

Learning Scipy For Numerical And Scientific Computing Second Edition

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Numerical Python Robert Johansson 2019-01-19 Leverage the numerical and mathematical modules in Python and its standard library as well as popular open source numerical Python packages like NumPy, SciPy, FiPy, matplotlib and more. This fully revised edition, updated with the latest details of each package and changes to Jupyter projects, demonstrates how to numerically compute solutions and mathematically model applications in big data, cloud computing, financial engineering, business management and more. Numerical Python, Second Edition, presents many brand-new case study examples of applications in data science and statistics using Python, along with extensions to many previous examples. Each of these demonstrates the power of Python for rapid development and exploratory computing due to its simple and high-level syntax and multiple options for data analysis. After reading this book, readers will be familiar with many computing techniques including array-based and symbolic computing, visualization and numerical file I/O, equation solving, optimization, interpolation and integration, and domain-specific computational problems, such as differential equation solving, data analysis, statistical modeling and machine learning. What You'll Learn Work with vectors and matrices using NumPy Plot and visualize data with Matplotlib Perform data analysis tasks with Pandas and SciPy Review statistical modeling and machine learning with statsmodels and scikit-learn Optimize Python code using Numba and Cython Who This Book Is For Developers who want to understand how to use Python and its related ecosystem for numerical computing.

[Learning SciPy for Numerical and Scientific Computing - Second Edition](#)

Sergio J. Rojas G. 2015-02-26 This book targets programmers and scientists who have basic Python knowledge and who are keen to perform scientific and numerical computations with SciPy.

Programming for Computations - Python Svein Linge 2019-10-30 This book is published open access under a CC BY 4.0 license. This book presents computer programming as a key method for solving mathematical problems. This second edition of the well-received book has been

extensively revised: All code is now written in Python version 3.6 (no longer version 2.7). In addition, the two first chapters of the previous edition have been extended and split up into five new chapters, thus expanding the introduction to programming from 50 to 150 pages. Throughout the book, the explanations provided are now more detailed, previous examples have been modified, and new sections, examples and exercises have been added. Also, a number of small errors have been corrected. The book was inspired by the Springer book TCSE 6: A Primer on Scientific Programming with Python (by Langtangen), but the style employed is more accessible and concise, in keeping with the needs of engineering students. The book outlines the shortest possible path from no previous experience with programming to a set of skills that allows students to write simple programs for solving common mathematical problems with numerical methods in the context of engineering and science courses. The emphasis is on generic algorithms, clean program design, the use of functions, and automatic tests for verification.

Python for Data Analysis Wes McKinney 2017-09-25 Get complete instructions for manipulating, processing, cleaning, and crunching datasets in Python. Updated for Python 3.6, the second edition of this hands-on guide is packed with practical case studies that show you how to solve a broad set of data analysis problems effectively. You'll learn the latest versions of pandas, NumPy, IPython, and Jupyter in the process. Written by Wes McKinney, the creator of the Python pandas project, this book is a practical, modern introduction to data science tools in Python. It's ideal for analysts new to Python and for Python programmers new to data science and scientific computing. Data files and related material are available on GitHub. Use the IPython shell and Jupyter notebook for exploratory computing Learn basic and advanced features in NumPy (Numerical Python) Get started with data analysis tools in the pandas library Use flexible tools to load, clean, transform, merge, and reshape data Create informative visualizations with matplotlib Apply the pandas groupby facility to slice, dice, and summarize datasets Analyze and manipulate regular and irregular time series data Learn how to solve real-world data analysis

problems with thorough, detailed examples

Applied Scientific Computing Peter R. Turner 2018-07-18 This easy-to-understand textbook presents a modern approach to learning numerical methods (or scientific computing), with a unique focus on the modeling and applications of the mathematical content. Emphasis is placed on the need for, and methods of, scientific computing for a range of different types of problems, supplying the evidence and justification to motivate the reader. Practical guidance on coding the methods is also provided, through simple-to-follow examples using Python. Topics and features: provides an accessible and applications-oriented approach, supported by working Python code for many of the methods; encourages both problem- and project-based learning through extensive examples, exercises, and projects drawn from practical applications; introduces the main concepts in modeling, python programming, number representation, and errors; explains the essential details of numerical calculus, linear, and nonlinear equations, including the multivariable Newton method; discusses interpolation and the numerical solution of differential equations, covering polynomial interpolation, splines, and the Euler, Runge–Kutta, and shooting methods; presents largely self-contained chapters, arranged in a logical order suitable for an introductory course on scientific computing. Undergraduate students embarking on a first course on numerical methods or scientific computing will find this textbook to be an invaluable guide to the field, and to the application of these methods across such varied disciplines as computer science, engineering, mathematics, economics, the physical sciences, and social science.

