Book Reviews

Forest Analytics with R (Use R)

Andrew R. ROBINSON and Jeff D. HAMANN. Berlin: Springer, 2011. ISBN 978-1-4419-7761-8. xv + 339 pp. €57.99 (paperback).

Forestry is a broad field touching economical management as well as landscape planning, survey design/analysis, spatial statistics, growth simulations and much more. Accordingly, also the topics related to statistical computing (and hence R) cover a lot of ground. The present book has luckily refrained from trying to cover all possible aspects, while at the same time still being surprisingly comprehensive. It aims at forest scientists, managers, researchers and students, who have little experience with R.

The book is organised in four parts. Part I, *Introduction and Data Management*, introduces R and typical forest data sets, of which several are provided in the companion R-package **FAwR**. Part II, *Sampling and Mapping*, illustrates the use of the **survey** package to estimate mean and variance of typical forest survey designs. It then continues to briefly sketch imputation and spatial interpolation techniques. Part III, *Allometry and Fitting Models*, covers regression, non-linear regression and mixed effect models. Part IV, *Simulation and Optimization* introduce the interaction of C-code with R through two forest growth models and uses a question from forest planing to illustrate the use of linear programming for optimisation.

The four parts differ greatly in their style, depth and quality. Part I can easily be skipped by the more experienced R-user, but offers a useful and gentle introduction to general R functionality with respect to the following three parts. To appreciate the sampling analyses of part II (including, for example, simple random and systematic sampling, cluster and two-stage sampling), a more detailed knowledge of the **survey** package (Lumley, 2010) and of sampling designs in general (e.g., Lohr, 2009) is required. I found the notation for variance estimation somewhat unsavoury, because it deviated from both these books, as well as *the* book dedicated to forest sampling (Gregoire and Valentine, 2008). Imputation and interpolation techniques receive only a superficial brush, e.g. focussing on (spatial!) nearest-neighbour imputation without mentioning regression-based imputation (Harrell, 2001) at all.

In stark contrast, regression, non-linear and mixed models are dealt with much more carefully and very competently. While the purpose of the book is not to explain so much why, but how, to carry out certain computations, this section is a showcase of how to teach model interpretation. Even after a decade of stats teaching I found this part inspiring. The key ingredient, I think, is that the authors carry a single example through different analyses. They show improvements (or lack thereof) compared to previous models, explain very accurately the model output and they give intuitive and rule-of-thumb guidance on which "knobs to turn" during analysis.

The final part is again rather different in style. It provides walk-through examples without much explanation of why one would want to use this specific forest growth model (provided through the **rconifers** package: Hamann et al., 2010) or any implementational details. The optimisation section using linear programming is virtually incomprehensible without parallel reading on the subject. This fourth part feels like an incomplete draft shoved in for the sake of topic coverage.

Overall, Forest Analytics with R offers an entry to several statistical computation topics encountered by forestry students and practitioners. The sampling-section is sufficient for many standard designs. Only the regression-section is both in-depth and generic, while the simulation studies are too specific to offer themselves to an easy transfer to other problems.

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Bibliography

T. G. Gregoire and H. T. Valentine. *Sampling Strategies for Natural Resources and the Environment*. Chapman and Hall/CRC, New York, 2008. ISBN 9781584883708.

J. Hamann, M. Ritchie, and the R Core team. *rconifers: Alternative Interface to the CONIFERS Forest Growth Model*, 2010. R package version 1.0.5.

F. E. Harrell. *Regression Modeling Strategies - with Applications to Linear Models, Logistic Regression, and Survival Analysis*. Springer, New York, 2001. ISBN 0-387-95232-2.

S. L. Lohr. *Sampling: Design and Analysis*. Duxbury Press, North Scituate, Mass., 2nd edition, 2009. ISBN 9780495105275.

T. Lumley. *Complex Surveys: A Guide to Analysis Using R*. Wiley, Hoboken, NJ, 2010. ISBN 9780470284308.