Space Filling Curves An Introduction With Applications In Scientific Computing Texts In Computational Science And Engineering

This is a graduate text introducing the fundamentals of measure theory and integration theory, which is the foundation of modern real analysis. The text focuses first on the concrete setting of Lebesgue measure and the Lebesgue integral (which in turn is motivated by the more classical concepts of Jordan measure and the Riemann integral), before moving on to abstract measure and integration theory, including the standard convergence theorems, Fubini's theorem, and the Carathéodory extension theorem. Classical differentiation theorems, such as the Lebesgue and Rademacher differentiation theorems, are also covered, as are connections with probability theory. The material is intended to cover a quarter or semester's worth of material for a first graduate course in real analysis. There is an emphasis in the text on tying together the abstract and the concrete sides of the subject, using the latter to illustrate and motivate the former. The central role of key principles (such as Littlewood's three principles) as providing guiding intuition to the subject is also emphasized. There are a large number of exercises throughout that develop key aspects of the theory, and are thus an integral component of the text. As a supplementary section, a discussion of general problem-

solving strategies in analysis is also given. The last three sections discuss optional topics related to the main matter of the book.

Elementary introduction to stable maps and quantum cohomology presents the problem of counting rational plane curves Viewpoint is mostly that of enumerative geometry Emphasis is on examples, heuristic discussions, and simple applications to best convey the intuition behind the subject Ideal for self-study, for a mini-course in quantum cohomology, or as a special topics text in a standard course in intersection theory

This book constitutes the refereed proceedings of the 6th International Symposium on Spatial Databases, SSD'99, held in Hong Kong, China in July 1999. The 17 revised full papers presented were carefully selected from 55 submissions. Also included are short papers corresponding to three invited talks and industrial applications presentations. The papers are organized in chapters on multi-resolution and scale, indexing, moving objects and spatio-temporal data, spatial mining and classification, spatial join, uncertainty and geological hypermaps, and industrial and visionary application track.

This Festschrift is in honor of Mario de Jesús Pérez-Jiménez, Professor in the Department of Computer Science of University of Seville, Spain, on the occasion of his 70th birthday. The title of this volume reflects both his main research area, viz., Natural Computing, and the guiding principle of his functioning: "once you choose to do something, enjoy doing it". The respect that Professor Mario de Jesús Pérez-Jiménez enjoys in the scientific community was well demonstrated by the enthusiastic response

received to the request to contribute to this book. The contributions by more than 70 authors from 15 countries cover a wide spectrum of research areas and reflect well the broad range of research interests of Professor Mario de Jesús Pérez-Jiménez. The research areas presented in this Festschrift include membrane computing, spiking neural networks, phylogenetic networks, ant colonies optimization, workbench for biocomputing, reaction systems, entropy of computation, rewriting systems, and insertion-deletion systems.

The present book provides an introduction to using space-filling curves (SFC) as tools in scientific computing. Special focus is laid on the representation of SFC and on resulting algorithms. For example, grammar-based techniques are introduced for traversals of Cartesian and octree-type meshes, and arithmetisation of SFC is explained to compute SFC mappings and indexings. The locality properties of SFC are discussed in detail, together with their importance for algorithms. Templates for parallelisation and cache-efficient algorithms are presented to reflect the most important applications of SFC in scientific computing. Special attention is also given to the interplay of adaptive mesh refinement and SFC, including the structured refinement of triangular and tetrahedral grids. For each topic, a short overview is given on the most important publications and recent research activities.

A text for a first graduate course in real analysis for students in pure and applied mathematics, statistics, education, engineering, and economics.

