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Nota di contenuto	Advances in Network Complexity; Contents; Preface; List of Contributors; 1 Functional Complexity Based on Topology; 1.1 Introduction; 1.2 A Measure for the Functional Complexity of Networks; 1.2.1 Topological Equivalence of LCE-Graphs; 1.2.2 Vertex Resolution Patterns; 1.2.3 Kauffman States for Link Invariants; 1.2.4 Definition of the Complexity Measure; 1.3 Applications; 1.3.1 Creation of a Loop; 1.3.2 Networks of Information; 1.3.3 Transport Networks of Cargo; 1.3.4 Boolean Networks of Gene Regulation; 1.3.5 Topological Quantum Systems; 1.3.6 Steering Dynamics Stored in Knots and Links 1.4 ConclusionsReferences; 2 Connections Between Artificial Intelligence and Computational Complexity and the Complexity of Graphs; 2.1 Introduction; 2.2 Representation Methods; 2.3 Searching Methods; 2.4 Turing Machines; 2.5 Fuzzy Logic and Fuzzy Graphs; 2.6 Fuzzy Optimization; 2.7 Fuzzy Systems; 2.8 Problems Related to AI; 2.9 Topology of Complex Networks; 2.10 Hierarchies; 2.10.1 Deterministic Case; 2.10.2 Nondeterministic Case; 2.10.3 Alternating Case; 2.11 Graph Entropy; 2.12 Kolmogorov Complexity; 2.13 Conclusion;

References

3 Selection-Based Estimates of Complexity Unravel Some Mechanisms and Selective Pressures Underlying the Evolution of Complexity in Artificial Networks 3.1 Introduction; 3.2 Complexity and Evolution; 3.3 Macroscopic Quantification of Organismal Complexity; 3.4 Selection-Based Methods of Complexity; 3.5 Informational Complexity; 3.6 Fisher Geometric Model; 3.7 The Cost of Complexity; 3.8 Quantifying Phenotypic Complexity; 3.8.1 Mutation-Based Method: Mutational Phenotypic Complexity (MPC); 3.8.2 Drift Load Based Method: Effective Phenotypic Complexity (EPC) 3.8.3 Statistical Method: Principal Component Phenotypic Complexity (PCPC) 3.9 Darwinian Adaptive Neural Networks (DANN); 3.10 The Different Facets of Complexity; 3.11 Mechanistic Understanding of Phenotypic Complexity; 3.12 Selective Pressures Acting on Phenotypic Complexity; 3.13 Conclusion and Perspectives; References; 4 Three Types of Network Complexity Pyramid; 4.1 Introduction; 4.2 The First Type: The Life's Complexity Pyramid (LCP); 4.3 The Second Type: Network Model Complexity Pyramid; 4.3.1 The Level-7: Euler (Regular) Graphs; 4.3.2 The Level-6: Erdős-Rényi Random Graph 4.3.3 The Level-5: Small-World Network and Scale-Free Models 4.3.4 The Level-4: Weighted Evolving Network Models; 4.3.5 The Bottom Three Levels of the NMCP; 4.3.5.1 The Level-3: The HUHPNM; 4.3.5.2 The Level-2: The LUHNM; 4.3.5.3 The Level-1: The LUHNM-VSG; 4.4 The Third Type: Generalized Farey Organized Network Pyramid; 4.4.1 Construction Method of the Generalized Farey Tree Network (GFTN); 4.4.2 Main Results of the GFTN; 4.4.2.1 Degree Distribution; 4.4.2.2 Clustering Coefficient; 4.4.2.3 Diameter and Small World; 4.4.2.4 Degree-Degree Correlations; 4.4.3 Weighted Property of GFTN 4.4.4 Generalized Farey Organized Network Pyramid (GFONP)

Sommario/riassunto

A well-balanced overview of mathematical approaches to complex systems ranging from applications in chemistry and ecology to basic research questions on network complexity. Matthias Dehmer, Abbe Mowshowitz, and Frank Emmert-Streib, well-known pioneers in the field, have edited this volume with a view to balancing classical and modern approaches to ensure broad coverage of contemporary research problems. The book is a valuable addition to the literature and a must-have for anyone dealing with network complexity and complexity issues.
