pub

Presents an introduction to the Scala programming language which is an abbreviated version of object-orientated programming combined with the power of concurrency capable of running on the Java Virtual Machine.

C++ for Scientists, Engineers and Mathematicians Springer Science & Business Media

Based on the author’s experience in teaching data science for more than 10 years, Mathematics and Programming for Machine Learning with R: From the Ground Up reveals how machine learning algorithms do their magic and explains how these algorithms can be

implemented in code. It is designed to provide readers with an understanding of the reasoning behind machine learning algorithms as well as how to program them. Written for novice programmers, the book progresses step-by-step, providing the coding skills needed to implement machine learning algorithms in R. The book begins with simple implementations and fundamental concepts of logic, sets, and probability before moving to the coverage of powerful deep learning algorithms. The first eight chapters deal with probability-based machine learning algorithms, and the last eight chapters deal with machine learning based on artificial neural networks. The first half of the book does not require mathematical sophistication, although familiarity with probability and statistics would be helpful. The second half assumes the reader is familiar with at least one semester of calculus. The text guides novice R programmers through algorithms and their application and along the way; the reader gains programming confidence in tackling advanced R programming challenges. Highlights of the book include: More than 400 exercises A strong emphasis on improving programming skills and guiding beginners to the implementation of full-fledged algorithms Coverage of fundamental computer and mathematical concepts including logic, sets, and probability In-depth explanations of machine learning algorithms

Metamath: A Computer Language for Mathematical Proofs

John Wiley & Sons

C++ is among the most powerful and popular of programming languages for applications. This is an adoptable textbook for undergraduate students who need to use this language for applications that are - in the main - numerical. Most engineering, phys ics, and mathematics degree courses include a computing element: this book should be used where C++ is the chosen language, already the majority of cases. The book is comprehensive and includes advanced features of the language, indicating where they ar e of special interest to the reader. No prior knowledge of C is assumed, and the book's bias towards numerical applications makes it unique in the field.

Introduction to College Mathematics with A Programming Language

Cambridge University Press

This volume contains the proceedings of the Seventh International Conferenceon the Mathematical Foundations of Programming Semantics, held at Carnegie Mellon University, March 1991. The conference continued a series of annual meetings, alternating between workshop and conference formats, intended to bring together computer scientists and mathematicians for discussion of research problems, results and directions in programming language semantics and related areas. A major goalof the series is to improve communication and interaction between researchers in these areas and to establish ties between related areas of research. The volume contains revised and refereed versions of each of the contributed papers and refereed papers by three invited speakers:Jon Barwise, John Reynolds, and Mitchell Wand.

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