Introduction to Computation and Programming Using Python, second edition John V. Guttag 2016-08-12 The new edition of an introductory text that teaches students the art of computational problem solving, covering topics ranging from simple algorithms to information visualization. This book introduces students with little or no prior programming experience to the art of computational problem solving using Python and various Python libraries, including PyLab. It provides students with skills that will enable them to make productive use of computational techniques, including some of the tools and techniques of data science for using computation to model and interpret data. The book is based on an MIT course (which became the most popular course offered through MIT's OpenCourseWare) and was developed for use not only in a conventional classroom but in in a massive open online course (MOOC). This new edition has been updated for Python 3, reorganized to make it easier to use for courses that cover only a subset of the material, and offers additional material including five new chapters. Students are introduced to Python and the basics of programming in the context of such computational concepts and techniques as exhaustive enumeration, bisection search, and efficient approximation algorithms. Although it covers such traditional topics as computational complexity and simple algorithms, the book focuses on a wide range of topics not found in most introductory texts, including

information visualization, simulations to model randomness, computational techniques to understand data, and statistical techniques that inform (and misinform) as well as two related but relatively advanced topics: optimization problems and dynamic programming. This edition offers expanded material on statistics and machine learning and new chapters on Frequentist and Bayesian statistics.

Mastering SciPy Francisco J. Blanco-Silva 2015-11-10 Implement state-of-the-art techniques to visualize solutions to challenging problems in scientific computing, with the use of the SciPy stack About This Book Master the theory and algorithms behind numerical recipes and how they can be applied to real-world problems Learn to combine the most appropriate built-in functions from the SciPy stack by understanding the connection between the sources of your problem, volume of data, or computer architecture A comprehensive coverage of all the mathematical techniques needed to solve the presented topics, with a discussion of the relevant algorithms built in the SciPy stack Who This Book Is For If you are a mathematician, engineer, or computer scientist with a proficiency in Python and familiarity with IPython, this is the book for you. Some basic knowledge of numerical methods in scientific computing would be helpful. What You Will Learn Master relevant algorithms used in symbolic or numerical mathematics to address approximation, interpolation, differentiation, integration, root-finding, and optimization of scalar or multivariate functions Develop different algorithms and strategies to efficiently store and manipulate large matrices of data, in particular to solve systems of linear equations, or compute their eigenvalues/eigenvectors Understand how to model physical problems with systems of differential equations and distinguish the factors that dictate the strategies to solve them Perform statistical analysis, hypothesis test design and resolution, or data mining at a higher level, and apply them to real-life problems in the field of data analysis Gain insights on the power of distances, Delaunay triangulations and Voronoi diagrams for Computational Geometry, and apply them to various engineering problems Familiarize yourself with different techniques in signal/image processing, including filtering audio, images, or video to extract information, features, or remove components In Detail The SciPy stack is a collection of open source libraries of the powerful scripting language Python, together with its interactive shells. This environment offers a cutting-edge platform for numerical computation, programming, visualization and publishing, and is used by some of the world's leading mathematicians, scientists, and engineers. It works on any operating system that supports Python and is very easy to install, and completely free of charge! It can effectively transform into a data-processing and system-prototyping environment, directly rivalling MATLAB and Octave. This book goes beyond a mere description of the different built-in functions coded in the libraries from the SciPy stack. It presents you with a solid mathematical and computational background to help you identify the right tools for each problem in scientific computing and visualization. You will

gain an insight into the best practices with numerical methods depending on the amount or type of data, properties of the mathematical tools employed, or computer architecture, among other factors. The book kicks off with a concise exploration of the basics of numerical linear algebra and graph theory for the treatment of problems that handle large data sets or matrices. In the subsequent chapters, you will delve into the depths of algorithms in symbolic algebra and numerical analysis to address modeling/simulation of various real-world problems with functions (through interpolation, approximation, or creation of systems of differential equations), and extract their representing features (zeros, extrema, integration or differentiation). Lastly, you will move on to advanced concepts of data analysis, image/signal processing, and computational geometry. Style and approach Packed with real-world examples, this book explores the mathematical techniques needed to solve the presented topics, and focuses on the algorithms built in the SciPy stack.

Building Machine Learning Systems with Python – Second Edition Luis Pedro Coelho 2015-03-26 This book primarily targets Python developers who want to learn and use Python's machine learning capabilities and gain valuable insights from data to develop effective solutions for business problems.

Numerical Python Robert Johansson 2015-10-07 Numerical Python by Robert Johansson shows you how to leverage the numerical and mathematical modules in Python and its Standard Library as well as popular open source numerical Python packages like NumPy, FiPy, matplotlib and more to numerically compute solutions and mathematically model applications in a number of areas like big data, cloud computing, financial engineering, business management and more. After reading and using this book, you'll get some takeaway case study examples of applications that can be found in areas like business management, big data/cloud computing, financial engineering (i.e., options trading investment alternatives), and even games. Up until very recently, Python was mostly regarded as just a web scripting language. Well, computational scientists and engineers have recently discovered the flexibility and power of Python to do more. Big data analytics and cloud computing programmers are seeing Python's immense use. Financial engineers are also now employing Python in their work. Python seems to be evolving as a language that can even rival C++, Fortran, and Pascal/Delphi for numerical and mathematical computations.

