

Jianxi Gao, Ph.D.

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RESEARCH INTEREST

- *Theories* Network Science, Control Theory, Data Science, Information Science, Operations Research
- *Methods* Graph Theory, Statistical Mechanics, Data Mining, Info. Visualization, Multi-Agent Model
- *Applications* Critical Infrastructure, Cyber Physical, Ecological, Biological, & Social-economical Systems

My Major Contributions: (I) A fundamental and theoretical framework of robustness of a network of networks published in *Nature Physics* (citation over 500) and *Physical Review Letters* (citation over 300); (II) A fundamental framework for the resilience of complex systems. The NSF has selected our video as the best science videos of 2016 ([Network Earth](#)); (III) An innovative methodology to minimize the driver nodes in control systems. My publications have been cited for over 1,500 times and have been reported over 20 times by international public and professional media.

APPOINTMENTS

Assistant Professor of computer science Rensselaer Polytechnic Institute	Aug. 2017 -
Research Assistant Professor, Northeastern University	Sep. 2016 - Aug. 2017
<i>Advisor: Albert-Laszlo Barabasi, Robert Gray Dodge Professor of Network Science</i>	
Postdoctoral Research Associate, Northeastern University	Nov. 2013 - Aug. 2016
<i>Advisor: Albert-Laszlo Barabasi, Robert Gray Dodge Professor of Network Science</i>	
Vis Post-Doc Research Assoc, Northeastern University	Nov. 2012 - May 2013
<i>Advisor: Albert-Laszlo Barabasi, Robert Gray Dodge Professor of Network Science</i>	
Research Assistant, Boston University	Sep. 2010 - May 2012
<i>Advisor: H. Eugene Stanley (NAS), William Fairfield Warren Distinguished Professor</i>	
Visiting Scholar, Boston University	Sep. 2009 - Aug. 2010
<i>Advisor: H. Eugene Stanley (NAS), William Fairfield Warren Distinguished Professor</i>	
Research Assistant, Intelligent Information Control Lab at SJTU	2006-2009
<i>Advisor: Xiaoming Xu, Past Vice President of Shanghai Jiao Tong University, Professor of Automation</i>	

EDUCATION

Ph.D. Shanghai Jiao Tong University, Control Theory and Control Engineering	2008-2012
<i>Advisor: Xiaoming Xu, Thesis: Robustness and synchronization of network of networks.</i>	
<i>Co-Advisor: H. Eugene Stanley (NAS) and Shlomo Havlin (Past President of Israel Physical Society).</i>	
M.S. Shanghai Jiao Tong University, Control Theory and Control Engineering	2006-2009
<i>Advisor: Xiaoming Xu; Thesis: Convergence of dynamic networks based on Vicsek model</i>	
B.S. Dalian University of Technology, Chemical and Mechanical Engineering	2002-2006
<i>Advisor: Hongguang Dong; Thesis: Real-time optimization of process system - Data Rectification</i>	

JOURNAL PAPERS [\[Google Scholar\]](#) [\[Researcher ID\]](#)

- [1] Gu, Yupeng and Sun, Yizhou and Gao, Jianxi [The Co-Evolution Model for Social Network Evolving and Opinion Migration](#) *Proceedings of the 23rd ACM SIGKDD International Conference on Knowledge Discovery and Data Mining*, 175-184 (2017).
- [2] N. K. Panduranga, [J. Gao](#), X. Yuan, H. E. Stanley, and S. Havlin. [Generalized model for \$k\$ -core percolation and interdependent networks](#) *Phys. Rev. E*, 96, 032317 (2017).

