

Essential Math For Data Science

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Essential Math for Data Science

Take Control of Your Data with Fundamental
Linear Algebra, Probability, and Statistics



Thomas Nield

Essential Math for Data Science: A Comprehensive Guide

Data science is booming, attracting professionals from diverse backgrounds. But regardless of your initial field, a solid foundation in certain mathematical concepts is crucial for success. This comprehensive guide dives deep into the essential math for data science, equipping you with the knowledge you need to tackle complex problems and unlock the power of data. We'll explore key areas, providing clear explanations and practical examples to make your learning journey smoother and more effective. Get ready to build your mathematical muscle for a rewarding data science career!

1. Linear Algebra: The Foundation of Data Manipulation

Linear algebra forms the bedrock of many data science techniques. Understanding vectors, matrices, and their operations is paramount.

1.1 Vectors and Matrices: More Than Just Numbers

Vectors represent data points in multi-dimensional space, while matrices organize and manipulate these data points efficiently. Understanding vector addition, scalar multiplication, and matrix multiplication is key to performing operations like data transformations and feature scaling.

1.2 Eigenvalues and Eigenvectors: Unveiling Data Structure

Eigenvalues and eigenvectors reveal crucial information about the underlying structure of your data. They're vital in dimensionality reduction techniques like Principal Component Analysis (PCA), helping you simplify complex datasets while retaining essential information. Understanding how to calculate and interpret these values is a significant advantage.

1.3 Linear Transformations: Reshaping Your Data

Linear transformations allow you to manipulate data in systematic ways, for example, rotating data points or scaling features. This is crucial for preparing data for machine learning algorithms. Mastering linear transformations empowers you to control and optimize your data preprocessing steps.

2. Calculus: Understanding Change and Optimization

Calculus, the study of change, is essential for understanding and optimizing machine learning algorithms.

2.1 Derivatives: Measuring the Rate of Change

Derivatives help you understand how a function changes with respect to its input. This is fundamental in gradient descent, an optimization algorithm used to train many machine learning models. Understanding derivatives allows you to pinpoint the optimal settings for your models.

2.2 Integrals: Accumulating Change

Integrals, the opposite of derivatives, measure the accumulation of change over an interval. They appear in probability distributions and are essential for calculating areas under curves, which has applications in statistical analysis and model evaluation.

2.3 Gradient Descent: Finding the Best Fit

Gradient descent leverages derivatives to iteratively adjust model parameters, minimizing the error and finding the best possible fit to the data. A strong grasp of derivatives is absolutely crucial for understanding and implementing this core machine learning technique.

3. Probability and Statistics: Making Sense of Uncertainty

Probability and statistics are indispensable tools for data analysis and interpretation.

3.1 Probability Distributions: Modeling Randomness

Understanding different probability distributions (e.g., normal, binomial, Poisson) is critical for modeling data and making inferences. Knowing which distribution best represents your data is essential for accurate analysis.

3.2 Hypothesis Testing: Drawing Valid Conclusions

Hypothesis testing allows you to draw conclusions from data, assessing the likelihood of observing certain results given a specific hypothesis. This is crucial for making data-driven decisions and validating research findings.

3.3 Statistical Inference: Estimating and Predicting

Statistical inference allows you to make estimations and predictions about populations based on sample data. Confidence intervals and p-values are key concepts in this area, enabling you to quantify the uncertainty associated with your inferences.

4. Discrete Mathematics: The Logic Behind Algorithms

While not as frequently used as linear algebra or calculus, discrete mathematics plays a crucial role in understanding the logic behind algorithms and data structures.

4.1 Graph Theory: Analyzing Relationships

Graph theory provides tools for analyzing relationships between data points, which is essential in social network analysis, recommendation systems, and many other applications. Understanding concepts like paths, cycles, and connectivity is beneficial.

4.2 Set Theory: Working with Collections of Data

Set theory provides a formal framework for working with collections of data, enabling you to perform operations like union, intersection, and difference, which are fundamental in data manipulation and analysis.

Conclusion

Mastering the essential math for data science is an ongoing journey, but the rewards are significant. By building a strong foundation in linear algebra, calculus, probability and statistics, and elements of discrete mathematics, you'll unlock the power of data and position yourself for success in this rapidly evolving field. Consistent learning and practice are key to solidifying your understanding and applying these concepts effectively.

