



COMPLEX'2009

The First International Conference on Complex Sciences: Theory and Applications

Feb. 23-25, 2009

Shanghai, China

Sponsored by

**Institute for Computer Sciences, Social-Informatics and
Telecommunications Engineering (ICST)**

Technical Co-Sponsors

(in alphabetic order)

Asia-Pacific Center for Theoretical Physics (APCTP)

Create-Net

Shanghai Academy of Systems Science (SASS)

University of Shanghai for Science and Technology (USST)



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**Conference Programme****Feb. 23, 2009 (Monday)**

Time	Programme
0800-0820	Opening Ceremony
0820-0900	Opening Talk: "Applications of statistical physics to understanding complex systems", by Dr. H. Eugene Stanley, Boston University
0900-0940	Keynote: "Synchronization and intervention of locally interacting multi-agent systems", by Dr. Lei Guo, Chinese Academy of Sciences
0940-1020	Photo taking session and tea break
1020-1100	Keynote: "Spreading processes in complex techno-social networks", by Dr. Alessandro Vespignani, Indiana University
1100-1130	Plenary Talk: "A Schroedinger-like Equation for the PageRank", by Dr. Guido Caldarelli, University of Rome "Sapienza"
1130-1200	Plenary Talk: "Molecular models of the origin of life and biological evolution", by Dr. Chin-Kun Hu, Academia Sinica
1200-1330	Lunch
1330-1400	Plenary Talk: "Shortest path discovery of complex networks and the Internet: Some exact results", by Dr. Gábor Vattay, Eötvös University
1400-1430	Plenary Talk: "Complexity in brain function", by Dr. Seunghwan (Swan) Kim, Pohang University of Science & Technology
1430-1500	Plenary Talk: "Analyzing and modeling large scale social networks based on mobile phone data" by Dr. János Kertész, Budapest University of Technology and Economics
1500-1530	Tea Break
1530-1730	Poster Session I (Lobby, outside Postgraduate Lecture Theater)
1830	Banquet at Golden Jade Sunshine Hotel Shanghai

Feb. 24, 2009 [Tuesday]

Time	Programme
0820-0900	Keynote: "Characterizing node activity and local effect in complex networks", by Dr. Deyi Li, National Natural Science Foundation of China
0900-0930	Plenary Talk: "Percolation and immunization of complex networks", by Dr. Shlomo Havlin, Bar-Ilan University
0930-1000	Plenary Talk: "Comparison of cellular networks by using dynamic-based measures", by Dr. Baowen Li, National University of Singapore
1000-1030	Tea break
1030-1100	Plenary Talk: "Mechanisms of systemic risk: contagion, reinforcement, redistribution", by Dr. Frank Schweitzer, ETH Zurich

1100-1130	Plenary Talk: "The social harmony equation based on social physics", by Dr. Wenyuan Niu, Institute of Policy and Management						
1130-1200	Plenary Talk: "Universal behavior of rank-ordered distributions in arts and sciences", by Dr. Gustavo Martínez-Mekler, National Autonomous University of Mexico						
1200-1330	Lunch						
1330-1400	Plenary Talk: "Experimental evidence for fragile to strong crossover in general glass forming liquids" by Dr. Francesco Mallamace, Università di Messina						
1400-1430	Plenary Talk: "Self-organization and finite size effects of the stylized facts in economics in a workable agent based model", by Dr. Luciano Pietronero, University of Rome "La Sapienza"						
1430-1500	Plenary Talk: "Evolution of complex networks studies during the past 10 years", by Dr. Byungnam Kahng, Seoul National University						
1500-1530	Tea Break						
1530-1750	Complex Network-I (D-101)	Complex Biological Systems-I (D-107)	Complex Social Systems-I (D-111)	Complex Engineering Systems-I (D-201)	Complex Economic Systems-I (D-106)	Complex System Methods-I (D-207)	Other Complex Systems (D-206)
1900-	Tour (to be finalized)						

Feb. 25, 2009 [Wednesday]

Time	Programme							
0900-0930	Plenary Talk: "Component detection in complex networks" by Dr. Choy Heng Lai, National University of Singapore							WORKSHOPS COART ComplexCCS ComplexEN MANDYN SPA (for outline of schedules of all the workshops, please refer to the next page)
0930-1000	Plenary Talk: "Statistical properties (entropy, freezing, organization) of single solution clusters for a random K-Satisfiability formula", by Dr. Haijun Zhou, Chinese Academy of Sciences							
1000-1030	Tea break							
1030-1210	Complex Networks-II (D-101)	Complex Networks III (D-107)	Complex Social Systems-II (D-111)	Complex Economic Systems-II (D-106)				
1210-1330	Lunch							
1330-1500	Poster Session II (Lobby, outside Postgraduate Lecture Theater)							
1500-1530	Tea Break							
1530-1730	Complex Networks-IV (D-101)	Complex Biological Systems-II (D-107)	Complex Engineering Systems-II (D-111)	Complex System Methods-II (D-106)				
1735-1815	Closing Talk: "The architecture of complexity: From the topology of the WWW to the structure of the cell", by Dr. Albert-László Barabási, Northeastern University and Harvard Medical School							

Note: All the plenary talks will be given at the Conference Hall, New Complex Building of USST.



Time Frame of Workshops
Date: Feb. 25, 2009

Time	Complex Theory of Art and Music (COART) (D-102)	Causality in Complex Systems (ComplexCCS) (D-206)	Complex Engineering Networks (ComplexEN) (D-211)	Modelling and Analysis of Human Dynamics (MANDYN) (D-207)	Social Physics and Its Applications (SPA) (D-201)
0830-0900			Morning Session I		
0900-1000					
1000-1030	Tea break				
1030-1200		Session I	Morning Session II	Session I	Session I-A
1200-1300	Lunch Break				
1300-1330		Session II		Session II	
1330-1500	Session I		Afternoon Session I		Session I-B
1500-1530	Tea Break				
1530-1700	Session II	Planning Meeting for Future Workshops (by Invitation) (D-202)	Afternoon Session II	Session III	Session II
1700-1730					



Oral Presentation Schedule

Structure and Dynamics of Complex Networks

Complex Networks-I Feb. 24, 2009, 1530-1750

Session Chair: Jin-Qing Fang Room: D-101

Network Complexity Pyramid Jin-Qing Fang, Yong Li

Generalized Farey Tree Network Jin-Qing Fang, Yong Li

Community Identification in Directed Networks Youngdo Kim, Seung-Woo Son, Hawoong Jeong

Impact of Local Events on Communities and Diseases Xin-Jian Xu, Li-Jie Zhang, Xun Zhang, Jie Lou

An Emergence Principle for Complex Systems Michel Cotsaftis

Phase Transitions of Active Rotators in Complex Networks Seung-Woo Son, Hawoong Jeong, Hyunsuk Hong

Exploring and Understanding Scientific Metrics in Citation Networks Mikalai Krapivin, Maurizio Marchese, Fabio Casati

Complex Networks-II Feb. 25, 2009, 1030-1210

Session Chair: Zonghua Liu Room: D-101

Hypernetworks of Complex Systems Jeffrey Johnson

Inefficiency in Networks with Multiple Sources and Sinks Hyejin Youn, Michael T. Gastner, Hawoong Jeong

Adaptive Routing Approaches of Controlling Traffic Congestion in Internet Zonghua Liu, Ming Tang, P. M. Hui

Evolution of the Internet AS-Level Ecosystem Srinivas Shakkottai, Marina Fomenkov, Ryan Koga, Dmitri Krioukov, Kimberley Claffy

Using the Weighted Rich-Club Coefficient to Explore Traffic Organization in Mobility Networks Jos'e J. Ramasco, Vittoria Colizza, Pietro Panzarasa

Complex Networks-III Feb. 25, 2009, 1030-1210

Session Chair: TBA Room: D-107

Modular Synchronization in Complex Network with a Gauge Kuramoto Model C. Choi, E. Oh, B. Kahng, D. Kim

Slowdown in the Annihilation of Two Species Diffusion-Limited Reaction on Fractal Scale-Free Networks C-K. Yun, B. Kahng, D. Kim

Funnelling Effect in Networks Parongama Sen

Analysing Weighted Networks: An Approach via Maximum Flows Markus Brede, Fabio Boschetti

Strong Dependence of Infection Profiles on Grouping Dynamics during Epidemiological Spreading Zhenyuan Zhao, Guannan Zhao, Chen Xu, Pak Ming Hui, Neil F. Johnson



