

Alexander J. Gates

CONTACT INFORMATION

Center for Complex Networks Research
Network Science Institute
Northeastern University
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ACADEMIC POSITIONS

Northeastern University, Network Science Institute
Center for Complex Networks Research (Advisor: [Albert-Laszlo Barabasi](#))

- Associate Research Scientist 2019 to present
- Post-doctoral Research Associate 2017 to 2019

EDUCATION

Ph.D. Informatics (Networks & Complex Systems) joint with *Cognitive Science* May 2017
Indiana University (Bloomington, Indiana, USA)

- Thesis topic: Anatomical and Effective Structure of Complex Systems
- Advisers: Professors Yong-Yeol Ahn, Randall D. Beer, Luis M. Rocha

M.Sc. Mathematical Modelling for Complex Systems January 2012
King's College London (London, United Kingdom)


B.A. Mathematics May 2009
Cornell University (Ithaca, New York, USA)


PUBLICATIONS

 [Google Scholar Profile](#)
 [ORCID Profile](#)

Working Papers & Currently Under Review

†: equal contribution

- P9. Grudt, R., Zippel, K. & **Gates, A. J.** (in prep.) Quantifying the Impact of NSF ADVANCE Grants on Recipients' Careers
- P8. **Gates, A. J.**[†], Gysi, D. M.[†], Kellis, M. & Barabasi, A.-L. (in submission) Tracing the impact of the Human Genome Project
- P7. Wang, X., **Gates, A. J.**, Resch, M. & Barabasi, A.-L. (in prep.) Quantifying systemic gender inequality in art
- P6. **Gates, A. J.**[†], Ke, Q.[†] & Barabasi, A.-L. (in prep.) Career trajectories of scientific excellence
- P5. **Gates, A. J.** & Barabasi, A.-L. (in prep.) Reproducible Science of Science at scale: pySciSci
 Code on: [Github](#)
- P4. Shekhtman, L. **Gates, A. J.** & Barabasi, A.-L. (in prep.) Elite hierarchies shape non-profit funding and governance
- P3. Ke, Q., **Gates, A. J.** & Barabasi, A.-L. (in prep.) The quantitative evolution of scientific fields

- P2. Varol, O., Kovacs, I. A., **Gates, A. J.** & Barabasi, A.-L. (in prep.) Quantifying the universal patterns of online success
- P1. **Gates, A. J.**, Wang, X., Correia, R. B. & Rocha, L. M. (in submission) The effective graph reveals redundancy, collective canalization, and control pathways in biochemical regulation and signalling
 Code on: **GitHub**

Peer Reviewed Journals


†: equal contribution

- J11. Huang, J.[†], **Gates, A.J.**[†], Sinatra, R. & Barabasi, A.-L. (2020) Historical comparison of gender inequality in scientific careers across countries and disciplines. **Proc. Natl. Acad. Sci. USA (PNAS)**.

Commentaries and Press coverage:

- **PNAS** "Do the social roles that women and men occupy in science allow equal access to publication?"
- **Nature Index** "Women rival men in scientific research publications and citations"
- **Inside Higher Education** "Gender Inequality in Science Careers and Publishing"
- **Diverse News** "Study: Gender Inequality Persists in Science Careers and Publishing"
- **Chemical & Engineering News** "Women publish at rates equal to men but leave science earlier"
- **Drug Target Review** "Gender inequality in STEM publishing due to female dropout rates, says study"
- **Science Nordic** "Women are not formally discriminated against in Norwegian academia but they still dont become professors"
- **The Paper** (in chinese)
- **News@Northeastern** "Do women publish less than men in scientific fields? Turns out, scientists have been asking the wrong question."

- J10. **Gates, A. J.** & Ahn, Y.-Y. (2019) CluSim: a python package for calculating clustering similarity. **Journal of Open Source Software** 4, 1264

 Code on: **GitHub**


- J9. **Gates, A. J.**, Ke, Q., Varol, O. & Barabasi, A.-L. (2019) Nature's reach: narrow work has broad impact. **Nature** 575, 32-34

Press coverage:

- **Fast Company** "This mesmerizing 3D map visualizes millions of scientific studies"
- **InfoDocket** "A Network of Science: 150 Years of Nature Papers"
- **ICMAB** "A network of science: 150 years of Nature papers"
- **Hungarian Insider** "Hungarian helps Nature magazine celebrate 150th anniversary"
- **News@Northeastern** "150 years of science in a cosmic web of paper trails"

- J8. **Gates, A. J.**, Wood, I. B., Hetrick, W. P & Ahn, Y.-Y. (2019) Element-centric clustering comparison unifies overlaps and hierarchy. **Scientific Reports** 9, 8574

