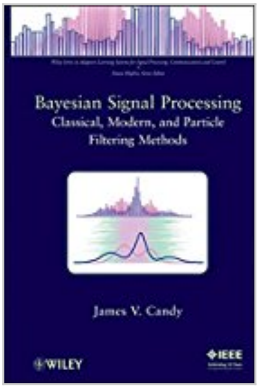

Bayesian Signal Processing: Classical, Modern and Particle Filtering Methods

By James V. Candy

Bayesian Signal Processing: Classical, Modern and Particle Filtering Methods By James V. Candy

New Bayesian approach helps you solve tough problems in signal processing with ease

Signal processing is based on this fundamental concept—the extraction of critical information from noisy, uncertain data. Most techniques rely on underlying Gaussian assumptions for a solution, but what happens when these assumptions are erroneous? Bayesian techniques circumvent this limitation by offering a completely different approach that can easily incorporate non-Gaussian and nonlinear processes along with all of the usual methods currently available.

This text enables readers to fully exploit the many advantages of the "Bayesian approach" to model-based signal processing. It clearly demonstrates the features of this powerful approach compared to the pure statistical methods found in other texts. Readers will discover how easily and effectively the Bayesian approach, coupled with the hierarchy of physics-based models developed throughout, can be applied to signal processing problems that previously seemed unsolvable.

Bayesian Signal Processing features the latest generation of processors (particle filters) that have been enabled by the advent of high-speed/high-throughput computers. The Bayesian approach is uniformly developed in this book's algorithms, examples, applications, and case studies. Throughout this book, the emphasis is on nonlinear/non-Gaussian problems; however, some classical techniques (e.g. Kalman filters, unscented Kalman filters, Gaussian sums, grid-based filters, et al) are included to enable readers familiar with those methods to draw parallels between the two approaches.

Special features include:

- Unified Bayesian treatment starting from the basics (Bayes's rule) to the more advanced (Monte Carlo sampling), evolving to the next-generation techniques (sequential Monte Carlo sampling)
- Incorporates "classical" Kalman filtering for linear, linearized, and nonlinear systems; "modern" unscented Kalman filters; and the "next-generation" Bayesian particle filters
- Examples illustrate how theory can be applied directly to a variety of processing problems
- Case studies demonstrate how the Bayesian approach solves real-world problems in practice

- MATLAB notes at the end of each chapter help readers solve complex problems using readily available software commands and point out software packages available
- Problem sets test readers' knowledge and help them put their new skills into practice

The basic Bayesian approach is emphasized throughout this text in order to enable the processor to rethink the approach to formulating and solving signal processing problems from the Bayesian perspective. This text brings readers from the classical methods of model-based signal processing to the next generation of processors that will clearly dominate the future of signal processing for years to come. With its many illustrations demonstrating the applicability of the Bayesian approach to real-world problems in signal processing, this text is essential for all students, scientists, and engineers who investigate and apply signal processing to their everyday problems.

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Editorial Review

From the Back Cover
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About the Author
JAMES V. CANDY, PhD, is Chief Scientist for Engineering, founder, and former director of the Center for

Advanced Signal & Image Sciences at the Lawrence Livermore National Laboratory. Dr. Candy is also an Adjunct Full Professor at the University of California, Santa Barbara, a Fellow of the IEEE, and a Fellow of the Acoustical Society of America. Dr. Candy has published more than 225 journal articles, book chapters, and technical reports. He is also the author of *Signal Processing: Model-Based Approach*, *Signal Processing: A Modern Approach*, and *Model-Based Signal Processing* (Wiley). Dr. Candy was awarded the IEEE Distinguished Technical Achievement Award for his development of model-based signal processing and the Acoustical Society of America Helmholtz-Rayleigh Interdisciplinary Silver Medal for his contributions to acoustical signal processing and underwater acoustics.

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