This book is for anyone who wishes to illustrate their mathematical ideas, which in our experience means everyone. It is organized by material, rather than by subject area, and purposefully emphasizes the process of creating things, including discussions of failures that occurred along the way. As a result, the reader can learn from the experiences of those who came before, and will be inspired to create their own illustrations. Topics illustrated within include prime numbers, fractals, the Klein bottle, Borromean rings, tilings, space-filling curves, knot theory, billiards, complex dynamics, algebraic surfaces, groups and prime ideals, the Riemann zeta function, quadratic fields, hyperbolic space, and hyperbolic 3-manifolds. Everyone who opens this book should find a type of mathematics with which they identify. Each contributor explains the mathematics behind their illustration at an accessible level, so that all readers can appreciate the beauty of both the object itself and the mathematics behind it. This book constitutes the refereed proceedings of the 19th International Workshop on Combinatorial Image Analysis, IWCIA 2018, held in Porto, Portugal, in November 2018. The 18 revised full papers presented were carefully reviewed and selected from 32 submissions. The papers are grouped into two sections. The first one includes nine papers devoted to theoretical foundations of combinatorial image analysis, including digital geometry and topology, array grammars, tilings and patterns, discrete geometry in non-rectangular grids, and other technical tools for image analysis. The second part includes nine papers presenting application-driven research on topics such as discrete

tomography, image segmentation, texture analysis, and medical imaging.

This proceedings volume collects review articles that summarize research conducted at the Munich Centre of Advanced Computing (MAC) from 2008 to 2012. The articles address the increasing gap between what should be possible in Computational Science and Engineering due to recent advances in algorithms, hardware, and networks, and what can actually be achieved in practice; they also examine novel computing architectures, where computation itself is a multifaceted process, with hardware awareness or ubiquitous parallelism due to many-core systems being just two of the challenges faced. Topics cover both the methodological aspects of advanced computing (algorithms, parallel computing, data exploration, software engineering) and cutting-edge applications from the fields of chemistry, the geosciences, civil and mechanical engineering, etc., reflecting the highly interdisciplinary nature of the Munich Centre of Advanced Computing.

Partial Differential Equations presents a balanced and comprehensive introduction to the concepts and techniques required to solve problems containing unknown functions of multiple variables. While focusing on the three most classical partial differential equations (PDEs)—the wave, heat, and Laplace equations—this detailed text also presents a broad practical perspective that

merges mathematical concepts with real-world application in diverse areas including molecular structure, photon and electron interactions, radiation of electromagnetic waves, vibrations of a solid, and many more. Rigorous pedagogical tools aid in student comprehension; advanced topics are introduced frequently, with minimal technical jargon, and a wealth of exercises reinforce vital skills and invite additional self-study. Topics are presented in a logical progression, with major concepts such as wave propagation, heat and diffusion, electrostatics, and quantum mechanics placed in contexts familiar to students of various fields in science and engineering. By understanding the properties and applications of PDEs, students will be equipped to better analyze and interpret central processes of the natural world.

Our first knowledge of differential geometry usually comes from the study of the curves and surfaces in I\!\!R^3 that arise in calculus. Here we learn about line and surface integrals, divergence and curl, and the various forms of Stokes' Theorem. If we are fortunate, we may encounter curvature and such things as the Serret-Frenet formulas. With just the basic tools from multivariable calculus, plus a little knowledge of linear algebra, it is possible to begin a much richer and rewarding study of differential geometry, which is what is presented in this book. It starts with an introduction to the classical differential geometry of curves and

surfaces in Euclidean space, then leads to an introduction to the Riemannian geometry of more general manifolds, including a look at Einstein spaces. An important bridge from the low-dimensional theory to the general case is provided by a chapter on the intrinsic geometry of surfaces. The first half of the book, covering the geometry of curves and surfaces, would be suitable for a one-semester undergraduate course. The local and global theories of curves and surfaces are presented, including detailed discussions of surfaces of rotation, ruled surfaces, and minimal surfaces. The second half of the book, which could be used for a more advanced course, begins with an introduction to differentiable manifolds, Riemannian structures, and the curvature tensor. Two special topics are treated in detail: spaces of constant curvature and Einstein spaces. The main goal of the book is to get started in a fairly elementary way, then to guide the reader toward more sophisticated concepts and more advanced topics. There are many examples and exercises to help along the way. Numerous figures help the reader visualize key concepts and examples, especially in lower dimensions. For the second edition, a number of errors were corrected and some text and a number of figures have been added.