- J7. Correia, R. B., **Gates, A. J.**, Wang, X. & Rocha, L.M. (2018) CANA: A Python Package for Quantifying Control and Canalization in Boolean Networks. **Frontiers in Physiology** 9, 1046

 Code on: **GitHub**

- J6. **Gates, A. J.** & Ahn, Y.-Y. (2017) Impact of Random Models on Clustering Similarity. **Journal of Machine Learning Research** 18, 1-28

- J5. Agmon, E., **Gates, A. J.** & Beer, R. D. (2016) The structure of ontogenies in a model protocell. **Artificial life** 22, 1-19
- J4. Agmon, E., **Gates, A. J.**, Churavy, V. & Beer, R. D. (2016) Exploring the space of viable configurations in a model of metabolism-boundary co-construction. **Artificial life** 22, 153-171
- J3. **Gates, A. J.** & Rocha, L.M. (2016) Control of complex networks requires both structure and dynamics. **Scientific Reports** 6, 24456
- J2. Kolchinsky, A., **Gates, A. J.** & Rocha, L. M. (2015) Modularity and the spread of perturbations in complex dynamical systems. **Physical Review E** 92, 060801
- J1. Das, S., **Gates, A. J.**, Abdu, H. A., Rose, G. S., Picconatto, C. A. & Ellenbogen, J. C. (2007) Designs for ultra-tiny, special-purpose nanoelectronic circuits. **IEEE: Circuits and Systems I**, 54, 2528-2540

Peer Reviewed Conference Proceedings

- C3. Agmon, E., **Gates, A. J.** & Beer, R. D. (2015) Ontogeny and adaptivity in a model protocell. **Proceedings of the European Conference on Artificial Life (ECAL'15)**. 216-223. York, UK.
- C2. Agmon, E., **Gates, A. J.**, Churavy, V. & Beer, R. D. (2014) Quantifying robustness in a spatial model of metabolism-boundary co-construction. **Proceedings of the International Conference on Artificial Life (ALife'14)**. 514-521. NYC, USA.
- C1. **Gates, A. J.** & Rocha, L. M. (2014) Structure and dynamics affect the controllability of complex systems: a preliminary study. **Proceedings of the International Conference on Artificial Life (ALife'14)**. 429-430. NYC, USA.

Other Works

- O1. Macdonald, B. & **Gates, A. J.** (2020) Experts' Commentary: The Soccer Team Problem. **The UMAP Journal** 41(3): 257-260

MULTIMEDIA PROJECTS

- M1. **Nature 150th anniversary** 2019
 Depicting the interconnected history of a scientific journal.



- 1) Cover visualization
- 2) Animated movie
- 3) 3D interactive network visualization

🏆 Awards: 2020 Webby Award; 2020 Peoples Choice Webby Award; Fast Company's 2020 Innovation by Design finalist in the Data Design category; 2020 European Design Gold Medal; Places & Spaces featured work

GRANTS

Contributed

- G3. **National Science Foundation:** (NSF # 2000713) Innovation Networks: The Creation and Diffusion of Gender Equity Ideas in Universities Senior Scientific Advisor (PIs: Kathrin Zippel & Laura Nelson) 2020-2023
 USD 990,931

- G2. Minerva Award, **Department of Defense**: Understanding fundamental dynamics, predictabilities, and uncertainties of scientific discovery 2019-2020
 Written and Subgroup Lead (PIs: Dashun Wang & Albert-Laszlo Barabasi)
 USD 1,500,000
- G1. **Templeton Foundation**: Using Big Data to Quantify & Cultivate Genius 2018-2021
 Written and Project Lead (PI: Albert-Laszlo Barabasi)
 USD 2,000,000

PRESENTATIONS

Invited conference talks and lectures

- NetSci-X 5th Intl. Conference and School on Network Science (Tokyo, Japan) 2020
 "How to find Network Communities and what to do with them"
- University of Oklahoma (Norman, Oklahoma) 2018
 "Visual analytics for network resilience"

Contributed Talks

- Complex Networks 2020 (Madrid, Spain) 2020
 "The effective graph reveals redundancy, canalization, and control pathways in biochemical regulation and signaling"
- International Conference on Network Science (Burlington, VT) 2019
 "The effective graph captures canalizing dynamics and control in Boolean network models of biochemical regulation"
- International Conference on Network Science (Indianapolis, IN) 2017
 "On comparing clusterings: an element-centric framework unifies overlaps and hierarchy"
- Advanced Computational Neuroscience Network (Ann Arbor, MI) 2016
 "Comparing the multi-scale structure of human connectomes"
- Conference on Complex Systems (Tempe, AZ) 2015
 "Control of complex networks requires structure and dynamics"
- International Conference on Artificial Life (New York, NY) 2014
 "Structure and dynamics affect the controllability of complex systems: a preliminary study"
- Workshop on Very Small Robots (McLean, VA) 2005
 "Designs for ultra-tiny, special-purpose nanoelectronic circuits"