Complex Networks-IV Feb. 25, 2009, 1530-1730

Session Chair: Shiwei Yan Room: D-101

- A Novel Measurement of Structure Properties in Complex Networks* Yanni Han, Jun Hu, Shuqing Zhang, Deyi Li
- Immunization of Geographical Networks* Bing Wang, Kazuyuki Aihara, Beom Jun Kim
- Community Division of Heterogeneous Networks* Tsuyoshi Murata
- Evolving Model of Weighted Networks* Xianmin Geng, Hongwei Zhou, Guanghui Wen
- A Preliminary Study on the Effects of Fear Factors in Disease Propagation* Yubo Wang, Jie Hu, Gaoxi Xiao, Limsoon Wong, Stefan Ma, Tee Hiang Cheng
- A Statistical Study on Oscillatory Protein Expression* Shiwei Yan

Complex Biological Systems

Complex Biological Systems-I Feb. 24, 2009, 1530-1750

Session Chair: Christine Nardini Room: D-107

- Exponential Synchronization of General Complex Delayed Dynamical Networks via Adaptive Feedback Control* Haifeng Zhang, Bing-Hong Wang
- An Approach to Enhance Convergence Efficiency of Self-Propelled Agent System* Jian-Xi Gao, Zhuo Chen, Yun-Ze Cai, Xiao-Ming Xu
- Allometric Scaling of Weighted Food Webs* Jiang Zhang
- MANIA: A Gene Network Reverse Algorithm for Compounds Mode-of-Action and Genes Interactions Inference* Darong Lai, Hongtao Lu, Mario Lauria, Diego di Bernardo, Christine Nardini
- Modeling and Robustness Analysis of Biochemical Networks of Glycerol Metabolism by Klebsiella Pneumonia* Jianxiong Ye, Enmin Feng, Lei Wang, Zhilong Xiu, Yaqin Sun
- A Max-Min Principle for Phyllotactic Patterns* Wai-Ki Ching, Yang Cong, Nam-Kiu Tsing
- A Bipartite Graph Based Model of Protein Domain Networks* J. C. Nacher, T. Ochiai M. Hayashida, T. Akutsu

Complex Biological Systems-II Feb. 25, 2009, 1530-1730

Session Chair: Jae Woo Lee Room: D-107

- Structure of Mutualistic Complex Networks* Jun Kyung Hwang, Sung Eun Mang, Moon Young Cha, Jae Woo Lee
- Conservation of Edge Essentiality Profiles in Metabolic Networks across Species* Tomasz Arodz
- Statistical Properties of Cell Topology and Geometry in a Tissue-Growth Model* Patrik Sahlin, Henrik Jönsson
- New Statistics for Testing Differential Expression of a Pathway from Microarray Data* Hoicheong Siu, Hua Dong, Li Jin, Momiao Xiong
- Spiral Waves Emergence in a Cyclic Predator-Prey Model* Luo-Luo Jiang, Wen-Xu Wang, Xin Huang, Bing-Hong Wang
- Modeling a Complex Biological Network with Temporal Heterogeneity: Cardiac Myocyte Plasticity as a Case Study* Amin R. Mazloom, Kalyan Basu, Subhrangsu S. Mandal, Sajal K. Das



Complex Economic Systems

Complex Economic Systems-I

Feb. 24, 2009, 1530-1750

Session Chair: Jürgen Mimkes

Room: D-106

An Adaptive Markov Chain Monte Carlo Method for GARCH Model

Tetsuya Takaishi

Morphological Similarities between DBM and An Economic Geography Model of City Growth

Dominique Peeters, Pierre Frankhauser, Geoffrey Caruso, Jean Cavailhes, Isabelle Thomas, Gilles Vuidel
Scaling Behavior of Cities Size Distribution in China

Xiaowu Zhu, Aimin Xiong, Liangsheng Li, Maoxin Liu, X.S. Chen

Cross-Correlations among Plate Indexes of Stock Market In China

Xun Zhang, Huijie Yang

Autonomous Co-operation and Control in Complex Adaptive Logistic Systems - Contributions and Limitations for the Innovation Capability of International Supply Networks

Michael Hülsmann, Philip Cordes

Dynamic Regimes of a Multi-Agent Stock Market Model

Tongkui Yu, Honggang Li

Differential Forms: A New Tool in Economic Systems

Jürgen Mimkes

Complex Economic Systems-II

Feb. 25, 2009, 1030-1210

Session Chair: Da-Ren He

Room: D-106

Financially Constrained Fluctuations in an Evolving Network Economy

Domenico Delli Gatti, Mauro Gallegati, Bruce Greenwald, Alberto Russo, Joseph Stiglitz

Application of the Kelly Criterion to Ornstein-Uhlenbeck Processes

Yingdong Lv, Bernhard K. Meister

A Firm-Growing Model and the Study of Communication Patterns' Effect on the Structure of Firm's Social Network

Liang Chen, Haigang Li, Zhong Chen, Li Li, Da-Ren He

Optimal Service Capacities in a Competitive Multiple-Server Queuing Environment

Wai-Ki Ching, Sin-Man Choi, Min Huang

Evolving Specialization, Market and Productivity in an Agent-Based Cooperation Model

Erbo Zhao, Guo Liu, Dan Luo, Xing'ang Xia, Zhangang Han

Complex Social Systems

Complex Social Systems-I

Feb. 24, 2009, 1530-1750

Session Chair: Stanislaw Drozd

Room: D-111

Linguistic Complexity

Stanislaw Drozd, Jaroslaw Kwapien, Adam Orczyk

A Priority Queue Model of Human Dynamics with Bursty Input Tasks

Jin Seop Kim, Naoki Masuda, Byungnam Kahng

Multiple Phase Transitions in the Culture Dissemination

Bing Wang, Yuexing Han, Luonan Chen, Kazuyuki Aihara

Community Detection of Time-Varying Mobile Social Networks

Shu-Yan Chan, Pan Hui, Kuang Xu



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Evolutionary Prisoner's Dilemma Game in Flocks

Zhuo Chen, Jianxi Gao, Yunze Cai, Xiaoming Xu

Recognition of Important Subgraphs in Collaboration Networks

Chun-Hua Fu, Yue-Ping Zhou, Xiu-Lian Xu, Hui Chang, Ai-Xia Feng, Jian-Jun Shi, Da-Ren He

Application of Simple Recommendation Model Diverse Populations

Sahin Delipinar, Haluk Bingol

Complex Social Systems-II

Feb. 25, 2009, 1030-1210

Session Chair: Ning Zhang

Room: D-111

You Never Walk Alone: Recommending Academic Events Based on Social Network Analysis

Ralf Klamma, Pham Manh Cuong, Yiwei Cao

Organizational Adaptive Behavior: The Complex Perspective of Individual-Task Interactions

Jiang Wu, Bin Hu, Yu Zhang

European Airlines' TFP and the 2001 Attack: Towards Safety in a Risk Society

Panayotis Michaelides, Kostas Theologou, Angelos Vouldis

Selection of Imitation Strategies in Populations (When to Learn or When to Replicate?)

Juan G. Diaz Ochoa

Inter-Profile Similarity (IPS): A Method for Semantic Analysis of Online Social Networks

Matt Spear, Xiaoming Lu, Norman S. Matloff, S. Felix Wu

Complex Engineering Systems

Complex Engineering Systems-I

Feb. 24, 2009, 1530-1750

Session Chair: Steve Uhlig

Room: D-201

Capturing Internet Traffic Dynamics Through Graph Distances

Steve Uhlig, Bingjie Fu, Almerima Jamakovic

Understanding the Spreading Patterns of Mobile Phone Viruses

Zehui Qu, Pu Wang, Zhiguang Qin

Spam Source Clustering by Constructing Spammer Network with Correlation Measure

Jeongkyu Shin, Seunghwan Kim

Detecting Gross Errors for Steady State Systems

Congli Mei

Identifying Social Communities in Complex Communications for Network Efficiency

Pan Hui, Eiko Yoneki, Jon Crowcroft, Shu-Yan Chan

Designing Capital-Intensive Systems with Architectural and Operational Flexibility Using a Screening Model

