## **Table of Contents**

Ch. 1. Bayesian Inference for Causal Effects 1

List of Contributors xi

Donald B. Rubin

1. 2. 3. 4.	
Ch.	<ol> <li>Model Selection and Hypothesis Testing based on Objective Probabilities and Bayes Factors Luis Raúl Pericchi</li> </ol>
3. 4.	Introduction 17 Objective Bayesian model selection methods 23 More general training samples 45 Prior probabilities 47 Conclusions 47 Acknowledgements 48
Ch.	3. Bayesian Model Checking and Model Diagnostics 53 Hal S. Stern and Sandip Sinharay
2. 3. 4. 5. 6.	Introduction 53 Model checking overview 54 Approaches for checking if the model is consistent with the data 55 Posterior predictive model checking techniques 58 Application 1 62 Application 2 63 Conclusions 72
Ch.	4. Bayesian Nonparametric Modeling and Data Analysis: An Introduction 75 Timothy E. Hanson, Adam J. Branscum and Wesley O. Johnson

77

1. Introduction to Bayesian nonparametrics

2. Probability measures on spaces of probability measures

		rations 87 cluding remarks 102
Ch.		Some Bayesian Nonparametric Models 107  Paul Damien
2. 3. 4. 5. 6.	Rand Mixto Rand Sub-o Haza Polya	duction 107  lom distribution functions 109  ures of Dirichlet processes 112  lom variate generation for NTR processes 114  classes of random distribution functions 120  urd rate processes 126  a trees 130  ond NTR processes and Polya trees 134
Ch.		Bayesian Modeling in the Wavelet Domain 143 Fabrizio Ruggeri and Brani Vidakovic
2.	Baye Other	duction 143 es and wavelets 145 r problems 160 rowledgements 162
Ch.		Bayesian Methods for Function Estimation 167 Nidhan Choudhuri, Subhashis Ghosal and Anindya Roy
2. 3. 4. 5. 6. 7. 8.	Prior Cons Estim Dens Regre Speci	duction 167 s on infinite-dimensional spaces 168 distency and rates of convergence 177 nation of cumulative probability distribution 187 dity estimation 189 ession function estimation 195 tral density estimation 198 nation of transition density 200 cluding remarks 201
Ch.		MCMC Methods to Estimate Bayesian Parametric Models 209 Antonietta Mira

6. The perfect Bayesian pie: How to avoid "burn-in" issues7. Conclusions 226

2. Bayesian ingredients

4. How can the Bayesian pie burn

3. Bayesian recipe

5. MCMC methods

209

210

211

225

210

212

1. Motivation

Ch.	<ol> <li>Bayesian Computation: From Posterior Densities to Bayes Factors, Marginal Likelihoods, and Posterior Model Probabilities 231 Ming-Hui Chen</li> </ol>
1.	Introduction 231
2.	Posterior density estimation 232
3.	Marginal posterior densities for generalized linear models 241
4.	Savage–Dickey density ratio 243
	Computing marginal likelihoods 244
	Computing posterior model probabilities via informative priors 245
7.	Concluding remarks 249
Ch.	<ul> <li>10. Bayesian Modelling and Inference on Mixtures of</li> <li>Distributions 253</li> <li>Jean-Michel Marin, Kerrie Mengersen and Christian P. Robert</li> </ul>
1.	Introduction 253
2.	The finite mixture framework 254
	The mixture conundrum 260
	Inference for mixtures models with known number of components 274
	Inference for mixture models with unknown number of components 290
6.	Extensions to the mixture framework 294 Acknowledgements 296
Ch	11 Variable Selection and Covariance Selection in Multivariate

## Ch. 11. Variable Selection and Covariance Selection in Multivariate Regression Models 301 Edward Cripps, Chris Carter and Robert Kohn

