STATISTICAL PHYSICS, OPTIMIZATION, INFERENCE, AND MESSAGE-PASSING ALGORITHMS

Book details:

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Readership: Students and researchers from statistics interested in understanding the foundations and application of techniques based on message-passing algorithms, such as graphical models.

The book is a special issue that brings together the lectures given at the school *Statistical Physics, Optimization, Inference, and Message-Passing Algorithms* held at the Les Houches School of Physics in France in the autumn of 2013 (this School of Physics has organized more than one hundred sessions starting from 1951). The lectures reported in this book are mainly related to the message-passing

algorithms (computer science) and the cavity method and Bethe approximation (physics). The reason of this choice is that the use of these techniques have spread with increasing speed into new fields such as information theory, machine learning, probability, optimization, statistics and signal processing.

Then the aim of the school has been to present the background necessary to students to entry in this fast-developing field, to understand the foundations of these topics and the related applications.

The editors of this book are the organizers of the school and they are all active leading experts in their fields. Their intention is that same concepts can be explained in several different lectures from slightly different perspectives, perhaps with different notations and vocabulary.

It is an intriguing book.

For statisticians some chapters may be of major interest than others: Chapter 1 covers the basics of inference and learning, explaining how inference problems can be represented as graphical models; Chapter 2 introduces the notion of computational complexity and the basics of random graph theory; Chapter 5 presents the basics of statistical estimation for linear models connecting the theory of denoising to "compressed sensing", a recent concept from signal processing; Chapter 8 analyzes local algorithms over sparse random graphs.

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