The Encyclopedia of GIS provides a comprehensive and authoritative guide, contributed by experts and peer-reviewed for accuracy, and alphabetically

arranged for convenient access. The entries explain key software and processes used by geographers and computational scientists. Major overviews are provided for nearly 200 topics: Geoinformatics, Spatial Cognition, and Location-Based Services and more. Shorter entries define specific terms and concepts. The reference will be published as a print volume with abundant black and white art, and simultaneously as an XML online reference with hyperlinked citations, cross-references, four-color art, links to web-based maps, and other interactive features.

The book titled Advanced Computational and Communication Paradigms: Proceedings of International Conference on ICACCP 2017, Volume 2 presents refereed high-quality papers of the First International Conference on Advanced Computational and Communication Paradigms (ICACCP 2017) organized by the Department of Computer Science and Engineering, Sikkim Manipal Institute of Technology, held from 8– 10 September 2017. ICACCP 2017 covers an advanced computational paradigms and communications technique which provides failsafe and robust solutions to the emerging problems faced by mankind. Technologists, scientists, industry professionals and research scholars from regional, national and international levels are invited to present their original unpublished work in this conference. There were about 550 technical paper

submitted. Finally after peer review, 142 high-quality papers have been accepted and registered for oral presentation which held across 09 general sessions and 05 special sessions along with 04 keynote address and 06 invited talks. This volume comprises 77 accepted papers of ICACCP 2017.

An Introduction to Statistical Learning provides an accessible overview of the field of statistical learning, an essential toolset for making sense of the vast and complex data sets that have emerged in fields ranging from biology to finance to marketing to astrophysics in the past twenty years. This book presents some of the most important modeling and prediction techniques, along with relevant applications. Topics include linear regression, classification, resampling methods, shrinkage approaches, tree-based methods, support vector machines, clustering, and more. Color graphics and real-world examples are used to illustrate the methods presented. Since the goal of this textbook is to facilitate the use of these statistical learning techniques by practitioners in science, industry, and other fields, each chapter contains a tutorial on implementing the analyses and methods presented in R, an extremely popular open source statistical software platform. Two of the authors co-wrote The Elements of Statistical Learning (Hastie, Tibshirani and Friedman, 2nd edition 2009), a popular reference book for statistics and machine learning researchers. An Introduction to Statistical

Learning covers many of the same topics, but at a level accessible to a much
broader audience. This book is targeted at statisticians and non-statisticians alike
who wish to use cutting-edge statistical learning techniques to analyze their data.
The text assumes only a previous course in linear regression and no knowledge
of matrix algebra.

The fundamental mathematical tools needed to understand machine learning
include linear algebra, analytic geometry, matrix decompositions, vector calculus,
optimization, probability and statistics. These topics are traditionally taught in
disparate courses, making it hard for data science or computer science students,
or professionals, to efficiently learn the mathematics. This self-contained textbook
bridges the gap between mathematical and machine learning texts, introducing
the mathematical concepts with a minimum of prerequisites. It uses these
concepts to derive four central machine learning methods: linear regression,
principal component analysis, Gaussian mixture models and support vector
machines. For students and others with a mathematical background, these
derivations provide a starting point to machine learning texts. For those learning
the mathematics for the first time, the methods help build intuition and practical
experience with applying mathematical concepts. Every chapter includes worked
examples and exercises to test understanding. Programming tutorials are offered

on the book's web site.

This two-volume set (LNAI 10448 and LNAI 10449) constitutes the refereed proceedings of the 9th International Conference on Collective Intelligence, ICCCI 2017, held in Nicosia, Cyprus, in September 2017. The 117 full papers presented were carefully reviewed and selected from 248 submissions. The conference focuseson the methodology and applications of computational collective intelligence, included: multi-agent systems, knowledge engineering and semantic web, social networks and recommender systems, text processing and information retrieval, data mining methods and applications, sensor networks and internet of things, decision support & control systems, and computer vision techniques.