FAQs

1. Do I need to be a math genius to become a data scientist? No, you don't need to be a math genius. A solid understanding of the core concepts discussed here is sufficient for most data science roles. Practical application and coding skills are equally important.
2. What are the best resources for learning this math? Online courses (Coursera, edX, Udacity), textbooks, and YouTube tutorials are excellent resources. Choose resources tailored to your learning style and pace.
3. Can I learn this math without a formal background in mathematics? Absolutely! Many online resources cater to learners with little or no prior math experience. Start with introductory materials and gradually build your understanding.
4. Which mathematical area is most important for data science? Linear algebra is arguably the most fundamental, followed closely by probability and statistics. However, all the areas mentioned contribute significantly to your overall skill set.
5. How can I apply this math in a real-world data science project? Start by choosing a project that interests you. Then, identify the mathematical concepts needed to solve the problem, and practice applying them through coding and analysis. This hands-on experience is crucial for solidifying your knowledge.

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a data science perspective. This practical guide explains how to apply various statistical methods to data science, tells you how to avoid their misuse, and gives you advice on what's important and what's not. Many data science resources incorporate statistical methods but lack a deeper statistical perspective. If you're familiar with the R programming language, and have some exposure to statistics, this quick reference bridges the gap in an accessible, readable format. With this book, you'll learn: Why exploratory data analysis is a key preliminary step in data science How random sampling can reduce bias and yield a higher quality dataset, even with big data How the principles of experimental design yield definitive answers to questions How to use regression to estimate outcomes and detect anomalies Key classification techniques for predicting which categories a record belongs to Statistical machine learning methods that "learn" from data Unsupervised learning methods for extracting meaning from unlabeled data

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fields 12 Optimizing a physical system 13 Analyzing sound waves with a Fourier series PART 3 - MACHINE LEARNING APPLICATIONS 14 Fitting functions to data 15 Classifying data with logistic regression 16 Training neural networks

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Key topics are data classification, Graph Cut, the Laplacian Matrix, Google Page Rank, efficient algorithms, hardness of problems, different types of big data, geometric data structures, topological data processing, and various learning methods. For unsolved problems such as incomplete data relation and reconstruction, the book includes possible solutions and both statistical and computational methods for data analysis. Initial chapters focus on exploring the properties of incomplete data sets and partial-connectedness among data points or data sets. Discussions also cover the completion problem of Netflix matrix; machine learning method on massive data sets; image segmentation and video search. This book introduces software tools for data science and Big Data such MapReduce, Hadoop, and Spark. This book contains three parts. The first part explores the fundamental tools of data science. It includes basic graph theoretical methods, statistical and AI methods for massive data sets. In second part, chapters focus on the procedural treatment of data science problems including machine learning methods, mathematical image and video processing, topological data analysis, and statistical methods. The final section provides case studies on special topics in variational learning, manifold learning, business and financial data recovery, geometric search, and computing models. Mathematical Problems in Data Science is a valuable resource for researchers and professionals working in data science, information systems and networks. Advanced-level students studying computer science, electrical engineering and mathematics will also find the content helpful.

essential math for data science: Statistical Learning with Math and Python Joe Suzuki, 2021-08-03 The most crucial ability for machine learning and data science is mathematical logic for grasping their essence rather than knowledge and experience. This textbook approaches the essence of machine learning and data science by considering math problems and building Python programs. As the preliminary part, Chapter 1 provides a concise introduction to linear algebra, which will help novices read further to the following main chapters. Those succeeding chapters present essential topics in statistical learning: linear regression, classification, resampling, information criteria, regularization, nonlinear regression, decision trees, support vector machines, and unsupervised learning. Each chapter mathematically formulates and solves machine learning problems and builds the programs. The body of a chapter is accompanied by proofs and programs in an appendix, with exercises at the end of the chapter. Because the book is carefully organized to provide the solutions to the exercises in each chapter, readers can solve the total of 100 exercises by simply following the contents of each chapter. This textbook is suitable for an undergraduate or graduate course consisting of about 12 lectures. Written in an easy-to-follow and self-contained style, this book will also be perfect material for independent learning.

