Vicky Chuqiao Yang

Omidyar Fellow and Peters Hurst Scholar, Santa Fe Institute

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Education

Ph.D. Applied Mathematics 2018
Northwestern University, Evanston, IL
Advised by: Daniel M. Abrams
Dissertation: Mathematical Models of Social Systems
with Applications to Urban Scaling Laws and Political Party Polarization

M.S. Applied Mathematics 2014
Northwestern University

B.S. Mathematical Sciences; B.S. Physics 2013
Worcester Polytechnic Institute (WPI), Worcester, MA
With high distinction

Academic Positions

Santa Fe Institute (SFI), Santa Fe, NM 2018–present
Omidyar Fellow and Peters Hurst Scholar (independent research position)

Northwestern University, Evanston, IL 2014–2018
Teaching and Research Assistant

Argonne National Laboratory, Lemont, IL 2012
Lee Teng Intern in Accelerator Physics

Worcester Polytechnic Institute, Worcester, MA 2010–2012
Research Assistant, Social Psychology Inquiry Lab

Grants

- National Science Foundation: Rule of Life: Emergent Networks, 2021–2025
  "Towards a unified theory of regulatory functions and networks across biological and social systems." $2,199,383. H. Youn (PI, Northwestern Kellogg), **V.C. Yang** (co-PI), C.P. Kempes, S. Redner, G.B. West (co-PIs, SFI).
- National Science Foundation: Decision, Risk, and Management Sciences, 2021–2024
  "Understanding the effect of individual decision-making strategies on collective decision outcomes." **V.C. Yang** (PI), J.L. Skorinko (co-PI, WPI), A. Harutyunyan (co-PI, Sunwater Institute). (funding recommended, forthcoming)

Peer-reviewed Publications in Journals

- **V.C. Yang**, M. Galesic, H. McGuinness*, A. Harutyunyan "Dynamical-system model predicts when social learners impair collective performance," *Proceedings of the National Academy of Sciences* (2021, forthcoming) Preprint: `arxiv.org/abs/2104.00770`.
- E.H. Mora*, C. Heine*, J.J. Jackson*, G.B. West, **V.C. Yang**, C.P. Kempes "Scaling of urban income inequality in the USA," *Journal of the Royal Society Interface* 18:20210223 (2021).
- **V.C. Yang**, T. van der Does, H. Olsson, "Falling through the cracks: A dynamical model for the formation of social category boundaries," *PLoS ONE* 16(3): e0247562 (2021).

*Undergraduate mentee

- **V.C. Yang**, D.M. Abrams, G. Kernell, A.E. Motter, "Why are US parties so polarize? A 'satisficing' dynamical model," *SIAM Review*, 62(3), 646–65 (2020).
- L.M.A. Bettencourt, **V.C. Yang**, J. Lobo, C. Kempes, D. Rybski, M. Hamilton, "The interpretation of urban scaling analysis in time," *Journal of the Royal Society Interface*, 17, 163 (2020).
- **V.C. Yang**, A.V. Papachristos, D.M. Abrams, "The origin of urban-productivity scaling laws," *Physical Review E*, 100, 032306 (2019).
- L. Lee*, S. Zhang*, **V.C. Yang**, "Do two parties represent the US? Clustering analysis of US public ideology survey," *SIAM Undergraduate Research Online*, vol. 12 (2019). DOI: 10.1137/17S016518.
- B.S. Tilley, **V.C. Yang**, J.C. Baiense, and S. Evans, "Frequency-dependent thermal resistance of vertical U-tube geothermal heat exchangers," *Journal of Engineering Mathematics*, 102 131-150 (2017).
- E.M. Moon, **C. Yang**, and V.V. Yakovlev, "Microwave-induced temperature fields in cylindrical samples of graphite powder—Experimental and modeling studies," *International Journal of Heat and Mass Transfer*, vol. 87, No 8, pp. 359–368 (2015).
- **C. Yang** and V.V. Yakovlev, "An efficient empirical model for microwave-induced average temperature of liquid cylindrical reactants," *Journal of Microwave Power and Electromagnetic Energy*, 47 (3), pp. 177-185 (2013).

Media Coverage of Research

- SIAM News article "Social learners impact outcome of group decision-making" reports on my research of collective decision making. [article link] 2021
- BigThink article "Math explains polarization, and it's not just about politics" reports on my research of social categories. [article link] 2021
- Forbes article "This is the reason American politics are so polarized" reports at length about my work on political party polarization. [article link] 2020
- Wall Street Journal article "Social media is so good at polarizing us" discusses my work on political party polarization. [article link] 2020
- Complexity podcast. [audio link] 2020
- KTRC Talk Radio, The Richard Eeds Show. [audio link] 2020
- Santa Fe New Mexican article "Santa Fe Institute leads study on political polarization." 2020
- KSFR Santa Fe Public Radio. [audio link] 2020
- WCGO Radio Chicago, The Hard Question. [audio link] 2020

Peer-reviewed Publications in Conference Proceedings

- E.M. Moon, **C. Yang**, M. Patel, H. He, and V.V. Yakovlev, "Microwave-induced temperature fields in graphite powder heated in a waveguide reactor." In: *Microwave Symposium, IEEE Microwave Theory and Techniques Society International*, pp. 1-4 (2014).
- A.O. Holmes, **C. Yang**, M. Patel, K. Savaram, H. He, V.V. Yakovlev, and A.A. Zozulya, "Microwave-enabled production of solution-processable graphene: Principles and techniques of macroscopic modeling," In: *14th International AMPERE Conference on Microwave and High Frequency Heating*, Nottingham, UK (2013).
- A.O. Holmes, **C. Yang**, and V.V. Yakovlev, "Temperature modeling for process control in microwave-assisted chemistry," In: *IEEE Microwave Theory and Techniques Society Microwave Symposium Digest*, Seattle, WA (2013).