Jijun Lin, Olivier de Weck, Richard de Neufville

A Hybrid Ant-Colony Routing Algorithm for Mobile Ad-Hoc Networks

Shahab Kamali, Jaroslav Opatrny

Complex Engineering Systems-II

Feb. 25, 2009, 1530-1730

Session Chair: Wei Yan

Room D-111

Chaotic and Hyperchaotic attractors in Time-Delayed Neural Networks

Dong Zhang, Jian Xu

Modification Propagation in Complex Networks

Mary Luz Mouronte, María Luisa Vargas, Luis Gregorio Moyano,

Francisco Javier García Algarra, Luis Salvador Del Pozo

The Nonlinear Mechanism of Phase Transition in Computer Networks

Li Yi-Peng, Huang Yi-Hua, Wang lei, Ren Yong



Towards Automatic Discovery of Malware Signature for Anti-virus Cloud Computing

Wei Yan, Erik Wu

Entropy Based Detection of DDoS Attacks in Packet Switching Network Models

Anna T. Lawniczak, Hao Wu, Bruno Di Stefano

Extinction and Coexistence in the Internet Market as Complex Networks

Jiandong Zhao, Liping Fu, Rongfu Cheng

Complex Systems Methods

Complex Systems Methods-I

Feb. 24, 2009, 1530-1750

Session Chair: Jeffery Johnson

Room: D-207

Self-Organized Balanced Resources in Random Networks with Transportation Bandwidths

C. H. Yeung, K. Y. Michael Wong

Extremal Dependencies and Rank Correlations in Power Law Networks

Yana Volkovich, Nelly Litvak, Bert Zwart

An Adaptive Strategy for Resource Allocation with Changing Capacities

Yingni She, Ho-fung Leung

Policy, Design and Management: the in-vivo Laboratory for the Science of Complex Socio-Technical Systems

Jeffrey Johnson

Characters of Networks with Optimal Synchronizability

Ming Zhao, Tao Zhou, Changsong Zhou, Bambi Hu, Bing-Hong Wang

Antisynchronization of Two Complex Dynamical Networks

Ioan Grosu, Ranjib Banerjee, Syamal K. Dana

Synchronization Stability of Coupled Near-Identical Oscillator Network

Jie Sun, Erik M. Bollt, Takashi Nishikawa

Complex Systems Methods-II

Feb. 25, 2009, 1530-1730

Session Chair: TBA

Room: D-106

Emergence and Simulation

Alan Baker

The Origin of Evolution in Physical Systems

Jean-Claude Heudin

Epidemic Self-Synchronization in Complex Networks

Ingo Scholtes, Jean Botev, Markus Esch, Peter Sturm

Scaling in Modulated Systems

O. Portmann, A. Vindigni, D. Pescia

SIRS Dynamics on Random Networks: Simulations and Analytical Models

Ganna Rozhnova, Ana Nunes

Optimization Using a New Bio-inspired Approach

Xiang Feng, Francis C.M. Lau

Other Complex Systems

Other Complex Systems-I

Feb. 24, 2009, 1530-1750

Session Chair: Chin-Kun Hu

Room: D-206



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Time, Incompleteness and Singularity in Quantum Cosmology

Philip V. Fellman, Jonathan Vos Post, Christine M. Carmichael, Alexandru Manus

Complex Systems in Cosmology: "The Antennae" Case Study

Jean-Claude Torrel, Claude Lattaud, Jean-Claude Heudin

Mechanism of Morphological Transition in Hetero-Epitaxial Growth of Metal Films

Cui-Lian Li, Chin-Kun Hu

Temperature-Induced Domain Shrinking in Ising Ferromagnets Frustrated by Long-Range Interaction

A. Vindigni, O. Portmann, N. Saratz, F. Cinti, P. Politi, D. Pescia

On Distributed Multi-Point Concurrent Test System and Its Implementation

Hao Luo, Huaxin Zeng

Almost Periodicity and Distributional Chaos in Banach Space

Lidong Wang, Shi Tang, Zhenyan Chu

Complex Liquids and Glasses: the Jagla Model

Limei Xu



Poster Presentations Schedule

Poster Session I

Feb. 23, 2009, 1530-1730

- P1 - Measuring the Efficiency of Network Designing*
Guoqiang Zhang, Guoqing Zhang
- P2 - A Comparative Analysis of Specific Spatial Network Topological Models*
Jun Wang, Gregory Provan
- P3 - Characterizing the Structural Complexity of Real-world Complex Networks*
Jun Wang, Gregory Provan
- P4 - Complex Networks with Different Types of Nodes*
Juan Zhang, Wenfeng Wu
- P5 - The Effects of Link and Node Capacity on Traffic Dynamics in Weighted Scale-free Networks*
M.B. Hu, R. Jiang, Y.H. Wu, Q.S. Wu
- P6 - Enhancement of Synchronizability of the Kuramoto Model with Assortative Degree-frequency Mixing*
Jin Fan, David J. Hill
- P7 - Analysis the Group Interest Network*
Ning Zhang
- P8 - A Bipartite Network Study of the Library Lending System*
Nan-Nan Li, Ning Zhang
- P9 - Stability of Non-diagonalizable Networks: Eigenvalue Analysis*
Linying Xiang, Zengqiang Chen, Jonathan J.H. Zhu
- P10 - Community Structure Detection in Complex Networks with Applications to Gas-liquid Two-phase Flow*
Zhongke Gao, Ningde Jin
- P11 - On General Laws of Complex Networks*
Wenjun Xiao, Behrooz Parhami
- P12 - Topological Analysis and Measurements of an Online Chinese Student Social Network*
Jiang Wu, Bin Hu, Kathleen M. Carley
- P13 - Analysis and Modeling on the Government's Co-agglomeration in Industrial Clustering*
Ying-Chao Zhang, Chao Chen, Xin-Yi Huang, Yi-Lu Cai
- P14 - Frequency Domain Analysis of a Stochastic Biological Network Motif with Delay*
Qi Wang, Shiwei Yan, Shengjun Liu, Xian Li
- P15 - Modeling and Properties of Nonlinear Stochastic Dynamical System of Continuous Culture*
Lei Wang, Jianxiong Ye, Enmin Feng, Zhilong Xiu
- P16 - Organizational Structure of the Transcriptional Regulatory Network of Yeast: Periodic Genes*
Frank Emmert-Streib, Matthias Dehmer
- P17 - Invariance of the Hybrid System in Microbial Fermentation*
Caixia Gao, Enmin Feng
- P18 - Reconstructing Gene Networks from Microarray Time-Series Data via Granger Causality*
Qiang Luo, Xu Liu, Dongyun Yi
- P19 - The Complex Economic System of Supply Chain Financing*
Lili Zhang, Guangle Yan
- P20 - Collaborative Transportation Planning in Complex Adaptive Logistics Systems - A Complexity Science-based Analysis of Decision Making Problems of "Groupage Systems"*
Michael Hülsmann, Herbert Kopfer, Melanie Bloos, Philip Cordes
- P21 - An Agent-based Model of Retail Location Choice with Complementary Goods*
Arthur Huang, David Levinson



- P22 - Finding Sales Promotion and Making Decision for New Product Based on Group Analysis of Edge-enhanced Product Networks*
Jianbin Tan, Yi Huang, Bin Wu
- P23 - Stabilities of Stock States in Chinese Stock Markets*
Gyuchang Lim, Kyungho Seo, Soo Yong Kim, Kyungsik Kim
- P24 - Firm Size Distribution in Fortune Global 500*
Qinghua Chen, LiuJun Chen, Kai liu
- P25 - Bifurcation Phenomena of Opinion Dynamics in Complex Networks*
L. Guo, X. Cai
- P26 - Ecologic Research the Voluntary Disclosure of Information of Listed Companies*
Hu Jing-Jing, Yan Guang-Le
- P27 - The Evolution of ICT Markets: An Agent-Based Model on Complex Networks*
Liangjie Zhao, Zhong Chen, Li Li
- P28 - A Research of Tacit Knowledge Transfer Based on the Complex Network Technology in Hierarchy Structure Organization*
Ting-Ting Cheng, Heng-Shan Wang, Lu-Bang Wang
- P29 - Scaling Law between Urban Electrical Consumption and Population in China*
Xiaowu Zhu, Aimin Xiong, Liangsheng Li, Maoxin Liu, X.S. Chen
- P30 - On the Approximation Solution of a Cellular Automaton Traffic Flow Model and its Relationship with Synchronized Flow*
R.Jiang, Y.M.Yuan, K.Nishinari
- P31 - An Effective Local Routing Strategy on the Complex Network*
Yu-Jian Li, Bing-hong Wang, Zheng-dong Xi, Chuan-yang Yin, Han-xin Yang, Duo Sun
- P32 - Development of Road Traffic CA Model of 4-Way Intersection to Study Travel Time*
Anna T. Lawniczak, Bruno N. Di Stefano
- P33 - Channel Estimation and ISI/ICI Cancellation for MIMO-OFDM Systems with Insufficient Cyclic Prefix*
Yi-Jen Chiu, Chien-Sheng Chen, Ting-Wei Chang
- P34 - Briefly Review of China High Technology Networks*
Yong Li, Jin-Qing Fang, Liu Qiang
- P35 - Towards Network Complexity*
Matthias Dehmer, Frank Emmert-Streib
- P36 - Packet-Level Traffic Allocation for Real-Time Streaming over Multipath Networks*
Yanfeng Zhang, Cuirong Wang, Yuan Gao
- P37 - Pollution Modeling and Simulation with Multi-Agent and Pretopology*
Murat Ahat, Sofiane Ben Amor, Marc Bui
- P38 - Enhancing Synchronization in Systems of Non-identical Oscillators*
Markus Brede
- P39 - Internal-Evolution Driven Growth in Creation-Annihilation Cyclic Games*
Xiao-Pu Han, Luo-Luo Jiang, Tao Zhou, Bing-Hong Wang
- P40 - Consensus Seeking and Controlling Over Directed Delayed Networks*
Jianquan Lu, Daniel W.C. Ho
- P41 - Non-Sufficient Memories that are Sufficient for Prediction*
Wolfgang Loehr, Nihat Ay
- P42 - An New Bio-inspired Approach to Traveling Salesman Problem*
Xiang Feng, Francis C.M. Lau
- P43 - Research on Web2.0 System Design base on CAS Theory*
Kai Chen, Hen-Shan Wang



