Python Tutorial Poincare

This book brings together geometric tools and their applications for Information analysis. It collects current and many uses of in the interdisciplinary fields of Information Geometry Manifolds in Advanced Signal, Image & Video Processing, Complex Data Modeling and Analysis, Information Ranking and Retrieval, Coding, Cognitive Systems, Optimal Control, Statistics on Manifolds, Machine Learning, Speech/sound recognition and natural language treatment which are also substantially relevant for the industry.

A self-contained introductory text for beginning graduate students that is contemporary in approach without ignoring historical matters.

This book constitutes the refereed proceedings of the Second International Conference on Geometric Science of Information, GSI 2015, held in Palaiseau, France, in October 2015. The 80 full papers presented were carefully reviewed and selected from 110 submissions and are organized into the following thematic sessions: Dimension reduction on Riemannian manifolds; optimal transport; optimal transport and applications in imagery/statistics; shape space and diffeomorphic mappings; random geometry/homology; Hessian information geometry; topological forms and Information; information geometry optimization; information geometry in image analysis; divergence geometry; optimization on manifold; Lie groups and geometric mechanics/thermodynamics; computational information geometry; Lie groups: novel statistical and computational frontiers; geometry of time series and linear dynamical systems; and Bayesian and information geometry for inverse problems.

On August 8, 1900, at the second International Congress of Mathematicians in Paris, David Hilbert delivered his famous lecture in which he described twenty-three problems that were to play an influential role in mathematical research. A century later, on May 24, 2000, at a meeting at the College de France, the Clay Mathematics Institute (CMI) announced the creation of a US$7 million prize fund for the solution of seven important classic problems which have resisted solution. The prize fund is divided equally among the seven problems. There is no time limit for their solution. The Millennium Prize Problems were selected by the founding Scientific Advisory Board of CMI--Alain Connes, Arthur Jaffe, Andrew Wiles, and Edward Witten--after consulting with other leading mathematicians. Their aim was somewhat different than that of Hilbert: not to define new challenges, but to record some of the most difficult issues with which mathematicians were struggling at the turn of the second millennium; to recognize achievement in mathematics of historical dimension; to elevate in the consciousness of the general public the fact that in mathematics, the frontier is still open and abounds in important unsolved problems; and to emphasize the importance of working towards a solution of the deepest, most difficult problems. The present volume sets forth the official description of each of the seven problems and the rules governing the prizes. It also contains an essay by Jeremy Gray on the history of prize problems in mathematics.

Modeling Creativity
Nonlinear Time Series Analysis
Field Guide to Polarization
ODE Architect Companion
Riemannian Geometric Statistics in Medical Image Analysis
Mathematics of Epidemics on Networks

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.

This book explains the fundamentals of computational physics and describes the techniques that every physicist should know, such as finite difference methods, numerical quadrature, and the fast Fourier transform. The book offers a complete introduction to the topic at the undergraduate level, and is also suitable for the advanced student or researcher. The book begins with an introduction to Python, then moves on to a step-by-step description of the techniques of computational physics, with examples ranging from simple mechanics problems to complex calculations in quantum mechanics, electromagnetism, statistical mechanics, and more.

This volume reviews the current understanding of the Fermi-Pasta-Ulam (FPU) Problem without trying to force coherence on differing perspectives on the same problem by various groups or approaches. The contributions lead the interested but inexperienced reader through gradual understanding, starting from general analysis and proceeding towards more specialized topics. The volume also includes a reprint of the original Fermi-Pasta-Ulam paper.

This textbook provides a broad introduction to continuous and discrete dynamical systems. With its hands-on approach, the text leads the reader from basic theory to recently published research material in nonlinear ordinary differential equations, nonlinear optics, multifractals, neural networks, and binary oscillator computing. Dynamical Systems with Applications Using Python takes advantage of Python's extensive visualization, simulation, and algorithmic tools to study those topics in nonlinear dynamical systems through numerical algorithms and generated diagrams. After a tutorial introduction to Python, the first part of the book deals with continuous systems using differential equations, including both ordinary and delay differential equations. The second part of the book deals with discrete dynamical systems and progresses to the study of both continuous and discrete systems in contexts like chaos control and synchronization, neural networks, and binary oscillator computing. These later sections are useful reference material for undergraduate student projects. The book is rounded off with example coursework to challenge students' programming abilities and Python-based exam questions. This book will appeal to advanced undergraduate and graduate students, applied mathematicians, engineers, and researchers in a range of disciplines, such as biology, chemistry, computing, economics, and physics. Since it provides a survey of dynamical systems, a familiarity with linear algebra, real and complex analysis, calculus, and ordinary differential equations is necessary, and knowledge of a programming language like C or Java is beneficial but not essential.

