1. Record Nr. UNINA9910857790203321

Autore	Gros Claudius
Titolo	Complex and Adaptive Dynamical Systems : A Comprehensive Introduction / / by Claudius Gros
Pubbl/distr/stampa	Cham : , : Springer International Publishing : , : Imprint : Springer, , 2024
ISBN	3-031-55076-5
Edizione	[5th ed. 2024.]
Descrizione fisica	1 online resource (468 pages)
Disciplina	530.1
Soggetti	System theory Dynamics Nonlinear theories Graph theory Neural networks (Computer science) Stochastic processes Complex Systems Applied Dynamical Systems Graph Theory Dynamical Systems Mathematical Models of Cognitive Processes and Neural Networks Stochastic Networks
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Network Theory -- Bifurcations and Chaos in Dynamical Systems -- Dissipation, Noise and Adaptive Systems -- Self Organization -- Information Theory of Complex Systems -- Self-Organized Criticality -- Random Boolean Networks -- Darwinian Evolution, Hypercycles and Game Theory -- Synchronization Phenomena -- Complexity of Machine Learning -- Solutions.
Sommario/riassunto	This textbook offers a comprehensive introduction to the concepts underpinning our modern understanding of complex and emergent behavior. Mathematical methods necessary for the discussion are introduced and explained on the run. All derivations are presented

step-by-step. This new fifth edition has been fully revised and includes a new chapter, a range of new sections, figures and exercises. The Solution chapter has been reorganized for clarity. The core aspects of modern complex system sciences are presented in the first chapters, covering the foundations of network- and dynamical system theory, with a particular focus on scale-free networks and tipping phenomena. The notion of deterministic chaos is treated together with bifurcation theory and the intricacies of time delays. Modern information theoretical principles are discussed in further chapters, together with the notion of self-organized criticality, synchronization phenomena, and a game-theoretical treatment of the tragedy of the commons. The dynamical systems view of modern machine learning is presented in a new chapter. Chapters include exercises and suggestions for further reading. The textbook is suitable for graduate and advanced undergraduate students. The prerequisites are the basic mathematical tools of courses in natural sciences, computer science or engineering.