Scientific Computing with Python – Second Edition CLAUS. FUHRER 2021-07-23 Leverage this example-packed, comprehensive guide for all your Python computational needs Key Features: Learn the first steps within Python to highly specialized concepts Explore examples and code snippets taken from typical programming situations within scientific computing. Delve into essential computer science concepts like iterating, object-oriented programming, testing, and MPI presented in strong connection to applications within scientific computing. Book Description:

Python has tremendous potential within the scientific computing domain. This updated edition of Scientific Computing with Python features new chapters on graphical user interfaces, efficient data processing, and parallel computing to help you perform mathematical and scientific computing efficiently using Python. This book will help you to explore new Python syntax features and create different models using scientific computing principles. The book presents Python alongside mathematical applications and demonstrates how to apply Python concepts in computing with the help of examples involving Python 3.8. You'll use pandas for basic data analysis to understand the modern needs of scientific computing, and cover data module improvements and built-in features. You'll also explore numerical computation modules such as NumPy and SciPy, which enable fast access to highly efficient numerical algorithms. By learning to use the plotting module Matplotlib, you will be able to represent your computational results in talks and publications. A special chapter is devoted to SymPy, a tool for bridging symbolic and numerical computations. By the end of this Python book, you'll have gained a solid understanding of task automation and how to implement and test mathematical algorithms within the realm of scientific computing. What You Will Learn: Understand the building blocks of computational mathematics, linear algebra, and related Python objects Use Matplotlib to create high-quality figures and graphics to draw and visualize results Apply object-oriented programming (OOP) to scientific computing in Python Discover how to use pandas to enter the world of data processing Handle exceptions for writing reliable and usable code Cover manual and automatic aspects of testing for scientific programming Get to grips with parallel computing to increase computation speed Who this book is for: This book is for students with a mathematical background, university teachers designing modern courses in programming, data scientists, researchers, developers, and anyone who wants to perform scientific computation in Python.

Big Data Integration Xin Luna Dong 2015-02-01 The big data era is upon us: data are being generated, analyzed, and used at an unprecedented scale, and data-driven decision making is sweeping through all aspects of society. Since the value of data explodes when it can be linked and fused with other data, addressing the big data integration (BDI) challenge is critical to realizing the promise of big data. BDI differs from traditional data integration along the dimensions of volume, velocity, variety, and veracity. First, not only can data sources contain a huge volume of data, but also the number of data sources is now in the millions. Second, because of the rate at which newly collected data are made available, many of the data sources are very dynamic, and the number of data sources is also rapidly exploding. Third, data sources are extremely heterogeneous in their structure and content, exhibiting considerable variety even for substantially similar entities. Fourth, the data sources are of widely differing qualities, with significant differences in the coverage, accuracy and timeliness of data provided. This book explores the progress that has been made by the

data integration community on the topics of schema alignment, record linkage and data fusion in addressing these novel challenges faced by big data integration. Each of these topics is covered in a systematic way: first starting with a quick tour of the topic in the context of traditional data integration, followed by a detailed, example-driven exposition of recent innovative techniques that have been proposed to address the BDI challenges of volume, velocity, variety, and veracity. Finally, it presents merging topics and opportunities that are specific to BDI, identifying promising directions for the data integration community.

Numerical Python Robert Johansson 2018-12-24 Leverage the numerical and mathematical modules in Python and its standard library as well as popular open source numerical Python packages like NumPy, SciPy, FiPy, matplotlib and more. This fully revised edition, updated with the latest details of each package and changes to Jupyter projects, demonstrates how to numerically compute solutions and mathematically model applications in big data, cloud computing, financial engineering, business management and more. Numerical Python, Second Edition, presents many brand-new case study examples of applications in data science and statistics using Python, along with extensions to many previous examples. Each of these demonstrates the power of Python for rapid development and exploratory computing due to its simple and high-level syntax and multiple options for data analysis. After reading this book, readers will be familiar with many computing techniques including array-based and symbolic computing, visualization and numerical file I/O, equation solving, optimization, interpolation and integration, and domain-specific computational problems, such as differential equation solving, data analysis, statistical modeling and machine learning. What You'll Learn Work with vectors and matrices using NumPy Plot and visualize data with Matplotlib Perform data analysis tasks with Pandas and SciPy Review statistical modeling and machine learning with statsmodels and scikit-learn Optimize Python code using Numba and Cython Who This Book Is For Developers who want to understand how to use Python and its related ecosystem for numerical computing.

Numerical and Scientific Computing with SciPy Sergio Rojas 2017 "This practical course begins with an introduction to the Python SciPy Stack and a coverage of its basic usage cases. You will then delve right into the different functionalities offered by the main modules comprising the SciPy Stack (Numpy, Scipy, and Matplotlib) and see the basics on how they can be implemented in real-life scenarios. You will see how you can make the most of the algorithms in the SciPy Stack to solve problems in linear algebra, numerical analysis, visualization, and much more, including some practical examples drawn from the field of Machine Learning."--Resource description page.

Numerical Analysis and Optimization Grégoire Allaire 2007-05-24 This text, based on the author's teaching at École Polytechnique, introduces the reader to the world of mathematical modelling and numerical simulation.

Covering the finite difference method; variational formulation of elliptic problems; Sobolev spaces; elliptical problems; the finite element method; Eigenvalue problems; evolution problems; optimality conditions and algorithms and methods of operational research, and including a several exercises throughout, this is an ideal text for advanced undergraduate students and graduates in applied mathematics, engineering, computer science, and the physical sciences.

