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Coding The Matrix: Linear Algebra Through Computer Science Applications About The Course The course has been taught at Brown University since 2008, and is being taught in Fall 2017 .

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An engaging introduction to vectors and matrices and the algorithms that operate on them, intended for the student who knows how to program. Mathematical concepts and computational problems are motivated by applications in computer science. The reader learns by doing, writing programs to implement the mathematical concepts and using them to carry out tasks and explore the applications. Examples include: error-correcting codes, transformations in graphics, face detection, encryption and secret-sharing, integer factoring, removing perspective from an image, PageRank (Google's ranking algorithm), and cancer detection from cell features. A companion web site, codingthematrix.com provides data and support code. Most of the assignments can be auto-graded online. Over two hundred illustrations, including a selection of relevant xkcd comics. Chapters: The Function, The Field, The Vector, The Vector Space, The Matrix, The Basis, Dimension, Gaussian Elimination, The Inner Product, Special Bases, The Singular Value Decomposition, The Eigenvector, The Linear Program

An engaging introduction to vectors and matrices and the algorithms that operate on them, intended for the student who knows how to program. Mathematical concepts and computational problems are motivated by applications in computer science. The reader learns by "doing," writing programs to implement the mathematical concepts and using them to carry out tasks and explore the applications. Examples include: error-correcting codes, transformations in graphics, face detection, encryption and secret-sharing, integer factoring, removing perspective from an image, PageRank (Google's ranking algorithm), and cancer detection from cell features. A companion web site, codingthematrix.com provides data and support code. Most of the assignments can be auto-graded online. Over two hundred illustrations, including a selection of relevant "xkcd" comics. Chapters: "The Function," "The Field," "The Vector," "The Vector Space," "The Matrix," "The Basis," "Dimension," "Gaussian Elimination," "The Inner Product," "Special Bases," "The Singular Value Decomposition," "The Eigenvector," "The Linear Program" A new edition of this text, incorporating corrections and an expanded index, has been issued as of September 4, 2013, and will soon be available on Amazon.

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

Thought-provoking and accessible in approach, this updated and expanded second edition of the Coding the Matrix: Linear Algebra through Computer Science Applications provides

a user-friendly introduction to the subject, Taking a clear structural framework, it guides the reader through the subject's core elements. A flowing writing style combines with the use of illustrations and diagrams throughout the text to ensure the reader understands even the most complex of concepts. This succinct and enlightening overview is a required reading for advanced graduate-level students. We hope you find this book useful in shaping your future career. Feel free to send us your enquiries related to our publications to info@risepress.pw Rise Press

One of the best available works on matrix theory in the context of modern algebra, this text bridges the gap between ordinary undergraduate studies and completely abstract mathematics. 1952 edition.

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.

Linear algebra is a pillar of machine learning. You cannot develop a deep understanding and application of machine learning without it. In this laser-focused Ebook, you will finally cut through the equations, Greek letters, and confusion, and discover the topics in linear algebra that you need to know. Using clear explanations, standard Python libraries, and step-by-step tutorial lessons, you will discover what linear algebra is, the importance of linear algebra to machine learning, vector, and matrix operations, matrix factorization, principal component analysis, and much more.

Python is one of the most popular languages for data analysis and prediction. What's more, tensorflow and torch, useful tools of recent deep learning, are fully implemented by Python. The basic form of data in these languages is an array, created by Python's important package numpy. In particular, arrays are the basis of data science because they have structures of vectors and matrices that give the meaning of direction and magnitude to each value in the data set. The matrix structure allows transformation to a simple form without losing the basic characteristics of a vast data set. These transformations are useful for efficient processing of data and for finding implicit characteristics. Linear Algebra, a field that provides a basic theory of vectors and matrices, provides many algorithms to increase the accuracy and speed of computation for analyzing data and to discover the characteristics of a data set. These algorithms are very useful for understanding the computing process of probability, statistics and the learning machine. This book introduces many basics of linear algebra using Python packages numpy, sympy, and so on. Chapters 1 and 2 introduce the creation and characteristics of vectors and matrices. Chapter 3 describes the linear system(linear combination) through the process finding the solution in a system of simultaneous equations. Vector space, a concept introduced in Chapter 4, is used to infer the collective characteristics and relationships of each vector of a linear system. Chapter 5 introduces the coordinate system to represent the linear system geometrically. Chapter 6 introduces the process of transforming while maintaining basic characteristics such as vectors and matrices. Finally, Chapter 7 describes several ways to decompose the original form into a simple form. In this process, we use a variety of Python functions.

Clear prose, tight organization, and a wealth of examples and computational techniques make Basic Matrix Algebra with Algorithms and Applications an outstanding introduction to linear algebra. The author designed this treatment specifically for freshman majors in mathematical subjects and upper-level students in natural resources, the social sciences, business, or any discipline that eventually requires an understanding of linear models. With extreme pedagogical clarity that avoids abstraction wherever possible, the author emphasizes minimal polynomials and their computation using a Krylov algorithm. The presentation is highly visual and relies heavily on work with a graphing calculator to allow readers to focus on concepts and techniques rather than on tedious arithmetic. Supporting materials, including test preparation Maple worksheets, are available for download from the Internet. This unassuming but insightful and remarkably original treatment is organized into bite-sized, clearly stated objectives. It goes well beyond the LACSG recommendations for a first course while still implementing their philosophy and core material. Classroom tested with great success, it prepares readers well for the more advanced studies their fields ultimately will require.

This unique text provides a geometric approach to group theory and linear algebra, bringing to light the interesting ways in which these subjects interact. Requiring few prerequisites beyond understanding the notion of a proof, the text aims to give students a strong foundation in both geometry and algebra. Starting with preliminaries (relations, elementary combinatorics, and induction), the book then proceeds to the core topics: the elements of the theory of groups and fields (Lagrange's Theorem, cosets, the complex numbers and the prime fields), matrix theory and matrix groups, determinants, vector spaces, linear mappings, eigentheory and diagonalization, Jordan decomposition and normal form, normal matrices, and quadratic forms. The final two chapters consist of a more intensive look at group theory, emphasizing orbit stabilizer methods, and an introduction to linear algebraic groups, which enriches the notion of a matrix group. Applications involving symm etry groups, determinants, linear coding theory and cryptography are interwoven throughout. Each section ends with ample practice problems assisting the reader to better understand the material. Some of the applications are illustrated in the chapter appendices. The author's unique melding of topics evolved from a two semester course that he taught at the University of British Columbia consisting of an undergraduate honors course on abstract linear

algebra and a similar course on the theory of groups. The combined content from both makes this rare text ideal for a year-long course, covering more material than most linear algebra texts. It is also optimal for independent study and as a supplementary text for various professional applications. Advanced undergraduate or graduate students in mathematics, physics, computer science and engineering will find this book both useful and enjoyable.

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