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doing, providing a clear understanding of how concepts work under the hood while connecting them to applications like machine learning. You'll get a solid foundation in the math essential for data science, but more importantly, you'll be able to use it to: Recognize the nuances and pitfalls of probability math Master statistics and hypothesis testing (and avoid common pitfalls) Discover practical applications of probability, statistics, calculus, and machine learning Intuitively understand linear algebra as a transformation of space, not just grids of numbers being multiplied and added Perform calculus derivatives and integrals completely from scratch in Python Apply what you've learned to machine learning, including linear regression, logistic regression, and neural networks

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Vladimir Shikhman, David Müller, 2021-02-11 In this textbook, basic mathematical models used in Big Data Analytics are presented and application-oriented references to relevant practical issues are made. Necessary mathematical tools are examined and applied to current problems of data analysis, such as brand loyalty, portfolio selection, credit investigation, quality control, product clustering, asset pricing etc. – mainly in an economic context. In addition, we discuss interdisciplinary applications to biology, linguistics, sociology, electrical engineering, computer science and artificial intelligence. For the models, we make use of a wide range of mathematics – from basic disciplines of numerical linear algebra, statistics and optimization to more specialized game, graph and even complexity theories. By doing so, we cover all relevant techniques commonly used in Big Data Analytics. Each chapter starts with a concrete practical problem whose primary aim is to motivate the study of a particular Big Data Analytics technique. Next, mathematical results follow – including important definitions, auxiliary statements and conclusions arising. Case-studies help to deepen the acquired knowledge by applying it in an interdisciplinary context. Exercises serve to improve understanding of the underlying theory. Complete solutions for exercises can be consulted by the interested reader at the end of the textbook; for some which have to be solved numerically, we provide descriptions of algorithms in Python code as supplementary material. This textbook has been recommended and developed for university courses in Germany, Austria and Switzerland.

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Rongpeng Li, 2020-11-12 Reinforce your understanding of data science and data analysis from a statistical perspective to extract meaningful insights from your data using Python programming Key Features Work your way through the entire data analysis pipeline with statistics concerns in mind to make reasonable decisions Understand how various data science algorithms function Build a solid foundation in statistics for data science and machine learning using Python-based examples Book Description Statistics remain the backbone of modern analysis tasks, helping you to interpret the results produced by data science pipelines. This book is a detailed guide covering the math and various statistical methods required for undertaking data science tasks. The book starts by showing you how to preprocess data and inspect distributions and correlations from a statistical perspective. You'll then get to grips with the fundamentals of statistical analysis and apply its concepts to real-world datasets. As you advance, you'll find out how statistical concepts emerge from different stages of data science pipelines, understand the summary of datasets in the language of statistics, and use it to build a solid foundation for robust data products such as explanatory models and predictive models. Once you've uncovered the working mechanism of data science algorithms, you'll cover essential concepts for efficient data collection, cleaning, mining, visualization, and analysis. Finally, you'll implement statistical methods in key machine learning tasks such as classification, regression, tree-based methods, and ensemble learning. By the end of this Essential Statistics for Non-STEM Data Analysts book, you'll have learned how to build and present a self-contained, statistics-backed data product to meet your business goals. What you will learn Find out how to grab and load data into an analysis environment Perform descriptive analysis to extract meaningful summaries from data Discover probability, parameter estimation, hypothesis tests, and experiment design best practices Get to grips with resampling and bootstrapping in Python Delve into statistical tests with variance analysis, time series analysis, and A/B test examples Understand the statistics behind popular machine learning algorithms Answer questions on statistics for data scientist interviews Who this book is for This book is an entry-level guide for data science enthusiasts, data analysts, and anyone starting out in the field of data science and looking to learn the essential statistical concepts with the help of simple explanations and examples. If you're a developer or student with a non-mathematical background, you'll find this book useful. Working knowledge of the Python programming language is required.

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science libraries, frameworks, modules, and toolkits are great for doing data science, but they're also a good way to dive into the discipline without actually understanding data science. In this book, you'll learn how many of the most fundamental data science tools and algorithms work by implementing them from scratch. If you have an aptitude for mathematics and some programming skills, author Joel Grus will help you get comfortable with the math and statistics at the core of data science, and with hacking skills you need to get started as a data scientist. Today's messy glut of data holds answers to questions no one's even thought to ask. This book provides you with the know-how to dig those answers out. Get a crash course in Python Learn the basics of linear algebra, statistics, and probability—and understand how and when they're used in data science Collect, explore, clean, munge, and manipulate data Dive into the fundamentals of machine learning Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks, and clustering Explore recommender systems, natural language processing, network analysis, MapReduce, and databases

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essential math for data science: Essential Mathematics for Political and Social Research Jeff Gill, 2006-04-24 More than ever before, modern social scientists require a basic level of

mathematical literacy, yet many students receive only limited mathematical training prior to beginning their research careers. This textbook addresses this dilemma by offering a comprehensive, unified introduction to the essential mathematics of social science. Throughout the book the presentation builds from first principles and eschews unnecessary complexity. Most importantly, the discussion is thoroughly and consistently anchored in real social science applications, with more than 80 research-based illustrations woven into the text and featured in end-of-chapter exercises. Students and researchers alike will find this first-of-its-kind volume to be an invaluable resource.--BOOK JACKET.

