

Data Science And Complex Networks Real Case Studies With Python

This book focuses on a wide range of optimization, learning, and control algorithms for interdependent complex networks and their role in smart cities operation, smart energy systems, and intelligent transportation networks. It paves the way for researchers working on optimization, learning, and control spread over the fields of computer science, operation research, electrical engineering, civil engineering, and system engineering. This book also covers optimization algorithms for large-scale problems from theoretical foundations to real-world applications, learning-based methods to enable intelligence in smart cities, and control techniques to deal with the optimal and robust operation of complex systems. It further introduces novel algorithms for data analytics in large-scale interdependent complex networks.

- Specifies the importance of efficient theoretical optimization and learning methods in dealing with emerging problems in the context of interdependent networks
- Provides a comprehensive investigation of advance data analytics and machine learning algorithms for large-scale complex networks
- Presents basics and mathematical foundations needed to enable efficient decision making and intelligence in interdependent complex networks

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This book aims to bring together researchers and practitioners working across domains and research disciplines to measure, model, and visualize complex networks. It collects the works presented at the 9th International Conference on Complex Networks (CompleNet) in Boston, MA, March, 2018. With roots in physical, information and social science, the study of complex networks provides a formal set of mathematical methods, computational tools and theories to describe, prescribe and predict dynamics and behaviors of complex systems. Despite their diversity, whether the systems are made up of physical, technological, informational, or social networks, they share many common organizing principles and thus can be studied with similar approaches. This book provides a view of the state-of-the-art in this dynamic field and covers topics such as group decision-making, brain and cellular connectivity, network controllability and resiliency, online activism, recommendation systems, and cyber security.

This two-volume set constitutes the proceedings of the Third Conference on Creativity in Intellectual Technologies and Data Science, CIT&DS 2019, held in Volgograd, Russia, in September 2019. The 67 full papers, 1 short paper and 3

keynote papers presented were carefully reviewed and selected from 231 submissions. The papers are organized in topical sections in the two volumes. Part I: cyber-physical systems and Big Data-driven world. Part II: artificial intelligence and deep learning technologies for creative tasks; intelligent technologies in social engineering.

Complex networks are one of the most challenging research focuses of disciplines, including physics, mathematics, biology, medicine, engineering, and computer science, among others. The interest in complex networks is increasingly growing, due to their ability to model several daily life systems, such as technology networks, the Internet, and communication, chemical, neural, social, political and financial networks. The Special Issue "Computation in Complex Networks" of Entropy offers a multidisciplinary view on how some complex systems behave, providing a collection of original and high-quality papers within the research fields of:

- Community detection
- Complex network modelling
- Complex network analysis
- Node classification
- Information spreading and control
- Network robustness
- Social networks
- Network medicine

This edited volume on the latest advances in data science covers a wide range of topics in the context of data analysis and classification. In particular, it includes contributions on classification methods for high-dimensional data, clustering methods, multivariate statistical methods, and various applications. The book gathers a selection of peer-reviewed contributions presented at the Fifteenth Conference of the International Federation of Classification Societies (IFCS2015), which was hosted by the Alma Mater Studiorum, University of Bologna, from July 5 to 8, 2015.

Construct, analyze, and visualize networks with networkx, a Python language module. Network analysis is a powerful tool you can apply to a multitude of datasets and situations. Discover how to work with all kinds of networks, including social, product, temporal, spatial, and semantic networks. Convert almost any real-world data into a complex network--such as recommendations on co-using cosmetic products, muddy hedge fund connections, and online friendships. Analyze and visualize the network, and make business decisions based on your analysis. If you're a curious Python programmer, a data scientist, or a CNA specialist interested in mechanizing mundane tasks, you'll increase your productivity exponentially. Complex network analysis used to be done by hand or with non-programmable network analysis tools, but not anymore! You can now automate and program these tasks in Python. Complex networks are collections of connected items, words, concepts, or people. By exploring their structure and individual elements, we can learn about their meaning, evolution, and resilience. Starting with simple networks, convert real-life and synthetic network graphs into networkx data structures. Look at more sophisticated networks and learn more powerful machinery to handle centrality calculation, blockmodeling, and clique and community detection. Get familiar with presentation-quality network visualization tools, both programmable and interactive--such as Gephi, a CNA explorer. Adapt the patterns from the case

