modeling, and mixed effects models. The book includes an ample collection of
exercises for all the chapters. One strength of the book is its good discussion of
Gibbs sampling and Metropolis–Hastings algorithms. The author goes beyond
a description of the MCMC algorithms, but also provides insight into why the
algorithms work.

The author illustrates Bayesian computation throughout the book by provid-
ing snippets of R code. It is clear that the author assumes the reader has some
knowledge of R, so there is little explanation of the particular R functions that
are used. But the sections of R code clearly illustrate the ease of programming
Monte Carlo and MCMC simulations and can provide the starting point for the
reader to do his or her own Bayesian programming. My only criticism of this
aspect is that author could better facilitate the use of these sections of R code
by providing some initial R instruction either in the book or the book’s website.

How does this book fit in the growing number of Bayesian books on the
market? The book is clearly more concise than Gelman et al. (2003), Carlin
and Louis (2008), and Gill (2007), but it is designed for a one-semester text.
The book appears to be more mathematically sophisticated than Lee (2009).
There is no mention of the popular Bayesian software program WinBUGS, but
one can argue that one should not use a program like WinBUGS until one has a
good understand of the characteristics of the main MCMC algorithms.

In summary, I believe this text would be an excellent choice for my Bayesian
class since it seems to cover a good number of introductory topics and give the
student a good introduction to the modern computational tools for Bayesian
inference with illustrations using R.

Jim Albert
Bowling Green State University

REFERENCES

Carlin, B., and Louis, T. (2008), Bayesian Methods for Data Analysis (3rd ed.),
New York: Chapman & Hall. [875]

(2nd ed.), New York: Chapman & Hall. [875]

Gill, J. (2007), Bayesian Methods: A Social and Behavioral Sciences Approach
(2nd ed.), New York: Chapman & Hall. [875]


Longitudinal Data Analysis.


Longitudinal Data Analysis is a survey of methods for analyzing longitu-
dinal data that have emerged over the last 20 years. Longitudinal data present
many challenges, such as complicated correlation structures, high dimensionality,
mixing data, and mixed categorical and continuous outcomes. In response to
these challenges, this area has experienced tremendous growth and inter-
est, with many competing developments in a variety of application areas. This
presents the statistician with many choices, and Longitudinal Data Analysis is
the first book to collect and sort through many of the most important develop-
ments. The authors make clear the assumptions of the statistical methods and
their consequences. Coupled with an abundance of examples, the book guides
the practitioner about when to apply one method as opposed to another. The
book has remarkable breadth and contains material that would likely be new
even to those that analyze longitudinal data on a regular basis. Longitudinal
Data Analysis would be useful for applied statisticians looking to expand their
analytical toolkit and statistical researchers familiar with the area but looking for
a good reference. Most of the models in the book are generalizations of the
linear mixed model and generalized linear models. The reader would need to be
familiar with these at a minimum and also familiar with using likelihood meth-
ods of model construction. As such, the book would make an excellent text for
a special topics course for Ph.D. students in statistics. It has a good balance of
statistical theory and applications, with a large number of real data examples
and case studies to illustrate how to use the methods described therein. While
most of these examples are from the health sciences, with a few from the so-
cial sciences, the methods described are typically general and could be used in
application areas from econometrics to engineering and physical sciences.

Longitudinal Data Analysis is organized into five parts. The first part is a one
chapter historical review that begins with early ANOVA methods and continues
to the present. The other four parts each begin with a brief introductory chapter
followed by several chapters related to a particular aspect of longitudinal data
analysis. Every chapter is contributed by a set of experts in the area covered and
has its own bibliography that is useful as a source for further reading. Most of
the chapters are written to be fairly independent of the previous ones, making
the book useful as a reference.

Part II discusses parametric models, devoting one chapter each to general-
ized estimating equations (GEE), generalized linear mixed models (GLMM),
and nonlinear mixed models (NLMM). Chapter 6 covers growth mixture models,
a generalization of linear mixed models that can accommodate non-
Gaussian random effects. Of particular interest is modeling mixture distribu-
tions for random effects, providing a framework for identifying latent classes
within the subject population. Chapter 7 uses several examples to discuss how
explicit study goals should be used to choose between a marginal GEE model
and a subject specific GLMM model.

Part III covers nonparametric and semi-parametric models for longitudinal
data. Chapter 9 introduces adaptations of kernel-based nonparametric regres-
sion estimators to the longitudinal setting. Chapter 10 covers recent develop-
ments in the application of functional data analysis methods to longitudinal
setting. Chapters 11 and 12 focus on penalized and smoothing spline models
and contain a useful review of spline methods and their close relationship to the
linear mixed model.

