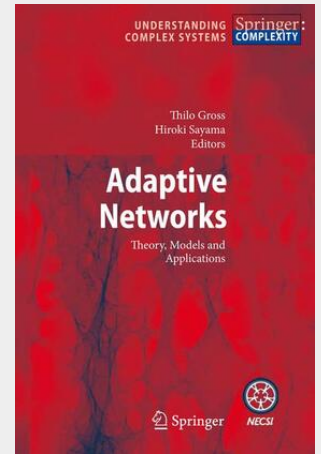


Adaptive Networks

Theory, Models and Applications

Adding one and one makes two, usually. But sometimes things add up to more than the sum of their parts. This observation, now frequently expressed in the maxim "more is different", is one of the characteristic features of complex systems and, in particular, complex networks. Along with their ubiquity in real world systems, the ability of networks to exhibit emergent dynamics, once they reach a certain size, has rendered them highly attractive targets for research. The resulting network hype has made the word "network" one of the most influential buzzwords seen in almost every corner of science, from physics and biology to economy and social sciences. The theme of "more is different" appears in a different way in the present volume, from the viewpoint of what we call "adaptive networks." Adaptive networks uniquely combine dynamics on a network with dynamical adaptive changes of the underlying network topology, and thus they link classes of mechanisms that were previously studied in isolation. Here adding one and one certainly does not make two, but gives rise to a number of new phenomena, including highly robust self-organization of topology and dynamics and other remarkably rich dynamical behaviors.

With adaptive, complex networks, the evolution of the network topology and the dynamical processes on the network are equally important and often fundamentally entangled. Recent research has shown that such networks can exhibit a plethora of new phenomena which are ultimately required to describe many real-world networks. Some of those phenomena include robust self-organization towards dynamical criticality, formation of complex global topologies based on simple, local rules, and the spontaneous division of "labor" in which an initially homogenous population of network nodes self-organizes into functionally distinct classes. These are just a few. This book is a state-of-the-art survey of those unique networks. In it, leading researchers set out to define the future scope and direction of some of the most advanced developments in the vast field of complex network science and its applications.



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