studies to your problems. Explore big networks with NetworkKit, a high-performance networkx substitute. Each part in the book gives you an overview of a class of networks, includes a practical study of networkx functions and techniques, and concludes with case studies from various fields, including social networking, anthropology, marketing, and sports analytics. Combine your CNA and Python programming skills to become a better network analyst, a more accomplished data scientist, and a more versatile programmer. What You Need: You will need a Python 3.x installation with the following additional modules: Pandas (≥ 0.18), NumPy (≥ 1.10), matplotlib (≥ 1.5), networkx (≥ 1.11), python-louvain (≥ 0.5), NetworkKit (≥ 3.6), and generalizesimilarity. We recommend using the Anaconda distribution that comes with all these modules, except for python-louvain, NetworkKit, and generalizesimilarity, and works on all major modern operating systems.

This book highlights cutting-edge research in the field of network science, offering scientists, researchers, students, and practitioners a unique update on the latest advances in theory and a multitude of applications. It presents the peer-reviewed proceedings of the Eighth International Conference on Complex Networks and their Applications (COMPLEX NETWORKS 2019), which took place in Lisbon, Portugal, on December 10–12, 2019. The carefully selected papers cover a wide range of theoretical topics such as network models and measures; community structure, and network dynamics; diffusion, epidemics, and spreading processes; resilience and control as well as all the main network applications, including social and political networks; networks in finance and economics; biological and neuroscience networks; and technological networks.

Workshop Proceedings, Indian Statistical Institute, Kolkata December 19-20, 2015

Network Science is the emerging field concerned with the study of large, realistic networks. This interdisciplinary endeavor, focusing on the patterns of interactions that arise between individual components of natural and engineered systems, has been applied to data sets from activities as diverse as high-throughput biological experiments, online trading information, smart-meter utility supplies, and pervasive telecommunications and surveillance technologies. This unique text/reference provides a fascinating insight into the state of the art in network science, highlighting the commonality across very different areas of application and the ways in which each area can be advanced by injecting ideas and techniques from another. The book includes contributions from an international selection of experts, providing viewpoints from a broad range of disciplines. It emphasizes networks that arise in nature—such as food webs, protein interactions, gene expression, and neural connections—and in technology—such as finance, airline transport, urban development and global trade. Topics and Features: begins with a clear overview chapter to introduce this interdisciplinary field; discusses the classic network science of fixed connectivity structures, including empirical studies,

mathematical models and computational algorithms; examines time-dependent processes that take place over networks, covering topics such as synchronisation, and message passing algorithms; investigates time-evolving networks, such as the World Wide Web and shifts in topological properties (connectivity, spectrum, percolation); explores applications of complex networks in the physical and engineering sciences, looking ahead to new developments in the field.

Researchers and professionals from disciplines as varied as computer science, mathematics, engineering, physics, chemistry, biology, ecology, neuroscience, epidemiology, and the social sciences will all benefit from this topical and broad overview of current activities and grand challenges in the unfolding field of network science.

This book highlights cutting-edge research in the field of network science, offering scientists, researchers, students and practitioners a unique update on the latest advances in theory and a multitude of applications. It presents the peer-reviewed proceedings of the IX International Conference on Complex Networks and their Applications (COMPLEX NETWORKS 2020). The carefully selected papers cover a wide range of theoretical topics such as network models and measures; community structure, network dynamics; diffusion, epidemics and spreading processes; resilience and control as well as all the main network applications, including social and political networks; networks in finance and economics; biological and neuroscience networks and technological networks.

