D. Rasch, J. Pilz, R. Verdooren, A. Gebhardt: Optimal experimental design with R

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“This is not a textbook which introduces the reader systematically into the theory of experimental design. It should instead be understood as a manual for the R-package OPDOE.” This is how the authors describe their book in the preface. But this claim is much too modest. Although the book assumes that readers are familiar with basic statistical concepts such as confidence intervals, significance tests, linear models or analysis of variance, most concepts that one needs to do an efficient experiment, such as block designs and so on, are carefully explained along the way, mostly using examples from the real world.

The book has two parts. The first is concerned with determining the size of the sample as a function of the precision that is required in terms of the lengths of confidence intervals or the probabilities of an error of the second kind. The focus here is on ANOVA models. The second part of the book is devoted to the construction of optimal designs. This is discussed in detail—again with the help of lots of examples—for balanced incomplete block and fractional factorial designs, plus selected types of linear regression models. There is also a smaller part III on special designs for nonlinear relationships which will mostly be of interest to specialists.

It is obvious from every line of the text that the authors are experts in this field; many examples are drawn from consulting jobs or from other genuine applications. If one were to sort the continuum of statistics textbooks from rather sterile mathematical treatments on the one end to hands-on approaches to real problems on the other, this book is rather close to the second end (without sacrificing mathematical rigor, though). It can be recommended to any statistician familiar with the R programming package who is supposed to plan an experiment and does not yet know how.

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