Characterization of Partially Polarized Light Fields

Mathematics for Neuroscientists

Analyzing Text with the Natural Language Toolkit

Release 3.6.4

Computational Physics

Case Studies in Python

This book will help those wishing to teach a course in technical writing, or who wish to write themselves.

Make the Leap From Beginner to Intermediate in Python... Python Basics: A Practical Introduction to Python 3 Your Complete Python Curriculum-With Exercises, Interactive Quizzes, and Sample Projects What should you learn about Python in the beginning to get a strong foundation? With Python Basics, you'll not only cover the core concepts you really need to know, but you'll also learn them in the most efficient order with the help of practical exercises and interactive quizzes. You'll know enough to be dangerous with Python, fast! Who Should Read This Book If you're new to Python, you'll get a practical, step-by-step roadmap on developing your foundational skills. You'll be introduced to each concept and language feature in a logical order. Every step in this curriculum is explained and illustrated with short, clear code samples. Our goal with this book is to educate, not to impress or intimidate. If you're familiar with some basic programming concepts, you'll get a clear and well-tested introduction to Python. This is a practical introduction to Python that jumps right into the meat and potatoes without sacrificing substance. If you have prior experience with languages like VBA, PowerShell, R, Perl, C, C++, C#, Java, or Swift the numerous exercises within each chapter will fast-track your progress. If you're a seasoned developer, you'll get a Python 3 crash course that brings you up to speed with modern Python programming. Mix and match the chapters that interest you the most and use the interactive quizzes and review exercises to check your learning progress as you go along. If you're a self-starter completely new to coding, you'll get practical and motivating examples. You'll begin by installing Python and setting up a coding environment on your computer from scratch, and then continue from there. We'll get you coding right away so that you become competent and knowledgeable enough to solve real-world problems, fast. Develop a passion for programming by solving interesting problems with Python every day! If you're looking to break into a coding or data-science career, you'll pick up the practical foundations with this book. We won't just dump a boat load of theoretical information on you so you can "sink or swim"-instead you'll learn from hands-on, practical examples one step at a time. Each concept is broken down for you so you'll always know what you can do with it in practical terms. If you're interested in teaching others "how to Python," this will be your guidebook. If you're looking to stoke the coding flame in your coworkers, kids, or relatives-use our material to teach them. All the sequencing has been done for you so you'll always know what to cover next and how to explain it. What Python Developers Say About The Book: "Go forth and learn this amazing language using this great book." - Michael Kennedy, Talk Python "The wording is casual, easy to understand, and makes the information flow well." - Thomas Wong, Pythonista "I floundered for a long time trying to teach myself. I slogged through dozens of incomplete online tutorials. I snoozed

through hours of boring screencasts. I gave up on countless crufty books from big-time publishers. And then I found Real Python. The easy-to-follow, step-by-step instructions break the big concepts down into bite-sized chunks written in plain English. The authors never forget their audience and are consistently thorough and detailed in their explanations. I'm up and running now, but I constantly refer to the material for guidance." - Jared Nielsen, Pythonista

This book offers a concise and gentle introduction to finite element programming in Python based on the popular FEniCS software library. Using a series of examples, including the Poisson equation, the equations of linear elasticity, the incompressible Navier–Stokes equations, and systems of nonlinear advection–diffusion–reaction equations, it guides readers through the essential steps to quickly solving a PDE in FEniCS, such as how to define a finite variational problem, how to set boundary conditions, how to solve linear and nonlinear systems, and how to visualize solutions and structure finite element Python programs. This book is open access under a CC BY license.