Master modern web and network data modeling: both theory and applications. In *Web and Network Data Science*, a top faculty member of Northwestern University's prestigious analytics program presents the first fully-integrated treatment of both the business and academic elements of web and network modeling for predictive analytics. Some books in this field focus either entirely on business issues (e.g., *Google Analytics and SEO*); others are strictly academic (covering topics such as sociology, complexity theory, ecology, applied physics, and economics). This text gives today's managers and students what they really need: integrated coverage of concepts, principles, and theory in the context of real-world applications. Building on his pioneering *Web Analytics* course at Northwestern University, Thomas W. Miller covers usability testing, Web site performance, usage analysis, social media platforms, search engine optimization (SEO), and many other topics. He balances this practical coverage with accessible and up-to-date introductions to both social network analysis and network science, demonstrating how these disciplines can be used to solve real business problems.

All papers were peer-reviewed. The main goal of this conference is to combine the theories of statistical physics and random graph with the fundamental principles that govern the structure, function, and evolution of biological networks and modules. Applications to the Internet and WWW are also considered. In this proceedings, the reader will find an overview of the state-of-the-art of the new and fast growing field of complex networks.

This book presents papers based on the presentations and discussions at the international workshop on Big Data Smart Transportation Analytics held July 16 and 17, 2016 at Tongji University in Shanghai and chaired by Professors Ukkusuri and Yang. The book is intended to explore a multidisciplinary perspective to big data science in urban transportation, motivated by three critical observations: The rapid advances in the observability of assets, platforms for matching supply and demand, thereby allowing sharing networks previously unimaginable. The nearly universal agreement that data from multiple sources, such as cell phones, social media, taxis and transit systems can allow an understanding of infrastructure systems that is critically important to both quality of life and successful economic competition at the global, national, regional, and local levels. There is presently a lack of unifying principles and methodologies that approach big data urban systems. The workshop brought together varied perspectives from engineering, computational scientists, state and central government, social scientists, physicists, and network science experts to develop a unifying set of research challenges and methodologies that are likely to impact infrastructure systems with a particular focus on transportation issues. The book deals with the emerging topic of data science for cities, a central topic in the last five years that is expected to become critical in academia, industry, and the government in the future. There is currently limited literature for researchers to know the opportunities and state of the art in this emerging area, so this book fills a gap by synthesizing the state of the art from various scholars and help identify new research directions for further study. This book presents the features and advantages offered by complex networks in the machine learning domain. In the first part, an overview on complex networks and network-based machine learning is presented, offering necessary background material. In the second part, we describe in details some specific techniques based on complex networks for supervised, non-supervised, and semi-supervised learning. Particularly, a stochastic particle competition technique for both non-supervised and semi-supervised learning using a stochastic nonlinear dynamical system is described in details. Moreover, an analytical analysis is supplied, which enables one to predict the behavior of the proposed technique. In addition, data reliability issues are explored in semi-supervised learning. Such matter has practical importance and is not often found in the literature. With the goal of validating these techniques for solving real problems, simulations on broadly accepted databases are conducted. Still in this book, we present a hybrid supervised classification technique that combines both low and high orders of learning. The low level term can be implemented by any classification technique, while the high level term is realized by the extraction of features of the underlying network constructed from the input data. Thus, the former classifies the test instances by their physical features, while the latter measures the compliance of the test instances with the pattern formation of the data. We show that the high level technique can realize classification according to the semantic meaning of the data. This book intends to combine two widely studied research areas,

machine learning and complex networks, which in turn will generate broad interests to scientific community, mainly to computer science and engineering areas.

This two volume set (CCIS 1257 and 1258) constitutes the refereed proceedings of the 6th International Conference of Pioneering Computer Scientists, Engineers and Educators, ICPCSEE 2020 held in Taiyuan, China, in September 2020. The 98 papers presented in these two volumes were carefully reviewed and selected from 392 submissions. The papers are organized in topical sections: database, machine learning, network, graphic images, system, natural language processing, security, algorithm, application, and education. The chapter “Highly Parallel SPARQL Engine for RDF” is available open access under a Creative Commons Attribution 4.0 International License via link.springer.com.

