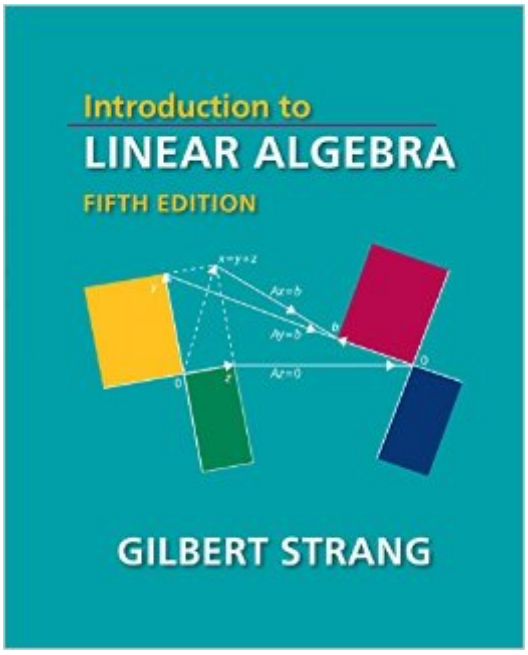
Introduction To Linear Algebra, Fifth Edition



Synopsis

Gilbert Strang’s textbooks have changed the entire approach to learning linear algebra -- away from abstract vector spaces to specific examples of the four fundamental subspaces: the column space and nullspace of A and A’. This new fifth edition has become more than a textbook for the basic linear algebra course. That is its first purpose and always will be. The new chapters about applications of the SVD, probability and statistics, and Principal Component Analysis in finance and genetics, make it also a textbook for a second course, plus a resource at work. Linear algebra has become central in modern applied mathematics. This book supports the value of understanding linear algebra. Introduction to Linear Algebra, Fifth Edition includes challenge problems to complement the review problems that have been highly praised in previous editions. The basic course is followed by eight applications: differential equations in engineering, graphs and networks, statistics, Fourier methods and the FFT, linear programming, computer graphics, cryptography, Principal Component Analysis, and singular values. Audience: Thousands of teachers in colleges and universities and now high schools are using this book, which truly explains this crucial subject. This text is for readers everywhere, with support from the websites and video lectures. Every chapter begins with a summary for efficient review. Contents: Chap. 1: Introduction to Vectors; Chap. 2: Solving Linear Equations; Chap. 3: Vector Spaces and Subspaces; Chap. 4: Orthogonality; Chap. 5: Determinants; Chap. 6: Eigenvalues and Eigenvectors; Chap. 7: Singular Value Decomposition; Chap. 8: Linear Transformations; Chap. 9: Complex Vectors and Matrices; Chap. 10: Applications; Chap. 11: Numerical Linear Algebra; Chap. 12: Linear Algebra in Probability and Statistics; Matrix Factorizations; Index; Six Great Theorems.

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Customer Reviews

Introduction to Linear Algebra, 5th Edition by Gilbert Strang Wellesley - Cambridge Press, 2016, ISBN 978-0-9802327-7-6, x+574 pages. Reviewed by Douglas Farenick, University of Regina Undergraduate mathematics textbooks are not what they used to be, and Gilbert Strang's superb new edition of Introduction to Linear Algebra is an example of everything that a modern textbook could possibly be, and more. First, let us consider the book itself. As with his classic Linear Algebra and its Applications (Academic Press) from forty years ago, Strang's new edition of Introduction to Linear Algebra keeps one eye on the theory, the other on applications, and has thestated goal of "opening linear algebra to the world" (Preface, page x).Aimed at the serious undergraduate student - though not just thoseundergraduates who fill the lecture halls of MIT, Strang's homeinstitution - the writing is engaging and personal, and the presentation is exceptionally clear and informative (even seasoned instructors maybenefit from Strang's insights). The first six chapters offer atraditional first course that covers vector algebra and geometry,systems of linear equations, vector spaces and subspaces, orthogonality, determinants, and eigenvalues and eigenvectors. The next three chapters are devoted to the singular value decomposition, lineartransformations, and complex numbers and complex matrices, followed bychapters that address a wide range of contemporary applications andcomputational issues. The book concludes with a brief but cogenttreatment of linear statistical analysis. I would like to stress that there is arichness to the material that goes beyond most texts at this level.Included are guides to websites and to OpenCourseWare, which I shallcomment upon later in this review. The final page lists "Six GreatTheorems of Linear Algebra." Chapter 7 begins with an informativeaccount of image compression, and would be wonderful material for an undergraduate student to present in a seminar to other students.Strang's experience at writing and teachinglinear algebra is apparent in the layout of the typeset. Offset in bluetype are topic-specific headings that indicate what is contained in thecontent of the text to follow. For example, on page 5, after developingmaterial on linear combinations of vectors, we find the heading "TheImportant Questions." On page 149, after studying the null space, thereis a subsection with the heading "Elimination: The Big Picture." Eachsection contains the headings "Review of the Key Ideas," "WorkedExamples," "Problems," and "Challenge Problems." These sections areessential reading for the instructor, not just the student. The WorkedExamples include material such as the Gershgorin Circle Theorem, whilethe Problems