Mathematics for Neuroscientists, Second Edition, presents a comprehensive introduction to mathematical and computational methods used in neuroscience to describe and model neural components of the brain from ion channels to single neurons, neural networks and their relation to behavior. The book contains more than 200 figures generated using Matlab code available to the student and scholar. Mathematical concepts are introduced hand in hand with neuroscience, emphasizing the connection between experimental results and theory. Fully revised material and corrected text Additional chapters on extracellular potentials, motion detection and neurovascular coupling Revised selection of exercises with solutions More than 200 Matlab scripts reproducing the figures as well as a selection of equivalent Python scripts

How I Became a Quant

An Introduction with Applications in Data Science

Dynamical Systems with Applications Using Mathematica®

The Python Library Reference

Solving PDEs in Python

A Practical Introduction to Python 3

Polarization involves the vectorial nature of light fields. In current applications of optical science, the electromagnetic description of light with its vector features has been shown to be essential: In practice, optical radiation also exhibits randomness and spatial non-uniformity of the polarization state. Moreover, propagation through photonic devices can alter the correlation properties of the light field, resulting in changes in polarization. All these vectorial properties have been gaining importance in recent years, and they are attracting increasing attention in the literature. This is the

framework and the scope of the present book, which includes the authors' own contributions to these issues.

If you know how to program, you have the skills to turn data into knowledge, using tools of probability and statistics. This concise introduction shows you how to perform statistical analysis computationally, rather than mathematically, with programs written in Python. By working with a single case study throughout this thoroughly revised book, you'll learn the entire process of exploratory data analysis—from collecting data and generating statistics to identifying patterns and testing hypotheses. You'll explore distributions, rules of probability, visualization, and many other tools and concepts. New chapters on regression, time series analysis, survival analysis, and analytic methods will enrich your discoveries. Develop an understanding of probability and statistics by writing and testing code Run experiments to test statistical behavior, such as generating samples from several distributions Use simulations to understand concepts that are hard to grasp mathematically Import data from most sources with Python, rather than rely on data that's cleaned and formatted for statistics tools Use statistical inference to answer questions about real-world data

Over the past 15 years, there has been a growing need in the medical image computing community for principled methods to process nonlinear geometric data. Riemannian geometry has emerged as one of the most powerful mathematical and computational frameworks for analyzing such data. Riemannian Geometric Statistics in Medical Image Analysis is a complete reference on statistics on Riemannian manifolds and more general nonlinear spaces with applications in medical image analysis. It provides an introduction to the core methodology followed by a presentation of state-of-the-art methods. Content includes: - The foundations of Riemannian geometric methods for statistics on manifolds with emphasis on concepts rather than on proofs - Applications of statistics on manifolds and shape spaces in medical image computing - Diffeomorphic deformations and their applications As the methods described apply to domains such as signal processing (radar signal processing and brain computer interaction), computer vision (object and face recognition), and other domains where statistics of geometric features appear, this book is suitable for

researchers and graduate students in medical imaging, engineering and computer science. - A complete reference covering both the foundations and state-of-the-art methods - Edited and authored by leading researchers in the field - Contains theory, examples, applications, and algorithms - Gives an overview of current research challenges and future applications

The best parts of physics are the last topics that our students ever see. These are the exciting new frontiers of nonlinear and complex systems that are at the forefront of university research and are the basis of many high-tech businesses. Topics such as traffic on the World Wide Web, the spread of epidemics through globally-mobile populations, or how the synchronization of global economies are governed by universal principles just as profound as Newton's laws. Nonetheless, the conventional university physics curriculum reserves most of these topics for graduate study because of the assumed need for advanced mathematics. However, by using only linear algebra and calculus, combined with exploratory computer simulations, all of these topics become accessible to advanced undergraduate students. The structure of this book combines the three main topics of modern dynamics - chaos theory, dynamics on complex networks, and general relativity - into a coherent framework. By taking a geometric view of physics, concentrating on the time evolution of physical systems as trajectories through abstract spaces, these topics share a common and simple mathematical language through which any student can gain a unified physical intuition. Given the growing importance of complex dynamical systems in many areas of science and technology, this text provides students with an up-to-date foundation for their future careers. This second edition has an updated introductory chapter and has added key topics to help students prepare for their GRE physics subject exam. It also has expanded chapters on Hamiltonian dynamics, Hamiltonian chaos, and Econophysics, while increasing the number of homework problems at the end of each chapter. The second edition is designed to fulfill the textbook needs of any advanced undergraduate course in mechanics.

