

Editor-in-Chief

Prof. Janusz Kacprzyk
Systems Research Institute
Polish Academy of Sciences
ul. Newelska 6
01-447 Warsaw
Poland
E-mail: kacprzyk@ibspan.waw.pl

Ronaldo Menezes, Alexandre Evsukoff,
and Marta C. González (Eds.)

Complex Networks

 Springer

Editors

Ronaldo Menezes
Florida Institute of Technology
Melbourne, FL
USA

Marta C. González
Massachusetts Institute of Technology
Cambridge, MA
USA

Alexandre Evsukoff
COPPE/Federal University of Rio de Janeiro
Rio de Janeiro, RJ
Brazil

ISSN 1860-949X

e-ISSN 1860-9503

ISBN 978-3-642-30286-2

e-ISBN 978-3-642-30287-9

DOI 10.1007/978-3-642-30287-9

Springer Heidelberg New York Dordrecht London

Library of Congress Control Number: 2012939520

© Springer-Verlag Berlin Heidelberg 2013

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed. Exempted from this legal reservation are brief excerpts in connection with reviews or scholarly analysis or material supplied specifically for the purpose of being entered and executed on a computer system, for exclusive use by the purchaser of the work. Duplication of this publication or parts thereof is permitted only under the provisions of the Copyright Law of the Publisher's location, in its current version, and permission for use must always be obtained from Springer. Permissions for use may be obtained through RightsLink at the Copyright Clearance Center. Violations are liable to prosecution under the respective Copyright Law.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Printed on acid-free paper

Springer is part of Springer Science+Business Media (www.springer.com)

Preface

The International Workshop on Complex Networks series – CompleNet (www.complenet.org) was initially proposed in 2008 with the first workshop taking place in 2009. The initiative was the result of efforts from researchers from the *BioComplex Laboratory in the Department of Computer Sciences at Florida Institute of Technology, USA*, and the *Dipartimento di Ingegneria Informatica e delle Telecomunicazioni, Universita' di Catania, Italia*. CompleNet aims at bringing together researchers and practitioners working on areas related to complex networks. In the past two decades we have been witnessing an exponential increase on the number of publications in this field. From biological systems to computer science, from economics to social systems, complex networks are becoming pervasive in many fields of science. It is this interdisciplinary nature of complex networks that CompleNet aims at addressing. CompleNet 2012 was the third event in the series and was hosted by the *BioComplex Laboratory, Department of Computer Sciences at the Florida Institute of Technology, USA* from March 7–9, 2012.

This book includes the peer-reviewed list of works presented at CompleNet 2012. We received 98 submissions from 22 countries. Each submission was reviewed by at least 3 members of the Program Committee. Acceptance was judged based on the relevance to the workshop themes, clarity of presentation, originality and accuracy of results, and proposed solutions. After the review process, 9 papers and 18 short papers were selected to be included in this book.

The 27 contributions in this book address many topics related to complex networks and have been organized in seven major groups: (1) Network Measures and Models, (2) Agents, Communication and Mobility, (3) Communities, Clusters and Partitions, (4) Emergence in Networks, (5) Social Structures and Networks, (6) Networks in Biology and Medicine, and (7) Applications of Networks.

We would like to thank to the Program Committee members for their work in promoting the event and refereeing submissions. We deeply appreciate the efforts of our keynote speakers: Albert-László Barabási (Northeastern University), Sinan Aral (New York University), and Robert Bonneau (Air Force Office of Scientific Research); their presentation is one of the reasons CompleNet 2012 was such a success. We are grateful to our invited speakers who enriched CompleNet 2012 with

their presentations and insights in the field of Complex Networks (in alphabetical order): Julia Poncela Casasnovas (Northwestern University), Gourab Ghoshal (Northeastern University), Neil Johnson (University of Miami), Sune Lehmann (Technical University of Denmark), Nathalie “Henry” Riche (Microsoft Research), and My Thai (University of Florida).

Special thanks also go to Marco Carvalho, Eraldo Ribeiro, Ryan Stansifer and William Shoaff from the Florida Institute of Technology for their help in organizing CompleNet 2012. The next edition of CompleNet will be hosted by the Freie Universität Berlin, Germany, from March 13-15, 2013.