- P44 - *Complex Modelling of Open System Design for Sustainable Architecture*
Yan Gu, John Frazer
- P45 - *Optimality Conditions of a Three-Dimension Non-Smooth Thermodynamic System of Sea Ice*
Wei Lv, Enmin Feng
- P46 - *Frequency Distributions of Sand Pile Models*
Ruey-Tarng Liu
- P47 - *Queueing Transition of Directed Polymer in Random Media with a Defect*
Jae Hwan Lee, Jin Min Kim

Poster Session II

Feb. 25, 2009, 1330-1500

- P1 - *Cache Allocation in CDN: An Evolutionary Game Generalized Particle Model*
Xiang Feng, Francis C.M. Lau
- P2 - *A More Strict Definition of Stationary Degree Distribution*
Xiaojun Zhang, Zheng He
- P3 - *Emergence of Scale-Free Networks with Seceding Mechanism*
Xian-Min Geng, Guang-Hui Wen, Shun-Chen Wan, Jie-Yu Xiong
- P4 - *A Novel Software Evolving Model Based on Software Networks*
Weifeng Pan, Bing Li, Yutao Ma, Jing Liu
- P5 - *Social Network as Double-edged Sword to Exchange: Frictions and the Emerging of Intellectual Intermediary Service*
Li Li, Bangtao Wu, Zhong Chen, Liangjie Zhao
- P6 - *The Topological Characteristics and Community Structure in Consumer-Service Bipartite Graph*
Lin Li, Bao-Yan Gu, Li Chen
- P7 - *The Stability of Growing Networks*
Zhenting Hou, Xiangxing Kong, Qinggui Zhao
- P8 - *Gravity Model for Spatial and Weighted Network Based on Optimal Expected Traffic*
Jiang-Hai Qian, Ding-Ding Han
- P9 - *Comparing Networks from a Data Analysis Perspective*
Wei Li, Jing-Yu Yang
- P10 - *A Generating Method for Internet Topology with Multi-ASes and Multi-Tiers*
Jian-qiang Liu, Jiang-xing Wu, Xiao Huang, Dan Li
- P11 - *A New Genetic Algorithm for Community Detection*
Chuan Shi, Yi Wang, Bin Wu
- P12 - *Degree Distribution of a Two-Component Growing Network*
Jianhong Ke, Xiaoshuang Chen
- P13 - *Fractal Fingerprint for Network Topologies*
Yuchun Guo, Changjia Chen, Shi Zhou
- P14 - *Generalized Greedy Algorithm for Shortest Superstring*
Zhengjun Cao, Lihua Liu
- P15 - *The Results on the Stability of Glycolytic Metabolic Networks in Different Cells*
Qinghua Zhou, Li Jin, Momiao Xiong
- P16 - *On Scale-free Prior Distributions and Their Applicability in Large-scale Network Inference with Gaussian Graphical Models*
Paul Sheridan, Takeshi Kamimura, Hidetoshi Shimodaira
- P17 - *Time Dependent Virus Replication in Cell Cultures*
J. G. Diaz Ochoa, A. Voigt, H. Briesen, K. Sundmacher



- P18 - Studies on Interpretive Structural Model for Forest Ecosystem Management Decision-making*
Suqing Liu, Yingshan Pu, Yuanman Zhou, Yuequn Huang, Weidong Han, Linfeng Li, Jiping Li, Qunying Zen
- P19 - Moving Breather Collisions in the Peyrard-Bishop DNA Model*
A. Alvarez, FR Romero, J. Cuevas, JFR Archilla
- P20 - The Contrast of Parametric and Nonparametric Volatility Measurement Based on Chinese Stock Market*
Xinwu Zhang, Yan Wang, Handong Li
- P21 - An Application on Merton Model in the Non-Efficient Market*
Feng Ya-nan, Xiao Qing-xian
- P22 - Symmetry Breaking in the Evolution of World Economic Structure*
Hui Wang, Guangle Yan
- P23 - Research on Block & Comovement Effect of Stock Market in Financial Complex Network by Community Structure Analysis*
Chongwei Du
- P24 - Fuzzy Entropy Method for Quantifying Supply Chain Networks Complexity*
Jihui Zhang, Junqin Xu
- P25 - A Social Network Model Based on Topology Vision*
Ping-Nan Hsiao
- P26 - The System Dynamics Research on the Private Cars' Amount in Beijing*
Fan Jie, Yan Guang-le
- P27 - Dynamics of Research Team Formation in Complex Networks*
Caihong Sun, Yuzi Wan, Yu Chen
- P28 - Modelling of Population Migration to Reproduce Rank-Size Distribution of Cities in Japan*
Hiroto Kuninaka, Mitsugu Matsushita
- P29 - Tracking the Evolution in Social Network: Method and Results*
Shengqi Yang, Bin Wu, Bai Wang
- P30 - Self-Organized Collaboration Network Model Based on Module Emerging*
Yang Hongyong, Lu Lan, Zhang Siying
- P31 - Performance Analysis of Public Transport Systems in Nanjing Based on Network Topology*
Li Ping, Zhu Zhen-Tao, Zhou Jing, Ding Jin-Yuan, Wang Hong-Wei, Wei Shan-Sen
- P32 - The Probability Distribution of Inter-car Spacings*
Jin Guo Xian, Dong Han
- P33 - Correlation Properties and Self-Similarity of Renormalization Email Networks*
Lianming Zhang, Sundong Liu, Yuling Tang, Hualan Xu
- P34 - Constructing Searchable P2P Network with Randomly Selected Long-Distance Connections*
Jingbo Shen, Jinlong Li, Xufa Wang
- P35 - Measurement and Statistics of Application Business in Complex Internet*
Lei Wang, Weiji Su, Yong Ren, Shuhang Wu, Xiuming Shan, Shiji Song
- P36 - Joint Channel-Network Coding (JCNC) for Distributed Storage in Wireless Network*
Ning Wang, Gang Yang
- P37 - Average Consensus in Networks of Multi-agents with both Impulsive Effects and Time-delays*
Quanjun Wu, Jin Zhou, Lan Xiang, Zengrong Liu
- P38 - The Control Based on Internal Average Kinetic Energy in Complex Environment for Multi-robot System*
Mao Yang, Yantao Tian, Xianghua Yin
- P39 - Adjustable Consensus of Mobile Agent Systems with Heterogeneous Delays*
Hong-yong Yang, Si-ying Zhang
- P40 - Sediment Transport Dynamics in River Networks: a Model*



Jie Huo, Xu-Ming Wang, Rui Hao, Jin-Feng Zhang

P41 - Less Restrictive Synchronization Criteria in Complex Networks with Coupling Delays

Yun Shang, Maoyin Chen

P42 - Synchronization of Complex Networks with Time-varying Coupling Delay via Impulsive Control

Yang Dai, Yunze Cai, Xiaoming Xu

P43 - Global Synchronization of Generalized Complex Networks with Mixed Coupling Delays

Yang Dai, Yunze Cai, Xiaoming Xu

P44 - Evolutionary Game in a Single Hub Structure

Xiaolan Qian, Junzhong Yang

P45 - Design of Multiphase Sinusoidal Oscillator based on FTFN

Yan Hui Xi, Qiao Liu, Li Liu

P46 - Scaling Relations in Absorbing Phase Transitions with a Conserved Field in one Dimension

Sang-Gui Lee, Sang B. Lee

Note: A-1 size portable boards will be provided for the authors to put on their posters. If one such board is not enough, a second board can be provided upon request. Authors are strongly encouraged to put on their posters as early as possible on the day with their respective poster session so that they could make use of tea break or lunch time to start their discussions earlier. Authors are gently reminded to remove their posters after their poster session. Local organizers will provide necessary tools for putting on posters. Student helpers will be around to provide help upon request. Thank you for your kind attention and enjoy your presentation.