LMSST: 24 Lectures on Elliptic Curves

Infinite Dimensional Dynamical Systems

Geometry VI

Riemannian Geometry

The FEniCS Tutorial I

Dynamical Systems with Applications using PythonSpringer

This software is intended to provide a highly interactive environment for readers to examine the properties of linear and nonlinear systems of Ordinary Differential Equations and DDS's, explore and construct realistic mathematical models, and apply understanding of the behavior of solutions of ODEs to new real-world and hypothetical situations. The lab book contains an index to the CD-ROM, including Library, and Documentation for the Solver tool with a troubleshooting section.

Work with Python and powerful open source tools such as Gensim and spaCy to perform modern text analysis, natural language processing, and computational linguistics algorithms. Key Features Discover the open source Python text analysis ecosystem, using spaCy, Gensim, scikit-learn, and Keras Hands-on text analysis with Python, featuring natural language processing and computational linguistics algorithms Learn deep learning techniques for text analysis Book Description Modern text analysis is now very accessible using Python and open source tools, so discover how you can now perform modern text analysis in this era of textual data. This book shows you how to use natural language processing, and computational linguistics algorithms, to make inferences and gain insights about data you have. These algorithms are based on statistical machine learning and artificial intelligence techniques. The tools to work with these algorithms are available to you right now - with Python, and tools like Gensim and spaCy. You'll start by learning about data cleaning, and then how to perform computational linguistics from first concepts. You're then ready to explore the more sophisticated areas of statistical NLP and deep learning using Python, with realistic language and text samples. You'll learn to tag, parse, and model text using the best tools. You'll gain hands-on knowledge of the best frameworks to use, and you'll know when to choose a tool like Gensim for topic models, and when to work with Keras for deep learning. This book balances theory and practical hands-on examples, so you can learn about and conduct your own natural language processing projects and computational linguistics. You'll discover the rich ecosystem of Python tools you have available to conduct NLP - and enter the interesting world of modern text analysis. What you will learn Why text analysis is important in our modern age Understand NLP terminology and get to know the Python tools and datasets Learn how to pre-process and clean textual data Convert textual data into vector space representations Using spaCy to process text Train your own NLP models for computational linguistics Use statistical learning and Topic Modeling algorithms for text, using Gensim and scikit-learn Employ deep learning techniques for text analysis using Keras Who this book is for This book is for you if you want to dive in, hands-first, into the interesting world of text analysis and NLP, and you're ready to work with the rich Python ecosystem of tools and datasets waiting for you!

The content of Geometry with an Introduction to Cosmic Topology is

motivated by questions that have ignited the imagination of stargazers since antiquity. What is the shape of the universe? Does the universe have and edge? Is it infinitely big? Dr. Hitchman aims to clarify this fascinating area of mathematics. This non-Euclidean geometry text is organized intothree natural parts. Chapter 1 provides an overview including a brief history of Geometry, Surfaces, and reasons to study Non-Euclidean Geometry. Chapters 2-7 contain the core mathematical content of the text, following the ErlangenProgram, which develops geometry in terms of a space and a group of transformations on that space. Finally chapters 1 and 8 introduce (chapter 1) and explore (chapter 8) the topic of cosmic topology through the geometry learned in the preceding chapters.