Introduction 301
 Model description

3. Sampling scheme 308

4. Real data 309

5. Simulation study

6. Summary 332

## Ch. 12. Dynamic Models 335

Helio S. Migon, Dani Gamerman, Hedibert F. Lopes and Marco A.R. Ferreira

1. Model structure, inference and practical aspects 335

303

323

- 2. Markov Chain Monte Carlo 346
- 3. Sequential Monte Carlo 354

4. Extensions 361

Acknowledgements 365

## Ch. 13. Elliptical Measurement Error Models – A Bayesian Approach 371 Heleno Bolfarine and R.B. Arellano-Valle

375

373

1. Introduction

6. Application

4. Dependent elliptical MEM

Acknowledgements

5. Independent elliptical MEM

371 2. Elliptical measurement error models

388

3. Diffuse prior distribution for the incidental parameters

389

376

381

Ch. 14. Bayesian Sensitivity Analysis in Skew-Elliptical Models  1. Vidal, P. Iglesias and M.D. Branco
<ol> <li>Introduction 391</li> <li>Definitions and properties of skew-elliptical distributions 394</li> <li>Testing of asymmetry in linear regression model 401</li> <li>Simulation results 407</li> <li>Conclusions 408         <ul> <li>Acknowledgements 409</li> </ul> </li> </ol>
Ch. 15. Bayesian Methods for DNA Microarray Data Analysis  Veerabhadran Baladandayuthapani, Shubhankar Ray and Bani K. Mallick  415
1. Introduction 415 2. Review of microarray technology 416 3. Statistical analysis of microarray data 418 4. Bayesian models for gene selection 419 5. Differential gene expression analysis 432 6. Bayesian clustering methods 436 7. Regression for grossly overparametrized models 439 8. Concluding remarks 440 Acknowledgements 440
Ch. 16. Bayesian Biostatistics 445  David B. Dunson
<ol> <li>Introduction 445</li> <li>Correlated and longitudinal data 446</li> <li>Time to event data 450</li> <li>Nonlinear modeling 454</li> <li>Model averaging 456</li> <li>Bioinformatics 458</li> <li>Discussion 459</li> </ol>
Ch. 17. Innovative Bayesian Methods for Biostatistics and Epidemiology 465  Paul Gustafson, Shahadut Hossain and Lawrence McCandless
Introduction 465     Meta-analysis and multicentre studies 467

3. 4. 5. 6. 7. 8. 9. 10. 11.	Spatial analysis for environmental epidemiology Adjusting for mismeasured variables 471 Adjusting for missing data 474 Sensitivity analysis for unobserved confounding 476 Ecological inference 478 Bayesian model averaging 481 Survival analysis 483 Case-control analysis 485 Bayesian applications in health economics 487 Discussion 488	
Ch.	18. Modeling and Analysis for Categorical Response Data  Siddhartha Chib  495	
1. 2.	Introduction 495 Binary responses 500	
3.	Ordinal response data 505	
4.	Sequential ordinal model 508	
5.	Multivariate responses 510	
6.	Longitudinal binary responses 517	
7. 8.	Longitudinal multivariate responses 522  Conclusion 524	
0.	Conclusion 524	
Ch.	<ul> <li>19. Bayesian Methods and Simulation-Based Computation for Contingency Tables 527         <i>James H. Albert</i></li> <li>Motivation for Bayesian methods 527</li> </ul>	
2. 3. 4.	Advances in simulation-based Bayesian calculation 527 Early Bayesian analyses of categorical data 528 Bayesian smoothing of contingency tables 530	
5.	Bayesian interaction analysis 534	
6.	Bayesian tests of equiprobability and independence 537	
7.	Bayes factors for GLM's with application to log-linear models  539	
8. 9.	Use of BIC in sociological applications 542 Bayesian model search for loglinear models 542	
10.	The future 545	
Ch.	20. Teaching Bayesian Thought to Nonstatisticians  Dalene K. Stangl  549	
1. 2. 3. 4. 5. 6. 7. 8.	Introduction 549 A brief literature review 550 Commonalities across groups in teaching Bayesian methods 550 Motivation and conceptual explanations: One solution 552 Conceptual mapping 554 Active learning and repetition 554 Assessment 555 Conclusions 557	

Subject Index

559