Workshop on "Complexity Theory of Art and Music" (COART)

Brief Introduction

Recent studies have revealed in many artworks and pieces of music such features of complex systems as power law, small-world phenomenon and so on. It is clear that all features of artworks and music (at least what have passed check by time) should obey to the principles of the brain functioning, for instance, to the principles of patterns recognition. The aim of this satellite workshop is to investigate how ubiquitous and universal are complex properties in art and music and try to understand the relation of art and music features with the brain working.

Conference Date: Feb. 25, 2009

Room D-102

Program of Half-Day COART Workshop

Time	Authors	Title
1330-1400	Yevin Igor	Complexity and Art: Review of Recent Publications
1400-1430	Manuel Beltran del Rio, Germinal Cocho	Rank-Size Distribution of Notes in Harmonic Music. Shuffling of Distribution
1430-1500	Xiaofan Liu, Chi K. Tse, Michael Small	Composing Music with Complex Networks
1500-1530	Tea Break	
1530-1600	Grigolini Paolo, Adams David	Music, New Aesthetics and Complexity
1600-1630	Beautement Patrick, Bronner Christine	Complex Phenomena in Orchestras: Metaphors for Leadership and Enterprise
1630-1700	Koblyakov Alexander	Complexity Approach to Musicology



Workshop on "Causality in Complex Systems" (ComplexCCS)

Brief Introduction

One of the reasons people have difficulty in dealing with complex systems is that the linear causal chain way of thinking - A causes B causes C ... etc - breaks down in the presence of feedback and multiple interactions between causal and influence pathways. One could say that complex systems are characterised by networked rather than linear causal relationships. Moreover, the open-ended nature of complex adaptive systems implies that their structure, properties and behaviour can change dynamically as a result of interactions with the system's environment (e.g. through adaptation) and as a result of internal interactions (through self-organisation), so traditional notions of causality are even further stretched by these adaptive, self-organising and autopoietic behaviours. Nevertheless it is important to be able to reason about complex systems, make inferences about factors that contribute to current and alternative states of complex systems and explore their possible future trajectories, especially if we wish to influence them towards more favourable futures, and away from more dangerous possibilities.

This workshop seeks to review the state-of-the-art in thinking about Causality in Complex Systems, and to develop and discuss the key research questions the complex systems community most needs to address.

Furthermore, it aims to leverage relevant experience and knowledge by bringing together people who have expertise in particular domain-specific approaches to dealing with causal networks in different fields. We seek to stimulate cross-disciplinary synthesis and cooperation in methodological research.

Program of Full-Day ComplexCCS Workshop

Conference Date: Feb. 25, 2009

Room: D-206

Time	Titles and Presenters
1030-1040	Anne-Marie Grisogono "Introduction to Workshop"
1040-1110	David Batten "Causality and Complexity in Adaptive Neural Systems"
1110-1140	Peter Goodison, Peter Johnson, Joanne Thoms "Establishing Causality in Complex Human Interactions: Identifying Breakdowns of Intentionality"
1140-1210	Patrick Beaument, Christine Broenner "Complex Multi-modal Multi-level Influence Networks - Affordable Housing Case Study"
1210-1300	Lunch Break
1300-1330	Qin Zhang "The Difference between Single-Valued and Multi-Valued Cases in the Compact Representation of CPD in Bayesian Networks"
1330-1400	Qiang Luo, Xu Liu, and Dongyun Yi "Reconstructing Gene Networks from Microarray Time-Series Data via Granger Causality"
1400-1430	Frank Emmert-Streib, Matthias Dehmer "Towards a Partitioning of the Input Space of Boolean Networks: Variable Selection using Bagging"
1430-1500	Discussions on the Papers Presented
1500-1530	Tea Break
1530-1730	Planning Meeting for Future Workshops (by Invitation)



Workshop on "Complex Engineering Networks" (ComplexEN)

Scope

Complex network has been an active research field over the world after the great development over the last decade. This is the case not only in deeper and wider theoretical studies but also in many newly found real-world applications. This workshop aims at promoting the latest researches and applications on complex engineering networks, which serves as a representative collection and frontier exchange of this fast developing field.

Program of Full-Day ComplexEN Workshop

Conference Date: Feb. 25, 2009

Room: D-211

Time	Activities	Chair Person
0830-0835	Workshop Opening	Guanrong Chen City University of Hong Kong
0835-1015	Morning Session 1: <i>Modelling and analysis of complex networks - I</i>	Xiaofan Wang Shanghai Jiao Tong University
1015-1040	Tea Break	
1040-1155	Morning Session 2: <i>Modelling and analysis of complex networks - II</i>	Zengqiang Chen Nankai University
1200-1345	Lunch Time	
1345-1500	Afternoon Session 1: <i>Epidemics and failure spreadings on complex networks</i>	Michael Z.Q. Chen Leicester University
1500-1530	Tea Break	
1530-1710	Afternoon Session 2: <i>Control and coordination of complex networking systems</i>	Xiang Li Fudan University
1710	Workshop Closing	Guanrong Chen City University of Hong Kong

Oral Presentation Schedule

Morning Session 1: Modelling and analysis of complex networks - I
 Session Chair: Xiaofan Wang

- 08:35-09:00 Modeling and Dynamical Analysis of Molecular Networks Ruiqi Wang, Zengrong Liu
- 09:00-09:25 Networks That Optimize a Trade-Off between Efficiency and Dynamical Resilience Markus Brede, Bert de Vries
- 09:25-09:50 Power Law Modelling of Internet Topology Shi Zhou
- 09:50-10:15 Collective Aggregation Pattern Dynamics Control via Attractive/ Repulsive Function Michael Chen, Zhao Cheng, Hai-Tao Zhang, Tao Zhou, Ian Postlethwaite



Morning Session 2: Modelling and analysis of complex networks –II

Session Chair: Zengqiang Chen

- 10:40-11:05 Transforming Time Series into Complex Networks
Michael Small, Jie Zhang, Xiaoke Xu
- 11:05-11:30 Observing Stock Market Fluctuation in Networks of Stocks
Jing Liu, Chi Tse, Francis Lau, Keqing He
- 13:30-11:55 Visual Analysis of Complex Networks and Community Structure
Bin Wu

Afternoon Session 1: Epidemics and failure spreadings on complex networks

Session Chair: Michael Z.Q. Chen

- 13:45-14:10 Modeling Failure Propagation in Large-Scale Engineering Networks
Markus Schläpfer, Jonathan L. Shapiro
- 14:10-14:35 Modelling of Epidemics with a Generalized Nonlinear Incidence on Complex Networks
Maoxing Liu, Jiong Ruan
- 14:35-15:00 Model and Dynamic Behavior of Malware Propagation over Wireless Sensor Networks
Yu-Rong Song, Guo-Ping Jiang

Afternoon Session 2: Control and coordination of complex networking systems

Session Chair: Xiang Li

- 15:30-15:55 Eigenvalue Based Stability Analysis for Asymmetric Complex Dynamical Networks
Zengqiang Chen, Linying Xiang
- 15:55-16:20 Synchronization in Gradient Complex Networks
Xingang Wang
- 16:20-17:45 Collective Behavior Coordination and Aggregation with Low-Cost Communication
Hai-Tao Zhang, Michael Chen, Tao Zhou, Zhao Cheng, Pin-Ze Yu
- 16:45-17:10 Synchronization Stability of Coupled Near-Identical Oscillator Networks
Jie Sun, Erik M. Bollt, Takashi Nishikawa

Note: Each paper is offered 18 mins for presentation and 7 mins for free Q & A.



Workshop on "Modelling And Analysis of Human Dynamics" (MANDYN)

Brief Introduction

The activity of the recent years in the fields of computer science, sociology and statistical physics made possible to approach in a quantitative way the study of a variety of social systems. Network theory, agent-based modelling and simple cellular automata have been used to describe many systems related to human activity as: urban development, econophysics, traffic, analysis of queuing models. In all these cases the dynamics of these phenomena are driven by individual human actions. There is increasing evidence that the timing of many human activities, ranging from communication to entertainment and work patterns, follow non- Poisson statistics and more generally a universal behaviour. This inherent similarity in human patterns could impact all phenomena driven by human mobility, from epidemic prevention to emergency response, urban planning and agent-based modelling. This important conference is a perfect occasion to put together the scientists operating in the area of complex systems in such a way to produce a critical mass of competence and people necessary to boost the activity in the quantitative study of human dynamics.



