

# Universal patterns in egocentric communication networks

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Tie strengths in social networks are heterogeneous, with strong and weak ties playing different roles at the network and individual levels. Egocentric networks, networks of relationships around an individual, exhibit few strong ties and more weaker ties, as evidenced by electronic communication records. Mobile phone data has also revealed persistent individual differences within this pattern. However, the generality and driving mechanisms of social tie strength heterogeneity remain unclear. Here, we study tie strengths in egocentric networks across multiple datasets of interactions between millions of people during months to years. We find universality in tie strength distributions and their individual-level variation across communication modes, even in channels not reflecting offline social relationships. Via a simple model of egocentric network evolution, we show that the observed universality arises from the competition between cumulative advantage and random choice, two tie reinforcement mechanisms whose balance determines the diversity of tie strengths. Our results provide insight into the driving mechanisms of tie strength heterogeneity in social networks and have implications for the understanding of social network structure and individual behavior.

Social networks are key to the exchange of ideas, norms, and other cultural constructs in human society<sup>1</sup>, influencing the way we communicate<sup>2</sup>, support each other<sup>3,4</sup>, and form enduring communities<sup>5</sup>. Decades of research have focused on regularities in the patterns of relations among individuals<sup>6</sup> as well as the drivers and mechanisms behind their origin<sup>7</sup>. One particularly prominent feature of social networks is the diversity of tie strengths<sup>8</sup>, where strong ties are typically embedded within social groups while weak ties are crucial for the cohesiveness of the network as a whole<sup>9–11</sup>. At the micro level, ego networks—the sets of social ties between an individual (the ego) and their family, friends, and acquaintances (the alters)—commonly feature a small core of close relationships. These close relationships are associated with high emotional intensity and they are surrounded by a larger number of weaker ties. The emergence of this characteristic structural pattern has been associated with

constraints on maintaining social relationships, which include limited information processing capacity<sup>12</sup>, social cognition<sup>13–15</sup>, and time availability<sup>16–17</sup>.

Studies of human communication via mobile phones have shown that in line with the above picture, there is a consistent, general pattern in egocentric networks where a small number of close alters receive a disproportionately large share of communication. Data on the frequency of mobile phone calls and text messages also indicate that within this general pattern, there are clear and persistent individual differences<sup>18–22</sup>: some people repeatedly focus most of their attention on a few close relationships, while others tend to distribute communication among their alters more evenly<sup>23</sup>. These differences are stable in time even under high personal network turnover. However, the mechanisms that generate such heterogeneity of tie strengths, its individual-level variation, and the generality of this pattern beyond

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# Using Egocentric Networks To Understand Communication

**J Spring**



## **Using Egocentric Networks To Understand Communication:**

Management in Marketing Communications ,2024-10-09 This book provides a comprehensive overview of the essential topics in the field of management in marketing communication These substantial topics are examined and addressed by scholars from the marketing and management discipline Beginning with the role of culture as a crucial element in marketing communication the book delves into various matters within the scope of marketing communication Consequently social media and its significance in modern marketing strategies are examined together with the topic of transition from offline to online marketing emphasizing the impact of accelerated digitalization and its onset during the third decade of the twenty first century Furthermore the book discusses the rapid digital transformation stimulated by the COVID 19 pandemic and thus creates room for further exploration and research Throughout the book the evolving dynamics of marketing communication in a digitalized world are examined providing a resource base for scholars conducting research in the context of modern marketing management

**Computational Social Network Analysis** Ajith Abraham,Aboul-Ella Hassanien,Vaclav Snášel,2009-12-10 Social networks provide a powerful abstraction of the structure and dynamics of diverse kinds of people or people to technology interaction Web 2 0 has enabled a new generation of web based communities social networks and folksonomies to facilitate collaboration among different communities This unique text reference compares and contrasts the ethological approach to social behavior in animals with web based evidence of social interaction perceptual learning information granulation the behavior of humans and affinities between web based social networks An international team of leading experts present the latest advances of various topics in intelligent social networks and illustrates how organizations can gain competitive advantages by applying the different emergent techniques in real world scenarios The work incorporates experience reports survey articles and intelligence techniques and theories with specific network technology problems Topics and Features Provides an overview social network tools and explores methods for discovering key players in social networks designing self organizing search systems and clustering blog sites surveys techniques for exploratory analysis and text mining of social networks approaches to tracking online community interaction and examines how the topological features of a system affects the flow of information reviews the models of network evolution covering scientific co citation networks nature inspired frameworks latent social networks in e Learning systems and compound communities examines the relationship between the intent of web pages their architecture and the communities who take part in their usage and creation discusses team selection based on members social context presents social network applications including music recommendation and face recognition in photographs explores the use of social networks in web services that focus on the discovery stage in the life cycle of these web services This useful and comprehensive volume will be indispensable to senior undergraduate and postgraduate students taking courses in Social Intelligence as well as to researchers developers and postgraduates interested in intelligent social networks research and related areas

