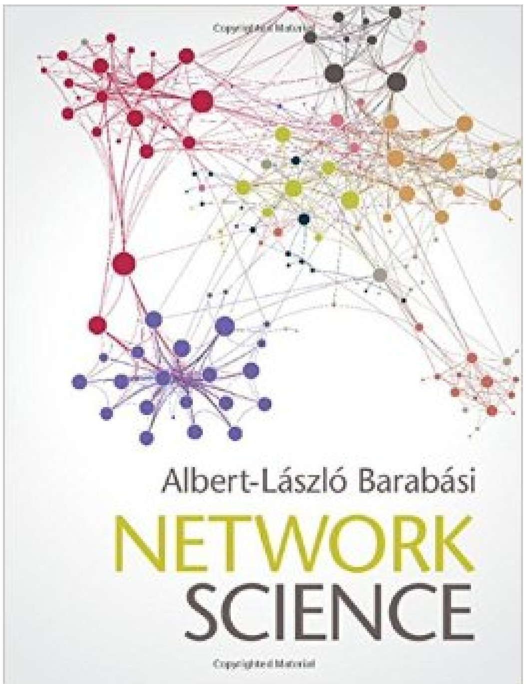
Network Science



Synopsis

Networks are everywhere, from the internet, to social networks, and the genetic networks that determine our biological existence. Illustrated throughout in full colour, this pioneering textbook, spanning a wide range of topics from physics to computer science, engineering, economics and the social sciences, introduces network science to an interdisciplinary audience. From the origins of the six degrees of separation to explaining why networks are robust to random failures, the author explores how viruses like Ebola and H1N1 spread, and why it is that our friends have more friends than we do. Using numerous real-world examples, this innovatively designed text includes clear delineation between undergraduate and graduate level material. The mathematical formulas and derivations are included within Advanced Topics sections, enabling use at a range of levels. Extensive online resources, including films and software for network analysis, make this a multifaceted companion for anyone with an interest in network science.

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Customer Reviews

'Network Science introduces the reader to basic graph-theory notions, elements of data analysis, statistics, and some of the computational and modeling methods that allow us to interrogate network data sets. Throughout, the book illustrates those ideas with concrete and intuitive examples that also help achieve its main purpose, which is to instill network-based thinking in the reader. The writing is engaging, peppered throughout with stories, anecdotes, and historical connections ... Its discussion of the spread of disease in particular clearly illustrates the necessity of network thinking in solving a fundamental and practical problem that affects us all. The book is carefully structured and visually pleasing, with lots of colorful diagrams, figures, tables, and schematics to help convey fundamental concepts and ideas. Its pedagogical value is significantly enhanced by a Tufte-style exposition that recognizes and works with the nonlinear character of learning. The wide margins contain bits of information ... that expand on the main text.' ZoltÃƒÂ¡n Toroczkai, Physics Today

Illustrated throughout in full colour, this pioneering textbook, spanning a wide range of disciplines from physics to the social sciences, is the only book needed for an introduction to network science. In modular format, with clear delineation between undergraduate and graduate material, its unique design is supported by extensive online resources.

Beautifully produced book. Lots of useful math to build concepts in network science. An enormous amount of time and space is occupied by author (re)writing history to make sure everyone is clear how he made all of his landmark discoveries, after humbly describing his early misfires and the immense ignorance of the field until he made his contributions. The book does not provide nearly enough practical examples to build intuition about applications of networks to various fields of life. Of course you cannot make all happy, but would be great to take this topic to a point where folks can build applied intuition beyond the simple 80:20 rule. Maybe in the next rounds.

This is a beautifully set text, with rich color illustrations, figures, and tables that make reading pleasurable and fun. The content is rigorous with an appropriate amount of mathematics for an introductory, graduate-level course in network science. What makes this book stand out from many other textbooks on the subject, is the personal introduction, the historical narrative of the development of the field, and the easy movement back and forth between mathematical concepts and real-world social and scientific applications. From a pedagogical standpoint, the book supports an approach of intuition development and application to the relevant concepts. The text really focuses on the analysis of networks, and doesn't touch on topics like primary or secondary data collection, or computational or software considerations (i.e. no code examples in Python or R) in their analysis. Overall it's an enjoyable read for its clarity and stunning visuals. I look forward to teaching from this text in a future class on applied network science.