Program of Full-Day MANDYN Workshop

Conference Date: Feb. 25, 2009

Room: D-207

Time	Titles and Presenters
1030-1100	INVITED TALK: Registration to a Conference: How People react to a deadline (Tentative Topic) L. Pietronero
1100-1130	Interplay between Evolutionary Game and Network Structure: the Coevolution of Social Net, Cooperation and Wealth Distribution Jie Ren et al.
1130-1200	The Simulation Modeling of the Complex System Sustainable Development : Case of World Economy Dmitry Chistilin
1200-1300	Lunch
1300-1330	Modified Human Development Index Evgeny Borodkin, Andrei Vityazev
1330-1400	Weighted Networks and Community Detection: Planning Productive Districts in Sardinia Alessandro Chessa
1400-1430	Dynamics of Priority-Queue Networks Kwang-Il Goh



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1430-1500	Generalized Thermodynamics Underlying the Laws of Zipf and Benford Carlo Altamirano, Alberto Robledo
1500-1530	Tea Break
1530-1600	High Resolution Dynamical Mapping of Social Interactions with Active RFID Ciro Cattuto
1600-1630	Human Mobility Networks and Epidemic Invasion Vittoria Colizza,
1630-1700	Towards the Characterization of Individual Users through Web Analytics Jose J Ramasco, Bruno Goncalves
1700-1730	Human Dynamics Song



Workshop on " Social Physics and its Applications" (SPA)

Brief Introduction

Social physics is to understand human society through using the reasoning and methodology of natural science, which seeks analogies from the world of physics to aggregate human behavior. When human organizes a society, it has its law of collective behaviors. Therefore social physics has two sides: material characteristic and mental attributes. Social physics as a scientific discipline has his own history of development. Around 1830 year Auguste Comte described sociology as 'social physics', but he only may find the simple analogies between physics and society. In 1950'-1980's there were appeared a lot of important scholars, such as Zipf, Garison, Haggett, Simon, Wilson and Prigogine etc. In China Niu had put the social combustion theory , Wang put artificial society and social computing and Gu put Wuli-Shili-Renli system approach to forward the social physics studies forward from different aspects

Society itself is a complex system, so we require some complex science theory, new system methodologies, complex system modeling, social network analysis etc to push the theoretical studies on social physics. The applied aspects in recent years the social stability, social harmony and anti-terrorism etc. put forward some crucial problems to be solved by us. We just wish organize this workshop to give a good chance to exchange the new research results in social physics and related topics. This workshop will be divided into two parts: 1. Social physics and its application to some real social problems in China; 2. Different useful system methodologies, expert mining, complex network, system modeling and cognitive theory for social problems. You are welcome to participate to our workshop.

Program of Full-Day SPA Workshop

Conference Date: Feb. 25, 2009

Room: D-201

Part I **Chair: Prof. NIU Wenyuan**

Time	Titles and Authors
1030-1100	Gu J.F.* , Song W.Q. , Zhu Z.X. , Liu Y.J. , "Expert mining for Solving Social Harmony Problems"
1100-1130	Yang J.M.* , Wang W.J. , Chen G.R. , "A Two-Level Complex Network Model and Its Application"
1130-1200	Tang X.J.* , "Qualitative Meta-Synthesis Techniques for Analysis of Public Opinions for In-Depth Study"
1200-1330	Lunch
1330-1400	Zheng R.* , Shi K. , Li S. , "The Influence Factors and Mechanism of Societal Risk Perception"
1400-1430	Fan Z.M.* , Niu W.Y. , Gu J.F. , "Control Mode of Public Emergency Response"
1430-1500	Liu Y.J.* , "Opinion Modeling Based on Meta-synthesis Approach"

Part II **Chair: Prof. GU Jifa**

Time	Titles and Authors
1530-1550	Li D.* , Wang Y.L. , Fu Y. , "Social Physics and the Flow of Migrant Peasant Workers"
1550-1610	Ma Y.H.* , Niu W.Y. , Li Q.Q. , "Research on Early Warning of Chinese Food Safety Based on Social



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	physics”
1610-1630	Ning M.* , Gu J.F. , “Research on Social Stability Mechanisms Based on Activation Energy and Gradual Activation Reaction Theory”
1630-1650	Wang Y.L.* , Li D. , “Social Physics and China’s Population Migration”
1650-1710	Fu Y.* , “Two-dimensional Coupling Model on Social Deprivation and its Application”
1710-1730	Chen M.Y.* , Liu Y.J. , “Research on the Best Time to Intervene into Network Public Opinion for Managers——Based on "Nankai Buick Affair"”

Note: The authors with * will give talks.



Invited Plenary Talks

Applications of statistical physics to understanding complex systems (Opening Talk)

H. Eugene Stanley,
Departments of Physics, Chemistry, Physiology, and Biomedical Engineering
Boston University USA

Abstract

We will address some significant open questions where statistical physics concepts and methods may be helpful.

- (1) The Anomalies of a Complex Fluid, Liquid Water
- (2) The Behavior of Complex Economic Systems
- (3) Threat Networks and Threatened Networks
- (4) Biological Physics: "THE FIRST THREE MINUTES OF ALZHEIMER DISEASE"

Additional concepts in complex systems will also be briefly discussed:

- (5) Applications of statistical physics to genomics (addressing questions such as why 97 percent of the human genome is called "junk DNA" since a traditional belief is that it has no known purpose).
- (6) Using statistical physics concepts to detect physiological abnormalities before they become life threatening

The architecture of complexity: From the topology of the WWW to the structure of the cell (Keynote and Closing Talk)

Dr. Albert-László Barabási
Center for Complex Network Research at Northeastern University
and Department of Medicine, Harvard Medical School, USA

Abstract

Systems as diverse as the world wide web, Internet or the cell are described by highly interconnected networks with amazingly complex topology. Recent studies indicate that these networks are the result of self-organizing processes governed by simple but generic laws, resulting in architectural features that makes them much more similar to each other than one would have expected by chance. I will discuss the amazing order characterizing our interconnected world and its implications to network robustness, social networks and potentially human diseases.

Synchronization and intervention of locally interacting multi-agent systems (Keynote)

Dr. Lei Guo
Academy of Mathematics and Systems Science
Chinese Academy of Sciences, China

Abstract

Multi-agent systems (MAS) arise from diverse fields in natural and artificial systems, e.g., schools of fish, flocking of birds, swarm intelligence and the coordination of autonomous mobile robots, *etc.* Generally speaking, MAS are composed of many agents which interact with each other by either local or global rules, or both. Even with only local interactions, the whole system may still emerge some kinds of collective behaviors, such as, consensus, synchronization, clustering, whirlpool, *etc.*, which are



macroscopic properties of the MAS. The understanding of the emergence phenomena from local to global (or from micro to macro), is a basic problem in the study of complex systems.

In this paper, we will work with a basic class of MAS, where each agent has the tendency to behave as other agents do in its neighborhood. This is a typical phenomenon in many MAS, especially in biological systems, and such a property is well captured by the so called Vicsek model. This model possesses some key features of the MAS, such as dynamic behavior, local interactions, and changing neighbor graphs. The simulations done by Vicsek and his coauthors tell us that all agents will eventually move in the same direction (synchronization) when the density is large and the noise is small. This model looks simple, but the nonlinear coupling relationship between the positions and headings makes the theoretical analysis quite involved. In fact, almost all of the existing studies have to resort to a certain kind of connectivity assumptions, which are difficult and troublesome issues in themselves.

In the first part of this talk, we will present some recent progress in the synchronization analysis of the above mentioned Vicsek model. We will give a complete theoretical analysis of this model without imposing any connectivity conditions. The main technical results are the following: a) For any given and fixed model parameters concerning with both the interaction radius r and the agents' moving velocity v , the overall system will synchronize as long as the population size n is large enough, which is consistent with the simulations given by Vicsek *et al*; b) If both r and v decrease as the population size n increases, but satisfy a certain decaying rates, then again, the overall system will synchronize for large n .

In the second part, we will address the problem of intervention of MAS. In many real applications, it is difficult or impossible to change the local rules of the agents, such as, the human customized behavior, the moving strategies of animals. Then what is the feasible way to intervene such kinds of MAS? To answer this question, we will propose a new notion called "soft control", which is different from the traditional approach of distributed control. To demonstrate the feasibility, we will consider two ways to intervene such MAS in this talk. The first one is to use a small portion of "information" agents, and the second one is to design one or more "intelligent" agent(s). In the first case, we will show that the proportion of the information agents needed will tends to zero as the population size increases to infinity. In the second case, we will give some examples to show how to design one or a few "intelligent" agents.