As network science and technology continues to gain popularity, it becomes imperative to develop procedures to examine emergent network domains, as well as classical networks, to help ensure their overall optimization. Centrality Metrics for Complex Network Analysis: Emerging Research and Opportunities is a pivotal reference source for the latest research findings on centrality metrics and their broader applications for different categories of networks including wireless sensor networks, curriculum networks, social networks etc. Featuring extensive coverage on relevant areas, such as complex network graphs, node centrality metrics, and mobile sensor networks, this publication is an ideal resource for students, faculty, industry practitioners, and business professionals interested in theoretical concepts and current developments in network domains.

Big Data of Complex Networks presents and explains the methods from the study of big data that can be used in analysing massive structural data sets, including both very large networks and sets of graphs. As well as applying statistical analysis techniques like sampling and bootstrapping in an interdisciplinary manner to produce novel techniques for analyzing massive amounts of data, this book also explores the possibilities offered by the special aspects such as computer memory in investigating large sets of complex networks. Intended for computer scientists, statisticians and mathematicians interested in the big data and networks, Big Data of Complex Networks is also a valuable tool for researchers in the fields of visualization, data analysis, computer vision and bioinformatics. Key features: Provides a complete discussion of both the hardware and software used to organize big data Describes a wide range of useful applications for managing big data and resultant data sets Maintains a firm focus on massive data and large networks Unveils innovative techniques to help readers handle big data Matthias Dehmer received his PhD in computer science from the Darmstadt University of Technology, Germany. Currently, he is Professor at UMIT - The Health and Life Sciences University, Austria, and the Universität der Bundeswehr München. His research interests are in graph theory, data science, complex networks, complexity, statistics and information theory. Frank Emmert-Streib received his PhD in theoretical physics from the University of Bremen, and is currently Associate professor at Tampere University of Technology, Finland. His research interests are in the field of computational biology, machine learning and network medicine. Stefan Pickl holds a PhD in mathematics from the Darmstadt University of Technology, and is currently a Professor at Bundeswehr Universität München. His research interests are in operations research, systems biology, graph theory and discrete optimization. Andreas Holzinger received his PhD in cognitive science from Graz University and

his habilitation (second PhD) in computer science from Graz University of Technology. He is head of the Holzinger Group HCI-KDD at the Medical University Graz and Visiting Professor for Machine Learning in Health Informatics Vienna University of Technology.

This book provides a comprehensive yet short description of the basic concepts of Complex Network theory. In contrast to other books the authors present these concepts through real case studies. The application topics span from Foodwebs, to the Internet, the World Wide Web and the Social Networks, passing through the International Trade Web and Financial time series. The final part is devoted to definition and implementation of the most important network models. The text provides information on the structure of the data and on the quality of available datasets. Furthermore it provides a series of codes to allow immediate implementation of what is theoretically described in the book. Readers already used to the concepts introduced in this book can learn the art of coding in Python by using the online material. To this purpose the authors have set up a dedicated web site where readers can download and test the codes. The whole project is aimed as a learning tool for scientists and practitioners, enabling them to begin working instantly in the field of Complex Networks.

Filling a gap in literature, this self-contained book presents theoretical and application-oriented results that allow for a structural exploration of complex networks. The work focuses not only on classical graph-theoretic methods, but also demonstrates the usefulness of structural graph theory as a tool for solving interdisciplinary problems. Applications to biology, chemistry, linguistics, and data analysis are emphasized. The book is suitable for a broad, interdisciplinary readership of researchers, practitioners, and graduate students in discrete mathematics, statistics, computer science, machine learning, artificial intelligence, computational and systems biology, cognitive science, computational linguistics, and mathematical chemistry. It may also be used as a supplementary textbook in graduate-level seminars on structural graph analysis, complex networks, or network-based machine learning methods.

