Contemporary Bayesian and Frequentist Statistical Research Methods for Natural Resource Scientists


This book presents and discusses some mainstream and moderately recent parametric inference techniques that the author has found to be useful in the course of his career as a statistical consultant in the environmental sciences. In the words of the author, “This book was written to introduce these newer contemporary methods of statistical analysis to natural resource scientists…” The book employs plenty of examples and at the conclusion of each chapter includes student exercises with extensive worked solutions in the back of the book. Detailed command-language code is given for R (http://www.r-project.org; verified 3 Apr. 2008), S-Plus (http://www.insightful.com/; verified 3 Apr. 2008), and WinBugs (http://www.mrc-bsu.cam.ac.uk/bugs/; verified 3 Apr. 2008) software. The author makes good use of introduction and summary sections, with frequent recapitulation to reinforce major themes. Topics covered include Bayesian inference, Markov Chain Monte Carlo (MCMC) algorithms and software, model selection criteria and processes, generalized linear models (for non-normal data), mixed-effects models (for dependent data), some reflections on the misuse of statistics, study design, and the importance of allocating resources to analysis and interpretation. The statistical detail and sophistication of the techniques presented in this “introductory” book would stretch most non-statistical readers. In our view the book would be better suited as a practical reference for a newly appointed statistical consultant. Most chapters, if not paragraphs, are themselves the topic of whole books elsewhere.

The inclusion of both Bayesian and Frequentist methods in the one volume is unusual and leads one to hope for a refreshingly pragmatic appreciation for what each approach has to offer. But this is not well done. Even though in later chapters Frequentist methods are presented positively and in considerable detail, there is a tendency early on for the author to be dismissive of the Frequentist approach. While the seamless elegance of the Bayesian approach is recognized, the basic reason why a Frequentist approach might be desired (namely, that some quantities should not be regarded as random simply because, in fact, they are fixed) is never clearly articulated. One or two paragraphs providing a clear enunciation of the essential difference between the Bayesian and Frequentist philosophies, and why each should or should not be adopted could have made this book much less confusing for its target audience. Rather, one is lead into the more dangerous territory of being offered a collection of albeit useful and sophisticated techniques, with little understanding of the presuppositions that underpin them and which inform their interpretation.

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