Planning algorithms are impacting technical disciplines and industries around the world, including robotics, computer-aided design, manufacturing, computer graphics, aerospace applications, drug design, and protein folding. This coherent and comprehensive book unifies material from several sources, including robotics, control theory, artificial intelligence, and algorithms. The treatment is centered on robot motion planning, but integrates material on planning in discrete spaces. A major part of the book is devoted to planning under uncertainty, including decision theory, Markov decision processes, and information spaces, which are the 'configuration spaces' of all sensor-based planning problems. The last part of the book delves into planning under differential constraints that arise when automating the motions of virtually any mechanical system. This text and reference is intended for students, engineers, and

researchers in robotics, artificial intelligence, and control theory as well as computer graphics, algorithms, and computational biology.

Fractals for the Classroom breaks new ground as it brings an exciting branch of mathematics into the classroom. The book is a collection of independent chapters on the major concepts related to the science and mathematics of fractals. Written at the mathematical level of an advanced secondary student, Fractals for the Classroom includes many fascinating insights for the classroom teacher and integrates illustrations from a wide variety of applications with an enjoyable text to help bring the concepts alive and make them understandable to the average reader. This book will have a tremendous impact upon teachers, students, and the mathematics education of the general public. With the forthcoming companion materials, including four books on strategic classroom activities and lessons with interactive computer software, this package will be unparalleled.

Aimed primarily at graduate students and beginning researchers, this book provides an introduction to algebraic geometry that is particularly suitable for those with no previous contact with the subject; it assumes only the standard background of undergraduate algebra. The book starts with easily-formulated problems with non-trivial solutions and uses these problems to introduce the fundamental tools of modern algebraic geometry: dimension; singularities; sheaves; varieties; and cohomology. A range of exercises is provided for each topic discussed, and a selection of problems and exam papers are collected in an appendix to provide material for further study.

Mathematics is beautiful--and it can be fun and exciting as well as practical. Good Math is your guide to some of the most intriguing topics from two thousand years of mathematics: from

Egyptian fractions to Turing machines; from the real meaning of numbers to proof trees, group symmetry, and mechanical computation. If you've ever wondered what lay beyond the proofs you struggled to complete in high school geometry, or what limits the capabilities of computer on your desk, this is the book for you. Why do Roman numerals persist? How do we know that some infinities are larger than others? And how can we know for certain a program will ever finish? In this fast-paced tour of modern and not-so-modern math, computer scientist Mark Chu-Carroll explores some of the greatest breakthroughs and disappointments of more than two thousand years of mathematical thought. There is joy and beauty in mathematics, and in more than two dozen essays drawn from his popular "Good Math" blog, you'll find concepts, proofs, and examples that are often surprising, counterintuitive, or just plain weird. Mark begins his journey with the basics of numbers, with an entertaining trip through the integers and the natural, rational, irrational, and transcendental numbers. The voyage continues with a look at some of the oddest numbers in mathematics, including zero, the golden ratio, imaginary numbers, Roman numerals, and Egyptian and continuing fractions. After a deep dive into modern logic, including an introduction to linear logic and the logic-savvy Prolog language, the trip concludes with a tour of modern set theory and the advances and paradoxes of modern mechanical computing. If your high school or college math courses left you grasping for the inner meaning behind the numbers, Mark's book will both entertain and enlighten you. This book is dedicated to those who have something to hide. It is a book about "privacy preserving data publishing" -- the art of publishing sensitive personal data, collected from a group of individuals, in a form that does not violate their privacy. This problem has numerous and diverse areas of application, including releasing Census data, search logs, medical