essential math for data science: An Introduction to Statistical Learning Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Jonathan Taylor, 2023-08-01 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, marketing, and 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, deep learning, survival analysis, multiple testing, and more. Color graphics and real-world examples are used to illustrate the methods presented. This book is targeted at statisticians and non-statisticians alike, who wish to use cutting-edge statistical learning techniques to analyze their data. Four of the authors co-wrote An Introduction to Statistical Learning, With Applications in R (ISLR), which has become a mainstay of undergraduate and graduate classrooms worldwide, as well as an important reference book for data scientists. One of the keys to its success was that each chapter contains a tutorial on implementing the analyses and methods presented in the R scientific computing environment. However, in recent years Python has become a popular language for data science, and there has been increasing demand for a Python-based alternative to ISLR. Hence, this book (ISLP) covers the same materials as ISLR but with labs implemented in Python. These labs will be useful both for Python novices, as well as experienced users.

essential math for data science: Tiny Python Projects Ken Youens-Clark, 2020-07-21 "Tiny Python Projects is a gentle and amusing introduction to Python that will firm up key programming concepts while also making you giggle."—Amanda Debler, Schaeffler Key Features Learn new programming concepts through 21-bitesize programs Build an insult generator, a Tic-Tac-Toe AI, a talk-like-a-pirate program, and more Discover testing techniques that will make you a better programmer Code-along with free accompanying videos on YouTube Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About The Book The 21 fun-but-powerful activities in Tiny Python Projects teach Python fundamentals through puzzles and games. You'll be engaged and entertained with every exercise, as you learn about text manipulation, basic algorithms, and lists and dictionaries, and other foundational programming skills. Gain confidence and experience while you create each satisfying project. Instead of going quickly through a wide range of concepts, this book concentrates on the most useful skills, like text manipulation, data structures, collections, and program logic with projects that include a password creator, a word rhymmer, and a Shakespearean insult generator. Author Ken Youens-Clark also teaches you good programming practice, including writing tests for your code as you go. What You Will Learn Write command-line Python programs Manipulate Python data structures Use and control randomness Write and run tests for programs and functions Download testing suites for each project This Book Is Written For For readers familiar with the basics of Python programming. About The Author Ken Youens-Clark is a Senior Scientific Programmer at the University of Arizona. He has an MS in Biosystems Engineering and has been programming for over 20 years. Table of Contents 1 How to write and test a Python program 2 The crow's nest: Working with strings 3 Going on a picnic: Working with lists 4 Jump the Five: Working with dictionaries 5 Howler: Working with files and STDOUT 6 Words count: Reading files and STDIN, iterating lists, formatting strings 7 Gashlycrumb: Looking items up in a dictionary 8 Apples and Bananas: Find and replace 9

Dial-a-Curse: Generating random insults from lists of words 10 Telephone: Randomly mutating strings 11 Bottles of Beer Song: Writing and testing functions 12 Ransom: Randomly capitalizing text 13 Twelve Days of Christmas: Algorithm design 14 Rhymer: Using regular expressions to create rhyming words 15 The Kentucky Friar: More regular expressions 16 The Scrambler: Randomly reordering the middles of words 17 Mad Libs: Using regular expressions 18 Gematria: Numeric encoding of text using ASCII values 19 Workout of the Day: Parsing CSV files, creating text table output 20 Password strength: Generating a secure and memorable password 21 Tic-Tac-Toe: Exploring state 22 Tic-Tac-Toe redux: An interactive version with type hints

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essential math for data science: Foundations of Statistics for Data Scientists Alan Agresti, Maria Kateri, 2021-11-22 Foundations of Statistics for Data Scientists: With R and Python is designed as a textbook for a one- or two-term introduction to mathematical statistics for students training to become data scientists. It is an in-depth presentation of the topics in statistical science with which any data scientist should be familiar, including probability distributions, descriptive and inferential statistical methods, and linear modeling. The book assumes knowledge of basic calculus, so the presentation can focus on why it works as well as how to do it. Compared to traditional mathematical statistics textbooks, however, the book has less emphasis on probability theory and more emphasis on using software to implement statistical methods and to conduct simulations to illustrate key concepts. All statistical analyses in the book use R software, with an appendix showing the same analyses with Python. The book also introduces modern topics that do not normally appear in mathematical statistics texts but are highly relevant for data scientists, such as Bayesian inference, generalized linear models for non-normal responses (e.g., logistic regression and Poisson loglinear models), and regularized model fitting. The nearly 500 exercises are grouped into Data Analysis and Applications and Methods and Concepts. Appendices introduce R and Python and contain solutions for odd-numbered exercises. The book's website has expanded R, Python, and Matlab appendices and all data sets from the examples and exercises.