- [3] X. Liu, L. Pan, H. E. Stanley, and *J. Gao*^{*1}. [Controllability of giant connected components in a directed network](#). *Phys. Rev. E*, 95, 042318 (2017).
- [4] M. Posfai, *J. Gao*, S. Cornelius, R. D'Souza, and A.-L. Barabasi. [Controllability of Multilayer, Multi-Timescale Networks](#). *Phys. Rev. E*, 94, 032316 (2016).
- [5] *J. Gao*, B. Barzel, and A-L. Barabasi. [Universal Resilience Patterns in Complex Networks](#). *Nature*, 530(7590), 307-312 (2016). (MATLAB software, NuRsE.)
- [6] X. Liu, H. E. Stanley, and *J. Gao*. [Breakdown of Interdependent Directed Networks](#). *Proceedings of the National Academy of Sciences*, 113(5), 1138-1143 (2016).
- [7] J.-H. Cho and *J. Gao*^{*}. [Cyber War Game in Temporal Networks](#). *PLOS ONE*, 11(2), e0148674 (2016).
- [8] *J. Gao*, X. Liu, D. Li, and S. havlin. [Recent Progress on the Resilience of Complex Networks](#). *Energies*, 8(10), 12187–12210 (2015).
- [9] H. Peng, D. Zhao, X. Liu, and *J. Gao*^{*}. [Collective Motion on A Network of Self-propelled Agent Systems](#). *PLOS ONE*, 10(12): e0144153 (2015).
- [10] X. Liu, H. Peng, and *J. Gao*^{*}. [Vulnerability And Controllability of Networks of Networks](#). *Chaos, Solitons & Fractals*, 80, 125-138 (2015).
- [11] *J. Gao*, Y.-Y. Liu, R. D'Souza, and A.-L. Barabasi. [Target Control of Complex Networks](#). *Nature Communication* 5, 5415 (2014).
- [12] *J. Gao*, D. Li, and S. Havlin. [From Single Network to Network of Networks](#). *Nati. Sci. Rev.* 1, 346 (2014).
- [13] S. Havlin, H. E. Stanley, A. Bashan, *J. Gao*, and D. Y. Kenett. [Percolation of Interdependent Network of Networks](#). *Chaos, Solitons & Fractals* 72, 4-19 (2014).
- [14] S. Havlin, D. Y. Kenett, A. Bashan, *J. Gao*, and H. E. Stanley. [Vulnerability of Network of Networks](#). *Eur. Phys. J. Special Topics* 223, 2087 (2014).
- [15] *J. Gao*^{*}, S. V. Buldyrev, H. E. Stanley, X. Xu, and S. Havlin. [Percolation of A General Network of Networks](#). *Phys. Rev. E*, 107, 195701 (2013).
- [16] D. Zhou, *J. Gao*, H. E. Stanley, and S. Havlin [Percolation of Partially Interdependent Scale-free Networks](#). *Phys. Rev. E*, 88, 062816 (2013).
- [17] G. Dong, *J. Gao*, R. Du, L. Tian, H. E. Stanley, and S. Havlin. [Robustness of Network of Networks Under Targeted Attack](#). *Phys. Rev. E*, 87, 052804 (2013).
- [18] *J. Gao*, S. V. Buldyrev, S. Havlin, and H. E. Stanley. [Networks Formed From Interdependent Networks](#). *Nature Physics*, 8, 40-48 (2012). (C++ software, NON)
- [19] *J. Gao*^{*}, S. V. Buldyrev, S. Havlin, and H. E. Stanley. [Robustness of A Network Formed by n Interdependent Networks With A One-to-one Correspondence of Dependent Nodes](#). *Phys. Rev. E*, 85, 066134 (2012).
- [20] G. Dong, *J. Gao*^{*}, L. Tian, R. Du, Y. He [Percolation of Partially Interdependent Networks Under Targeted Attack](#). *Phys. Rev. E*, 85, 016112 (2012).

¹Symbol * indicates that I am the corresponding author or the co-corresponding author.

- [21] *J. Gao**, S. V. Buldyrev, S. Havlin, and H. E. Stanley. [Robustness of a Network of Networks](#). *Phys. Rev. Lett.*, 107, 195701 (2011).
- [22] X. Huang, *J. Gao*, S. V. Buldyrev, S. Havlin, and H. E. Stanley. [Robustness of Interdependent Networks Under Targeted Attack](#). *Phys. Rev. E*, 83, 065101(R) (2011).
- [23] *J. Gao**, S. Havlin, X. Xu, and H. E. Stanley. [Angle Restriction Enhances Synchronization of Self-propelled Objects](#). *Phys. Rev. E*, 84, 046115 (2011).
- [24] Z. Chen, *J. Gao*, Y. Cai, and X. Xu. [Evolutionary Prisoners Dilemma Game in Flocks](#). *Physica A*, 390, 50-56 (2011).
- [25] Z. Chen, *J. Gao*, Y. Cai, and X. Xu. [Evolution of Cooperation among Mobile Agents](#). *Physica A*, 390, 1615-1622 (2011).
- [26] Y. Cai, L. Xu, *J. Gao*, and X. Xu. [Study on Robust \$H_\infty\$ Filtering in Networked Environments](#). *International Journal of Automation and Computing*, 8, 465–471 (2011).
- [27] *J. Gao**, Z. Chen, Y. Cai, and X. Xu. [Enhancing The Convergence Efficiency of A Self-propelled Agent System Via A Weighted Model](#). *Phys. Rev. E*, 81, 041918 (2010).