records, and interactions on a social network. The purpose of this book is to provide a detailed overview of the current state of the art as well as open challenges, focusing particular attention on four key themes: RIGOROUS PRIVACY POLICIES Repeated and highly-publicized attacks on published data have demonstrated that simplistic approaches to data publishing do not work. Significant recent advances have exposed the shortcomings of naive (and not-so-naive) techniques. They have also led to the development of mathematically rigorous definitions of privacy that publishing techniques must satisfy; METRICS FOR DATA UTILITY While it is necessary to enforce stringent privacy policies, it is equally important to ensure that the published version of the data is useful for its intended purpose. The authors provide an overview of diverse approaches to measuring data utility; ENFORCEMENT MECHANISMS This book describes in detail various key data publishing mechanisms that guarantee privacy and utility; EMERGING APPLICATIONS The problem of privacy-preserving data publishing arises in diverse application domains with unique privacy and utility requirements. The authors elaborate on the merits and limitations of existing solutions, based on which we expect to see many advances in years to come.

Introduction to Data Science: Data Analysis and Prediction Algorithms with R introduces concepts and skills that can help you tackle real-world data analysis challenges. It covers concepts from probability, statistical inference, linear regression, and machine learning. It also helps you develop skills such as R programming, data wrangling, data visualization, predictive algorithm building, file organization with UNIX/Linux shell, version control with Git and GitHub, and reproducible document preparation. This book is a textbook for a first course in data science. No previous knowledge of R is necessary, although some experience with

programming may be helpful. The book is divided into six parts: R, data visualization, statistics with R, data wrangling, machine learning, and productivity tools. Each part has several chapters meant to be presented as one lecture. The author uses motivating case studies that realistically mimic a data scientist's experience. He starts by asking specific questions and answers these through data analysis so concepts are learned as a means to answering the questions. Examples of the case studies included are: US murder rates by state, self-reported student heights, trends in world health and economics, the impact of vaccines on infectious disease rates, the financial crisis of 2007-2008, election forecasting, building a baseball team, image processing of hand-written digits, and movie recommendation systems. The statistical concepts used to answer the case study questions are only briefly introduced, so complementing with a probability and statistics textbook is highly recommended for in-depth understanding of these concepts. If you read and understand the chapters and complete the exercises, you will be prepared to learn the more advanced concepts and skills needed to become an expert.

Introduction to Global Optimization Exploiting Space-Filling Curves provides an overview of classical and new results pertaining to the usage of space-filling curves in global optimization. The authors look at a family of derivative-free numerical algorithms applying space-filling curves to reduce the dimensionality of the global optimization problem; along with a number of unconventional ideas, such as adaptive strategies for estimating Lipschitz constant, balancing global and local information to accelerate the search. Convergence conditions of the described algorithms are studied in depth and theoretical considerations are illustrated through numerical examples. This work also contains a code for implementing space-filling curves that can be

used for constructing new global optimization algorithms. Basic ideas from this text can be applied to a number of problems including problems with multiextremal and partially defined constraints and non-redundant parallel computations can be organized. Professors, students, researchers, engineers, and other professionals in the fields of pure mathematics, nonlinear sciences studying fractals, operations research, management science, industrial and applied mathematics, computer science, engineering, economics, and the environmental sciences will find this title useful . ?

The essential introduction to the principles and applications of feedback systems—now fully revised and expanded This textbook covers the mathematics needed to model, analyze, and design feedback systems. Now more user-friendly than ever, this revised and expanded edition of Feedback Systems is a one-volume resource for students and researchers in mathematics and engineering. It has applications across a range of disciplines that utilize feedback in physical, biological, information, and economic systems. Karl Åström and Richard Murray use techniques from physics, computer science, and operations research to introduce control-oriented modeling. They begin with state space tools for analysis and design, including stability of solutions, Lyapunov functions, reachability, state feedback observability, and estimators. The matrix exponential plays a central role in the analysis of linear control systems, allowing a concise development of many of the key concepts for this class of models. Åström and Murray then develop and explain tools in the frequency domain, including transfer functions, Nyquist analysis, PID control, frequency domain design, and robustness. Features a new chapter on design principles and tools, illustrating the types of problems that can be solved using feedback Includes a new chapter on fundamental limits and new material on the Routh-Hurwitz