Studies in complexity gained momentum in Economics after Brian ArthurÃƒÂ¢Ã â ¬Ã â„¢s work (Arthur (2015) and Foster (2005)) as the head of New MexicoÃƒÂ¢Ã â ¬Ã â„¢s Santa Fe Institute in the late 1980s. With applications on various fronts, complex dynamical systems approaches have been applied to different fields of research in Economics and other sciences. Applications are used, for example, in Game Theory, Political Science, Biology and Physics. Original applications in Economics were on modeling of financial markets, individual agentsÃƒÂ¢Ã â ¬Ã â„¢ decision-making rules in various contexts and studies on path-dependence and technological dynamics with increasing returns. The Atlas of Economic Complexity presented in the previous section advances the discussion of complexity combining it with Big Data techniques to create what is perhaps one of todayÃƒÂ¢Ã â ¬Ã â„¢s most relevant economic databases for world trade analysis. The term Big Data has been widely used in various contexts to describe the explosive growth of data available from the digital world. At its roots, Big Data deals with a large volume and variety of high-velocity data.In a wonderful compilation of his works on and the history of scale-free complex networks, Barabasi (2002) provides a detailed explanation of the concepts and recent contributions to network science within the context of Big Data in different fields of knowledge; some practical examples of which include the internet itself, the network of Hollywood actors and films, biological and linguistic networks, among many more. The simple case of the US airlines network (see figure 1 below) as presented by Barabasi (2002) explains in a clear manner the concept of scale-free complex networks. The first network is that of the US highway system with many connection nodes (each city is a node) and no relevant hubs. The airlines network in the same graph is the opposite case: a complex network with hubs (that is, large nodes with many connections), therefore a non-random network. A few hubs exist that concentrate the majority of connections (Chicago, New York, Houston, LA, etc.). In such complex, non-random networks, a few hubs hold the majority of connections and many other nodes have very few connections. A new city that tries to compete in terms of ÃƒÂ¢Ã â ¬Ã Å“receivingÃƒÂ¢Ã â ¬Ã Â• and ÃƒÂ¢Ã â ¬Ã Å“sendingÃƒÂ¢Ã â ¬Ã Â• flights will face great difficulty when competing with the mega hubs. Its status as an ÃƒÂ¢Ã â ¬Ã Å“ordinary hubÃƒÂ¢Ã â ¬Ã Â• in the network makes entry into this ÃƒÂ¢Ã â ¬Ã Å“spaceÃƒÂ¢Ã â ¬Ã Â• far too difficult. The network is considered to be scale-free because the number of links connecting to the nodes does not follow a well-behaved pattern, but rather a power-law distribution.Nodes in a random network have a random number of links. In a scale-free complex network, a few nodes have the majority of the links (the hubs) and the great majority of other nodes have very few links. A Gaussian distribution characterizes the former kind of network, while the latter is characterized by a power-law distribution. Non-random networks show a hierarchy where the hubs prevail because they have far more access to links than ÃƒÂ¢Ã â ¬Ã Å“ordinaryÃƒÂ¢Ã â ¬Ã Â• nodes: a ÃƒÂ¢Ã â ¬Ã Å“topocracyÃƒÂ¢Ã â ¬Ã Â•

reigns (Borondo et al 2014). Competition inside these networks is uneven in the sense that, over time, certain nodes collect large numbers of links to become hubs with greater access to other nodes of the network. An ÃƒÂ¢Ã â ¬Ã Å“ordinaryÃƒÂ¢Ã â ¬Ã Â• node faces great difficulty when competing with a hub because it starts out from a poor position in terms of its stock of accumulated links. Barabasi and his team created a simplified model that reproduces with remarkable accuracy this kind of real-world network dynamics; the model has three pillars: i) a network that grows with new nodes being incorporated to other nodes by means of links at every point in time; ii) a preferential attachment rule according to which each new node prefers to connect to an existing node with lots of links; and, iii) fitness: some nodes are more competent link-accumulators than others, which may help a new node to overcome the difficulty of lacking links when it enters the network.Barabasi and his team use these three simple rules to formally replicate the characteristics of such networks in the real world, including the appearances of power-law distributions as indicated above in the case of the US airlines network. BarabasiÃƒÂ¢Ã â ¬Ã â„¢s ÃƒÂ¢Ã â ¬Ã Å“preferential attachmentÃƒÂ¢Ã â ¬Ã Â• mechanism is nothing more than the familiar dynamics of increasing returns illustrated in a single urn Polya process or in a generalized several urns Yules process. H. Simon showed that power laws may emerge as consequences of Yule-type processes (Newman 2010). These findings are crucially important for economists because they formalize and add analytical content for already known insights and empirical regularities; particularly for discussions of the new economic geography and trade theory (as previously noted by A. Marshall, Krugman et al (1999) among others). This kind of Barabasi network dynamics clearly illustrates the increasing returns and path-dependent processes that Arthur (2015) demonstrated in his works on economic complexity and technological dynamics.
BarabasiÃƒÂ¢Ã â ¬Ã â„¢s book is mind blowing. It completely changed the way I understand economics.

I had the chance to use a pre-print of this textbook before it was published, to teach a network science course during the academic year 2015-2016. Its added value in respect to other network science books is that it guides the reader gently, at the right pace and with a lot of insightful examples and visualizations in the world of networks. Students at their first encounter with networks have the chance to absorb increasingly complex network concepts at the right pace. However, intermediate and advanced network scientists do not get bored: they have standard concepts clarified and put under a new light, and they get the chance to expand their knowledge by delving into the Advanced Topics and Appendixes.The textbook is suitable for an interdisciplinary class -

indeed in my course I had students from physics, engineering, chemistry, computer science and even marine biology, and all gave positive feedback during the classes, which were closely based on the book materials.All in all, this is a great book both for teachers that plan to teach network science concepts or a whole network science course, or for readers that want to learn network science autonomously.

The Network Science is a great book, which gives you a totally new perspective about LIFE, including political science, Biology , Physics, Finance etc. Understanding Networks and Big Data will help us to build a better world or at least to understand how the world operates. In the book are practical examples of which include the internet itself, the network of Hollywood actors and films, biological and linguistic networks etc.In the book are also lots of useful mathematics to build original concepts in network science.All in all, this is a great book for everybody who intends to better undestand the world.it is a MUST READ!.

Nagano, 2001 Exercise, Nutrition, and Environmental Stress: Gssi Sports Science Network Forum : Nagano, 2000 Fraud Analytics Using Descriptive, Predictive, and Social Network Techniques: A Guide to Data Science for Fraud Detection (Wiley and SAS Business Series) Network Science Fascia: The Tensional Network of the Human Body: The science and clinical applications in manual and movement therapy, 1e SPORTS SCIENCE EXPERIMENT LOG GET A KICK OUT OF SCIENCE (MAD SCIENCE) Science Experiments For Kids: 40 + Cool Kids Science Experiments (A Fun & Safe Kids Science Experiment Book) SCIENCE EXPLORER C2009 LEP STUDENT EDITION PHYSICAL SCIENCE (Prentice Hall Science Explorer)