Alexander J. Gates

CONTACT INFORMATION

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ACADEMIC POSITIONS

Northeastern University, Network Science Institute
Center for Complex Networks Research (Barabasi Lab)

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

EDUCATION

Ph.D. *Informatics (Complex Systems)* joint with *Cognitive Science*, April 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*, Cornell University (Ithaca, New York, USA) May 2009

PUBLICATIONS

Google Scholar Profile
ORCID Profile

Working Papers & Currently Under Review
†: equal contribution

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.) Quantitative Science of Science at scale
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

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)**. (5-year IF: 10.620)

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 (5-year IF: 1.01)
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 4, 1264 (cover story; 5-year IF: 45.819)

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 (5-year IF: 7.670)

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 (5-year IF: 4.134)

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 (5-year IF: 3.621)

J5. Agmon, E., **Gates, A. J.** & Beer, R. D. (2016) The structure of ontogenies in a model protocell. **Artificial life** 22, 1-19 (5-year IF: 1.186)

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 (5-year IF: 1.186)

J3. **Gates, A. J.** & Rocha, L.M. (2016) Control of complex networks requires both structure and dynamics. **Scientific Reports** 6, 24456 (5-year IF: 7.670)

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 (5-year IF: 2.287)

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 (5-year IF: 2.918)

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; 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 2020-2023
Senior Scientific Advisor (PIs: Kathrin Zippel & Laura Nelson)
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

- 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 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

- Best Paper, European Conference on Artificial Life (York, United Kingdom) 2015
- Best Poster, IGERT Resarch Showcase (Bloomington, Indiana, USA) 2014
- Best Poster, IGERT Resarch Showcase (Bloomington, Indiana, USA) 2013
- MITRE Best Technical Paper Runner-Up (McLean, Virgina, USA) 2007
- Semi-Finalist, Intel Science Talent Search 2005
- State Finalist, Junior Science and Humanities (New York, USA) 2005

Scholarship

- Trainee, NSF/IGERT Brain Body Environment, Indiana University 2012-2015
- Thomas J. Watson Scholar, IBM 2005-2009

Service

International Service

- *Interdisciplinary Contest in Modeling* 2019-2020
  International undergraduate contest for approx. 20,000 students
  authored the Network Science Problem, participated in triage and final grading, and authored problem perspective

University and Departmental Service

- *CCNR Journal Club* 2017-2019
  organize a biweekly meeting of post-docs to discuss recent literature
- *Complex CopyCats* 2013-2016
  founder and lead organizer of this reading group focused on reproducing results from important complexity science papers
- *Graduate Program Committee* 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*