Fuelled by the big data paradigm, the study of networks is an interdisciplinary field that is growing at the interface of many branches of science including mathematics, physics, computer science, biology, economics and the social sciences. This book, written by experts from the Network Science community, covers a wide range of theoretical and practical advances in this highly active field, highlighting the strong interconnections between works in different disciplines. The eleven chapters take the reader through the essential concepts for the structural analysis of networks, and their applications to real-world scenarios. Being self-contained, the book is intended for researchers, graduate and advanced undergraduate students from different intellectual backgrounds. Each chapter combines mathematical rigour with rich references to the literature, while remaining accessible to a wide range of readers who wish to understand some of the key issues encountered in many aspects of networked everyday life.

This book highlights cutting-edge research in the field of network science, offering scientists, researchers, students and practitioners a unique update on the latest advances in theory, together with a wealth of applications. It presents the peer-reviewed proceedings of the VII International Conference on Complex Networks and their Applications (COMPLEX NETWORKS 2018), which was held in Cambridge on December 11–13, 2018. The carefully selected papers cover a wide range of theoretical topics such as network models and measures; community structure and network dynamics; diffusion, epidemics and spreading processes; and resilience and control; as well as all the main network applications, including social and political networks; networks in finance and economics; biological and neuroscience networks; and technological networks.

This two volume set (CCIS 1257 and 1258) constitutes the refereed proceedings of the 6th International Conference of Pioneering Computer Scientists, Engineers and Educators, ICPCSEE 2020 held in Taiyuan, China, in September 2020. The 98 papers presented in these two

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volumes were carefully reviewed and selected from 392 submissions. The papers are organized in topical sections: database, machine learning, network, graphic images, system, natural language processing, security, algorithm, application, and education.

Data science unifies statistics, data analysis and machine learning to achieve a better understanding of the masses of data which are produced today, and to improve prediction. Special kinds of data (symbolic, network, complex, compositional) are increasingly frequent in data science. These data require specific methodologies, but there is a lack of reference work in this field. *Advances in Data Science* fills this gap. It presents a collection of up-to-date contributions by eminent scholars following two international workshops held in Beijing and Paris. The 10 chapters are organized into four parts: Symbolic Data, Complex Data, Network Data and Clustering. They include fundamental contributions, as well as applications to several domains, including business and the social sciences.

This two volume set (CCIS 727 and 728) constitutes the refereed proceedings of the Third International Conference of Pioneering Computer Scientists, Engineers and Educators, ICPCSEE 2017 (originally ICYCSEE) held in Changsha, China, in September 2017. The 112 revised full papers presented in these two volumes were carefully reviewed and selected from 987 submissions. The papers cover a wide range of topics related to Basic Theory and Techniques for Data Science including Mathematical Issues in Data Science, Computational Theory for Data Science, Big Data Management and Applications, Data Quality and Data Preparation, Evaluation and Measurement in Data Science, Data Visualization, Big Data Mining and Knowledge Management, Infrastructure for Data Science, Machine Learning for Data Science, Data Security and Privacy, Applications of Data Science, Case Study of Data Science, Multimedia Data Management and Analysis, Data-driven Scientific Research, Data-driven Bioinformatics, Data-driven Healthcare, Data-driven Management, Data-driven eGovernment, Data-driven Smart City/Planet, Data Marketing and Economics, Social Media and Recommendation Systems, Data-driven Security, Data-driven Business Model Innovation, Social and/or organizational impacts of Data Science.

Air Route Networks Through Complex Networks Theory connects theory research with network connectivity analysis, providing practitioners with the tools they need to develop more efficient, resilient and profitable air route networks. The book helps airline route planners and executives create more robust route networks that are less vulnerable to disruptions, such as node isolation. The book further explores errors and attacks in complex networks, strategies for detecting critical nodes and cascading failure models to assess and maximize robustness. The book explains how to measure air route network connectivity with complex network representations. Air transport is among the most dynamic and toughest competition industries in today's global economy. The quality of air route network design is a key strategic factor in an airline's viability. These robust networks provide for more stable and secure carrier operations vs. those based simply on existing supply and demand volumes. Node-specific and network-specific representations are covered, along with in-depth coverage of connectivity in special and temporal networks. These collective tools serve as a guide for practitioners seeking to apply complex network theory to the airline industry. Presents complex networks theory research results applied to airline transportation networks Examines airline network robustness in the face of disruptions, providing strategies for detecting critical nodes of air transport networks Provides historical perspective on the economic, political,

technical, and geographical constraints that influence airline route portfolios Connects data from valuable tools, such as navpoints, area control centers (ACC), and flight information centers, with air network modeling Studies spreading-related phenomena, such as rumors, and disease contagions, and how these affect the airline industry