The Mathematics of Diffusion
IPython Interactive Computing and Visualization Cookbook
Geometric Science of Information
Finite Element Procedures
Brownian Motion
The Prime Numbers and Their Distribution

Sample Text

Over the last decades, assessment of heart rate variability (HRV) has increased in various fields of research. HRV describes changes in heartbeat intervals, which are caused by autonomic neural regulation, i.e. by the interplay of the sympathetic and the parasympathetic nervous systems. The most frequent application of HRV is connected to cardiological issues, most importantly to the monitoring of post-myocardial infarction patients and the prediction of sudden cardiac death. Analysis of HRV is also frequently applied in relation to diabetes, renal failure, neurological and psychiatric conditions, sleep disorders, psychological phenomena such as stress, as well as drug and addiction research including alcohol and smoking. The widespread application of HRV measurements is based on the fact that they are noninvasive, easy to perform, and in general reproducible - if carried out under standardized conditions. However, the amount of parameters to be analysed is still rising. Well-established time domain and frequency domain parameters are discussed controversially when it comes to their physiological interpretation and their psychometric properties like reliability and validity, and the sensitivity to cardiovascular properties of the variety of parameters seems to be a topic for further research. Recently introduced parameters like pNNxx and new dynamic methods such as approximate entropy and detrended fluctuation analysis offer new potentials and warrant standardization. However, HRV is significantly associated with average heart rate (HR) and one can conclude that HRV actually provides information on two quantities, i.e. on HR and its variability. It is hard to determine which of

these two plays a principal role in the clinical value of HRV. The association between HRV and HR is not only a physiological phenomenon but also a mathematical one which is due to non-linear (mathematical) relationship between RR interval and HR. If one normalizes HRV to its average RR interval, one may get 'pure' variability free from the mathematical bias. Recently, a new modification method of the association between HRV and HR has been developed which enables us to completely remove the HRV dependence on HR (even the physiological one), or conversely enhance this dependence. Such an approach allows us to explore the HR contribution to the clinical significance of HRV, i.e. whether HR or its variability plays a main role in the HRV clinical value. This Research Topic covers recent advances in the application of HRV, methodological issues, basic underlying mechanisms as well as all aspects of the interaction between HRV and HR.

This open access textbook presents a comprehensive treatment of the arithmetic theory of quaternion algebras and orders, a subject with applications in diverse areas of mathematics. Written to be accessible and approachable to the graduate student reader, this text collects and synthesizes results from across the literature. Numerous pathways offer explorations in many different directions, while the unified treatment makes this book an essential reference for students and researchers alike. Divided into five parts, the book begins with a basic introduction to the noncommutative algebra underlying the theory of quaternion algebras over fields, including the relationship to quadratic forms. An in-depth exploration of the arithmetic of quaternion algebras and orders follows. The third part considers analytic aspects, starting with zeta functions and then passing to an idelic approach, offering a pathway from local to global that includes strong approximation. Applications of unit groups of quaternion orders to hyperbolic geometry and low-dimensional topology follow, relating geometric and topological properties to arithmetic invariants. Arithmetic geometry completes the volume, including quaternionic aspects of modular forms, supersingular elliptic curves, and the moduli of QM abelian surfaces. Quaternion Algebras encompasses a vast wealth of knowledge at the intersection of many fields. Graduate students interested in algebra, geometry, and number theory will appreciate the many avenues and connections to be explored. Instructors will find numerous options for constructing introductory and advanced courses, while researchers will value the all-embracing treatment. Readers are assumed to have some familiarity with algebraic number theory and commutative algebra, as well as the fundamentals of linear algebra,

topology, and complex analysis. More advanced topics call upon additional background, as noted, though essential concepts and motivation are recapped throughout.

Though it incorporates much new material, this new edition preserves the general character of the book in providing a collection of solutions of the equations of diffusion and describing how these solutions may be obtained.

Second International Conference, GSI 2015, Palaiseau, France, October 28-30, 2015, Proceedings

Insights from 25 of Wall Street's Elite

A practical guide to text analysis with Python, Gensim, spaCy, and Keras

High-Dimensional Probability

Chaos, Networks, Space, and Time

A Status Report

A laboratory study that investigates how algorithms come into existence. Algorithms--often associated with the terms big data, machine learning, or artificial intelligence--underlie the technologies we use every day, and disputes over the consequences, actual or potential, of new algorithms arise regularly. In this book, Florian Jaton offers a new way to study computerized methods, providing an account of where algorithms come from and how they are constituted, investigating the practical activities by which algorithms are progressively assembled rather than what they may suggest or require once they are assembled.

