1. Record Nr. UNINA9911015963303321

Autore	Hartarsky Ivailo
Titolo	Kinetically Constrained Models / / by Ivailo Hartarsky, Cristina Toninelli
Pubbl/distr/stampa	Cham : , : Springer Nature Switzerland : , : Imprint : Springer, , 2025
ISBN	3-031-93115-7
Edizione	[1st ed. 2025.]
Descrizione fisica	1 online resource (240 pages)
Collana	SpringerBriefs in Mathematical Physics, , 2197-1765 ; ; 53
Altri autori (Persone)	ToninelliCristina
Disciplina	530.1
Soggetti	System theory Probabilities Mathematical physics Complex Systems Probability Theory Mathematical Physics Mathematical Methods in Physics Theoretical, Mathematical and Computational Physics Sistemes complexos Física matemàtica Probabilitats Física Llibres electrònics
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Preface -- The models -- Setting and notation -- The Markov processes: kinetically constrained spin models and kinetically constrained lattice gases -- The most studied choices of constraints -- Some useful classification: oriented/non–oriented models, cooperative/non–cooperative models -- Motivations from physics -- A crash course on liquid/glass and jamming transitions -- The quest of the ideal glass transition: models on Bethe lattices and the spiral model -- Kinetically Constrained Spin Models: the basic results -- Ergodicity and connection with bootstrap percolation -- Exponential convergence to equilibrium in L2 -- The failure of classic coercive inequalities (logarithmic and modified logarithmic Sobolev constant) -- Persistence

and exchange times -- Scaling with density of the spectral gap: the case of Friedrickson-Andersen 1f model -- Some open problems -- Kinetically Constrained Spin Models on trees -- A martingale technique to prove positivity of the spectral gap -- Power law scaling at criticality -- An open problem -- The out of equilibrium regime -- An easy perturbative result in one dimension -- Oriented models: East and models on trees -- Non cooperative models -- Some open problems -- Dynamical phase transition -- Activity and its large deviations -- The one dimensional case: finite size effects and surface tension -- Open problems -- The East model -- Combinatorics -- Spectral gap and mixing time -- Time scale separation -- Front motion and cut-off -- Plateau behavior, aging and scaling limits -- The generalized East process in higher dimensions -- An open problem: Aldous Diaconis conjecture -- Kinetically Constrained Lattice Gases -- Ergodicity -- Non cooperative models: spectral gap, log-Sobolev, tagged particle and hydrodynamic limit -- Cooperative models: spectral gap and polynomial decay to equilibrium.

Sommario/riassunto

This book offers an in-depth review of kinetically constrained models (KCMs), a topic that lies at the crossroads of probability and statistical mechanics. KCMs have captivated physicists ever since their introduction in the 1980s. Their remarkable glassy behavior makes them an essential toy model for exploring the liquid–glass transition, a longstanding puzzle in condensed matter physics. Over the past 20 years, KCMs have also gained significant attention in mathematics. Despite belonging to the well-established domain of interacting particle systems with stochastic dynamics, the presence of dynamical constraints gives rise to novel phenomena. These include anomalously long mixing times, aging effects, singularities in the dynamical large deviation function, dynamical heterogeneities, and atypical ergodicity-breaking transitions corresponding to the emergence of a large variety of amorphous structures. Authored by two leading experts in the field, this volume offers an extensive overview of rigorous results in the field. The self-contained exposition, with emphasis on high-level ideas and common techniques, is suitable for novices, as well as seasoned researchers, with backgrounds in mathematics or physics. The text covers crucial connections to bootstrap percolation cellular automata, along with sharp thresholds, universality, out-of-equilibrium dynamics, and more. The volume features challenging open questions and a detailed bibliography to direct future research. Whether as a reference or a study guide, it is a valuable resource for those interested in KCM.