Experts in data analytics and power engineering present techniques addressing the needs of modern power systems, covering theory and applications related to power system reliability, efficiency, and security. With topics spanning large-scale and distributed optimization, statistical learning, big data analytics, graph theory, and game theory, this is an essential resource for graduate students and researchers in academia and industry with backgrounds in power systems engineering, applied mathematics, and computer science.

This book approaches big data, artificial intelligence, machine learning, and business intelligence through the lens of Data Science. We have grown accustomed to seeing these terms mentioned time and time again in the mainstream media. However, our understanding of what they actually mean often remains limited. This book provides a general overview of the terms and approaches used broadly in data science, and provides detailed information on the underlying theories, models, and application scenarios. Divided into three main parts, it addresses what data science is; how and where it is used; and how it can be implemented using modern open source software. The book offers an essential guide to modern data science for all students, practitioners, developers and managers seeking a deeper understanding of how various aspects of data science work, and of how they can be employed to gain a competitive advantage.

This two-volume handbook presents a collection of novel methodologies with applications and illustrative examples in the areas of data-driven computational social sciences. Throughout this handbook, the focus is kept specifically on business and consumer-oriented applications with interesting sections ranging from clustering and network analysis, meta-analytics, memetic algorithms, machine learning, recommender systems methodologies, parallel pattern mining and data mining to specific applications in market segmentation, travel, fashion or entertainment analytics. A must-read for anyone in data-analytics, marketing, behavior modelling and computational social science, interested in the latest applications of new computer science methodologies. The chapters are contributed by leading experts in the associated fields. The chapters cover technical aspects at different levels, some of which are introductory and could be used for teaching. Some chapters aim at building a common understanding of the methodologies and recent application areas including the introduction of new theoretical results in the complexity of core problems. Business and marketing professionals may use the book to familiarize themselves with some important foundations of data science. The work is a good starting point to establish an open dialogue of communication between professionals and researchers from different fields. Together, the two volumes present a number of different new directions in Business and Customer Analytics with an emphasis in

personalization of services, the development of new mathematical models and new algorithms, heuristics and metaheuristics applied to the challenging problems in the field. Sections of the book have introductory material to more specific and advanced themes in some of the chapters, allowing the volumes to be used as an advanced textbook. Clustering, Proximity Graphs, Pattern Mining, Frequent Itemset Mining, Feature Engineering, Network and Community Detection, Network-based Recommending Systems and Visualization, are some of the topics in the first volume. Techniques on Memetic Algorithms and their applications to Business Analytics and Data Science are surveyed in the second volume; applications in Team Orienteering, Competitive Facility-location, and Visualization of Products and Consumers are also discussed. The second volume also includes an introduction to Meta-Analytics, and to the application areas of Fashion and Travel Analytics. Overall, the two-volume set helps to describe some fundamentals, acts as a bridge between different disciplines, and presents important results in a rapidly moving field combining powerful optimization techniques allied to new mathematical models critical for personalization of services. Academics and professionals working in the area of business analytics, data science, operations research and marketing will find this handbook valuable as a reference. Students studying these fields will find this handbook useful and helpful as a secondary textbook.

