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★**The coordinate-free approach to linear models.**

Cambridge Series in Statistical and Probabilistic Mathematics, 19.
Cambridge University Press, Cambridge, 2006. *xiv+199 pp.* $50.00.
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The general linear model problem is studied using a non-traditional coordinate-free approach. The book presents, in particular, regression models, ANOVA and analysis of covariance from the geometric point of view, which provides more insight into the nature of linear models but, on the other hand, the reader may need more experience in both linear algebra and statistical modeling.

More precisely, the author assumes a random vector Y in a vector space V, where the variance structure of the vector Y is known (up to a possible parameter) and the mean vector μ of Y lies in a vector subspace of the state space V. The main aim of the book is to estimate the mean vector or its linear functionals, to test models and submodels, and to treat missing observations—all in the geometric approach.

The book is divided into 8 chapters. Chapter 1 is a motivating Introduction and in Chapter 2 the basic results of linear algebra are recalled. Projections and inner products are the main tools used throughout the book and there are a lot of useful results covered by Chapter 2. Random vectors in inner product spaces, their expectation, covariance and dispersion operators are discussed in Chapter 3. This operator view of the variability is used in the coordinate-free approach rather than the usual variance-covariance matrices. Random vectors are preferred to be of weakly spherical distribution which may be achieved by a change of inner product in the vector space considered.

The core of the book is in Chapters 4–8. Chapter 4 covers the classical Gauss-Markov estimation of the mean vector or of its linear functionals (which is an equivalent problem). As a separate problem the estimation of unknown variability parameter is discussed together with the wrong inner product problem. In Chapters 5 and 6 the normality assumption is added to the distribution of vector Y. These chapters cover estimation, admissibility and minimum variability of estimate, James-Stein estimation (Chapter 5), likelihood ratio test and F-test, and confidence intervals for the mean (Chapter 6). The last two chapters are more specialized. Chapter 7 focuses on analysis of covariance, while the problem of missing variables is discussed in Chapter 8.

The reader will find a large number of examples and exercises in the book which are quite helpful for understanding the text. The index of the book is excellent but a short list of notations would have been appreciated.

The book will be useful for students (and researchers) of statistics to learn another, and possibly more insightful, approach to linear modeling. The book may also be recommended to all users of linear models who want to get another look at this part of statistics. *M. Hušková*