Numerical Methods Anne Greenbaum 2012-04-01 A rigorous and comprehensive introduction to numerical analysis Numerical Methods provides a clear and concise exploration of standard numerical analysis topics, as well as nontraditional ones, including mathematical modeling, Monte Carlo methods, Markov chains, and fractals. Filled with appealing examples that will motivate students, the textbook considers modern application areas, such as information retrieval and animation, and classical topics from physics and engineering. Exercises use MATLAB and promote understanding of computational results. The book gives instructors the flexibility to emphasize different aspects—design, analysis, or computer implementation—of numerical algorithms, depending on the background and interests of students. Designed for upper-division undergraduates in mathematics or computer science classes, the textbook assumes that students have prior knowledge of linear algebra and calculus, although these topics are reviewed in the text. Short discussions of the history of numerical methods are interspersed throughout the chapters. The book also includes polynomial interpolation at Chebyshev points, use of the MATLAB package Chebfun, and a section on the fast Fourier transform. Supplementary materials are available online. Clear and concise exposition of standard numerical analysis topics Explores nontraditional topics, such as mathematical modeling and Monte Carlo methods Covers modern applications, including information retrieval and animation, and classical applications from physics and engineering Promotes understanding of computational results through MATLAB exercises Provides flexibility so instructors can emphasize mathematical or applied/computational aspects of numerical methods or a combination Includes recent results on polynomial interpolation at Chebyshev points and use of the MATLAB package Chebfun Short discussions of the history of numerical methods interspersed throughout Supplementary materials available online

Python Data Science Handbook Jake VanderPlas 2016-11-21 For many researchers, Python is a first-class tool mainly because of its libraries for storing, manipulating, and gaining insight from data. Several resources exist for individual pieces of this data science stack, but only with the Python Data Science Handbook do you get them all—IPython, NumPy, Pandas, Matplotlib, Scikit-Learn, and other related tools. Working scientists and data crunchers familiar with reading and writing Python code will find this comprehensive desk reference ideal for tackling day-to-day issues: manipulating, transforming, and cleaning data; visualizing different types of

data; and using data to build statistical or machine learning models. Quite simply, this is the must-have reference for scientific computing in Python. With this handbook, you'll learn how to use: IPython and Jupyter: provide computational environments for data scientists using Python NumPy: includes the ndarray for efficient storage and manipulation of dense data arrays in Python Pandas: features the DataFrame for efficient storage and manipulation of labeled/columnar data in Python Matplotlib: includes capabilities for a flexible range of data visualizations in Python Scikit-Learn: for efficient and clean Python implementations of the most important and established machine learning algorithms

Python Programming and Numerical Methods Qingkai Kong 2020-11-27

Python Programming and Numerical Methods: A Guide for Engineers and Scientists introduces programming tools and numerical methods to engineering and science students, with the goal of helping the students to develop good computational problem-solving techniques through the use of numerical methods and the Python programming language. Part One introduces fundamental programming concepts, using simple examples to put new concepts quickly into practice. Part Two covers the fundamentals of algorithms and numerical analysis at a level that allows students to quickly apply results in practical settings. Includes tips, warnings and "try this" features within each chapter to help the reader develop good programming practice Summaries at the end of each chapter allow for quick access to important information Includes code in Jupyter notebook format that can be directly run online

Learning NumPy Array Ivan Idris 2014-06-13 A step-by-step guide, packed with examples of practical numerical analysis that will give you a comprehensive, but concise overview of NumPy. This book is for programmers, scientists, or engineers, who have basic Python knowledge and would like to be able to do numerical computations with Python.

Mastering Numerical Computing with NumPy Umit Mert Cakmak

2018-06-28 Enhance the power of NumPy and start boosting your scientific computing capabilities Key Features Grasp all aspects of numerical computing and understand NumPy Explore examples to learn exploratory data analysis (EDA), regression, and clustering Access NumPy libraries and use performance benchmarking to select the right tool Book Description NumPy is one of the most important scientific computing libraries available for Python. Mastering Numerical Computing with NumPy teaches you how to achieve expert level competency to perform complex operations, with in-depth coverage of advanced concepts. Beginning with NumPy's arrays and functions, you will familiarize yourself with linear algebra concepts to perform vector and matrix math operations. You will thoroughly understand and practice data processing, exploratory data analysis (EDA), and predictive modeling. You will then move on to working on practical examples which will teach you how to use NumPy statistics in order to explore US housing data and develop a predictive model using simple and multiple linear regression techniques. Once you have got to

grips with the basics, you will explore unsupervised learning and clustering algorithms, followed by understanding how to write better NumPy code while keeping advanced considerations in mind. The book also demonstrates the use of different high-performance numerical computing libraries and their relationship with NumPy. You will study how to benchmark the performance of different configurations and choose the best for your system. By the end of this book, you will have become an expert in handling and performing complex data manipulations. What you will learn Perform vector and matrix operations using NumPy Perform exploratory data analysis (EDA) on US housing data Develop a predictive model using simple and multiple linear regression Understand unsupervised learning and clustering algorithms with practical use cases Write better NumPy code and implement the algorithms from scratch Perform benchmark tests to choose the best configuration for your system Who this book is for Mastering Numerical Computing with NumPy is for you if you are a Python programmer, data analyst, data engineer, or a data science enthusiast, who wants to master the intricacies of NumPy and build solutions for your numeric and scientific computational problems. You are expected to have familiarity with mathematics to get the most out of this book.

