



# **Bayesian Signal Processing: Classical, Modern, and Particle Filtering Methods (Adaptive and Cognitive Dynamic Systems: Signal Processing, Learning, Communications and Control)**

*James V. Candy*

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**Presents the Bayesian approach to statistical signal processing for a variety of useful model sets**

This book aims to give readers a unified Bayesian treatment starting from the basics (Baye's rule) to the more advanced (Monte Carlo sampling), evolving to the next-generation model-based techniques (sequential Monte Carlo sampling). This next edition incorporates a new chapter on "Sequential Bayesian Detection," a new section on "Ensemble Kalman Filters" as well as an expansion of Case Studies that detail Bayesian solutions for a variety of applications. These studies illustrate Bayesian approaches to real-world problems incorporating detailed particle filter designs, adaptive particle filters and sequential Bayesian detectors. In addition to these major developments a variety of sections are expanded to "fill-in-the gaps" of the first edition. Here metrics for particle filter (PF) designs with emphasis on classical "sanity testing" lead to ensemble techniques as a basic requirement for performance analysis. The expansion of information theory metrics and their application to PF designs is fully developed and applied. These expansions of the book have been updated to provide a more cohesive discussion of Bayesian processing with examples and applications enabling the comprehension of alternative approaches to solving estimation/detection problems.

The second edition of *Bayesian Signal Processing* features:

- "Classical" Kalman filtering for linear, linearized, and nonlinear systems; "modern" unscented and ensemble Kalman filters: and the "next-generation" Bayesian particle filters
- Sequential Bayesian detection techniques incorporating model-based schemes for a variety of real-world problems
- Practical Bayesian processor designs including comprehensive methods of performance analysis ranging from simple sanity testing and ensemble techniques to sophisticated information metrics
- New case studies on adaptive particle filtering and sequential Bayesian detection are covered detailing more Bayesian approaches to applied problem solving
- MATLAB® notes at the end of each chapter help readers solve complex problems using readily available software commands and point out other software packages available
- Problem sets included to test readers' knowledge and help them put their new skills into practice Bayesian

*Signal Processing, Second Edition* is written for all students, scientists, and engineers who investigate and apply signal processing to their everyday problems.

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