Finally, we will present some interesting problems for future investigation.

Characterizing node activity and local effect in complex networks (Keynote)

Dr. Deyi Li

National Natural Science Foundation of China, China

Abstract

Node activity, local effect, asymmetric topology and preferential attachment are basic characteristics of realistic networks focused in network science. Each active node is an independent acting agent, having different energy and uncertainty. Local effect of nodes is the result of node activity interaction, that is, each node affects its neighboring nodes, and at the same time, its neighboring nodes also affect itself. Moreover, this effectiveness will gradually decrease with the increase of distance, without any centralized control upon it. Furthermore, complex networks have other typical properties, such as asymmetric topology which presents as clustering nodes, and preferential attachment in network growing which is different from random attachment.



The nonlinear interactions between different parts of complex networks cause the emergent properties of whole network. As we know now, the emergent mechanism from the simple local interactions to the global collective behaviors is the core issue of network science research. The known common measures, such as degree distribution, betweenness distribution, clustering coefficient and average path length, etc., are used to characterize general statistical regulations. However, all the above measures are hard to characterize the inherent rules behind the emergent properties. For example, degree may be used to measure the connection ability of a node, while betweenness characterizing the ability of flow bridging, and clustering coefficient characterizing the phenomena of structural clustering, etc. Different measurement ways may get different results, and it is difficult to mix and measure the node ability of interaction, connection and localization.

From the classic concept of field introduced by M. Faraday in 1837, the field as an interpretation of non-contact interaction between particles in every different granularity, from atom to universe, had attained huge success. In a potential field, potential means the work done to move a unit object, such as a mass point or a charge point, from some position to the reference point. Data field introduced in 1999 by our group, as the main method in cognitive physics, reflects field model into the data space. It is a virtual field, describing the relationship among data point in coordinates, could be used to dig out data characteristics.

The locality of a node in network reflects its position potential, named as topological potential, which characterizes its ability of affecting other nodes, and the result of other nodes interaction effect overlapping. Topological potential and its distribution focus on the structural localization conducted by node activity. Considering a node in network as a potential source, it can affect others along with paths connecting each other. Hence all of nodes in a network affect each other by their potential fields overlapping. The potential field in networks does not like other classic field owning Euclidean distance, so we replace Euclidean distance by jumps between two nodes.

We will further discuss the choice of potential functions and the optimal effect factor, which is used to characterize the mathematical law of nodes interaction. In order to uncover the physical measures behind nodes potential interactions, we compared the common measure ways, such as degree, betweenness, closeness centrality and each of their distribution. It should be especially pointed out that topological potential along with paths between nodes cannot be measured simply by those common measure ways. Topological potential emphasizes nodes connection pattern, local activity, which leads to the emergent patterns of different connections, and is also helpful to understand the dynamics of networks.

In real world, each node has many reality attributes, reflecting different node activity. Topological potential regards these attributes as a source of the node ability, named as mass of node, affecting other nodes. The emergence and evolution of complex networks are the interaction result of nodes localizing with different reality attributes.

As an illustration and application of topological potential, we have carefully analyzed nodes ranking, community detecting, bridging nodes detecting, kernel membership of community discovering and so on, took Krebs' political books online-selling network as the main demonstration. In the demonstration network, nodes represent real time best seller (books) about US politics sold by the online bookseller Amazon, and edges represent frequent co-purchasing of books by the same buyers, as indicated by the "customers who bought this book also bought these other books" feature on Amazon. We conclude that the partial order ranking, as the form of top N is useful to some actual problems, comparing the ranking result with other well-known algorithms, such as PageRank and HITS. We also conclude that nodes



cluster by topological potential effect, forming different communities. Some nodes are kernel to a community for they localize in the topology attracting kernel. Some other nodes bridge among different communities for they are affected equally by these communities.

Spreading processes in complex techno-social networks (Keynote)

Dr. Alessandro Vespignani
Indiana University, USA

Abstract

In different contexts we are challenged by multi-scale networks where infrastructures composed by different technological layers are interoperating with the social component that drives their use and development. Examples are provided by the Internet, the social Web, the new WiFi communication technologies and transportation and mobility infrastructures. The multi-scale nature and complexity of these techno-social networks are crucial features in the understanding of these systems and the dynamical processes occurring on top of them.

We will discuss the central statistical features of these networks and their impact on epidemic, contagion and spreading processes in both the biological world and the ITC domain. We will present the development of realistic computational models based on the network paradigm and the reaction-diffusion processes framework that allows their theoretical understanding. Finally we will analyze the central role of complex networks thinking in the definition of predictive large scale computational approaches for the modeling of emergent disease spreading.

A Schroedinger-like equation for the PageRank

Dr. Guido Caldarelli
University of Rome "Sapienza", Italy

Abstract

Computation of PageRank is usually made iteratively with a large use of computational time. In this paper we show that the PageRank can be expressed in terms of a wave function obeying a Schroedinger-like equation. In particular the topological disorder given by the unbalance of outgoing and ingoing links between pages, induces wave function and potential structuring. This allows to directly localize the pages with the largest score. Based on this analysis we also propose a model of growth of the WWW based on PageRank evaluation.

Percolation and immunization of complex networks

Dr. Shlomo Havlin
Bar-Ilan University, Israel

Abstract

Statistical physics approaches are developed and applied successfully in recent years to understand the topology, robustness and function of complex networks. We will show how ideas and tools from percolation theory lead to novel results on the robustness, immunization strategies, optimal paths and minimum spanning trees. These results are relevant to many real world systems ranging from the Internet to social systems and climate. A novel percolation process which is characterized by



fragmenting the network by removing a minimal number of nodes will be also discussed. This result is useful for efficient immunization strategies. We will also discuss how one can synthesize novel materials in which light can be localized by modifying the network topology.

Molecular models of the origin of life and biological evolution

Chin-Kun Hu

Institute of Physics, Academia Sinica, Taiwan

Abstract

In the talk, I first introduce molecular models of the origin of life and biological evolution with connected mutation-selection scheme proposed by Eigen [1] and the solution of a paradox about the origin of life with lethal mutants and truncated selection [2]. I then introduce Crow-Kimura model with parallel mutation-selection scheme [3]. Baake *et al.* mapped equations of the parallel model into a quantum spin model in a transverse magnetic field [4]. Recently, David B. Saakian and I did the similar mapping for the Eigen model [5]. Using Suzuki-Trotter formalism, we have studied statics and dynamics of the Eigen model and the Crow-Kimura model with the single-peak fitness function and found that the relaxation in the parallel model is faster than that in the connected model [5]. We have also studied both models with rather general fitness functions [5] and obtained error thresholds for various cases. For the Eigen model with nonzero degradation rate, we find a new phase which can represent virus quasi-species under attack by the immune system [6]. We also study the Eigen model with multiple peaks which can represent virus or cancer cells attached by drug or the immune systems [7]. Finally, we calculate the phase diagrams of a diploid biological evolution model and find new phases in which the final steady states depend on initial sequence distributions [8].

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Evolution of complex networks studies during the past 10 years.

Dr. Byungnam Kahng

Seoul National University, Korea

Abstract

During the past 10 years since the publication of pioneering papers on small-world and scale-free networks, explosive number of papers have been published in multidisciplinary fields. In my talks, I present how researches on complex networks have evolved during the past 10 years through the introduction of a growing co-authorship network in network science. Fractality is found to be distinct



feature of the co-authorship network in the early stage of the evolution, which is hidden in the later stage. However, we find that it is still underneath the network structure as a skeleton when we remove inactive links. Dynamics on fractal scale-free networks is introduced, which proceeds slowly compared with the one on non-fractal scale-free networks.

Analysis and modeling of large scale social networks based on mobile phone data

János Kertész,
Budapest University of Technology and Economics, Hungary

Abstract

Recent development in information and communication technology has enabled to study networks of social interactions of unprecedented size. Such systems include email or phone networks and e-communities. In contrast to the traditional, questionnaire-based investigations, in these cases a natural quantitative measure of the strength of the interactions is present (like the frequency or duration of calls) leading to weighted network representations. One important observation is that this strength of the interactions varies over many orders of magnitude. A natural conclusion is that the weights play important roles both in the evolution of the network topology and in the dynamics of the processes on the networks. Based on simple rules borrowed from sociology we construct a model [1], where the emergence of the community structure is a consequence of the interplay between topology and weights. We show that the model reflects well the observations made on a huge call network [2, 3].

References

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Complexity in brain function

Dr. Seunghwan (Swan) Kim
Pohang University of Science & Technology, Korea.

