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Dale & Fortin – the revised guide to spatial analysis

Spatial Analysis – A Guide for Ecologists. Mark R. T. Dale & Marie-Josée Fortin, 2nd edition, 2014, Cambridge University Press. 450 pp. £45.00 (paperback) ISBN: 978-0521143509; http://www.cambridge.org/

It may be too early to call "Spatial Analysis – A Guide for Ecologists" by Fortin and Dale a modern classic, but since its publication in 2005 the book has certainly become a widely cited reference in the field of spatial ecology. Cambridge University Press has now published a second edition of this introductory textbook.

When holding both editions back to back, it is apparent that the changes made for this new edition go beyond mere cosmetics. It not only comes with a redesigned cover and a new two-column layout, but also with a considerably altered content structure and a noticeable extension in text volume. The authors remark in the preface that "spatial analysis has been a rapidly growing field … since Fortin & Dale (2005)", and that the new edition provides "more breadth ... by including new topics not covered there (e.g. spatial aspects of diversity analysis)."

Whether the authors have succeeded in their ambitions depends on how one interprets these statements. Doubtless, the new edition updates and improves on its predecessor in many important aspects. As before, it provides a broad overview of methods in spatial analysis, covering data types and sampling design, point-patterns, continuous spatial patterns, spatial clustering and spatio-temporal data. The new layout is more readable, and the already concise and well-referenced text has been complemented in many places by added material and more recent references. From this point of view it is a logical successor, and an excellent guide to the field of spatial analysis.

What I did not find in the new edition was a substantial broadening of scope, nor a substantial shift of weight towards the developments of the last decade. As the authors note, there has been much recent development in spatial statistics, not least because of advances in computing power and computational meth-

ods. A particularly important trend is towards fitting explicit, often hierarchical spatial models to data, instead of merely testing against null models or assumptions of spatial homogeneity. Key to this shift has been the wider appreciation of Bayesian inference, as well as the progress in numerical approximation methods such as MCMC (Monte Carlo Markov Chain) sampling or INLA (Integrated Nested Laplace Approximation). Also, the use of simulations and therefore the importance of acquiring expertise in statistical programming has increased in the last decade. The authors comment on these issues in their final chapter, and they refer to references such as Cressie and Wikle (2011), but I still feel more movement in this direction, for example through a chapter on Bayesian inference and hierarchical models, would have been a worthwhile addition.

That the methodological scope has hardly been changed is somewhat obscured by the fact that substantial structural changes have been made to the text. Introduction and conclusions aside, the first edition was divided into (1) point patterns, (2) surface patterns, (3) spatial partitioning, (4) spatial autocorrelation, and (5) spatio-temporal patterns. For the second edition, these chapters have partly been split and reorganised so that the number of chapters has nearly doubled. One may argue about the utility of some of these structural changes. For example, a new chapter on ecological and spatial processes was added to the second edition. The addition of this material is useful, but I would have found it more natural to merge it with the introduction on spatial context, data and sampling instead of presenting it as a separate second chapter. Overall it seems to me that reader orientation and the storyline were better supported by the simpler structure of the first edition.

Furthermore, few concessions have been made to adjust the book to the arguably more practical needs of current-day graduate students. As with its predecessor, it remains at a rather theoretical level. Methods are explained concisely in text and formulae, but little time is spent discussing practical and computational issues that may arise when applying these methods, or on providing case studies. It may be a matter of taste, but I feel a slightly more applied focus, for example through a website with code, would have improved the usefulness of this book as a guide for self-study.

The impression that remains is of an overall improved and modernised version of an excellent reference on spatial analysis in ecology. If a theoretically solid, but still accessible overview on classic spatial methods in ecological statistics is desired, I can currently think of no alternative to this book. For a more gentle introduction to the field, the less concise, but more accessible text of Haining (2003) may be a better choice. A student starting with this topic would probably also want to invest in a text describing the practical implementation of the methods, for example Bivand et al. (2013). Excellent material is also provided for free by many software maintainers, for example Baddeley and Turner (2005). Some classic textbooks such as Ripley (1981) and Cressie (1993) remain worth reading despite being somewhat more mathematical and now a little dated. To learn about more recent developments, one needs to resort to other textbooks covering hierarchical models and Bayesian inference such as Cressie and Wikle (2011) or Banerjee et al. (2014). Finally, if the focus is mainly on point data, Diggle (2013), Illian et al. (2008), or Wiegand and Moloney (2013) would provide more detailed introductions than Dale and Fortin (2014).

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References

Baddeley, A. & Turner, R. (2005) spatstat: an R package for analyzing spatial point patterns. Journal of Statistical Software, 12, 1–42.

Banerjee, S., Carlin, B.P. & Gelfand, A.E. (2014) Hierarchical modeling and analysis for spatial data (2nd ed.). CRC Press, Boca Raton, FL.

Bivand, R.S., Pebesma, E.J. & Gómez-Rubio, V. (2013) Applied spatial data analysis with R (2nd ed.). Springer, New York.

Cressie, N.A. (1993) Statistics for spatial data. Wiley, New York.

Cressie, N. & Wikle, C.K. (2011) Statistics for spatio-temporal data. Wiley, Hoboken, NJ.

Diggle, P.J. (2013) Statistical analysis of spatial and spatio-temporal point patterns (3rd ed.). CRC Press, Boca Raton, FL.

Haining, R.P. (2003) Spatial data analysis: theory and practice. Cambridge University Press, Cambridge.

Illian, J., Penttinen, A., Stoyan, H. & Stoyan, D. (2008) Statistical analysis and modelling of spatial point patterns. Wiley, Hoboken, NJ.

Ripley, B.D. (1981) Spatial statistics. Wiley, New York.

Wiegand, T. & Moloney, K.A. (2013) Handbook of spatial point-pattern analysis in ecology. CRC Press, Boca Raton, FL.