Evolutionary Algorithms, Swarm

Dynamics and Complex Networks Ivan Zelinka, Guanrong Chen, 2017-11-25 Evolutionary algorithms constitute a class of well known algorithms which are designed based on the Darwinian theory of evolution and Mendelian theory of heritage They are partly based on random and partly based on deterministic principles Due to this nature it is challenging to predict and control its performance in solving complex nonlinear problems Recently the study of evolutionary dynamics is focused not only on the traditional investigations but also on the understanding and analyzing new principles with the intention of controlling and utilizing their properties and performances toward more effective real world applications In this book based on many years of intensive research of the authors is proposing novel ideas about advancing evolutionary dynamics towards new phenomena including many new topics even the dynamics of equivalent social networks In fact it includes more advanced complex networks and incorporates them with the CMLs coupled map lattices which are usually used for spatiotemporal complex systems simulation and analysis based on the observation that chaos in CML can be controlled so does evolution dynamics All the chapter authors are to the best of our knowledge originators of the ideas mentioned above and researchers on evolutionary algorithms and chaotic dynamics as well as complex networks who will provide benefits to the readers regarding modern scientific research on related subjects

**Information Search, Integration, and Personalization** Dimitris Kotzinos, Dominique Laurent, Jean-Marc Petit, Nicolas Spyrtatos, Yuzuru Tanaka, 2017-10-01 This book constitutes the revised selected papers of the 11th International Workshop on Information Search Integration and Personalization ISIP 2016 held in Lyon France in November 2016 The 8 revised full papers presented were carefully reviewed and selected from 13 papers submitted to these post conference proceedings from 30 conference presentations The papers are organized in topical sections on exploratory analysis mobility data analysis and management of large data graphs

*Communications, Signal Processing, and Systems* Qilian Liang, Jiasong Mu, Min Jia, Wei Wang, Xuhong Feng, Baoju Zhang, 2018-06-07 This book brings together papers presented at the 2017 International Conference on Communications Signal Processing and Systems ICCSP 2017 which was held on July 14 17 2017 in Harbin China Presenting the latest developments and discussing the interactions and links between these multidisciplinary fields the book spans topics ranging from communications signal processing and systems It is aimed at undergraduate and graduate electrical engineering computer science and mathematics students researchers and engineers from academia and industry as well as government employees

**Ubiquitous Intelligence and Computing** Zhiwen Yu, Ramiro Liscano, Guanlilng Chen, Daqing Zhang, Xingshe Zhou, 2010-10-05 Ubiquitous sensors devices networks and information are paving the way toward a smart world in which computational intelligence is distributed throughout the physical environment to provide reliable and relevant services to people This ubiquitous intelligence will change the computing landscape because it will enable new breeds of applications and systems to be developed and the realm of computing possibilities will be significantly extended By enhancing everyday objects with intelligence many tasks and processes could be simplified the physical spaces where people interact like

workplaces and homes could become more efficient safer and more enjoyable Ubiquitous computing or pervasive computing uses these many smart things or u things to create smart environments services and applications A smart thing can be endowed with different levels of intelligence and may be c text aware active interactive reactive proactive assistive adaptive automated sentient perceptual cognitive autonomic and or thinking Research on ubiquitous intelligence is an emerging research field covering many disciplines A series of grand challenges exists to move from the current level of computing services to the smart world of adaptive and intelligent services Started in 2005 the series of UIC conferences has been held in Taipei Nagasaki Three Gorges China Hong Kong Oslo and Brisbane The proceedings contain the papers presented at the 7th International Conference on Ubiquitous Intelligence and Computing UIC 2010 held in Xi an China October 26 29 2010 The conference was accompanied by six vibrant workshops on a variety of research challenges within the area of ubiquitous intelligence and computing

**The Influence of Technology on Social Network Analysis and Mining** Tansel Özyer,Jon Rokne,Gerhard Wagner,Arno H.P. Reuser,2013-03-15 The study of social networks was originated in social and business communities In recent years social network research has advanced significantly the development of sophisticated techniques for Social Network Analysis and Mining SNAM has been highly influenced by the online social Web sites email logs phone logs and instant messaging systems which are widely analyzed using graph theory and machine learning techniques People perceive the Web increasingly as a social medium that fosters interaction among people sharing of experiences and knowledge group activities community formation and evolution This has led to a rising prominence of SNAM in academia politics homeland security and business This follows the pattern of known entities of our society that have evolved into networks in which actors are increasingly dependent on their structural embedding General areas of interest to the book include information science and mathematics communication studies business and organizational studies sociology psychology anthropology applied linguistics biology and medicine