Abstract

TBA

Component detection in complex networks

Choy Heng Lai
National University of Singapore, Singapore

Abstract

We study how to detect, in complex networks, groups or components each of which consists of nodes sharing a similar connection pattern. Based on the mixture models and exploratory analysis set up by Newman and Leicht, we develop an algorithm that is applicable to a network with any degree



distribution. The partitioning of a network suggested by this algorithm also applies to its complementary network. In general, groups of similar components are not necessarily identical with the communities in a community network: thus partitioning a network into groups of similar components provides additional information of the network structure. The proposed algorithm can also be used for community detection when the groups and communities overlap. By introducing a tunable parameter that controls the involved effects of heterogeneity, we can also investigate conveniently how the group structure can be coupled with the heterogeneity characteristics. In particular, an interesting example shows that a group partition can evolve into a community partition in some situations where the involved heterogeneity effects are tuned. The extension of this algorithm to weighted networks is discussed as well.

Comparison of cellular networks by using dynamic-based measures

Baowen Li

National University of Singapore, Singapore

Abstract

Cellular networks describe the relations between genes, proteins, metabolites and so on. The relations are physical, chemical or functional interactions. Comparison of cellular networks is one of the essential topics in systems biology, for example, one can gain deep insights into evolution by comparing networks of different species, or find cure solutions to diseases by comparing the diseased networks to healthy ones.

Structures and functions of cellular networks are bridged by dynamical processes occurring from micro- to macro- scales. To reach a reliable comparison we should compare simultaneously the patterns at different scales in a quantitative way. What is more, because we can not explore completely a cellular network, the resulting data are just some samples of the entire network. This incomplete exploration may also introduce noise to the resulting network, namely, artificial edges and losing edges and nodes.

Structures of networks determine the dynamical processes. The structures of complex networks can induce nontrivial properties to the physical processes occurring on them. The physical processes in turn can be used as probes to capture the structure properties. Well studied dynamical processes, such as the random walks and the Boolean dynamics, can be good candidates as probes.

In this talk we review briefly some of our recent works on this topic. The localization properties of electrons walking on networks are used to detect the structural characteristics of cellular networks. Totally eight protein-protein interaction networks are considered. It is found that the real world networks share some characteristics significantly different from some modeling networks.

Experimental evidence for fragile to strong crossover in general glass forming liquids

Francesco Mallamace,
Università di Messina, Italy

Abstract

It is becoming common practice to partition glass-forming liquids into two classes, based on the behavior of an Arrhenius plot, $\log(\eta)$ vs $1/T$ where η is the shear viscosity. Strong liquids correspond to linear behavior while fragile liquids to have up word-curvature. Here we analyze the existing experimental data of the transport parameters (the shear viscosity, the self-diffusion coefficients and



the density-density time relaxations) of 76 glass forming liquids. We show the data are consistent with the onset of an Arrhenius behavior for T below a crossover temperature T_{cross} , where $\eta \sim 10^3$ Poise, well above the glass transition temperature T_G where η is of the order of 10^{13} Poise for all liquids we study. We also show that below T_{cross} the Stokes-Einstein relation (SE) $D/T \sim \eta^{-1}$ is replaced by a fractional SE $D/T \sim \eta^{-0.65}$. We also note that $\eta_{\text{cross}} \sim 10^3$ Poise is far below the glass transition $\eta_{\text{cross}} \sim 10^{13}$ Poise. An important goal of our study is that the fractional SE (the variation with respect to temperature of the transport properties of all these glass forming liquids) gives clear evidence of a remarkable degree of universality.

Universal behavior of rank-ordered distributions in arts and sciences

Gustavo Martínez-Mekler

National Autonomous University of Mexico, Mexico

Abstract

During the past decade or so, a considerable amount of research has been devoted to power law behaviors, particularly with regard to complex networks. However, when real data is analyzed, in most of the cases the power law trend holds only for an intermediate range of values; there is a power law breakdown in the distribution tails. Both the breakdown point and the tail functional form are of interest. Several explanations leading to various power law correction schemes have been provided for this phenomenon, such as finite size effects, network dilution, network growth constraints and different underlying dynamical regimes. Here we uncover a universal behavior of the way in which elements of a system are distributed according to their importance with respect to a given property, valid for the full range of values, regardless of whether or not a power law has previously been suggested [1]. The two parameter function we propose for these rank-ordered distributions is a generalization of the beta distribution and gives excellent fits to an impressive amount of very diverse phenomena, coming from the arts, social and natural sciences. The parameters have the potential of providing a criterion for rough classifications.

Based on our phenomenological observations we have studied several models that generate data following our distribution. In some cases, under appropriate limiting conditions, we obtain the generalized beta functional form as a stationary solution. From the modeling and data analysis we have identified relevant features such as conflicting dynamics and convergence of multiple heterogeneous processes. The ubiquity of this functional universality suggests that there must be a general underlying explanation, most probably of a statistical nature. Some progress has been attained in this respect.

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The social harmony equation based on social physics

Wenyuan Niu

Institute of Policy and Management, China

Abstract



Social Harmony Equation (SHE) leads the social system to the evolution direction of social entropy increase by accumulation of "social combustion substances", i.e., the accumulation of microcosmic "basic particles" (individual) in social system from assimilate "basic social energy" to dissimilated one; meanwhile, the catalysis of "social combustion promoter" (social excitation energy) has enhanced the "social temperature" of disordering process of social system and completed the energy accumulation of social entropy increase that can generate the transition. Finally, ignited by the "social trigger threshold", the social system has completed the abrupt change from orderliness to disorderliness. The continuous variation of the above-mentioned three basic nonlinear processes has jointly composed the whole contents of social combustion theory. Under the restriction of such conditions of different time (t), different space (α) and different scale (β), it is finally explained as a comprehensive dynamics of social system deterioration.

Self-organization and finite size effects of the stylized facts in economics in a workable agent based model

Luciano Pietronero

Department of Physics, Univ. La Sapienza, Roma
and Institute of Complex Systems CNR, Roma, Italy

Abstract

The deviation from a Random Walk behavior in financial time series have been identified as Stylized Facts (SF) and are common to all markets. The main ones are that the fluctuations are much larger than those predicted from the standard economic theory (gaussian fluctuations), the clustering of volatility and a substantial nonstationarity of all properties. Many Agent Based Models have been proposed to explain these phenomena and many are indeed able to reproduce some of them. However the situation is still rather problematic because these models are typically rather complicated and with various ad hoc assumptions. This has prevented a systematic study of these effects. We have tried therefore to define a workable Agent based Model (1), which would contain the essential elements, but in a mathematically simple and well defined framework. In addition we have considered some new important elements like the nonstationarity of the process with respect to the number of agents and the question of the self-organization. Namely why all markets evolve spontaneously towards the situation corresponding to the SF, considering that in all models this is restricted to a narrow range of parameters.

The SF are shown to correspond to finite size effects (with respect to time and to the number of agents N) which, however, can be active at different time scales. This implies that universality cannot be expected in describing these properties in terms of effective critical exponents. The introduction of a threshold in the agents' action (small price movements lead to no action) triggers the self-organization towards the intermittent state corresponding to the SF. From these studies the herding phenomenon seems to be a crucial one beyond the standard theory as a triggering element of bubbles and crashes which develop spontaneously without a cause-effect relation. The model can also be used backwards to derive the strategies of the agents from the price time series. Other applications are under consideration like the problem of finite liquidity and the possibility that the reference fundamental price is subject to large fluctuations if one considers that all markets are linked into a large network (2).

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Mechanisms of systemic risk: contagion, reinforcement, redistribution

Frank Schweitzer
Chair of Systems Design, ETH Zurich, Switzerland

Abstract

The term 'systemic risk' commonly denotes the risk that a whole system consisting of many interacting agents fails. It is a macroscopic property which emerges from the nonlinear interactions of agents. In fact, 'systemic risk' already implies that the failure of the system cannot be fully explained by the failure of a single agent. Instead, one has to understand how such singular failures are able to spread through the whole system, affecting other agents. Here, in addition to network topology, dynamic mechanisms such as contagion (similar to epidemic processes or herding behavior), reinforcement (of prevailing trends), and redistribution (e.g. of load, stress, or debt) play a considerable role. The talk aims at categorizing some of the existing models in a common framework, first, and discussing a specific model of financial networks, afterwards, to elucidate the critical conditions for the breakdown of a system.

Shortest path discovery of complex networks and the Internet: Some exact results

Gábor Vattay
Eötvös University, Hungary.

Abstract

TBA

Statistical properties (entropy, freezing, organization) of single solution clusters for a random K-Satisfiability formula

Haijun Zhou
Chinese Academy of Sciences, China

Abstract

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