

Contents

Preface	v
1. Introduction	1
Appendix	9
Exercises	11
2. Normal Approximations to Likelihoods and to Posteriors	14
2.1. Likelihood/Posterior Density	14
2.2. Specification of the Prior	21
2.3. Maximum Likelihood	26
2.4. Normal-Based Inference	31
2.5. The δ -Method (Propagation of Errors)	34
2.6. Highest Posterior Density Regions	34
Exercises	36
3. Nonnormal Approximations to Likelihoods and Posteriors	40
3.1. Numerical Integration	40
3.2. Posterior Moments and Marginalization Based on Laplace's Method	44
3.3. Monte Carlo Methods	51
Exercises	59
4. The <i>EM</i> Algorithm	64
4.1. Introduction	64
4.2. Theory	70
4.3. <i>EM</i> in the Exponential Family	71
4.4. Standard Errors in the Context of <i>EM</i>	74
4.5. Monte Carlo Implementation of the <i>E</i> -Step	80
4.6. Acceleration of <i>EM</i> (Louis' Turbo <i>EM</i>)	84
4.7. Facilitating the <i>M</i> -Step	85

Exercises	86
5. The Data Augmentation Algorithm	90
5.1. Introduction and Motivation	90
5.2. Computing and Sampling from the Predictive Distribution	101
5.3. Calculating the Content and Boundary of the HPD Region	103
5.4. Remarks on the General Implementation of the Data Augmentation Algorithm	106
5.5. Overview of the Convergence Theory of Data Augmentation	110
5.6. Poor Man's Data Augmentation Algorithms	112
5.7. Sampling/Importance Resampling (<i>SIR</i>)	117
5.8. General Imputation Methods	119
5.9. Further Importance Sampling Ideas	127
5.10. Sampling in the Context of Multinomial Data Exercises	130 135
6. Markov Chain Monte Carlo: The Gibbs Sampler and the Metropolis Algorithm	137
6.1. Introduction to the Gibbs Sampler	137
6.2. Examples	143
6.3. Assessing Convergence of the Chain	152
6.4. The Griddy Gibbs Sampler	164
6.5. The Metropolis Algorithm	174
6.6. Conditional Inference via the Gibbs Sampler Exercises	182 188
References	193
Subject Index	203