Book and Book chapters

- [1] D. Kenett, *J. Gao*, X. Huang, S. Shao, I. Vodenska, S. Buldyrev, G. Paul, H. E. Stanley, S. Havlin. [Network of Interdependent Networks: Overview of Theory and Applications](#). *Networks of Networks: The Last Frontier of Complexity*. Springer, 107, 3–36 (2014).
- [2] *J. Gao*, A. Bashan, S. Havlin. [Introduction to Network of Networks](#). IOP ebooks (2016) In preparation (invited).

Patents

- [1] *J. Gao*, Y. Cai, C. Wen, X. Xu. Optimization method for multi-agent synchronization. *China Patent*, CN102393709A, 2012.

Journal Publication in Chinese (Mainly Undergraduate Work)

- [1] L. Song, Y. Cai, *J. Gao*, X. Xu. Multi-Sensor Data Fusion for Delayed Systems. *Control Engineering*, 2, (2010).
- [2] R. Li, Y. Cai, *J. Gao*, X. Xu. A Multi-Sensor Fusion Estimation Method. *Control Engineering*, 2, (2010).
- [3] *J. Gao*, Z. Chen, Y. Cai, X. Xu. Approach to Enhance Convergence Efficiency of Vicsek Model. *Control and Decision*, 24(8), 1269-1272 (2009).
- [4] *J. Gao*, H. Dong, Y. Liu, S. Cui, X. Qin. Analysis and Simulation of Stock Market Based on Cellular Automata. *Mathematics in Practice and Theory*, 39(4), 6-12 (2009).
- [5] Y. Liu, H. Dong, *J. Gao*, S. Cui, X. Qin. Analysis of Investor's Psychology And Fluctuations of Stock's Price in Stock Market Based on Cellular Automata. *Bulletin of Science and Technology*, 24(3), 427-432 (2008).

- [6] *J. Gao*, H. Dong, J. Huang, Z. Han, X. Xu. Data Rectification Based on Fuzzy Self-Adaptability Genetic Algorithm. *Control and Instruments in Chemical Industry*, 34(4), 9-14 (2007).
- [7] H. Dong, Z. Han, *J. Gao*, Y. Cui, P. Yao, Y. Yuan. Realization of Integral Frame of Separation Sequence Synthesis by Intelligent Search Algorithm. *Applied Science and Technology*, 33(1), 55-58 (2006).
- [8] *J. Gao*, H. Dong, Y. Liu, J. Liu. Algorithm for Portfolio Based on The Strategy of Equal-Risk. *Journal of Xi'an Institute of Technology*, 25(5), 425-428 (2005).

SUMMARY OF JOURNAL PAPERS

Journals	#	Impact Factor	Journals	#	Impact Factor
<i>Nature</i>	1	41.5	<i>Nature Communications</i>	1	11.5
<i>Nature Physics</i>	1	20.1	<i>Physical Review Letters</i>	1	7.5
<i>PNAS</i>	1	9.7	<i>Physical Review E</i>	9	2.3
<i>Nati. Sci. Rev.</i>	1	8	<i>Chaos, Solitons and Fractals</i>	2	1.4
<i>PLOS ONE</i>	2	3.2	<i>Eur. Phys. J. Special Topics</i>	1	1.4
<i>Energies</i>	1	2.1	<i>Inter. Jour. of Auto. and Com.</i>	1	TBD
<i>Physica A</i>	2	1.7	TOTAL	24	133.4

