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Book Reviews

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BOOK REVIEWS

STOCHASTIC ANALYSIS AND RELATED TOPICS VI. (Eds.: Laurent Decreusefond, Jon Gjerde, Bernt Øksendal, Ali Süleyman Üstünel) The Geilo Workshop, 1996. Progress in Probability 42, Birkhäuser, Boston 1998, xii+409 pages, ISBN 0-8176-4018-5, price DM 268,–.

The sixth workshop "Stochastic analysis and related topics" was held in Geilo (Norway) in summer 1996; the book under review contains twenty one papers written by the participants of the workshop. All contributions are full-length papers devoted to a wide range of topics in stochastic analysis, from applications of white noise type calculi to stochastic partial differential equations to probabilistic interpretation of the symmetry group of heat equations.

As is usual with similar proceedings, it is not easy to find reasons why somebody should buy such an extremely expensive book which provides only papers that could have been published in any relevant journal. In the present case, a reason might be supplied by two interesting survey papers (taking approximately one quarter of the volume): "Stochastic differential systems with memory: Theory, examples and applications" by Salah-Eldin A. Mohammed, and "Backward stochastic differential equations and viscosity solutions of systems of semilinear parabolic and elliptic PDEs of second order" by Étienne Pardoux.

Ivo Vrkoč

LEARNING AND GEOMETRY: COMPUTATIONAL APPROACHES. Progress in Computer Science and Applied Logic 14. *D.W. Kueker, C.H. Smith*, Editors. Birkhäuser Verlag, Boston-Basel-Berlin 1996, xiv+210 pages, 53 Fig's. ISBN 3-7643-3825-3, price DM 118.–

The incentive for the edition of the book was a workshop "Learning and geometry" organized at the University of Maryland in January of 1991. Selected papers presented at the workshop reflecting the interchange of ideas proceeding there as well as further development constitute the basis of the book. Moreover, a few other contributions of the workshop participants have been added in order to form a contemporary review of problems and techniques of interpreting data produced by a variety of sensors. The unifying idea is to incorporate learning techniques into the manipulation of data and to make the pattern recognition of images easier in geometrical terms, *e.g.* to perform the partition of features in classes of geometrical shapes. Even when the human vision serves as a model, the successful procedures can be based on somewhat different approaches.

The first part of the book—*Learning*—includes three papers devoted to the concepts of computational learning, *i.e.* learning by examples. The basic Valiant model of learning considered as an estimation of a Boolean function from randomly collected data is extended in several directions, *e.g.* to include noisy data, to instances being points of $\mathbb{R}^d$ *etc.* The learning algorithms are examined in the framework of current MDL (Mean Description Length) and PAC (Probably Approximate Correct) learning models.

The second part entitled *Geometry* joins two topics—the various representations of geometric configurations (by Cartesian coordinates, distances, angles, matroids, combinatorial and topological patterns, drawings *etc.*) and geometry theorem proving (analytic, synthetic and computerwise fashions).

The book was printed from camera-ready manuscripts supplied by the authors without unifying prescribed format and the differences in composition and graphical setting between individual contributions are perhaps greater than is usual. However, the missing yet frequently referred to figures in the last paper should have been noticed by the editors.

The book will be appreciated not only by research workers and graduate students in computer science but also by specialists in geometry the fundamentals of which are revisited here in a non-conventional mode.

Ivan Saxl

Charles M. Newman: TOPICS IN DISORDERED SYSTEMS. Birkhäuser Verlag, Basel-Boston-Berlin 1997, viii, 88 pages, 245 Fig's. ISBN 3-7643-5777-0, price DM 34.–

The book is a very up-to-date presentation of carefully selected topics concerning equilibrium mechanics of statistical models in random environments. It is based on the lectures for a postgraduate course on disordered systems given by the author at the mathematics department of ETH Zürich and on several papers written by the author with various co-authors in the period 1991–1997.

Rather narrow class of disordered systems is chosen—namely Ising models whose nonzero (pair) interactions (as described by couplings J_e^Λ, where $e = \{x, y\}$ are the nearest neighbours bonds for $x, y \in \Lambda$, Λ being a finite subset of $\mathbb{Z}^d$, but some results concerning Poisson point process are also included), are i.i.d. random variables.

Two cases of couplings independent of Λ, *i.e.* disordered ferromagnets with $J_e \geqslant 0$ (Chapters 1,3) and spin glasses (Chapters 3, 4), with (symmetric) J_e equidistributed with $-J_e$, are treated in detail. A more general case of highly disordered systems with symmetric J_e^Λ strongly depending on Λ is shortly covered in Chapter 2. In these chapters, the attention is focused on the existence and number of ground states (at zero temperature) and Gibbs states (at higher temperatures) and on the connections of this subject with percolation problems (existence of the so called biogeodesics, spanning trees and forests) in systems of various dimensions d.

In the longest fourth chapter, a coherent mathematical background is developed for different concept and conjectures introduced with a loss of rigour in literature on spin glasses ("mean-field" model, (non)-self-averaging, replica symmetry breaking *etc.*) and several as yet unsolved research problems are presented and discussed.

A standard mathematical presentation with theorems and propositions subsequently proved is accompanied by more physically oriented remarks and discussions which make the book interesting not only to applied mathematicians and specialists in probability theory but also to materials scientists and condensed matter physicists.

Ivan Saxl

A. Kh. Gelig, A. D. Churilov: STABILITY AND OSCILLATIONS OF NONLINEAR PULSE-MODULATED SYSTEMS. Birkhäuser Verlag Basel, 1998, xiii + 362 p., DM 148.–

The fundamental mathematical methods for studying stability and oscillations in control systems of the form

$$\frac{\mathrm{d}x}{\mathrm{d}t} = Ax + bf$$

are presented in the book. Pulse modulated systems of various types are dealt with, which can be applied in communications and control. The presentation is in the form suitable for engineers. Original approaches of the authors (mostly averaging methods) are presented.

Štefan Schwabik