Modeling Creativity (doctoral thesis, 2013) explores how creativity can be represented using computational approaches. Our aim is to construct computer models that exhibit creativity in an artistic context, that is, that are capable of generating or evaluating an artwork (visual or linguistic), an interesting new idea, a subjective opinion. The research was conducted in 2008–2012 at the Computational Linguistics Research Group (CLiPS, University of Antwerp) under the supervision of Prof. Walter Daelemans. Prior research was also conducted at the Experimental Media Research Group (EMRG, St. Lucas University College of Art & Design Antwerp) under the supervision of Lucas Nijs. Modeling Creativity examines creativity in a number of different perspectives: from its origins in nature, which is essentially blind, to humans and machines, and from generating creative ideas to evaluating and learning their novelty and usefulness. We will use a hands-on approach with case studies and examples in the Python programming language.

Turning text into valuable information is essential for businesses looking to gain a competitive advantage. With recent improvements in natural language processing (NLP), users now have many options for solving complex challenges. But it's not always clear which NLP tools or libraries would work for a business's needs, or which techniques you should use and in what order. This practical book provides data scientists and developers with blueprints for best practice solutions to common tasks in text analytics and natural language processing. Authors Jens Albrecht, Sidharth Ramachandran, and Christian Winkler provide real-world case studies and detailed code examples in Python to help you get started

quickly. Extract data from APIs and web pages Prepare textual data for statistical analysis and machine learning Use machine learning for classification, topic modeling, and summarization Explain AI models and classification results Explore and visualize semantic similarities with word embeddings Identify customer sentiment in product reviews Create a knowledge graph based on named entities and their relations
This book is the first half of The Python Library Reference for Release 3.6.4, and covers chapters 1-18. The second book may be found with ISBN 9781680921090. The original Python Library Reference book is 1920 pages long. This book contains the original page numbers and index, along with the back sections fully intact. While reference-index describes the exact syntax and semantics of the Python language, this library reference manual describes the standard library that is distributed with Python. It also describes some of the optional components that are commonly included in Python distributions. Python's standard library is very extensive, offering a wide range of facilities as indicated by the long table of contents listed below. The library contains built-in modules (written in C) that provide access to system functionality such as file I/O that would otherwise be inaccessible to Python programmers, as well as modules written in Python that provide standardized solutions for many problems that occur in everyday programming. Some of these modules are explicitly designed to encourage and enhance the portability of Python programs by abstracting away platform-specifics into platform-neutral APIs. This book is available for free as a PDF at python.org.
The Fermi-Pasta-Ulam Problem
Geometry with an Introduction to Cosmic Topology
Heart Rate Variability: Clinical Applications and Interaction between HRV and Heart Rate
Introduction to Modern Dynamics
Galileo Unbound
From Exact to Approximate Models

This eagerly awaited textbook covers everything the graduate student in probability wants to know about Brownian motion, as well as the latest research in the area. Starting with the construction of Brownian motion, the book then proceeds to sample path properties like continuity and nowhere differentiability. Notions of fractal dimension are introduced early and are used throughout the book to describe fine properties of Brownian paths. The relation of Brownian motion and random walk is explored from several viewpoints, including a development of the theory of Brownian local times from random walk embeddings. Stochastic integration is introduced as a tool and an accessible treatment of the potential theory of Brownian motion clears the path for an extensive treatment of intersections of Brownian paths. An investigation of exceptional points on the Brownian path and an appendix on SLE processes, by Oded Schramm and Wendelin Werner, lead directly to recent research themes.
This book offers a highly accessible introduction to natural

language processing, the field that supports a variety of language technologies, from predictive text and email filtering to automatic summarization and translation. With it, you'll learn how to write Python programs that work with large collections of unstructured text. You'll access richly annotated datasets using a comprehensive range of linguistic data structures, and you'll understand the main algorithms for analyzing the content and structure of written communication. Packed with examples and exercises, Natural Language Processing with Python will help you: Extract information from unstructured text, either to guess the topic or identify "named entities" Analyze linguistic structure in text, including parsing and semantic analysis Access popular linguistic databases, including WordNet and treebanks Integrate techniques drawn from fields as diverse as linguistics and artificial intelligence This book will help you gain practical skills in natural language processing using the Python programming language and the Natural Language Toolkit (NLTK) open source library. If you're interested in developing web applications, analyzing multilingual news sources, or documenting endangered languages -- or if you're simply curious to have a programmer's perspective on how human language works -- you'll find Natural Language Processing with Python both fascinating and immensely useful.