PUBLIC MEDIA & ARTS

- [20] “The Complex Networks of Our Planet”, **Next Nature Net**, April 25, 2016. ([Link](#))
- [19] “Resilience and complex systems (Translated from Italy)”, **Alekoslab**, April 17, 2016. ([Link](#))
- [18] “Prophecy given to scientists: when the extinction of bees? (Translated from Hebrew)”, **YNET**, Mar. 25, 2016. ([Link](#))
- [17] “How resilient is a complex system? Is it near collapse?”, **The Connectivist**, Mar. 17, 2016. ([Link](#))
- [16] “Patterns of Resilience and Collapse”, **Andrew Zolli**, Mar. 13, 2016. ([Link](#))
- [15] “Predicting the resiliency ‘tipping points’ of complex natural and social systems”, **Resilient Investor**, Mar. 9, 2016. ([Link](#))
- [14] “Network Earth”, **Ecology**, Mar. 8, 2016. ([Link](#))
- [13] “A 5-minute video shows why the social network of plants and animals is so fragile (Translated from German)”, **WIRED**, Feb. 26, 2016. ([Link](#))
- [12] “What are the complex networks? (Translated from Italy)”, **WIRED**, Feb. 25, 2016. ([Link](#))
- [11] “We’re Pushing Nature’s Network Architecture To A Catastrophic Crash – Nature can compensate for failure. Until one too many things go wrong.”, **Fast Codesign News**, Feb. 23, 2016. ([Link](#))
- [10] “From Coral Reefs To Power Grids, This Math Tool Can Predict Whether A System Will Collapse”, **Forbes News**, Feb. 22, 2016. ([Link](#))
- [9] “Watch: Can nature handle many more extinctions?”, **Siliconrepublic News**, Feb. 22, 2016. ([Link](#))
- [8] “Social network of Earth’s plants and animals”, **Flowing Data**, Feb. 22, 2016. ([Link](#))
- [7] “Calculating Nature’s Tipping Point ”, **Geo Lounge**, Feb. 21, 2016. ([Link](#))
- [7] “Calculating Nature’s Tipping Point ”, **Remote Device**, Feb. 20, 2016. ([Link](#))
- [6] “Witness the Stunning Complexity of Network Earth”, **Stash Media**, Feb. 19, 2016. ([Link](#))

- [5] “Researchers find the tipping point between resilience and collapse in complex systems”, **Northeastern News**, Feb.17, 2016. ([Link](#))
- [4] “Network Earth”, Youtube, **Nature Video**, Feb. 17, 2016. ([Link](#))
- [3] “Scientists review worldwide rise of ‘network of networks’ ”, **Phys Org**, Dec. 3, 2014. ([Link](#))
- [2] “When Networks Network”, **Science News**, Sep. 7, 2012. ([The Link](#))
- [1] ”Tom Siegfried, Randomness: Networks of networks are all around you – and you are one”, **Science News**, Feb. 6, 2012. ([Link](#))

TEACHING EXPERIENCE

Teaching <i>Rensselaer Polytechnic Institute</i> ”Network Resilience (CSIC4977/6962)”.	2017 Fall
Co-Teaching <i>Boston University</i> ”Network Science (PY895)” with H. E. Stanley.	2016 Fall
Co-Teaching <i>Boston University</i> ”Network Science (PY895)” with H. E. Stanley.	2015 Fall
Teaching <i>Continuing Education School, Shanghai Jiao Tong University</i> “Computer Graph” and “Operating System”. The students were from Department of Computer Science.	2007–2008
Training <i>Baosteel Company</i> I trained Matlab to 13 employees of Baosteel Company (8 hours/day × 4 days).	Mar. 2009
Lab Supervisor <i>Intelligent Information Control Lab, Shanghai Jiao Tong University</i> Supervise undergraduate and graduate students on their research with Yunze Cai.	2007-2009
<i>Center for Polymer Studies, Boston University</i> Supervise graduate students on their research with H. Eugene Stanley.	2010-present

HONORS

Outstanding Thesis

- 2015 Outstanding Doctoral Dissertation, Shanghai.
- 2014 Outstanding Doctoral Dissertation Award by CAA.
- 2012 Shanghai Outstanding Doctoral Graduates.
- 2010 Outstanding Master’s Thesis, Shanghai.
- 2006 Outstanding Bachelor’s Thesis, Dalian University of Technology.