Learning Linux Binary Analysis Ryan "elfmaster" O'Neill 2016-02-29

Uncover the secrets of Linux binary analysis with this handy guide About This Book Grasp the intricacies of the ELF binary format of UNIX and Linux Design tools for reverse engineering and binary forensic analysis Insights into UNIX and Linux memory infections, ELF viruses, and binary protection schemes Who This Book Is For If you are a software engineer or reverse engineer and want to learn more about Linux binary analysis, this book will provide you with all you need to implement solutions for binary analysis in areas of security, forensics, and antivirus. This book is great for both security enthusiasts and system level engineers. Some experience with the C programming language and the Linux command line is assumed. What You Will Learn Explore the internal workings of the ELF binary format Discover techniques for UNIX Virus infection and analysis Work with binary hardening and software anti-tamper methods Patch executables and process memory Bypass anti-debugging measures used in malware Perform advanced forensic analysis of binaries Design ELF-related tools in the C language Learn to operate on memory with ptrace In Detail Learning Linux Binary Analysis is packed with knowledge and code that will teach you the inner workings of the ELF format, and the methods used by hackers and security analysts for virus analysis, binary patching, software protection and more. This book will start by taking you through UNIX/Linux object utilities, and will move on to teaching you all about the ELF specimen. You will learn about process tracing, and will explore the different types of Linux and UNIX viruses, and how you can make use of ELF Virus Technology to deal with them. The latter half of the book discusses the usage of Kprobe instrumentation for kernel hacking, code

patching, and debugging. You will discover how to detect and disinfect kernel-mode rootkits, and move on to analyze static code. Finally, you will be walked through complex userspace memory infection analysis. This book will lead you into territory that is uncharted even by some experts; right into the world of the computer hacker. Style and approach The material in this book provides detailed insight into the arcane arts of hacking, coding, reverse engineering Linux executables, and dissecting process memory. In the computer security industry these skills are priceless, and scarce. The tutorials are filled with knowledge gained through first hand experience, and are complemented with frequent examples including source code.

Python Scripting for Computational Science Hans Petter Langtangen

2013-03-14 Scripting with Python makes you productive and increases the reliability of your scientific work. Here, the author teaches you how to develop tailored, flexible, and efficient working environments built from small programs (scripts) written in Python. The focus is on examples and applications of relevance to computational science: gluing existing applications and tools, e.g. for automating simulation, data analysis, and visualization; steering simulations and computational experiments; equipping programs with graphical user interfaces; making computational Web services; creating interactive interfaces with a Maple/Matlab-like syntax to numerical applications in C/C++ or Fortran; and building flexible object-oriented programming interfaces to existing C/C++ or Fortran libraries.

Scientific Computing with Python Claus Fuhrer 2021-07-30

Leverage this example-packed, comprehensive guide for all your Python computational needs Key Features Learn the first steps within Python to highly specialized concepts Explore examples and code snippets taken from typical programming situations within scientific computing. Delve into essential computer science concepts like iterating, object-oriented programming, testing, and MPI presented in strong connection to applications within scientific computing. Book Description Python has tremendous potential within the scientific computing domain. This updated edition of *Scientific Computing with Python* features new chapters on graphical user interfaces, efficient data processing, and parallel computing to help you perform mathematical and scientific computing efficiently using Python. This book will help you to explore new Python syntax features and create different models using scientific computing principles. The book presents Python alongside mathematical applications and demonstrates how to apply Python concepts in computing with the help of examples involving Python 3.8. You'll use pandas for basic data analysis to understand the modern needs of scientific computing, and cover data module improvements and built-in features. You'll also explore numerical computation modules such as NumPy and SciPy, which enable fast access to highly efficient numerical algorithms. By learning to use the plotting module Matplotlib, you will be able to represent your computational

results in talks and publications. A special chapter is devoted to SymPy, a tool for bridging symbolic and numerical computations. By the end of this Python book, you'll have gained a solid understanding of task automation and how to implement and test mathematical algorithms within the realm of scientific computing. What you will learn Understand the building blocks of computational mathematics, linear algebra, and related Python objects Use Matplotlib to create high-quality figures and graphics to draw and visualize results Apply object-oriented programming (OOP) to scientific computing in Python Discover how to use pandas to enter the world of data processing Handle exceptions for writing reliable and usable code Cover manual and automatic aspects of testing for scientific programming Get to grips with parallel computing to increase computation speed Who this book is for This book is for students with a mathematical background, university teachers designing modern courses in programming, data scientists, researchers, developers, and anyone who wants to perform scientific computation in Python.

Introduction to Scientific Programming with Python Joakim Sundnes 2020

This open access book offers an initial introduction to programming for scientific and computational applications using the Python programming language. The presentation style is compact and example-based, making it suitable for students and researchers with little or no prior experience in programming. The book uses relevant examples from mathematics and the natural sciences to present programming as a practical toolbox that can quickly enable readers to write their own programs for data processing and mathematical modeling. These tools include file reading, plotting, simple text analysis, and using NumPy for numerical computations, which are fundamental building blocks of all programs in data science and computational science. At the same time, readers are introduced to the fundamental concepts of programming, including variables, functions, loops, classes, and object-oriented programming. Accordingly, the book provides a sound basis for further computer science and programming studies.