*Managing Big Data Integration in the Public Sector* Aggarwal, Anil,2015-11-12 The era of rapidly progressing technology we live in generates vast amounts of data however the challenge exists in understanding how to aggressively monitor and make sense of this data Without a better understanding of how to collect and manage such large data sets it becomes increasingly difficult to successfully utilize them Managing Big Data Integration in the Public Sector is a pivotal reference source for the latest scholarly research on the application of big data analytics in government contexts and identifies various strategies in which big data platforms can generate improvements within that sector Highlighting issues surrounding data management current models and real world applications this book is ideally designed for professionals government agencies researchers and non profit organizations interested in the benefits of big data analytics applied in the public sphere

*Innovative Approaches of Data Visualization and Visual Analytics* Huang, Mao Lin,Huang, Weidong,2013-07-31 Due to rapid advances in hardware and software technologies network infrastructure and data have become increasingly complex requiring efforts to more effectively

comprehend and analyze network topologies and information systems Innovative Approaches of Data Visualization and Visual Analytics evaluates the latest trends and developments in force based data visualization techniques addressing issues in the design development evaluation and application of algorithms and network topologies This book will assist professionals and researchers working in the fields of data analysis and information science as well as students in computer science and computer engineering in developing increasingly effective methods of knowledge creation management and preservation

**Web Services: Concepts, Methodologies, Tools, and Applications** Management Association, Information Resources, 2018-12-07 Web service technologies are redefining the way that large and small companies are doing business and exchanging information Due to the critical need for furthering automation engagement and efficiency systems and workflows are becoming increasingly more web based Web Services Concepts Methodologies Tools and Applications is an innovative reference source that examines relevant theoretical frameworks current practice guidelines industry standards and standardization and the latest empirical research findings in web services Highlighting a range of topics such as cloud computing quality of service and semantic web this multi volume book is designed for computer engineers IT specialists software designers professionals researchers and upper level students interested in web services architecture frameworks and security

**Multivariate Network Visualization** Andreas Kerren, Helen Purchase, Matthew O. Ward, 2014-04-15 This book is the outcome of the Dagstuhl Seminar 13201 on Information Visualization Towards Multivariate Network Visualization held in Dagstuhl Castle Germany in May 2013 The goal of this Dagstuhl Seminar was to bring together theoreticians and practitioners from Information Visualization HCI and Graph Drawing with a special focus on multivariate network visualization i e on graphs where the nodes and or edges have additional multidimensional attributes The integration of multivariate data into complex networks and their visual analysis is one of the big challenges not only in visualization but also in many application areas Thus in order to support discussions related to the visualization of real world data also invited researchers from selected application areas especially bioinformatics social sciences and software engineering The unique Dagstuhl climate ensured an open and undisturbed atmosphere to discuss the state of the art new directions and open challenges of multivariate network visualization

*Cooperative Design, Visualization, and Engineering* Yuhua Luo, 2006-09-21 This book constitutes the refereed proceedings of the Third International Conference on Cooperative Design Visualization and Engineering CDVE 2006 held in Mallorca Spain in September 2006 The book presents 40 revised full papers carefully reviewed and selected from numerous submissions The papers cover all current issues in cooperative design visualization and engineering ranging from theoretical and methodological topics to various systems and frameworks to applications in a variety of fields

**Advanced Data Mining and Applications** Ronghuai Huang, Qiang Yang, Jian Pei, João Gama, Xiaofeng Meng, Xue Li, 2009-08-09 This volume contains the proceedings of the International Conference on Advanced Data Mining and Applications ADMA 2009 held in Beijing China during August 17 19 2009 We are pleased to have a very

strong program Acceptance into the conference proceedings was extremely competitive From the 322 submissions from 27 countries and regions the Program Committee selected 34 full papers and 47 short papers for presentation at the conference and inclusion in the proceedings The contributed papers cover a wide range of data mining topics and a diverse spectrum of interesting applications The Program Committee worked very hard to select these papers through a rigorous review process and extensive discussion and finally composed a diverse and exciting program for ADMA 2009 An important feature of the main program was the truly outstanding keynote speakers program Edward Y Chang Director of Research Google China gave a talk titled Confucius and Its Intelligent Disciples Being right in the forefront of data mining applications to the world's largest knowledge and data base the Web Dr Chang scribed how Google's Knowledge Search product help to improve the scalability of machine learning for Web scale applications Charles X Ling a seasoned researcher in data mining from the University of Western Ontario Canada talked about his innovative applications of data mining and artificial intelligence to gifted child education