criterion and root locus plots Provides exercises at the end of every chapter Comes with an electronic solutions manual An ideal textbook for undergraduate and graduate students Indispensable for researchers seeking a self-contained resource on control theory
* A lovingly-crafted visual expedition, lead by a lifelong fractal wizard with an obsession for categorizing fractal species * Hundreds of beautiful color images * An in-depth taxonomy of Koch-constructed Fractal Curves * An intuitive introduction to Koch construction * A must-read for anyone interested in fractal geometry
With the increased adoption of RFID (Radio Frequency Identification) across multiple industries, new research opportunities have arisen among many academic and engineering communities who are currently interested in maximizing the practice potential of this technology and in minimizing all its potential risks. Aiming at providing an outstanding survey of recent advances in RFID technology, this book brings together interesting research results and innovative ideas from scholars and researchers worldwide. Current Trends and Challenges in RFID offers important insights into: RF/RFID Background, RFID Tag/Antennas, RFID Readers, RFID Protocols and Algorithms, RFID Applications and Solutions. Comprehensive enough, the present book is invaluable to engineers, scholars, graduate students, industrial and technology insiders, as well as engineering and technology aficionados.
The subject of space-filling curves has fascinated mathematicians for over a century and has intrigued many generations of students of mathematics. Working in this area is

like skating on the edge of reason. Unfortunately, no comprehensive treatment has ever been attempted other than the gallant effort by W. Sierpiriski in 1912. At that time, the subject was still in its infancy and the most interesting and perplexing results were still to come. Besides, Sierpiriski's paper was written in Polish and published in a journal that is not readily accessible (Sierpiriski [2]). Most of the early literature on the subject is in French, German, and Polish, providing an additional raison d'etre for a comprehensive treatment in English. While there was, understandably, some intensive research activity on this subject around the turn of the century, contributions have, nevertheless, continued up to the present and there is no end in sight, indicating that the subject is still very much alive. The recent interest in fractals has refocused interest on space filling curves, and the study of fractals has thrown some new light on this small but venerable part of mathematics. This monograph is neither a textbook nor an encyclopedic treatment of the subject nor a historical account, but it is a little of each. While it may lend structure to a seminar or pro-seminar, or be useful as a supplement in a course on topology or mathematical analysis, it is primarily intended for self-study by the aficionados of classical analysis.

Aperiodic tilings are interesting to mathematicians and scientists for both theoretical and practical reasons. The serious study of aperiodic tilings began as a solution to a problem in logic. Simpler aperiodic tilings eventually revealed hidden ""symmetries"" that were previously considered impossible, while the tilings themselves were quite

striking. The discovery of quasicrystals showed that such aperiodicity actually occurs in nature and led to advances in materials science. Many properties of aperiodic tilings can be discerned by studying one tiling at a time. However, by studying families of tilings, further properties are revealed.This broader study naturally leads to the topology of tiling spaces. This book is an introduction to the topology of tiling spaces, with a target audience of graduate students who wish to learn about the interface of topology with aperiodic order. It isn't a comprehensive and cross-referenced tome about everything having to do with tilings, which would be too big, too hard to read, and far too hard to write! Rather, it is a review of the explosion of recent work on tiling spaces as inverse limits, on the cohomology of tiling spaces, on substitution tilings and the role of rotations, and on tilings that do not have finite local complexity. Powerful computational techniques have been developed, as have new ways of thinking about tiling spaces. The text contains a generous supply of examples and exercises.

A groundbreaking introduction to vectors, matrices, and least squares for engineering applications, offering a wealth of practical examples.

