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BOOK REVIEW

Analysis of Complex Networks

From Biology to Linguistics

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Many natural phenomena, e.g., economical, social, IT and other processes that take place in everydays life can be modeled by complex networks. Such networks can be interpreted as graphs with non-trivial topological properties. The exploration of complex networks has recently attracted considerable attention in the scientific community, but the mathematical basis thereof can be found in pure graph theory. A starting point was the work of Euler performed in the eighteenth century. Nevertheless, the investigation of complex networks has grown tremendously during the last twenty years.

The book "*Analysis of Complex Networks — From Biology to Linguistics*" is a valuable attempt to present current research dealing with complex networks from different scientific areas. It consists of a Preface and seventeen chapters: (1. Entropy, Orbits, and Spectra of Graphs; 2. Statistical Mechanics of Complex Networks; 3. A Simple Approach to Network Complexity and Node Centrality; 4. Spectral Theory Networks: From Biomolecular to Ecological Systems; 5. On the Structure of Neutral Networks of RNA Pseudokont Structures; 6. Graph Edit Distance – Optimal and Suboptimal Algorithms with Applications; 7. Graph Energy; 8.Generalized Shortest Path Trees: A Novel Graph Class by Example of Semiotic Networks; 9. Applications of Graph Theory in Chemo– and Bioinformatics; 10. Structural and Functional Dynamics in Cortical and Neuronal Networks; 11. Network Mapping of Metabolic Path-

WAYS; 12. GRAPH STRUCTURE ANALYSIS AND COMPUTATIONAL TRACTABILITY OF SCHEDULING PROBLEMS; 13. COMPLEXITY OF PHYLOGENETIC NETWORKS: COUNTING CUBES IN MEDIAN GRAPHS AND RELATED PROBLEMS; 14. ELEMENTARY ELLIPTIC (R, q)–POLYCYCLES; 15. OPTIMAL DYNAMIC FLOWS IN NETWORKS AND ALGORITHMS FOR FINDING THEM; 16. ANALYZING AND MODELING EUROPEAN R&D COLLABORATIONS: CHALLENGES AND OPPORTUNITIES FROM A LARGE SOCIAL NETWORK; 17. ANALYTIC COMBINATORICS ON RANDOM GRAPHS) written by thirty scientists from Austria, China, Croatia, Japan, Germany, Moldova, Russia, Serbia, Slovenia, Switzerland, UK, and USA.

In the first chapter, the corresponding authors discuss the notion of orbits in a graph and its entropy (or information content) calculated from the orbit structure. They further elaborate algorithms for determining the orbits of graphs using some approximations and spectra of graphs. The second chapter deals with application of statistical mechanics on complex networks. In the third chapter, some new information measures have been reported and so forth. In other chapters (e.g., see Chapters 1, 2, 3, 4, 7, 9, 14, and 17), graph-theoretical methods such as topological descriptors etc. are presented and applied to investigate complex networks structurally. Also, some of these chapters do not only deal with analyzing the structure of a network mathematically, they additionally discuss numerical results by using real-world networks, e.g., biological, social and biochemical networks. In terms of the methods to be applied in this book, we mention information-theoretic and graph-theoretical techniques. Each chapter is written comprehensively but a basic understanding of complex network theory is required.

This book is well written and covers various disciplines where the analysis of complex networks turned out to be crucial. I have to admit that I learned very much when reading it. The book "*Analysis of Complex Networks — From Biology to Linguistics*" deserves attention for all who work on problems that can be modeled by means of complex networks.

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