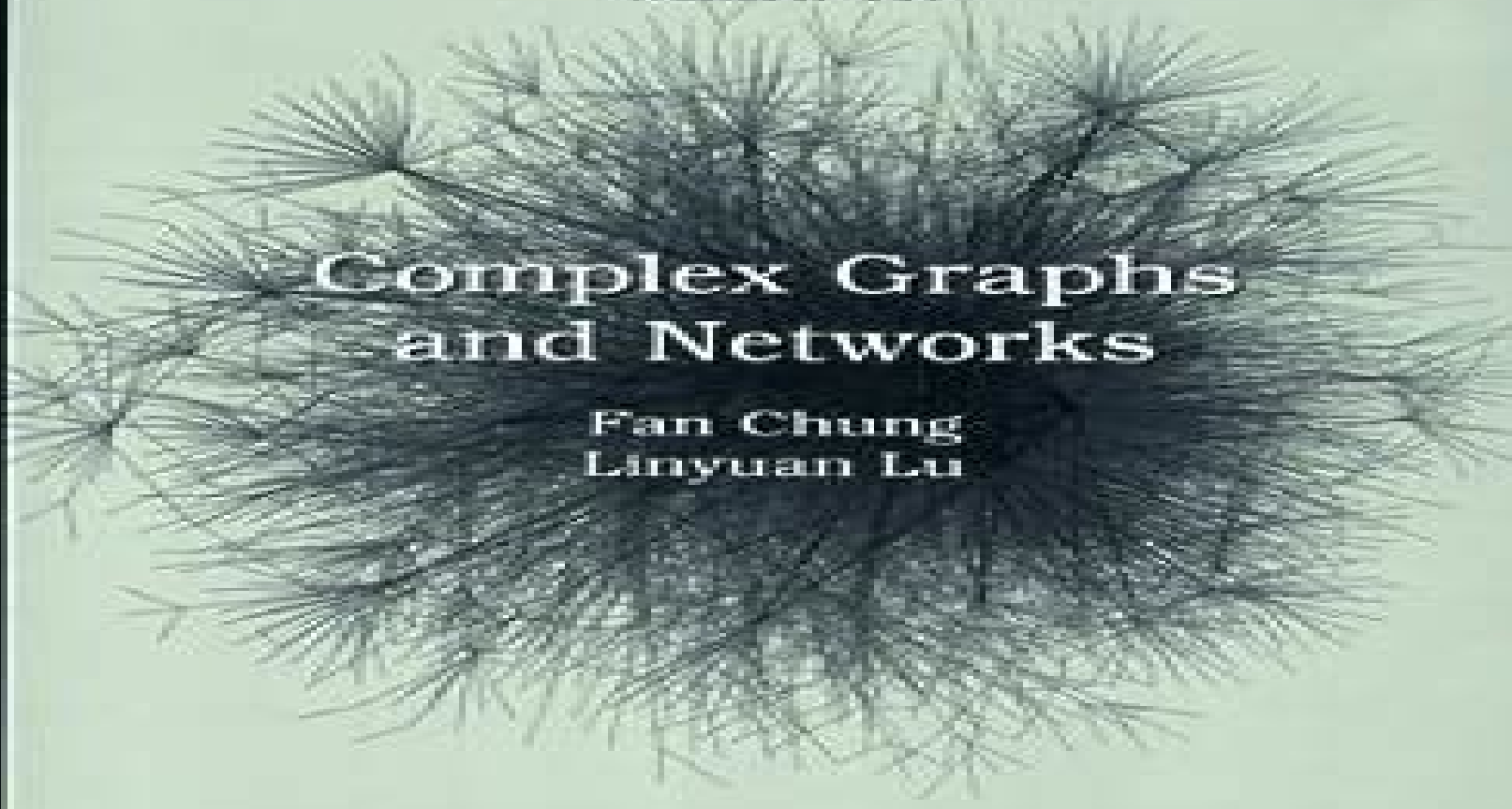


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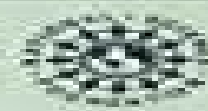