This lecture is intended as an introduction to the mathematical concepts of algebraic and analytic geometry. It is addressed primarily to theoretical physicists, in particular those working in string theories. The author gives a very clear exposition of the main theorems, introducing the necessary concepts by lucid examples, and shows how to work with the methods of algebraic geometry. As an example he presents the Krichever-

Novikov construction of algebras of Virasaro type. The book will be welcomed by many researchers as an overview of an important branch of mathematics, a collection of useful formulae and an excellent guide to the more extensive mathematical literature. Linking the differing techniques deployed in describing space-filling curves to their corresponding algorithms, this book introduces SFCs as tools in scientific computing, focusing in particular on the representation of SFCs and on the resulting algorithms. Publisher Description

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
The book offers a hollistic approach to the theory and numerics of random differential equations from an interdisciplinary and problem-centered point of view. In this interdisciplinary work, the authors examine state–of-the-art concepts of both dynamical systems and scientific computing.
Scientific Essay from the year 2015 in the subject Mathematics - Miscellaneous, language: English, abstract: Representation of two dimensional objects into one dimensional space is simple and efficient when using a two coordinate system imposed upon a grid. However, when the two dimensions are expanded far beyond visual and sometimes mental understanding, techniques are used to quantify and simplify the representation of such objects. These techniques center around spatial interpretations by means of a space-filling curve. Since the late 1800's, mathematicians and computer scientists have succeeded with algorithms that express high dimensional geometries. However, very few implementations of the algorithms

beyond three dimensions for computing these geometries exist. We propose using the basic spatial computations developed by pioneers in the field like G. Peano, D. Hilbert, E. H. Moore, and others in a working model. The algorithms in this paper are fully implemented in high-level programming languages utilizing a relation database management system. We show the execution speeds of the algorithms using a space-filling curve index for searching compared to brute force searching. Finally, we contrast three space-filling curve algorithms: Moore, Hilbert, and Morton, in execution time of searching for high dimensional data in point queries and range queries.

Ten amazing curves personally selected by one of today's most important math writers Curves for the Mathematically Curious is a thoughtfully curated collection of ten mathematical curves, selected by Julian Havil for their significance, mathematical interest, and beauty. Each chapter gives an account of the history and definition of one curve, providing a glimpse into the elegant and often surprising mathematics involved in its creation and evolution. In telling the ten stories, Havil introduces many mathematicians and other innovators, some whose fame has withstood the passing of years and others who have slipped into comparative obscurity. You will meet Pierre Bézier, who is known for his ubiquitous and eponymous curves, and Adolphe Quetelet, who trumpeted the ubiquity of the normal curve but whose name now hides behind the modern body mass index. These and other ingenious thinkers engaged with the challenges, incongruities, and insights to be found in these remarkable curves—and now you can share in this adventure. Curves for the Mathematically Curious is a rigorous and enriching mathematical experience for anyone interested in curves, and the book is designed so that readers who choose can follow the details with pencil and paper. Every curve has a story worth

telling.

Class-tested and coherent, this textbook teaches classical and web information retrieval, including web search and the related areas of text classification and text clustering from basic concepts. It gives an up-to-date treatment of all aspects of the design and implementation of systems for gathering, indexing, and searching documents; methods for evaluating systems; and an introduction to the use of machine learning methods on text collections. All the important ideas are explained using examples and figures, making it perfect for introductory courses in information retrieval for advanced undergraduates and graduate students in computer science. Based on feedback from extensive classroom experience, the book has been carefully structured in order to make teaching more natural and effective. Slides and additional exercises (with solutions for lecturers) are also available through the book's supporting website to help course instructors prepare their lectures.

This classic text and reference monograph applies modern differential geometry to general relativity. A brief mathematical introduction to gravitational curvature, it emphasizes the subject's geometric essence and stresses the global aspects of cosmology. Suitable for independent study as well as for courses in differential geometry, relativity, and cosmology. 1979 edition.

This book explains a taxonomy of plane-filling curves (fractal curves with a fractal dimension of 2). it includes the classic fractal curves described in Mandelbrot's original book. Many new fractal curves are introduced. The taxonomy is based upon the Gaussian integers and the Eisenstein integers - each forming a lattice (square and triangular). These lattices have algebraic properties, which allows number theory to be used in describing and classifying

these curves. This work has been under development for over 30 years. An earlier version of this taxonomy is described in the book ""Brain-filling Curves"", also by Jeffrey Ventrella. More on plane-filling curves can be found at fractalcurves.com

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