Python for Scientists John M. Stewart 2017-07-31

Scientific Python is a significant public domain alternative to expensive proprietary software packages. This book teaches from scratch everything the working scientist needs to know using copious, downloadable, useful and adaptable code snippets. Readers will discover how easy it is to implement and test non-trivial mathematical algorithms and will be guided through the many freely available add-on modules. A range of examples, relevant to many different fields, illustrate the language's capabilities. The author also shows how to use pre-existing legacy code (usually in Fortran77) within the Python environment, thus avoiding the need to master the original code. In this new edition, several chapters have been re-written to reflect the IPython notebook style. With an extended index, an entirely new chapter discussing SymPy and a substantial increase in the number of code snippets, researchers and research students will be able to quickly acquire

all the skills needed for using Python effectively.

Scientific Computing with Python 3 – Second Edition Claus Fuhrer

2016-11-24 An example-rich, comprehensive guide for all of your Python computational needs
About This Book* Your ultimate resource for getting up and running with Python numerical computations* Explore numerical computing and mathematical libraries using Python 3.x code with SciPy and NumPy modules* A hands-on guide to implementing mathematics with Python, with complete coverage of all the key concepts
Who This Book Is For
This book is for anyone who wants to perform numerical and mathematical computations in Python. It is especially useful for developers, students, and anyone who wants to use Python for computation. Readers are expected to possess basic a knowledge of scientific computing and mathematics, but no prior experience with Python is needed.
What you will learn* The principal syntactical elements of Python* The most important and basic types in Python* The essential building blocks of computational mathematics, linear algebra, and related Python objects* Plot in Python using matplotlib to create high quality figures and graphics to draw and visualize your results* Define and use functions and learn to treat them as objects* How and when to correctly apply object-oriented programming for scientific computing in Python* Handle exceptions, which are an important part of writing reliable and usable code* Two aspects of testing for scientific programming: Manual and Automatic
In Detail
Python can be used for more than just general-purpose programming. It is a free, open source language and environment that has tremendous potential for use within the domain of scientific computing. This book presents Python in tight connection with mathematical applications and demonstrates how to use various concepts in Python for computing purposes, including examples with the latest version of Python 3. Python is an effective tool to use when coupling scientific computing and mathematics and this book will teach you how to use it for linear algebra, arrays, plotting, iterating, functions, polynomials, and much more.

IPython Interactive Computing and Visualization Cookbook Cyrille Rossant

2014-09-25 Intended to anyone interested in numerical computing and data science: students, researchers, teachers, engineers, analysts, hobbyists... Basic knowledge of Python/NumPy is recommended. Some skills in mathematics will help you understand the theory behind the computational methods.

Practical Numerical and Scientific Computing with MATLAB® and Python

Eihab B. M. Bashier 2020-03-18 Practical Numerical and Scientific Computing with MATLAB® and Python concentrates on the practical aspects of numerical analysis and linear and non-linear programming. It discusses the methods for solving different types of mathematical problems using MATLAB and Python. Although the book focuses on the approximation problem rather than on error analysis of mathematical problems, it provides practical ways to calculate errors. The book is

divided into three parts, covering topics in numerical linear algebra, methods of interpolation, numerical differentiation and integration, solutions of differential equations, linear and non-linear programming problems, and optimal control problems. This book has the following advantages: It adopts the programming languages, MATLAB and Python, which are widely used among academics, scientists, and engineers, for ease of use and contain many libraries covering many scientific and engineering fields. It contains topics that are rarely found in other numerical analysis books, such as ill-conditioned linear systems and methods of regularization to stabilize their solutions, nonstandard finite differences methods for solutions of ordinary differential equations, and the computations of the optimal controls. It provides a practical explanation of how to apply these topics using MATLAB and Python. It discusses software libraries to solve mathematical problems, such as software Gekko, pulp, and pyomo. These libraries use Python for solutions to differential equations and static and dynamic optimization problems. Most programs in the book can be applied in versions prior to MATLAB 2017b and Python 3.7.4 without the need to modify these programs. This book is aimed at newcomers and middle-level students, as well as members of the scientific community who are interested in solving math problems using MATLAB or Python.

Effective Computation in Physics Anthony Scopatz 2015-06-25 More physicists today are taking on the role of software developer as part of their research, but software development isn't always easy or obvious, even for physicists. This practical book teaches essential software development skills to help you automate and accomplish nearly any aspect of research in a physics-based field. Written by two PhDs in nuclear engineering, this book includes practical examples drawn from a working knowledge of physics concepts. You'll learn how to use the Python programming language to perform everything from collecting and analyzing data to building software and publishing your results. In four parts, this book includes: Getting Started: Jump into Python, the command line, data containers, functions, flow control and logic, and classes and objects Getting It Done: Learn about regular expressions, analysis and visualization, NumPy, storing data in files and HDF5, important data structures in physics, computing in parallel, and deploying software Getting It Right: Build pipelines and software, learn to use local and remote version control, and debug and test your code Getting It Out There: Document your code, process and publish your findings, and collaborate efficiently; dive into software licenses, ownership, and copyright procedures

SciPy and NumPy Eli Bressert 2012 "Optimizing and boosting your Python programming"--Cover.

Introduction to Python for Engineers and Scientists Sandeep Nagar 2017-12-06 Familiarize yourself with the basics of Python for engineering and scientific computations using this concise, practical tutorial that is focused on writing code to learn concepts. Introduction to Python is useful

for industry engineers, researchers, and students who are looking for open-source solutions for numerical computation. In this book you will learn by doing, avoiding technical jargon, which makes the concepts easy to learn. First you'll see how to run basic calculations, absorbing technical complexities incrementally as you progress toward advanced topics.