March 2012
Melbourne, Florida

Ronaldo Menezes
Alexandre Evsukoff
Marta C. González

Contents

Network Measures and Models

- Hybrid Centrality Measures for Binary and Weighted Networks** 1
Alireza Abbasi, Liaquat Hossain
- A Growing Model for Scale-Free Networks Embedded in Hyperbolic Metric Spaces** 9
Giuseppe Mangioni, Antonio Lima
- The Robustness of Balanced Boolean Networks** 19
Ming Liu, Elena Dubrova

Agents, Communication and Mobility

- Structural Evolution in Knowledge Transfer Network:
An Agent-Based Model** 31
Haoxiang Xia, Yanyan Du, Zhaoguo Xuan
- Using Network Science to Define a Dynamic Communication Topology
for Particle Swarm Optimizers** 39
Marcos A.C. Oliveira Junior, Carmelo J.A. Bastos Filho, Ronaldo Menezes
- Weak Ties in Complex Wireless Communication Networks** 49
Amanda Leonel, Carlos H.C. Ribeiro, Matthias R. Brust
- Vulnerability-Aware Architecture for a Tactical, Mobile Cloud** 57
*Anne-Laure Joussemme, Kevin Huggins, Nicolas Léchevin, Patrick Maupin,
Dominic Larkin*
- Migration, Communication and Social Networks – An Agent-Based
Social Simulation** 67
Hugo S. Barbosa Filho, Fernando B. Lima Neto, Wilson Fusco

Communities, Clusters and Partitions

A Comparison of Methods for Community Detection in Large Scale Networks	75
<i>Vinícius da Fonseca Vieira, Alexandre Gonçalves Evsukoff</i>	
Stable Community Cores in Complex Networks	87
<i>Massoud Seifi, Ivan Junier, Jean-Baptiste Rouquier, Svilen Iskrov, Jean-Loup Guillaume</i>	
An Empirical Study of the Relation between Community Structure and Transitivity	99
<i>Keziban Orman, Vincent Labatut, Hocine Cherifi</i>	
Detecting Overlapping Communities in Complex Networks Using Swarm Intelligence for Multi-threaded Label Propagation	111
<i>Bradley S. Rees, Keith B. Gallagher</i>	
A Genetic Algorithm to Partition Weighted Planar Graphs in Which the Weight of Nodes Follows a Power Law	121
<i>Rodrigo Palheta, Vasco Furtado</i>	
Measuring a Category-Based Blogosphere	131
<i>Priya Saha, Ronaldo Menezes</i>	
Ripple Effects: Small-Scale Investigations into the Sustainability of Ocean Science Education Networks	141
<i>Robert Chen, Catherine Cramer, Pam DiBona, Russel Faux, Stephen Uzzo</i>	
Emergence in Networks	
Socio-dynamic Discrete Choice on Networks in Space: Impact of Initial Conditions, Network Size and Connectivity on Emergent Outcomes in Simple Nested Logit Model	149
<i>Elenna R. Dugundji, László Gulyás</i>	
Tipping Points of Diehards in Social Consensus on Large Random Networks	161
<i>W. Zhang, C. Lim, B. Szymanski</i>	
Social Structures and Networks	
Modeling Annual Supreme Court Influence: The Role of Citation Practices and Judicial Tenure in Determining Precedent Network Growth	169
<i>Ryan Whalen</i>	
The Effect of Citations to Collaboration Networks	177
<i>Pramod Divakarmurthy, Ronaldo Menezes</i>	

Network Analysis of Software Repositories: Identifying Subject Matter Experts 187
Andrew Dittrich, Mehmet Hadi Gunes, Sergiu Dascalu

The Social Structure of Organ Transplantation in the United States 199
Srividhya Venugopal, Evan Stoner, Martin Cadeiras, Ronaldo Menezes

Networks in Biology and Medicine

A Novel Framework for Complex Networks and Chronic Diseases 207
Philippe J. Giabbanelli

Centrality and Network Analysis in a Natural Perturbed Ecosystem 217
Gilberto C. Pereira, Fatima F. Santos, Nelson F.F. Ebecken

Applications of Networks

The Explanatory Power of Relations and an Application to an Economic Network 225
Mauricio Monsalve

Mapping Emerging News Networks: A Case Study of the San Francisco Bay Area 237
Daniel Ramos, Mehmet Hadi Gunes, Donica Mensing, David M. Ryfe

Identifying Critical Road Network Areas with Node Centralities Interference and Robustness 245
Giovanni Scardoni, Carlo Laudanna

Software Collaboration Networks 257
Christopher Zachor, Mehmet Hadi Gunes

Author Index 265