Outstanding Referees

- 2016 Outstanding Reviewer of Elsevier’s journals
- 2015 Distinguished Referees for Europhysics Letters.
- 2014 Distinguished Referees for Europhysics Letters.
- 2013 Distinguished Referees for Europhysics Letters.

Funding Awards

- 2011 Excellent Doctoral Student granted by Ministry of Education. \$5,000/year
- 2010 Outstanding Doctoral Dissertation Engagement Fund. \$ 11,800/year
- 2004 Science and Technology Innovation Fund for Undergraduates. \$ 320/year

Other Awards

- 2010 Guanghua Scholarship for Graduate Students.
2005 The Mathematical Contest in Modeling (USA), Second Prize.
2004 The Mathematical Contest in Modeling (USA), Second Prize.

GRANT PROPOSAL WRITING EXPERIENCE

- [1] Co-PI, wrote with Ryan Q. Wang (NEU), Haris Koutsopoulos (NEU), Amy Mueller (NEU), Ming Wang (NEU), Mario Small (Harvard) et al., “UrbanDN²A: Urban Dynamic Network of Networks Analysis for Community Connectivity Innovation (SCC, NSF)”, 2016, **Status: Submitted.**
- [2] Wrote with Albert-Laszlo Barabasi (NEU), Auroop R Ganguly (NEU), Stephen Flynn (NEU), Baruch Barzel (BIU) et al. “Critical Resilient Interdependent Infrastructure Systems and Processes (CRISP, NSF)”, 2016, **Status: Unfunded.**
- [3] Wrote with Albert-Laszlo Barabasi (NEU), R. D’Souza (UCDavis), Jin-Hee Cho (ARL) et al. ”Controlability of complex networks”, Army Research Lab (ARL), 2014. **Status: Funded, \$ 225K × 5 years.**
- [4] Wrote with Albert-Laszlo Barabasi (NEU), Yang-Yu Liu (Harvard) et al. ”Control strategies for multi-layer/multi-dependent network response to WMD attacks”, Defense Threat Reduction Agency (DTRA), 2013. **Status: Funded, \$ 210K × 5 years.**
- [5] Wrote with H. Eugene Stanley (BU), Shlomo Havlin (BIU) et al. “Dynamical processes in interdependent techno-social networks”, NSF, 2011, **Status: Funded, \$ 680K.**

INVITED TALKS

- [15] “Resilience of complex networks”, Scalable cooperation group in MIT Media Lab, Boston, June, 2016.
- [14] “Network of Networks: from structures to dynamics”, **NetSci Satellite: Netonets2016**, Seoul, South Korea, 2016.
- [13] “Network of Networks: from theory to applications”, **NetSci Satellite: Multiscale Characterization of the Human Diseases by Multinetworks**, Seoul, South Korea, 2016.
- [12] “Universal resilience patterns in complex networks”, Channing Lab, Harvard Medical School, February 2016.
- [11] “The extreme vulnerability of network of networks”, **NetSci Satellite: Physics of multilayered interconnected networks**, Berkeley, California, USA, 2014.
- [10] “The Extreme Vulnerability of Network of Networks”, **SIAM on Applications of Dynamic Systems**, Snowbird, USA, 2013, Featured Minisymposium Video ([Link](#)).
- [9] “Extremely vulnerability of a network of networks”, **FuturICT Workshop at MIT Media Lab**, Boston, USA, 2013.
- [8] “From single network to Network of networks”, **East Lake International Forum**, Wuhan, China, 2013.
- [7] “Controlling network of networks”, Automation Department, Shanghai Jiao Tong University, June 2013.
- [6] “Target control a complex network”, Automation Department, Huazhong University of Science and Technology, November 2013.
- [5] “Robustness of a network of networks”, **Workshop Networks’ Emergence and sustainability**, Venice, Italy, 2012.
- [4] “Networks of Networks”, **Workshop Complex networks**, Shanghai, China, 2012.
- [3] “Collective Motion”, Department of Mechanical Engineering and Department of Automation, Huazhong University of Science and Technology, June 2012.

- [2] “Extremely vulnerability of network of networks”, Physics Department, Bar-Ilan University, Sep. 2012.
- [1] “Networks of Networks”, Department of Electronic Engineering, Fu dan University, January 2012.