An integrated package of powerful probabilistic tools and key applications in modern mathematical data science.

This book treats that part of Riemannian geometry related to more classical topics in a very original, clear and solid style. The author successfully combines the co-ordinate and invariant approaches to differential geometry, giving the reader tools for practical calculations as well as a theoretical understanding of the subject.

Dynamical Systems with Applications using Python

Ground-Truthing, Programming, Formulating

Python Basics

The Constitution of Algorithms

Natural Language Processing and Computational Linguistics

Think Stats

Galileo Unbound traces the journey that brought us from Galileo's law of free fall to today's geneticists measuring evolutionary drift, entangled quantum particles moving among many worlds, and our lives as trajectories traversing a health space with thousands of dimensions. Remarkably, common themes persist that predict the evolution of species as readily as the orbits of planets or the collapse of stars into black holes. This book tells the history of spaces of expanding dimension and increasing abstraction and how they continue today to give new insight into the physics of complex systems. Galileo published the first modern law of motion, the Law of Fall, that was ideal and simple, laying the foundation upon which Newton built the first theory of dynamics. Early in the twentieth century, geometry became the cause of motion rather than the result when Einstein envisioned the fabric of space-time warped by mass and energy, forcing light rays to bend

past the Sun. Possibly more radical was Feynman's dilemma of quantum particles taking all paths at once — setting the stage for the modern fields of quantum field theory and quantum computing. Yet as concepts of motion have evolved, one thing has remained constant, the need to track ever more complex changes and to capture their essence, to find patterns in the chaos as we try to predict and control our world.

?This collection covers a wide range of topics of infinite dimensional dynamical systems generated by parabolic partial differential equations, hyperbolic partial differential equations, solitary equations, lattice differential equations, delay differential equations, and stochastic differential equations. Infinite dimensional dynamical systems are generated by evolutionary equations describing the evolutions in time of systems whose status must be depicted in infinite dimensional phase spaces. Studying the long-term behaviors of such systems is important in our understanding of their spatiotemporal pattern formation and global continuation, and has been among major sources of motivation and applications of new developments of nonlinear analysis and other mathematical theories. Theories of the infinite dimensional dynamical systems have also found more and more important applications in physical, chemical, and life sciences. This book collects 19 papers from 48 invited lecturers to the International Conference on Infinite Dimensional Dynamical Systems held at York University, Toronto, in September of 2008. As the conference was dedicated to Professor George Sell from University of Minnesota on the occasion of his 70th birthday, this collection reflects the pioneering work and influence of Professor Sell in a few core areas of dynamical systems, including non-autonomous dynamical systems, skew-product flows, invariant manifolds theory, infinite dimensional dynamical systems, approximation dynamics, and fluid flows.?

The polarization of light is one of the most remarkable phenomena in nature and has led to numerous discoveries and applications. The nature and mathematical formulation of unpolarized light and partially polarized light were not readily forthcoming until the 1950s, when questions about polarized light and the mathematical tools to deal with it began to be addressed in earnest. As a result, there is a very good understanding of polarized light today. The primary objective of this guide is to provide an introduction to the developments in polarized light that have taken place over the past half-century, and present the most salient topics of the subject matter such as Mueller matrices, Stokes polarization parameters, and Jones matrices.

If you know how to program, you have the skills to turn data into knowledge using the tools of probability and statistics. This concise introduction shows you how to perform statistical analysis computationally, rather than mathematically, with programs written in Python. You'll work with a case study throughout the book to help you learn the entire data analysis process—from collecting data and generating statistics to identifying patterns and testing hypotheses. Along the way, you'll become familiar with distributions, the rules of probability, visualization, and many other tools and concepts. Develop your understanding of probability and statistics by writing and testing code Run experiments to test statistical behavior, such as generating samples from several distributions Use simulations to understand concepts that are hard to grasp mathematically Learn topics not usually covered in an introductory course, such as Bayesian estimation Import data from almost any source using Python, rather than be limited to data that has been cleaned and formatted for statistics tools Use statistical inference to answer questions about real-world data