Throughout, the language is kept simple to ensure that readers at all levels can grasp the concepts. What You'll Learn Understand the fundamentals of the Python programming language Apply Python to numerical computational programming projects in engineering and science Discover the Pythonic way of life Apply data types, operators, and arrays Carry out plotting for visualization Work with functions and loops Who This Book Is For Engineers, scientists, researchers, and students who are new to Python. Some prior programming experience would be helpful but not required.

Programming for Computations - Python Svein Linge 2016-07-25 This book presents computer programming as a key method for solving mathematical problems. There are two versions of the book, one for MATLAB and one for Python. The book was inspired by the Springer book TCSE 6: A Primer on Scientific Programming with Python (by Langtangen), but the style is more accessible and concise, in keeping with the needs of engineering students. The book outlines the shortest possible path from no previous experience with programming to a set of skills that allows the students to write simple programs for solving common mathematical problems with numerical methods in engineering and science courses. The emphasis is on generic algorithms, clean design of programs, use of functions, and automatic tests for verification.

IPython Notebook Essentials L. Felipe Martins 2014-11-21 If you are a professional, student, or educator who wants to learn to use IPython Notebook as a tool for technical and scientific computing, visualization, and data analysis, this is the book for you. This book will prove valuable for anyone that needs to do computations in an agile environment.

Learning Scientific Programming with Python Christian Hill 2020-10-22 This fast-paced introduction to Python moves from the basics to advanced concepts, enabling readers to gain proficiency quickly.

A Primer on Scientific Programming with Python Hans Petter Langtangen 2016-07-28 The book serves as a first introduction to computer programming of scientific applications, using the high-level Python language. The exposition is example and problem-oriented, where the applications are taken from mathematics, numerical calculus, statistics, physics, biology and finance. The book teaches "Matlab-style" and procedural programming as well as object-oriented programming. High school mathematics is a required background and it is advantageous to study classical and numerical one-variable calculus in parallel with reading this book. Besides learning how to program computers, the reader will also learn how to solve mathematical problems, arising in various branches of science and engineering, with the aid of numerical methods and

programming. By blending programming, mathematics and scientific applications, the book lays a solid foundation for practicing computational science. From the reviews: Langtangen ... does an excellent job of introducing programming as a set of skills in problem solving. He guides the reader into thinking properly about producing program logic and data structures for modeling real-world problems using objects and functions and embracing the object-oriented paradigm. ... Summing Up: Highly recommended. F. H. Wild III, Choice, Vol. 47 (8), April 2010 Those of us who have learned scientific programming in Python 'on the streets' could be a little jealous of students who have the opportunity to take a course out of Langtangen's Primer." John D. Cook, The Mathematical Association of America, September 2011 This book goes through Python in particular, and programming in general, via tasks that scientists will likely perform. It contains valuable information for students new to scientific computing and would be the perfect bridge between an introduction to programming and an advanced course on numerical methods or computational science. Alex Small, IEEE, CiSE Vol. 14 (2), March /April 2012 "This fourth edition is a wonderful, inclusive textbook that covers pretty much everything one needs to know to go from zero to fairly sophisticated scientific programming in Python..." Joan Horvath, Computing Reviews, March 2015

Mastering Python Scientific Computing Hemant Kumar Mehta 2015-09-23 A complete guide for Python programmers to master scientific computing using Python APIs and tools About This Book The basics of scientific computing to advanced concepts involving parallel and large scale computation are all covered. Most of the Python APIs and tools used in scientific computing are discussed in detail The concepts are discussed with suitable example programs Who This Book Is For If you are a Python programmer and want to get your hands on scientific computing, this book is for you. The book expects you to have had exposure to various concepts of Python programming. What You Will Learn Fundamentals and components of scientific computing Scientific computing data management Performing numerical computing using NumPy and SciPy Concepts and programming for symbolic computing using SymPy Using the plotting library matplotlib for data visualization Data analysis and visualization using Pandas, matplotlib, and IPython Performing parallel and high performance computing Real-life case studies and best practices of scientific computing In Detail In today's world, along with theoretical and experimental work, scientific computing has become an important part of scientific disciplines. Numerical calculations, simulations and computer modeling in this day and age form the vast majority of both experimental and theoretical papers. In the scientific method, replication and reproducibility are two important contributing factors. A complete and concrete scientific result should be reproducible and replicable. Python is suitable for scientific computing. A large community of users, plenty of help and documentation, a large collection of scientific libraries and environments, great performance, and good support makes Python a great

choice for scientific computing. At present Python is among the top choices for developing scientific workflow and the book targets existing Python developers to master this domain using Python. The main things to learn in the book are the concept of scientific workflow, managing scientific workflow data and performing computation on this data using Python. The book discusses NumPy, SciPy, SymPy, matplotlib, Pandas and IPython with several example programs. Style and approach This book follows a hands-on approach to explain the complex concepts related to scientific computing. It details various APIs using appropriate examples.