CONTRIBUTED TALKS AND CONFERENCES

- [6] *J. Gao*, B. Barzel, and A.-L. Barabasi. “Universal resilience patterns in complex networks”, Netsci2016, Seoul, South Korea, 2016. (Abstract + Oral)
- [5] *J. Gao*, Y.-Y. Liu, R. D’Souza, and A.-L. Barabasi. “Target Control of complex networks”, APS March meeting, Denver, USA, 2014. (Abstract + Oral)
- [4] Di Zhou , Jianxi Gao , Shlomo Havlin , H.Eugene Stanley, “Percolation of Double-Layer Networks with Different Topologies Under Random Attacks”, APS March meeting, Boston, USA, 2012. (Abstract)
- [3] Jianxi Gao , Sergey V. Buldyrev , H. Eugene Stanley , Shlomo Havlin, “Robustness of a Network of Networks”, APS March meeting, Boston, USA, 2012. (Abstract + Oral)
- [2] Xuqing Huang , Jianxi Gao , Sergey Buldyrev , Shlomo Havlin , H. Eugene Stanley, “Robustness of interdependent networks under targeted attack”, APS March meeting, Boston, USA, 2012. (Abstract)
- [1] Jianxi Gao, Zhuo Chen, “An Approach to Enhance Convergence Efficiency of Self-propelled Agent System”, First International Conference, Complex 2009, Shanghai, China, 2009. (Paper+Oral)

PROFESSIONAL ACTIVITIES

Editor Board Member

Nature Scientific Reports, since January 2015.

Reviewer

Science, PNAS, Physical Review X, Physical Review Letters, Physical Review E, Nature Scientific Reports, Plos One, New Journal of Physics, Journal of Physics: Condensed Matter, Europhysics Letter, Nonlinear Dynamics, Psychology, and Life Sciences, Journal of Statistical Mechanics: Theory and Experiment, IEEE Transactions on Knowledge and Data Engineering, IEEE/ACM Transactions on Computational Biology and Bioinformatics, IEEE Transactions on Control of Network Systems, IEEE Transactions on Network Science and Engineering, Journal of Statistical Physics, BMC Systems Biology, Canadian Journal of Physics, Physics Letters A, Physica A: Statistical Mechanics and its Applications, Journal of Circuits, Systems, and Computers, International Journal of Control.

Program Committee

- [1] 7th International Workshop on Complex Networks (CompleNet2016)

Co-organizer

- [1] Satellite “Controlling complex networks” in NetSci 2014, Berkeley, California.

Section Chair

- [1] “Resilience” section in NetSci 2016, Seoul, South Korea.

SELECTED SUPERVISED STUDENTS & VISITING SCHOLARS

Xin Yuan <i>Graduate Student in BU.</i>	2015-Present
Nagendra Panduranga <i>Graduate Student in BU.</i>	2014-Present
Huixin Zhang <i>Graduate student in SJTU China.</i>	2013-present
Xueming Liu <i>Visiting student in BU. Now assistant professor in HZUST</i>	2013-2016
Di Zhou	2011-2013

<i>Graduate Student in BU. Now Financial Software Developer at Bloomberg LP</i>	
Rujin Du	2010-2013
<i>Visiting student in BU. Now assistant professor in Jiangsu University</i>	
Gaogao Dong	2010-2013
<i>Visiting student in BU. Now assistant professor in Jiangsu University</i>	
Xuqing Huang	2010-2011
<i>Graduate Student in BU. Now Software Engineer at Google</i>	
Lin Song	2008-2009
<i>Graduate student in SJTU China. Now working in Exxon Mobil.</i>	

MENTORING UNDERGRADUATE RESEARCH

National Undergraduate Innovative Test Program	9/08-1/10
<i>Research on the emergence of collective behavior of multiple agent systems.</i>	
Undergraduate students: Lei Ji, Sheng Ding, Cong Gu, Mingming Zhao	
National Undergraduate Innovative Test Program	9/08-1/10
<i>Research on the complexity of financial markets based on multi-agent models.</i>	
Undergraduate students: Zhongling Hang, Ziyi Zhou, Xiangyang Liu, Yi Sun	