Air traffic management (ATM) comprises a highly complex socio-technical system that keeps air traffic flowing safely and efficiently, worldwide, every minute of the year. Over the last few decades, several ambitious ATM performance improvement programmes have been undertaken. Such programmes have mostly delivered local technological solutions, whilst corresponding ATM performance improvements have fallen short of stakeholder expectations. In hindsight, this can be substantially explained from a complexity science perspective: ATM is simply too complex to address through classical approaches such as system engineering and human factors. In order to change this, complexity science has to be embraced as ATM's 'best friend'. The applicability of complexity science paradigms to the analysis and modelling of future operations is driven by the need to accommodate long-term air traffic growth within an already-saturated ATM infrastructure. Complexity Science in Air Traffic Management is written particularly, but not exclusively, for transport researchers, though it also has a complementary appeal to practitioners, supported through the frequent references made to practical examples and operational themes such as performance, airline strategy, passenger mobility, delay propagation and free-flight safety. The book should also have significant appeal beyond the transport domain, due to its intrinsic value as an exposition of applied complexity science and applied research, drawing on examples of simulations and modelling throughout, with corresponding insights into the design of new concepts and policies, and the understanding of complex phenomena that are invisible to classical techniques.

This open access book covers the use of data science, including advanced machine learning, big data analytics, Semantic Web technologies, natural language processing, social media analysis, time series analysis, among others, for applications in economics and finance. In addition, it shows some successful applications of advanced data science solutions used to extract new knowledge from data in order to improve economic forecasting models. The book starts with an introduction on the use of data science technologies in economics and finance and is followed by thirteen chapters showing success stories of the application of specific data science methodologies, touching on particular topics related to novel big data sources and technologies for economic analysis (e.g. social media and news); big data models leveraging on supervised/unsupervised (deep) machine learning; natural language processing to build economic and financial indicators; and forecasting and nowcasting of economic variables through time series analysis. This book is relevant to all stakeholders involved in digital and data-intensive research in economics and finance, helping them to understand the main opportunities and challenges, become familiar with the latest methodological findings, and learn how to use and evaluate the performances of novel tools and frameworks. It primarily targets data scientists and business analysts exploiting data science technologies, and it will also be a useful resource to research students in disciplines and courses related to these topics. Overall, readers will learn modern and effective data science solutions to create tangible innovations for economic and financial applications.

Data Science and Complex Networks Oxford University Press

Presenting a range of substantive applied problems within Bayesian Statistics along with their Bayesian solutions, this book arises from a research program at CIRM in France in the second semester of 2018, which supported Kerrie Mengersen as a visiting Jean-Morlet Chair and Pierre Pudlo as the local Research Professor. The field of Bayesian statistics has exploded over the past thirty years and is now an established field of research in mathematical statistics and computer science, a key component of data science, and an underpinning methodology in many domains of science, business and social science. Moreover, while remaining naturally entwined, the three arms of Bayesian statistics, namely modelling, computation and inference, have grown into independent research fields. While the research arms of Bayesian statistics continue to grow in many directions, they are harnessed when attention turns to solving substantive applied problems. Each such problem set has its own challenges and hence draws from the suite of research a bespoke solution. The book will be useful for both theoretical and applied statisticians, as well as practitioners, to inspect these solutions in the context of the problems, in order to draw further understanding, awareness and inspiration.

Coping with the complexities of the social world in the 21st century requires deeper quantitative and predictive understanding. Forty-three internationally acclaimed scientists and thinkers share their vision for complexity science in the next decade in this invaluable book. Topics

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cover how complexity and big data science could help society to tackle the great challenges ahead, and how the newly established Complexity Science Hub Vienna might be a facilitator on this path.

This book concentrates on mining networks, a subfield within data science. Mining complex networks to understand the principles governing the organization and the behaviour of such networks is crucial for a broad range of fields of study.

This volume comprises papers dedicated to data science and the extraction of knowledge from many types of data: structural, quantitative, or statistical approaches for the analysis of data; advances in classification, clustering and pattern recognition methods; strategies for modeling complex data and mining large data sets; applications of advanced methods in specific domains of practice. The contributions offer interesting applications to various disciplines such as psychology, biology, medical and health sciences; economics, marketing, banking and finance; engineering; geography and geology; archeology, sociology, educational sciences, linguistics and musicology; library science. The book contains the selected and peer-reviewed papers presented during the European Conference on Data Analysis (ECDA 2013) which was jointly held by the German Classification Society (GfKI) and the French-speaking Classification Society (SFC) in July 2013 at the University of Luxembourg.

