Banerjee, Sudipto; **Roy, Anindya**
Linear algebra and matrix analysis for statistics. (English) | Zbl 1309.15002 |
Chapman & Hall/CRC Texts in Statistical Science Series. Boca Raton, FL: CRC Press (ISBN 978-1-4200-9538-8/hbk). xvii, 465 p. (2014).

The presented book covers the basic theory of linear algebra. It introduces vector spaces and matrices definitions and fundamental properties. It can serve as a reference material for one- or two-semester course for a wide variety of students at the junior undergraduate level. From the Preface: "The book tries to be as self-contained as possible and does not assume any prior knowledge of linear algebra. However, those who have seen some elementary linear algebra will be able to move quickly through the early chapters." This is definitely true.

The sixteen chapters cover the full range of topics starting from Euclidean spaces, including linear equations, orhogonality, projections, eigenvalues and singular values, quadratic forms and the Kronecker product, iterative methods and ending with a section devoted to abstract Hilbert spaces. Topics are presented in a logical order and in a reasonable pace. The book is compactly written and the approach throughout is rigorous, yet well readable. Althoug written in a "theorem and proof" manner, the connecting text clarifies the background sufficiently. Emphasis is put on the proper topics like factorization, eigenvalues, orthogonalization. Algorithms are explained in adequate detail. Every chapter contains numerous illustrative excersises solvable using pencil and paper.

Apart from these, two rather major issues should be mentioned. Although the book appears to be a very good one, it contains several typing mistakes (even in formulas) or grammatical errors. An errata sheet would therefore be useful. The second issue is more serious. The book is an excellent introduction to linear algebra. However, the statistical applications are represented only by one subsection 'Web page ranking and Markov chains' (8 pages), which is in fact devoted only to the description of a particular example of a web search engine. On the basis of this example the authors introduce the concept of stochastic matrices, Markov chains, etc., and thus give the reader a notion of the relationship between the abstract linear algebra and the main subject of his or her interest, i.e. statistics. If the book had more of such examples, at least one for each of the chapters; it would have become an exceptionally helpful resource for the students of statistics. It would have helped to make the connection between linear algebra and statistics far more apparent, as promised in the title of the book, and the book could have scored far better than it actually does. Though a good one, it is just one of the many linear algebra books on the market.

Reviewer: Cyril Fischer (Praha)

MSC:

15-01	Introductory exposition (textbooks, tutorial papers, etc.) pertaining to linear algebra	Cited in **1** Review
65Fxx	Numerical linear algebra	Cited in **8** Documents
15A06	Linear equations (linear algebraic aspects)	
15A18	Eigenvalues, singular values, and eigenvectors	
15A63	Quadratic and bilinear forms, inner products	
15A23	Factorization of matrices	

Keywords:

linear algebra; matrix analysis; numerical methods; textbook; linear equation; eigenvalue; singular value; quadratic form; Kronecker product; iterative method; factorization; orthogonalization; algorithm