and Challenge Problems offer the student a chance to master basic ideas and to think much more mathematically about the conceptsunder study. For example, Problem 29 of Chapter 6 asks for thecomputation of the eigenvalues of three matrices (not just genericmatrices, but matrices with structure and, thus, a chance to learnsomething about how the features of the matrix influence theeigenvalues), while Problem 39 of the same chapter asks for the possible values of the determinants, traces, and eigenvalues of the six 3 X 3permutation matrices. There is nothing here that can be said to be dry,uninteresting, or irrelevant; rarely does an undergraduate mathematicstext feel so alive as this one.This review appeared in the Bulletin of the International Linear Algebra Society, IMAGE Vol.58 (2017) 18-19

Linear algebra is something all mathematics undergraduates and many other students, in subjects ranging from engineering to economics, have to learn. The fifth edition of this hugely successful textbook retains all the qualities of earlier editions while at the same time seeing numerous minor improvements and major additions.

I wanted a re-introduction to Linear Algebra after taking a course in "Elementary Linear Algebra with Differential Equations" as an engineer back in college. As a note I have only worked through chapters 1-6, and looked over other portions of the text. But, I found it very refreshing how the author managed to connect the concepts from the very basics of vectors.The masterful thing about this book is that by adding just a little bit each chapter and connecting it back to the Four Fundamental Subspaces, orthogonality, basis, and linear independence, every new idea is very easy to grasp. The problems range from easy to medium difficulty (though these usually depend on tricks which you may/may not easily get) and help in building your abstraction muscle and thankfully shy away from the tedious computational realm most of the time. I find the way I look at matrices and systems of equations have been forever molded by this book. Perhaps most importantly, and the reason I believe this book is stellar, is that I believe this book is ideal for self-study. I did not even use his online video lectures, I simply did the examples along with him in the book and did all of the problems with solutions in the back. I say this not as a math genius, but as someone with an interest in learning some math a couple of hours per week. This book has given me the confidence to pursue a more abstract treatment of the subject, as well as a numerical linear algebra text which fleshes out the complexity of matrix decompositions and such.

This book is a great accompaniment to the free video lectures available from MIT, Linear Algebra

Spring 2005. I would say that a reader should have at least completed Pre-Calculus to do well in this course. Any introductory experience in discrete math, differential equations, or 3D graphing will be helpful but not required. I was able to easily complete randomly selected homework problems after watching the video lectures, as the lecturer (Dr. Strang) is also the author of this book. Remember, Linear Algebra is much different from your standard Algebra class - you'll need to stretch your brain to consider higher dimensions, matrix operations, etc.

Gilbert Strang is an exceptional teacher, from that very thin group of educators that not only tell you both the WHY and the HOW but also show you how beautiful it all is.Don't miss the pleasure that arises from coupling the book to the MIT OCW videos !This type of experience has been tried on french TV 15 years ago and failed abysmally : the so-called teacher --although from the world-famous math institution, NormaleSup -- seemed to come from outer space, using an alien peer-to-alien peer jargon...That's why such a successful effort from Gil Strang should be encouraged and developed, e.g. from what I read, there's a demand for an OCW based on Apostol's superb trilogy of Analysis (Calculus 1, 2 and Math Analysis) (see my review).

I have read two other linear algebra texts, and this is by far the most intutitive. I was even able to get in contact with the author and ask a few questions here and there. Highly recommended for anyone intersted in self studying linear algebra.

This book is very good for studying linear algebra for the first time (especially self-study). It goes well together with Prof. Strang MIT OCW. The book explanation focuses more on intuition and concept. It does not favour readers who prefer rigorous math. However exercises/problems will require solid understanding and rigorous math to solve; they will leave "knowledge mark" in ones' mind if they invest enough effort/time.