essential math for data science: Build a Career in Data Science Emily Robinson, Jacqueline Nolis, 2020-03-24 Summary You are going to need more than technical knowledge to

succeed as a data scientist. Build a Career in Data Science teaches you what school leaves out, from how to land your first job to the lifecycle of a data science project, and even how to become a manager. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the technology What are the keys to a data scientist's long-term success? Blending your technical know-how with the right "soft skills" turns out to be a central ingredient of a rewarding career. About the book Build a Career in Data Science is your guide to landing your first data science job and developing into a valued senior employee. By following clear and simple instructions, you'll learn to craft an amazing resume and ace your interviews. In this demanding, rapidly changing field, it can be challenging to keep projects on track, adapt to company needs, and manage tricky stakeholders. You'll love the insights on how to handle expectations, deal with failures, and plan your career path in the stories from seasoned data scientists included in the book. What's inside Creating a portfolio of data science projects Assessing and negotiating an offer Leaving gracefully and moving up the ladder Interviews with professional data scientists About the reader For readers who want to begin or advance a data science career. About the author Emily Robinson is a data scientist at Warby Parker. Jacqueline Nolis is a data science consultant and mentor. Table of Contents: PART 1 - GETTING STARTED WITH DATA SCIENCE 1. What is data science? 2. Data science companies 3. Getting the skills 4. Building a portfolio PART 2 - FINDING YOUR DATA SCIENCE JOB 5. The search: Identifying the right job for you 6. The application: Résumés and cover letters 7. The interview: What to expect and how to handle it 8. The offer: Knowing what to accept PART 3 - SETTLING INTO DATA SCIENCE 9. The first months on the job 10. Making an effective analysis 11. Deploying a model into production 12. Working with stakeholders PART 4 - GROWING IN YOUR DATA SCIENCE ROLE 13. When your data science project fails 14. Joining the data science community 15. Leaving your job gracefully 16. Moving up the ladder

essential math for data science: Think Like a Data Scientist Brian Godsey, 2017-03-09
 Summary Think Like a Data Scientist presents a step-by-step approach to data science, combining analytic, programming, and business perspectives into easy-to-digest techniques and thought processes for solving real world data-centric problems. Purchase of the print book includes a free eBook in PDF, Kindle, and ePub formats from Manning Publications. About the Technology Data collected from customers, scientific measurements, IoT sensors, and so on is valuable only if you understand it. Data scientists revel in the interesting and rewarding challenge of observing, exploring, analyzing, and interpreting this data. Getting started with data science means more than mastering analytic tools and techniques, however; the real magic happens when you begin to think like a data scientist. This book will get you there. About the Book Think Like a Data Scientist teaches you a step-by-step approach to solving real-world data-centric problems. By breaking down carefully crafted examples, you'll learn to combine analytic, programming, and business perspectives into a repeatable process for extracting real knowledge from data. As you read, you'll discover (or remember) valuable statistical techniques and explore powerful data science software. More importantly, you'll put this knowledge together using a structured process for data science. When you've finished, you'll have a strong foundation for a lifetime of data science learning and practice. What's Inside The data science process, step-by-step How to anticipate problems Dealing with uncertainty Best practices in software and scientific thinking About the Reader Readers need beginner programming skills and knowledge of basic statistics. About the Author Brian Godsey has worked in software, academia, finance, and defense and has launched several data-centric start-ups. Table of Contents PART 1 - PREPARING AND GATHERING DATA AND KNOWLEDGE Philosophies of data science Setting goals by asking good questions Data all around us: the virtual wilderness Data wrangling: from capture to domestication Data assessment: poking and prodding PART 2 - BUILDING A PRODUCT WITH SOFTWARE AND STATISTICS Developing a plan Statistics and modeling: concepts and foundations Software: statistics in action Supplementary software: bigger, faster, more efficient Plan execution: putting it all together PART 3 - FINISHING OFF THE PRODUCT AND WRAPPING UP Delivering a product After product delivery: problems and revisions