TEACHING

Instructor of Record, Indiana University Bloomington

- I201 Mathematical Foundations of Informatics Spring 2017
- I201 Mathematical Foundations of Informatics Fall 2016
- I201 Mathematical Foundations of Informatics Spring 2016
- I201 Mathematical Foundations of Informatics Fall 2015

Associate Instructor, Indiana University Bloomington

- I201 Mathematical Foundations of Informatics, Honors Spring 2012
- I201 Mathematical Foundations of Informatics Fall 2011

Instructor of Record, Cornell University

- BTRY 115 Intro To Quantitative Methods Spring 2009
- BTRY 115 Intro To Quantitative Methods Spring 2008

Teaching Assistant, Cornell University

- Math 012 Calculus Spring 2009
- Math 011 Calculus Fall 2008

	Math 012 Calculus	Spring 2008
	Math 011 Calculus	Fall 2007
	Prefreshman Mathematics Summer Program	Summer 2007
ADVISING	PhD Students	
	Charles Levine, Maj. US Army	2019-present
	Xindi Wang	2019-present
	Milan Janosov	2019
	Masters Students - Thesis	
	Rachael Grudt	2020-2021
	Masters Students - Project	
	Trevor Pearce, Indraneel Sunil Mane, Ashutosh Singh, Nolan Bock	2020
	Xinyu Tang, Apoorva Kasoju, Sreejith Sreekumar	2019
	Undergraduate Students	
	Kristen Flaherty	2019
INDUSTRIAL POSITIONS	MITRE	
	Student Intern in the Nanosystems Group	2006
	Student Intern in the Nanosystems Group	2004
HONORS	Conference	
	<ul style="list-style-type: none"> • Best Paper, European Conference on Artificial Life (York, United Kingdom) 2015 • Best Poster, IGERT Research Showcase (Bloomington, Indiana, USA) 2014 • Best Poster, IGERT Research Showcase (Bloomington, Indiana, USA) 2013 • MITRE Best Technical Paper Runner-Up (McLean, Virginia, USA) 2007 • Semi-Finalist, Intel Science Talent Search 2005 • State Finalist, Junior Science and Humanities (New York, USA) 2005 	
	Scholarship	
	<ul style="list-style-type: none"> • Trainee, NSF/IGERT Brain Body Environment, Indiana University 2012-2015 • Thomas J. Watson Scholar, IBM 2005-2009 	
SERVICE	International Service	
	<ul style="list-style-type: none"> • <i>Interdisciplinary Contest in Modeling</i> 2019-2020 The ICM is an international contest for $\approx 20,000$ undergraduate students. Here I authored the Network Science Problem, participated in triage and final grading, and authored the problem perspective [O1]. 	
	University and Departmental Service	
	<ul style="list-style-type: none"> • <i>CCNR Journal Club</i> 2017-2019 organize a biweekly meeting of post-docs to discuss recent literature • <i>Complex CopyCats</i> 2013-2016 founder and lead organizer of this reading group focused on reproducing results from important complexity science papers • <i>Graduate Program Committee</i> 2013-2015 student representative with focus on curriculum development, degree requirements, and admissions 	

- *Graduate Informatics Student Association (GISA)* 2013-2015
co-founder and institutional voice chair

Conference Organization

- Program Committee, *Complex Networks 2020* (Madrid, Spain). December 2020
- Satellite Organizer, *Quantifying Success* (Rome, Italy). September 2020
- Program Committee, *NetSci 2020* (Rome, Italy). September 2020
- Program Committee, *NetSci-X 2020* (Tokoyo, Japan). January 2020
- Program Committee, *Complex Networks 2019* (Lisbon, Portugal). December 2019
- Poster Session Co-chair, *CompleNet 2018* (Boston, MA). March 2018

Reviewer

- **Funding:** National Science Foundation (NSF, SoS:DCI)
- **General:** *Proc. Natl. Acad. Sci. U.S.A* (PNAS); *Nature Communications*; *Scientific Reports*
- **Data Science:** *EPJ Data Science*; *Applied Network Science*; *Transactions on Knowledge Discovery in Data*; *Pattern Recognition*
- **Physics:** *Physical Review X*; *Physical Review E*; *Chaos*
- **Computer Science:** *PeerJ Computer Science*; *IEEE Access*; *IEEE Transactions on Fuzzy Systems*; *Journal of Open Source Software*; *IEEE Signal Processing Letters*; *Engineering Optimization*
- **Computational Biology:** *Nature Neuroscience*; *Proceedings of the Royal Society B*; *Bioinformatics*; *Nucleic Acids Research*
- **Other:** *Intelligent Systems in Accounting, Finance and Management*; *Artificial Life*