My bookshelves are lined with materials that support my work in data science and machine learning. I have a large section of mathematics books including several on the subject of linear algebra. For many years my ÃƒÂ¢Ã â ¬Ã Å“go toÃƒÂ¢Ã â ¬Ã Â• text on linear algebra was an old 2nd edition of MIT Professor Gilbert StrangÃƒÂ¢Ã â ¬Ã â„¢s seminal book on the subject that I picked up at a swap meet. To my surprise, the good professor recently sent me a copy of his latest and greatest 5th edition of ÃƒÂ¢Ã â ¬Ã Å“Introduction to Linear AlgebraÃƒÂ¢Ã â ¬Ã Â• (Wellesley-Cambridge Press).I found the new edition to be even better than previous editions. For one it is now 574 pages

versus my old copyÃƒÂ¢Ã â ¬Ã â„¢s 374. I also found the book to be impressively re-tooled for educational purposes. The chapters contain useful ÃƒÂ¢Ã â ¬Ã Å“Review of the Key IdeasÃƒÂ¢Ã â ¬Ã Â• sections, worked examples, and well thought out problem sets (with special ÃƒÂ¢Ã â ¬Ã Å“Challenge ProblemsÃƒÂ¢Ã â ¬Ã Â• for those who want to dive deeper). Gilbert StrangÃƒÂ¢Ã â ¬Ã â„¢s textbooks have changed the entire approach to learning linear algebra ÃƒÂ¢Ã â ¬Ã â œ away from abstract vector spaces to specific examples of the four fundamental subspaces: the column space and nullspace of A and AÃƒÂ¢Ã â ¬Ã â„¢.The chapters directly apply to the needs of data scientists wishing to establish a firm foundation for how machine learning happens behind the scenes. All chapters are superbly crafted, but my favorites are: Chapter 7 because SVD plays an important role in Principal Component Analysis for dimensionality reduction as well as PCA regression; Chapter 10 as it enhances the math subject matter with practical applications; Chapter 11 which is a nice adjunct to the pure math content and reminds me of portions of the old ÃƒÂ¢Ã â ¬Ã Å“Numerical MethodsÃƒÂ¢Ã â ¬Ã Â• (Prentice-Hall) text by G. Dahlquist et al that I used in my early days of data science; and Chapter 12 which is perfect for data scientists who want to see the relationship with statistics and probability.StrangÃƒÂ¢Ã â ¬Ã â„¢s new edition is a great launching point for newbies as well as practicing data scientists to gain a foothold in the theory behind the technology. If you feel a bit insecure with your mathematical prowess when reading the statistical leaning bible ÃƒÂ¢Ã â ¬Ã Å“Elements of Statistical LearningÃƒÂ¢Ã â ¬Ã Â• by Hastie, Tibshirani and Friedman (a group of high-profile Stanford researchers), then StrangÃƒÂ¢Ã â ¬Ã â„¢s book is the best way to lay a firm foundation.Gilbert Strang is a Professor of Mathematics at Massachusetts Institute of Technology and an Honorary Fellow of Balliol College, of the University of Oxford. His current research interests include linear algebra, wavelets and filter banks, applied mathematics, and engineering mathematics. He is the author or co-author of eight textbooks. He is a Fellow of the American Academy of Arts and Sciences and a member of the National Academy of Sciences.The book also comes with an excellent web resource which includes downloadable sections (PDFs) of many chapters, a complete chapter-by-chapter solutions manual for the problem sets, and practice exam questions. The book is used as the textbook for MITÃƒÂ¢Ã â ¬Ã â„¢s undergrad linear algebra course 18.06. It is also the book used in MITÃƒÂ¢Ã â ¬Ã â„¢s Open Courseware class on the subject, complete with video lectures. This means you can take a full-fledged MIT course to help you become well-versed with this important subject matter. I highly recommend this book for any up-and-coming data scientist.I do have a big complaint with this new book! ItÃƒÂ¢Ã â ¬Ã â„¢s going to sap a lot of time from my busy schedule because with such a great learning resource in my hands, I know myself,

IÃƒÂ¢Ã â ¬Ã â„¢m going to spend time ÃƒÂ¢Ã â ¬Ã Å“re-learningÃƒÂ¢Ã â ¬Ã Â• the subject for the nth time, doing the problem sets, and thinking hard about how important math is to a firm understanding of machine learning. I donÃƒÂ¢Ã â ¬Ã â„¢t have time for this!

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