Introduction to Bayesian Scientific Computing: Ten Lectures on Subjective Computing (Surveys and Tutorials in the Applied Mathematical Sciences)

By Daniela Calvetti, Erkki Somersalo

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This book has been written for undergraduate and graduate students in various disciplines of mathematics. The authors, internationally recognized experts in their field, have developed a superior teaching and learning tool that makes it easy to grasp new concepts and apply them in practice. The book's highly accessible approach makes it particularly ideal if you want to become acquainted with the Bayesian approach to computational science, but do not need to be fully immersed in detailed statistical analysis.

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Editorial Review

Review

From the reviews:

"This witty, erudite, and surprisingly practical book is made up of ten chapters. … A central topic of the book is the relationship between statistical inference and the inverse problems that define Bayesian (subjective) statistics. … This excellent book will be valuable to scientists of various stripes, statisticians, numerical analysts, those who work in image processing, and those who implement Bayesian belief nets." (George Hacken, ACM Computing Reviews, Vol. 49 (11), November, 2008)

"Introduction to Bayesian Scientific Computing is a 200-page, easily accessible, pleasant introduction fusing Bayesian approaches with numerical linear algebra methods for inverse problems … . What I like most about this book is the apparent enthusiasm of the authors and their genuine interest in explaining rather than showing off. This enthusiasm is contagious, and the result is very readable." (Uri Ascher, The Mathematical Intelligencer, Vol. 31 (1), 2009)

From the Back Cover

A combination of the concepts subjective – or Bayesian – statistics and scientific computing, the book provides an integrated view across numerical linear algebra and computational statistics. Inverse problems act as the bridge between these two fields where the goal is to estimate an unknown parameter that is not directly observable by using measured data and a mathematical model linking the observed and the unknown.

Inverse problems are closely related to statistical inference problems, where the observations are used to infer on an underlying probability distribution. This connection between statistical inference and inverse problems is a central topic of the book. Inverse problems are typically ill-posed: small uncertainties in data may propagate in huge uncertainties in the estimates of the unknowns. To cope with such problems, efficient regularization techniques are developed in the framework of numerical analysis. The counterpart of regularization in the framework of statistical inference is the use prior information. This observation opens the door to a fruitful interplay between statistics and numerical analysis: the statistical framework provides a rich source of methods that can be used to improve the quality of solutions in numerical analysis, and vice versa, the efficient numerical methods bring computational efficiency to the statistical inference problems.

This book is intended as an easily accessible reader for those who need numerical and statistical methods in applied sciences.

Users Review

From reader reviews:

Brad Hawkes:

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Nelson McNamee:

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Kayla Congdon:

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