Complex Graphs and Networks

Fan Chung
Linyuan Lu



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of the cells molecular profiles in a systematic fashion Moreover recently also phenotypic data data on diseases symptoms patients etc are being collected at nation wide level thus giving us another source of highly related causal big data This wealth of data is usually modeled as networks aka binary relations graphs or webs of interactions including protein protein metabolic signaling and transcription regulatory interactions The network model is a key view point leading to the uncovering of mesoscale phenomena thus providing an essential bridge between the observable phenotypes and omics underlying mechanisms Moreover network analysis is a powerful hypothesis generation tool guiding the scientific cycle of data gathering data interpretation hypothesis generation and hypothesis testing A major challenge in contemporary research is the synthesis of deep insights coming from network science with the wealth of data often noisy contradictory incomplete and difficult to replicate so to answer meaningful biological questions in a quantifiable way using static and dynamic properties of biological networks

Mathematical Foundations and Applications of Graph Entropy Matthias Dehmer, Frank Emmert-Streib, Zengqiang Chen, Xueliang Li, Yongtang Shi, 2017-09-12 This latest addition to the successful Network Biology series presents current methods for determining the entropy of networks making it the first to cover the recently established Quantitative Graph Theory An excellent international team of editors and contributors provides an up to date outlook for the field covering a broad range of graph entropy related concepts and methods The topics range from analyzing mathematical properties of methods right up to applying them in real life areas Filling a gap in the contemporary literature this is an invaluable reference for a number of disciplines including mathematicians computer scientists computational biologists and structural chemists

Fractional Dynamics on Networks and Lattices Thomas Michelitsch, Alejandro Perez Riascos, Bernard Collet, Andrzej Nowakowski, Franck Nicollet, 2019-04-10 This book analyzes stochastic processes on networks and regular structures such as lattices by employing the Markovian random walk approach Part 1 is devoted to the study of local and non local random walks It shows how non local random walk strategies can be defined by functions of the Laplacian matrix that maintain the stochasticity of the transition probabilities A major result is that only two types of functions are admissible type i functions generate asymptotically local walks with the emergence of Brownian motion whereas type ii functions generate asymptotically scale free non local fractional walks with the emergence of Levy flights In Part 2 fractional dynamics and Levy flight behavior are analyzed thoroughly and a generalization of Plya's classical recurrence theorem is developed for fractional walks The authors analyze primary fractional walk characteristics such as the mean occupation time the mean first passage time the fractal scaling of the set of distinct nodes visited etc The results show the improved search capacities of fractional dynamics on networks

Algorithms and Models for the Web-Graph Konstantin Avrachenkov, Debora Donato, Nelly Litvak, 2009-01-26 This volume constitutes the refereed proceedings of the 6th Workshop on Algorithms and Models for the Web Graph WAW 2009 held in Barcelona in February 2009 The World Wide Web has become part of our everyday life and information retrieval and data mining on the Web are now of

enormous practical interest. The algorithms supporting these activities combine the view of the Web as a text repository and as a graph induced in various ways by links among pages, links among hosts or other similar networks. We also witness an increasing role of the second generation Web based applications, Web 2.0 such as social networking sites and wiki sites. The workshop program consisted of 14 regular papers and two invited talks. The invited talks were given by Ravi Kumar, Yahoo Research USA and Jos e Fernando Mendes, University of Aveiro, Portugal. The regular papers went through a thorough review process. The workshop papers were naturally cl tered in three sections: Graph Models for Complex Networks, PageRank and Web Graph, and Social Networks and Search. The rst section lays a foun tion for theoretical and empirical analysis of the Web graph and Web 2.0 graphs.

Introduction to Analysis on Graphs Alexander Grigor'yan, 2018-08-23. A central object of this book is the discrete Laplace operator on finite and infinite graphs. The eigenvalues of the discrete Laplace operator have long been used in graph theory as a convenient tool for understanding the structure of complex graphs. They can also be used in order to estimate the rate of convergence to equilibrium of a random walk Markov chain on finite graphs. For infinite graphs a study of the heat kernel allows to solve the type problem, a problem of deciding whether the random walk is recurrent or transient. This book starts with elementary properties of the eigenvalues on finite graphs, continues with their estimates and applications, and concludes with heat kernel estimates on infinite graphs and their application to the type problem. The book is suitable for beginners in the subject and accessible to undergraduate and graduate students with a background in linear algebra I and analysis I. It is based on a lecture course taught by the author and includes a wide variety of exercises. The book will help the reader to reach a level of understanding sufficient to start pursuing research in this exciting area.

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