Wrapping up: putting the project away

essential math for data science: Linear Algebra Problem Book Paul R. Halmos, 1995-12-31
Linear Algebra Problem Book can be either the main course or the dessert for someone who needs linear algebra and today that means every user of mathematics. It can be used as the basis of either an official course or a program of private study. If used as a course, the book can stand by itself, or if so desired, it can be stirred in with a standard linear algebra course as the seasoning that provides the interest, the challenge, and the motivation that is needed by experienced scholars as much as by beginning students. The best way to learn is to do, and the purpose of this book is to get the reader to DO linear algebra. The approach is Socratic: first ask a question, then give a hint (if necessary), then, finally, for security and completeness, provide the detailed answer.

essential math for data science: Getting Started with Data Science Murtaza Haider, 2015-12-14
Master Data Analytics Hands-On by Solving Fascinating Problems You'll Actually Enjoy! Harvard Business Review recently called data science "The Sexiest Job of the 21st Century." It's not just sexy: For millions of managers, analysts, and students who need to solve real business problems, it's indispensable. Unfortunately, there's been nothing easy about learning data science—until now. Getting Started with Data Science takes its inspiration from worldwide best-sellers like Freakonomics and Malcolm Gladwell's Outliers: It teaches through a powerful narrative packed with unforgettable stories. Murtaza Haider offers informative, jargon-free coverage of basic theory and technique, backed with plenty of vivid examples and hands-on practice opportunities. Everything's software and platform agnostic, so you can learn data science whether you work with R, Stata, SPSS, or SAS. Best of all, Haider teaches a crucial skillset most data science books ignore: how to tell powerful stories using graphics and tables. Every chapter is built around real research challenges, so you'll always know why you're doing what you're doing. You'll master data science by answering fascinating questions, such as: • Are religious individuals more or less likely to have extramarital affairs? • Do attractive professors get better teaching evaluations? • Does the higher price of cigarettes deter smoking? • What determines housing prices more: lot size or the number of bedrooms? • How do teenagers and older people differ in the way they use social media? • Who is more likely to use online dating services? • Why do some purchase iPhones and others Blackberry devices? • Does the presence of children influence a family's spending on alcohol? For each problem, you'll walk through defining your question and the answers you'll need; exploring how others have approached similar challenges; selecting your data and methods; generating your statistics; organizing your report; and telling your story. Throughout, the focus is squarely on what matters most: transforming data into insights that are clear, accurate, and can be acted upon.

essential math for data science: Deep Learning for Coders with fastai and PyTorch Jeremy Howard, Sylvain Gugger, 2020-06-29
Deep learning is often viewed as the exclusive domain of math PhDs and big tech companies. But as this hands-on guide demonstrates, programmers comfortable with Python can achieve impressive results in deep learning with little math background, small amounts of data, and minimal code. How? With fastai, the first library to provide a consistent interface to the most frequently used deep learning applications. Authors Jeremy Howard and Sylvain Gugger, the creators of fastai, show you how to train a model on a wide range of tasks using fastai and PyTorch. You'll also dive progressively further into deep learning theory to gain a complete understanding of the algorithms behind the scenes. Train models in computer vision, natural language processing, tabular data, and collaborative filtering Learn the latest deep learning techniques that matter most in practice Improve accuracy, speed, and reliability by understanding how deep learning models work Discover how to turn your models into web applications Implement deep learning algorithms from scratch Consider the ethical implications of your work Gain insight from the foreword by PyTorch cofounder, Soumith Chintala

essential math for data science: Math and Architectures of Deep Learning Krishnendu Chaudhury, 2024-03-26
Math and Architectures of Deep Learning bridges the gap between theory and practice, laying out the math of deep learning side by side with practical implementations in Python and PyTorch. You'll peer inside the black box to understand how your code is working, and

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essential math for data science: Convex Optimization Stephen P. Boyd, Lieven Vandenberghe, 2004-03-08 Convex optimization problems arise frequently in many different fields. This book provides a comprehensive introduction to the subject, and shows in detail how such problems can be solved numerically with great efficiency. The book begins with the basic elements of convex sets and functions, and then describes various classes of convex optimization problems. Duality and approximation techniques are then covered, as are statistical estimation techniques. Various geometrical problems are then presented, and there is detailed discussion of unconstrained and constrained minimization problems, and interior-point methods. The focus of the book is on recognizing convex optimization problems and then finding the most appropriate technique for solving them. It contains many worked examples and homework exercises and will appeal to students, researchers and practitioners in fields such as engineering, computer science, mathematics, statistics, finance and economics.

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