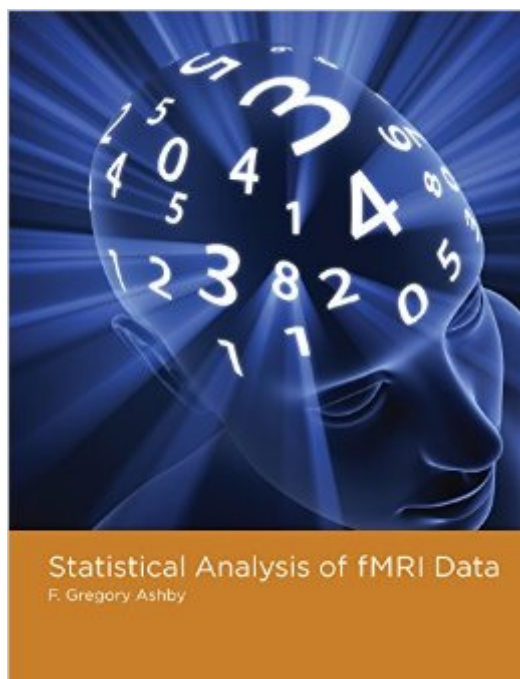# Statistical Analysis Of FMRI Data (MIT Press)

Synopsis

Functional magnetic resonance imaging (fMRI), which allows researchers to observe neural activity in the human brain noninvasively, has revolutionized the scientific study of the mind. An fMRI experiment produces massive amounts of highly complex data; researchers face significant challenges in analyzing the data they collect. This book offers an overview of the most widely used statistical methods of analyzing fMRI data. Every step is covered, from preprocessing to advanced methods for assessing functional connectivity. The goal is not to describe which buttons to push in the popular software packages but to help readers understand the basic underlying logic, the assumptions, the strengths and weaknesses, and the appropriateness of each method.The book covers all of the important current topics in fMRI data analysis, including the relation of the fMRI BOLD (blood oxygen-level dependent) response to neural activation; basic analyses done in virtually every fMRI article -- preprocessing, constructing statistical parametrical maps using the general linear model, solving the multiple comparison problem, and group analyses; the most popular methods for assessing functional connectivity -- coherence analysis and Granger causality; two widely used multivariate approaches, principal components analysis and independent component analysis; and a brief survey of other current fMRI methods. The necessary mathematics is explained at a conceptual level, but in enough detail to allow mathematically sophisticated readers to gain more than a purely conceptual understanding. The book also includes short examples of Matlab code that implement many of the methods described; an appendix offers an introduction to basic Matlab matrix algebra commands (as well as a tutorial on matrix algebra). A second appendix introduces multivariate probability distributions.

Book Information

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Customer Reviews

One of the most challenging aspects of learning and teaching the non-trivial statistical methodology associated with the analysis of fMRI data is a widespread tendency (in textbooks and papers) not to write down the underlying mathematical ideas precisely and clearly.In an effort to improve my own understanding of the field, and to train my post-docs and PhD students, I have carefully looked at every related textbook in the field. This book is on a class of its own and is a MUST read for every serious student of fMRI.The book carries the reader through a precise but highly readable analysis of the statistical issues associated with analyzing fMRI data, from basic issues such as preprocessing, to an outstanding four chapter discussion of 'connectivity methods' and 'multivariate approaches'. To top it all, the book includes multiple snipets of MATLAB code that greatly add to the reader's understanding of the subject.Overall, the book is an example of how methods should be disseminated in this highly technical area to an area that spans a wide range of mathematical backgrounds.Everybody in my lab is getting a copy of this!Antonio RangelProf. of Neuroscience & EconomicsCaltech

The books succeeds in elucidates the complex world of fMRI statistics. The book guides a reader throughout the process of fMRI data analysis with clear, practical examples. It is also possible to read select chapters on particular topics of interest. Additionally, there are many specific tips and tricks to improve the quality of fMRI studies and subsequent analysis. The value (i.e., price for information) is extraordinary. Thus, making it an appropriate textbook choice for a graduate level course in fMRI data analysis. As additional value, there is Matlab code on his personal website, [...], to facilitate a deeper understanding of the concepts. Overall, this book is an invaluable asset to the field.

I bought the book because I was auditing fMRI course at MIT. It's good book for starting to work with

fMRI data without getting too much into physical details.

Good book.

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