Mathematical Writing
Blueprints for Text Analytics Using Python
Geometric Theory of Information
A Path Across Life, the Universe and Everything
The Millennium Prize Problems
Quaternion Algebras

Praise for How I Became a Quant "Led by two top-notch quants, Richard R. Lindsey and Barry Schachter, How I Became a Quant details the quirky world of quantitative analysis through stories told by some of today's most successful quants. For anyone who might have thought otherwise, there are engaging personalities behind all that number crunching!" --Ira Kawaller, Kawaller & Co. and the Kawaller Fund "A fun and fascinating read. This book tells the story of how academics, physicists, mathematicians, and other scientists became professional investors managing billions." --David A. Krell, President and CEO, International Securities Exchange "How I Became a Quant should be must reading for all students with a quantitative aptitude. It provides fascinating examples of the dynamic career opportunities potentially open to anyone with the skills and passion for quantitative analysis." --Roy D. Henriksson, Chief Investment Officer, Advanced Portfolio Management "Quants"--those who design and implement mathematical models for the pricing of derivatives, assessment of risk, or prediction of market movements--are the backbone of today's investment industry. As the greater volatility of current financial markets has driven investors to seek shelter from increasing uncertainty, the quant revolution has given people the opportunity to avoid unwanted financial risk by literally trading it away, or more specifically, paying someone else to take on the unwanted risk. How I Became a Quant reveals the faces behind the quant revolution, offering you?the?chance to learn firsthand what it's like to be a?quant today. In this fascinating collection of Wall Street war stories, more than two dozen quants detail their roots, roles, and contributions, explaining what they do and how they do it, as well as outlining the sometimes unexpected paths they have followed from the halls of academia to the front lines of an investment revolution.

One notable new direction this century in the study of primes has been the influx of ideas from probability. The goal of this book is to provide insights into the prime numbers and to describe how a sequence so tautly determined can incorporate such a striking amount of randomness. The book opens with some classic topics of number theory. It ends with a discussion of some of the outstanding conjectures in number theory. In between are an excellent chapter on the stochastic properties of primes and a walk through an elementary proof of the Prime Number Theorem. This book is suitable for anyone who has had a little number theory and some advanced calculus involving estimates. Its engaging style and invigorating point of view will make refreshing reading for advanced undergraduates through research mathematicians.

This book provides an introduction to the theory of dynamical systems with the aid of the Mathematica®computer algebra package. The book has a very hands-on approach and takes the reader from basic theory to recently published research material. Emphasized throughout are numerous applications to biology, chemical kinetics, economics, electronics, epidemiology, nonlinear optics, mechanics, population dynamics, and neural networks. Theorems and proofs are kept to a minimum. The first section deals with continuous systems using ordinary differential equations, while the second part is devoted to the study of discrete dynamical systems.
This textbook provides an exciting new addition to the area of network science featuring a stronger and more methodical link of models to their mathematical origin and explains how these relate to each other with special focus on epidemic spread on networks. The content of the book is at the interface of graph theory, stochastic processes and dynamical systems. The authors set out to make a significant contribution to closing the gap between model development and the supporting mathematics. This is done by: Summarising and presenting the state-of-the-art in modeling epidemics on networks with results and readily usable models signposted throughout the book; Presenting different mathematical approaches to formulate exact and solvable models; Identifying the concrete links between approximate models and their rigorous mathematical representation; Presenting a model hierarchy and clearly highlighting the links between model assumptions and model complexity; Providing a reference source for advanced undergraduate students, as well as doctoral students, postdoctoral researchers and academic experts who are engaged in modeling stochastic processes on networks; Providing software that can solve differential equation models or directly simulate epidemics on networks. Replete with numerous diagrams, examples, instructive exercises, and online access to simulation algorithms and readily usable code, this book will appeal to a wide spectrum of readers from different backgrounds and academic levels. Appropriate for students with or without a strong background in mathematics, this textbook can form the basis of an advanced undergraduate or graduate course in both mathematics and other departments alike.
Natural Language Processing with Python