Highly Structured Stochastic Systems (HSSS) is a modern strategy for building statistical models for real-world problems, for computing with them, and for interpreting the resulting inferences. Complexity is handled by working up from simple local assumptions in a coherent way, and that is the key to modelling, computation, inference and interpretation; the unifying framework is that of Bayesian hierarchical models. The aim of this book is to make recent developments in HSSS accessible to a general statistical audience.

Graphical modelling and Markov chain Monte Carlo (MCMC) methodology are central to the field, and in this text they are treated in depth. These underlying methodologies are balanced by substantive areas of application: to spatial statistics in epidemiology, ecology and image analysis; to genetics; and to infectious disease modelling. The book concludes with two topics (model criticism and Bayesian nonparametrics) that seek to challenge the parametric assumptions that otherwise underlie most HSSS models.

For each of the 15 topics in the book, there is a substantial article by a leading author in the field, and two invited commentaries that complement, extend, and discuss the topic, and should be read in parallel. All authors are distinguished researchers in the field, and were active participants in an international research programme on HSSS.

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