MULTIVARIATE BAYESIAN STATISTICS: Models for Source Separation and Signal Unmixing
D.B. Rowe, Boca Raton, FL: Chapman & Hall/CRC, 2003, pp. xx + 329.
Contents:

Intended Readership: Teachers of "Classical Multivariate Statistics" or of "Multivariate Bayesian Statistics"; readers interested in a Bayesian approach to the "Source Separation Problem".

The author's objective for this book is to develop a Bayesian approach to the "Source Separation Problem" presenting statistical background as necessary. The canonical example is that of several simultaneous speakers at a cocktail party whose conversations are recorded at a number of microphones placed about the room; the problem is to separate each spoken source from the mixed signals delivered by the microphones. An application of interest is that of functional magnetic resonance imaging whereby the image of a person's brain might be observed to change in response to different stimuli.

The first half of the book is intended to supply the reader with statistical background sufficient to be able to begin the problem of "Bayesian Source Separation" in Chapter 10. It is recommended in the preface that "Those with sufficient breath [sic] and depth in the fundamental material may skip directly to Chapter 8 . . . "; this is good advice for all readers. The "fundamentals" seem hastily put together, contain fundamental flaws (e.g. likelihood *defined* to be a joint density and so precluding, for example, its use on censored data), needless non-sequiturs (e.g. in the derivation of a vague prior for a variance parameter, p. 42), and equivocal explanations (e.g. as in the presentation and development of conjugate priors via the official sounding "Conjugate procedure" which proceeds by "writing down the likelihood, interchanging the roles of the random variable and the parameter, and 'enriching' the distribution so that it does not depend on the data"; inconsistently applied on pp. 44-45). Together these defects render the statistical fundamentals unnecessarily abstruse to a

novice.

Though an index exists, it is nearly useless. Where one might expect to find "likelihood" or "prior distribution" or even "Bayes' rule", one is startled to find instead such single concept entries as "ah ha", "between", "explicit", "hill", "increment", "large", and "moving", to name but a few. Personal favourites are "shift" and "shifts" (both of which appear reassuringly on the same page, 258) and "marginal" which, ironically, appears on nearly one third of the pages of the book. The index seems designed by a technology reminiscent of the very problem the book is meant to address.

And this brings us to the second, more substantive, half of the book. Here the text is based on the author's research, much of which has previously appeared only in technical reports; essentially no other authors are referenced. The models are based on multivariate normal distributions with conjugate priors and the mathematics seems straightforward. Estimation is via Gibbs sampling and the iterated conditional modes algorithm. The FMRI case study shows the complexity of the problem and its solution via this heavily computational approach; the unrealistic nature of the simplifying assumptions employed suggests that there is room for further research.

The book is likely to be of some interest to those working on the source separation problem; its value to others would appear to be minimal. A more mature work, aggressively edited, might produce an admirably thin volume such as those which were once the hallmark of Chapman & Hall's books.

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