In Part IV modeling approaches are discussed for multiple responses in ad-
dition to repeated measurements taken over time. Chapter 14 covers models for
mixed continuous and categorical responses. Chapter 15 covers random effects
modeling approaches for mixed responses where some responses are continu-
os and others are censored time-to-event data modeled using generalizations
of the proportional hazards model. Chapter 16 introduces a variety of methods
for handling high-dimensional longitudinal data with continuous responses.

Missing data are the norm rather than the exception in longitudinal studies.
It unfortunately complicates the analysis because the results are often sensitive
to how the missingness is handled and also to the mechanism that generates
the missingness, about which one usually has little to no information. Part V
is devoted to this important aspect of longitudinal data modeling. After an in-
troductory review of the taxonomy of missing data mechanisms, there are two
chapters devoted to three methods that explicitly model the missingness mecha-
nism, selection models, pattern-mixture models, and shared parameter models.
Chapter 20 covers the adaptation of inverse probability weighting methods of
handling missing data to the longitudinal context. Multiple imputation is cov-
ered in Chapter 21. Chapter 22 uses three examples to illustrate how a sensitiv-
ity analysis can be used to compare models with different amounts of structure
and assumptions about the missing data. There is also a practical discussion of
how to identify influential subjects that have outliers. The final chapter of the
book discusses estimation of causal effects, which can be cast as a missing data
problem.

One thing that the book tends to be light on is numerical algorithms and soft-
ware, but there is an openly accessible website maintained by Fitzmaurice that
has the data and a number of downloadable SAS and R files that can be used.
Overall, Longitudinal Data Analysis is a well organized, excellent overview
of the state of the art in modeling longitudinal data and would make a useful
supplement to the library of anyone that analyzes this type of data.

Christopher M. Gotwalt
SAS Institute


3. xii + 296 pp. $90.00 (H).

Etienne Pardoux’s Markov Processes and Applications: Algorithms, Net-
works, Genome and Finance is well organized and captures the flavor of a Ph.D.
course in computational statistics on stochastic processes and their applications
to computational biology and finance. This book emphasizes computational as-
pacts as well as the mathematical theory of the Monte Carlo method, discrete
time and continuous time Markov chains, and Poisson processes.
MIXED MODELS. This chapter introduces best linear unbiased prediction (BLUP), a general method for predicting random effects, while Chapter 27 is concerned with the estimation of variances by restricted maximum likelihood (REML). These two methods are related in that BLUP assumes that the appropriate variance components are known, while REML procedures estimate variance components in an iterative fashion from BLUP estimates of random effects. The model assumes an absence of sire—environment interaction. While this model may be reasonable for a random collection of individuals from a large population, when some sampled individuals are relatives, the sharing of alleles at other loci influencing the trait will induce correlations between residuals. Keywords: linear mixed models, model selection, crossed random effects, model simplicity.

1. Introduction. During the last ten years, there has been a significant change in how psycholinguistic experiments are analyzed when both subjects and items are included as random factors, specifically a change from analyses of variance to linear mixed models (LMMs), with Baayen et al. (2008) providing a rst major introduction. In a linear mixed model incorporating vector-valued random eects, say by-subject random eects for intercept and for slope, the variance component parameters determine a variance-covariance matrix for these random eects. As described in Bates et al. Each data-set deserves the exercise of judgement on part of the researcher. 6 Bates, Kliegl, Vasishth, Baayen. This book provides an overview of the theory and application of linear and nonlinear mixed-effects models in the analysis of grouped data, such as longitudinal data, repeated measures, and multilevel data. Over 170 figures are included in the book. The NLME library for analyzing mixed-effects models in S and S-PLUS, developed by the authors, provides the underlying software for implementing the methods presented in the text, being described and illustrated in detail throughout the book. Researchers in statistical computing will also find this book appealing for its presentation of novel and efficient computational methods for fitting linear and nonlinear mixed-effects models. A strength of the book is its good discussion of Gibbs sampling and Metropolis-Hastings algorithms. The author goes beyond a description of the MCMC algorithms, but also provides insight into why the algorithms work. Statistics and applied scientists. The book is accessible to readers having a basic familiarity with probability theory and grounding statistical methods. The author has succeeded in writing an acceptable introduction to the theory and application of Bayesian statistical methods which is modern and covers both the theory and practice. This book can be useful as a quick introduction to Bayesian methods for self study. In addition, I highly recommend this book as a text for a course for Bayesian statistics.