*More Than Just Food* Garrett Broad, 2016-02-09 The industrial food system has created a crisis in the United States that is characterized by abundant food for privileged citizens and food deserts for the historically marginalized In response food justice activists based in low income communities of color have developed community based solutions arguing that activities like urban agriculture nutrition education and food related social enterprises can drive systemic social change Focusing on the work of several food justice groups including Community Services Unlimited a South Los Angeles organization founded as the nonprofit arm of the Southern California Black Panther Party *More Than Just Food* explores the possibilities and limitations of the community based approach offering a networked examination of the food justice movement in the age of the nonprofit industrial complex

**Understanding Criminal Networks** Prof. Gisela Bichler, 2019-09-24 *Understanding Criminal Networks* is a short methodological primer for those interested in studying illicit deviant covert or criminal networks using social network analysis SNA Accessibly written by Gisela Bichler a leading expert in SNA for dark networks the book is chock full of graphics checklists software tips step by step guidance and straightforward advice Covering all the essentials each chapter highlights three themes the theoretical basis of networked criminology methodological issues and useful analytic tools and producing professional analysis Unlike any other book on the market the book combines conceptual and empirical work with advice on designing networking studies collecting data and analysis Relevant practical theoretical and methodologically innovative *Understanding Criminal Networks* promises to jumpstart readers understanding of how to cross over from conventional investigations of crime to the study of criminal networks

*Instructional Communication Competence and Instructor Social Presence: Enhancing Teaching and Learning in the Online Environment* Sherwyn Morreale, Patrick R. Lowenthal, Janice Thorpe, Larisa Olesova, 2024-05-16 The coronavirus pandemic mandated unexpected instant transitions to remote learning and accelerated student demand for online courses As a result colleges and universities in the U S and around the world began and have continued to expand their online courses

and degree programs The online learning industry is projected to pass 370 billion by 2026 and one third of post secondary school administrators indicate they will continue to offer both remote and online course options even after their campuses completely resume offering in person face to face courses Students have demonstrated there is an increased demand for online courses as well A national survey of 1 413 students registered at U S higher education institutions in fall 2020 and spring 2021 said their experiences with learning remotely during the pandemic left them with a positive attitude toward online and hybrid courses This increased interest calls attention to the need for more scholarly examination of online teaching and learning

**Computer Security -- ESORICS 2015** Günther Pernul, Peter Y A Ryan, Edgar Weippl, 2015-10-09 The two volume set LNCS 9326 and LNCS 9327 constitutes the refereed proceedings of the 20th European Symposium on Research in Computer Security ESORICS 2015 held in Vienna Austria in September 2015 The 59 revised full papers presented were carefully reviewed and selected from 298 submissions The papers address issues such as networks and Web security system security crypto application and attacks risk analysis privacy cloud security protocols and attribute based encryption code analysis and side channels detection and monitoring authentication policies and applied security

Econophysics and Sociophysics: Recent Progress and Future Directions Frédéric Abergel, Hideaki Aoyama, Bikas K. Chakrabarti, Anirban Chakraborti, Nivedita Deo, Dhruv Raina, Irena Vodenska, 2017-01-11 This book presents the proceedings from ECONOPHYS 2015 an international workshop held in New Delhi India on the interrelated fields of econophysics and sociophysics which have emerged from the application of statistical physics to economics and sociology Leading researchers from varied communities including economists sociologists financial analysts mathematicians physicists statisticians and others report on their recent work discuss topical issues and review the relevant contemporary literature A society can be described as a group of people who inhabit the same geographical or social territory and are mutually involved through their shared participation in different aspects of life It is possible to observe and characterize average behaviors of members of a society an example being voting behavior Moreover the dynamic nature of interaction within any economic sector comprising numerous cooperatively interacting agents has many features in common with the interacting systems of statistical physics It is on these bases that interest has grown in the application within sociology and economics of the tools of statistical mechanics This book will be of value for all with an interest in this flourishing field

Network Science with Python David Knickerbocker, 2023-02-28 Discover the use of graph networks to develop a new approach to data science using theoretical and practical methods with this expert guide using Python printed in color Key Features Create networks using data points and information Learn to visualize and analyze networks to better understand communities Explore the use of network data in both supervised and unsupervised machine learning projects Purchase of the print or Kindle book includes a free PDF eBook Book Description Network analysis is often taught with tiny or toy data sets leaving you with a limited scope of learning and practical usage Network Science with Python helps you extract relevant data draw conclusions and build

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Complex Network Analysis in Python Dmitry Zinoviev, 2018-01-19 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 NetworKit 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 NetworkX 3.6 and generalizedsimilarity We recommend using the Anaconda distribution that comes with all these modules except for python-louvain NetworkX and generalizedsimilarity and works on all major modern operating systems

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