Learning Scipy for Numerical and Scientific Computing Second Edition

Sergio Rojas 2015-02-26

Learning SciPy for Numerical and Scientific Computing – Second Edition

Sergio G. 2015 Quick solutions to complex numerical problems in physics, applied mathematics, and science with SciPy In Detail SciPy is an open source Python library used to perform scientific computing. The SciPy (Scientific Python) package extends the functionality of NumPy with a substantial collection of useful algorithms. The book starts with a brief description of the SciPy libraries, followed by a chapter that is a fun and fast-paced primer on array creation, manipulation, and problem-solving. You will also learn how to use SciPy in linear algebra, which includes topics such as computation of eigenvalues and eigenvectors. Furthermore, the book is based on interesting subjects such as definition and manipulation of functions, computation of derivatives, integration, interpolation, and regression. You will also learn how to use SciPy in signal processing and how applications of SciPy can be used to collect, organize, analyze, and interpret data. By the end of the book, you will have fast, accurate, and easy-to-code solutions for numerical and scientific computing applications. What You Will Learn Get to know the benefits of using the combination of Python, NumPy, SciPy, and matplotlib as a programming environment for scientific purposes Create and manipulate an object array used by SciPy Use SciPy with large matrices to compute eigenvalues and eigenvectors Focus on construction, acquisition, quality improvement, compression, and feature extraction of signals Make use of SciPy to collect, organize, analyze, and interpret data, with examples taken from statistics and clustering Acquire the skill of constructing a triangulation of points, convex hulls, Voronoi diagrams, and many similar applications Find out ways that SciPy can be used with other languages such as C/C++, Fortran, and MATLAB/Octave Downloading the example code for this book. You can download the example code files for all Packt books you have purchased from your account at <http://www.PacktPub.com>. If you purchased this book elsewhere, you can visit <http://www.PacktPub.com/support> and register to have the files e-mailed directly to you.

Elegant SciPy Juan Nunez-Iglesias 2017-08-11 Welcome to Scientific Python and its community. If you're a scientist who programs with Python, this practical guide not only teaches you the fundamental parts of SciPy

and libraries related to it, but also gives you a taste for beautiful, easy-to-read code that you can use in practice. You'll learn how to write elegant code that's clear, concise, and efficient at executing the task at hand. Throughout the book, you'll work with examples from the wider scientific Python ecosystem, using code that illustrates principles outlined in the book. Using actual scientific data, you'll work on real-world problems with SciPy, NumPy, Pandas, scikit-image, and other Python libraries. Explore the NumPy array, the data structure that underlies numerical scientific computation Use quantile normalization to ensure that measurements fit a specific distribution Represent separate regions in an image with a Region Adjacency Graph Convert temporal or spatial data into frequency domain data with the Fast Fourier Transform Solve sparse matrix problems, including image segmentations, with SciPy's sparse module Perform linear algebra by using SciPy packages Explore image alignment (registration) with SciPy's optimize module Process large datasets with Python data streaming primitives and the Toolz library

Learning Scientific Programming with Python Christian Hill 2016-02-04

Learn to master basic programming tasks from scratch with real-life scientifically relevant examples and solutions drawn from both science and engineering. Students and researchers at all levels are increasingly turning to the powerful Python programming language as an alternative to commercial packages and this fast-paced introduction moves from the basics to advanced concepts in one complete volume, enabling readers to quickly gain proficiency. Beginning with general programming concepts such as loops and functions within the core Python 3 language, and moving onto the NumPy, SciPy and Matplotlib libraries for numerical programming and data visualisation, this textbook also discusses the use of IPython notebooks to build rich-media, shareable documents for scientific analysis. Including a final chapter introducing challenging topics such as floating-point precision and algorithm stability, and with extensive online resources to support advanced study, this textbook represents a targeted package for students requiring a solid foundation in Python programming.

Mastering Numerical Computing with NumPy Umit Mert Cakmak

2018-06-28 Enhance the power of NumPy and start boosting your scientific computing capabilities Key Features Grasp all aspects of numerical computing and understand NumPy Explore examples to learn exploratory data analysis (EDA), regression, and clustering Access NumPy libraries and use performance benchmarking to select the right tool Book Description NumPy is one of the most important scientific computing libraries available for Python. Mastering Numerical Computing with NumPy teaches you how to achieve expert level competency to perform complex operations, with in-depth coverage of advanced concepts. Beginning with NumPy's arrays and functions, you will familiarize yourself with linear algebra concepts to perform vector and matrix math operations. You will thoroughly understand and practice data processing, exploratory data

analysis (EDA), and predictive modeling. You will then move on to working on practical examples which will teach you how to use NumPy statistics in order to explore US housing data and develop a predictive model using simple and multiple linear regression techniques. Once you have got to grips with the basics, you will explore unsupervised learning and clustering algorithms, followed by understanding how to write better NumPy code while keeping advanced considerations in mind. The book also demonstrates the use of different high-performance numerical computing libraries and their relationship with NumPy. You will study how to benchmark the performance of different configurations and choose the best for your system. By the end of this book, you will have become an expert in handling and performing complex data manipulations. What you

will learn Perform vector and matrix operations using NumPy Perform exploratory data analysis (EDA) on US housing data Develop a predictive model using simple and multiple linear regression Understand unsupervised learning and clustering algorithms with practical use cases Write better NumPy code and implement the algorithms from scratch Perform benchmark tests to choose the best configuration for your system Who this book is for Mastering Numerical Computing with NumPy is for you if you are a Python programmer, data analyst, data engineer, or a data science enthusiast, who wants to master the intricacies of NumPy and build solutions for your numeric and scientific computational problems. You are expected to have familiarity with mathematics to get the most out of this book.