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Nota di contenuto	Numerical Issues in Statistical Computing for the Social Scientist; Contents; Preface; 1 Introduction: Consequences of Numerical Inaccuracy; 1.1 Importance of Understanding Computational Statistics; 1.2 Brief History: Duhem to the Twenty-First Century; 1.3 Motivating Example: Rare Events Counts Models; 1.4 Preview of Findings; 2 Sources of Inaccuracy in Statistical Computation; 2.1 Introduction; 2.1.1 Revealing Example: Computing the Coefficient Standard Deviation; 2.1.2 Some Preliminary Conclusions; 2.2 Fundamental Theoretical Concepts; 2.2.1 Accuracy and Precision 2.2.2 Problems, Algorithms, and Implementations2.3 Accuracy and Correct Inference; 2.3.1 Brief Digression: Why Statistical Inference Is Harder in Practice Than It Appears; 2.4 Sources of Implementation Errors; 2.4.1 Bugs, Errors, and Annoyances; 2.4.2 Computer Arithmetic; 2.5 Algorithmic Limitations; 2.5.1 Randomized Algorithms; 2.5.2 Approximation Algorithms for Statistical Functions; 2.5.3 Heuristic Algorithms for Random Number Generation; 2.5.4 Local Search

Algorithms; 2.6 Summary; 3 Evaluating Statistical Software; 3.1 Introduction; 3.1.1 Strategies for Evaluating Accuracy 3.1.2 Conditioning 3.2 Benchmarks for Statistical Packages; 3.2.1 NIST Statistical Reference Datasets; 3.2.2 Benchmarking Nonlinear Problems with StRD; 3.2.3 Analyzing StRD Test Results; 3.2.4 Empirical Tests of Pseudo-Random Number Generation; 3.2.5 Tests of Distribution Functions; 3.2.6 Testing the Accuracy of Data Input and Output; 3.3 General Features Supporting Accurate and Reproducible Results; 3.4 Comparison of Some Popular Statistical Packages; 3.5 Reproduction of Research; 3.6 Choosing a Statistical Package; 4 Robust Inference; 4.1 Introduction; 4.2 Some Clarification of Terminology 4.3 Sensitivity Tests 4.3.1 Sensitivity to Alternative Implementations and Algorithms; 4.3.2 Perturbation Tests; 4.3.3 Tests of Global Optimality; 4.4 Obtaining More Accurate Results; 4.4.1 High-Precision Mathematical Libraries; 4.4.2 Increasing the Precision of Intermediate Calculations; 4.4.3 Selecting Optimization Methods; 4.5 Inference for Computationally Difficult Problems; 4.5.1 Obtaining Confidence Intervals with Ill-Behaved Functions; 4.5.2 Interpreting Results in the Presence of Multiple Modes; 4.5.3 Inference in the Presence of Instability 5 Numerical Issues in Markov Chain Monte Carlo Estimation 5.1 Introduction; 5.2 Background and History; 5.3 Essential Markov Chain Theory; 5.3.1 Measure and Probability Preliminaries; 5.3.2 Markov Chain Properties; 5.3.3 The Final Word (Sort of); 5.4 Mechanics of Common MCMC Algorithms; 5.4.1 Metropolis-Hastings Algorithm; 5.4.2 Hit-and-Run Algorithm; 5.4.3 Gibbs Sampler; 5.5 Role of Random Number Generation; 5.5.1 Periodicity of Generators and MCMC Effects; 5.5.2 Periodicity and Convergence; 5.5.3 Example: The Slice Sampler; 5.5.4 Evaluating WinBUGS; 5.6 Absorbing State Problem 5.7 Regular Monte Carlo Simulation

Sommario/riassunto

At last—a social scientist's guide through the pitfalls of modern statistical computing. Addressing the current deficiency in the literature on statistical methods as they apply to the social and behavioral sciences, *Numerical Issues in Statistical Computing for the Social Scientist* seeks to provide readers with a unique practical guidebook to the numerical methods underlying computerized statistical calculations specific to these fields. The authors demonstrate that knowledge of these numerical methods and how they are used in statistical packages is essential for making accurate inferences.