A comprehensive introduction to the theory and applications of complex network science, complete with real-world data sets and software tools.

This two volume set (CCIS 1058 and 1059) constitutes the refereed proceedings of the 5th International Conference of Pioneering Computer Scientists, Engineers and Educators, ICPCSEE 2019 held in Guilin, China, in September 2019. The 104 revised full papers presented in these two volumes were carefully reviewed and selected from 395 submissions. The papers cover a wide range of topics related to basic theory and techniques for data science including data mining; data base; net work; security; machine learning; bioinformatics; natural language processing; software engineering; graphic images; system; education; application.

This book concentrates on mining networks, a subfield within data science. Data science uses scientific and computational tools to extract valuable knowledge from large data sets. Once data is processed and cleaned, it is analyzed and presented to support decision-making processes. Data science and machine learning tools have become widely used in companies of all sizes. Networks are often large-scale, decentralized, and evolve dynamically over time. Mining complex networks aim to understand the principles governing the organization and the behavior of such networks is crucial for a broad range of fields of study. Here are a few selected typical applications of mining networks: Community detection (which users on some social media platforms are close friends). Link prediction (who is likely to connect to whom on such platforms). Node attribute prediction (what advertisement should be shown to a given user of a particular platform to match their interests). Influential node detection (which social media users would be the best ambassadors of a specific product). This textbook is suitable for an upper-year undergraduate course or a graduate course in programs such as data science, mathematics, computer science, business, engineering, physics, statistics, and social science. This book can be successfully used by all enthusiasts of data science at various levels of sophistication to expand their knowledge or consider changing their career path. Jupiter notebooks (in Python and Julia) accompany the book and can be accessed on <https://www.ryerson.ca/mining-complex-networks/>. These not only contain all the experiments presented in the book, but also include additional material. Bogumi? Kami?ski is the Chairman of the Scientific Council for the Discipline of Economics and Finance at SGH Warsaw School of Economics. He is also an Adjunct Professor at the Data Science Laboratory at Ryerson University. Bogumi? is an expert in applications of mathematical modeling to solving complex real-life problems. He is also a substantial open-source

contributor to the development of the Julia language and its package ecosystem. Paweł Prażmowski is a Professor of Mathematics in Ryerson University, whose main research interests are in random graph theory, especially in modeling and mining complex networks. He is the Director of Fields-CQAM Lab on Computational Methods in Industrial Mathematics in The Fields Institute for Research in Mathematical Sciences and has pursued collaborations with various industry partners as well as the Government of Canada. He has written over 170 papers and three books with 130 plus collaborators. François Thériault holds a B.Sc. degree in applied mathematics from the University of Ottawa, a M.Sc. in telecommunications from INRS and a PhD in electrical engineering from McGill University. He has been employed by the Government of Canada since 1996 where he was involved in the creation of the data science team as well as the research group now known as the Tutte Institute for Mathematics and Computing. He also holds an adjunct professorial position in the Department of Mathematics and Statistics at the University of Ottawa. His current interests include relational-data mining and deep learning.

This book constitutes the refereed proceedings of the Second Conference on Creativity in Intelligent Technologies and Data Science, CIT&DS 2017, held in Volgograd, Russia, in September 2017. The 58 revised full papers and two keynote papers presented were carefully reviewed and selected from 194 submissions. The papers are organized in topical sections on Knowledge Discovery in Patent and Open Sources for Creative Tasks; Open Science Semantic Technologies; Computer Vision and Knowledge-Based Control; Pro-Active Modeling in Intelligent Decision Making Support; Data Science in Energy Management and Urban Computing; Design Creativity in CASE/CAI/CAD/PDM; Intelligent Internet of Services and Internet of Things; Data Science in Social Networks Analysis; Creativity and Game-Based Learning; Intelligent Assistive Technologies: Software Design and Application.

This work guides the reader in the analysis of big-data by providing theoretical and practical instruments to tame the complexity of such systems. Together with support provided by the companion website, it constitutes a simple and useful handbook for data analysts.

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