- **C. Yang** and V.V. Yakovlev, "Computation of microwave-induced temperature in liquid cylindrical reactants," In: *47th International Microwave Power Institute Microwave Power Symposium*, pp. 105-107, Providence, RI (2013).
- **C. Yang** and V.V. Yakovlev, "A simple model of microwave-induced heat transfer in cylindrical reactants with strong convection," In: *International Conference on Heating by Electromagnetic Sources*, Padua, Italy (2013).

Other Reports and Articles

- **V.C. Yang**, Collective intelligence as infrastructure for reducing broad existential risks, *Effective Altruism Forum* (2021). [link]
- L. Hebert-Dufresne, **V.C. Yang**, Misinformation about an outbreak like Covid-19 is important public health data, *STAT News* (2020). [link]
- **V.C. Yang**, Visualizing the US Congress, interactive visualization in d3 (2016), online at `http://www.vcyang.com/vis_congress/`.
- **C. Yang**, Thermal modeling of wire-coil insert, project report submitted to Argonne National Laboratory (2012).
- **C. Yang**, J. L. Skorinko, Does having a foreign accent affect men and women differently? Effect of foreign accent and gender on employment decisions and negotiations, project report submitted to Worcester Polytechnic Institute (2012).

Fellowships

- Omidyar Fellowship, Santa Fe Institute 2018
- Terminal Year Fellowship, Northwestern University 2017
- Walter Murphy Fellowship, Northwestern University 2013
- WPI Presidential Scholarship 2009

Awards and Honors

- Grand Prize in Interactive Data Visualization,
  Northwestern University Computational Research Day 2018
- The Red Sock Award for Best Poster Presentation,
  SIAM Conference on Applications of Dynamical Systems 2017
- SIAM Student Chapter Certificate of Recognition 2017
- Integrated Data Science Traineeship, Northwestern University 2016
- Provost's Major Qualifying Project Award, WPI 2013

Invited Presentations

- Guest speaker, Mathematics of Democracy course, Harvey Mudd College Nov 2021, forthcoming
- Colloquium speaker, Department of Computer Science, Sept 2021, forthcoming
  University of New Mexico
- "Scaling of income inequality in the Uniter States," June 2021
  talk and panel discussion at the SFI Applied Complexity Network, virtual
- "Using mathematics to understand the American political landscape," Sept 2020
  talk at the SFI Applied Complexity Network, virtual
- "Dynamical-system modeling of the formation of social categories," Nov 2019
  talk at University of Chicago, Dept. of Sociology, Chicago, IL

- "Dynamical system models applied to social phenomena,"
  lecture at the SFI Complex Systems Summer School, Santa Fe, NM — June 2019
- "Collective decision making," presentation and panel discussion at
  SFI Applied Complexity meeting on search and decisions at
  Google Ventures, Mountain View, CA — April 2019
- "The search for simplicity in complex cities," Transforming cities mini-course,
  Carnegie Mellon University and University of Pittsburg, Pittsburg, PA — March 2019
- "A 'satisficing' dynamical model for political elections," talk at the
  American Marketing Association Meeting, Austin, TX — Feb 2019
- Guest lecture at the Northwestern University Undergraduate Math Society — Nov 2016

Selected Contributed Presentations

- Virtual presentation at International Conference on Computational Social Science — July 2021
- Virtual presentation at SIAM Conference on the Application Dynamical Systems — May 2021
- Virtual presentation at ACM Collective Intelligence Conference [Video] — June 2020
- Talk at Dynamics Days US, Hartford CT — Jan 2020
- Talk at Data Science Research Day, Northwestern University — June 2018
- Poster at SIAM Conference on Applications of Dynamical Systems, Snowbird UT
  (The Red Sock Award for Best Poster Presentation) — May 2017
- Talk at Chicago Area SIAM Student Conference, Evanston IL — April 2017
- Talk at Seven Minutes of Science Symposium (science outreach), Evanston IL
  [Video] — April 2017
- Poster at International Conference on Computational Social Science, Evanston IL — June 2016
- Poster at Dynamics Days US, Durham NC — Jan 2016
- Talk at IEEE Microwave Theory and Technique International Symposium, Tampa FL — June 2014
- Talk at International Microwave Power Institute Symposium, Providence RI
  (First Place, Student Paper Competition) — June 2013
- Talk at IEEE Student Conference, Cambridge MA
  (Second Place, IEEE Student Paper Competition) — April 2013
- Poster at New England Psychological Association Annual Conference, Worcester MA — Oct 2012

Undergraduate Student Mentoring

- Kate Tanha (Minerva Schools at KGI) — 2020
  Computational text analysis for immigration narratives in ethnic newspapers
- Bronwynn Woodsworth (St Olaf College) — 2020
  Computational text analysis of metaphor use on Mexican immigrants in US newspapers
- Harvey McGuinness (Johns Hopkins University/Santa Fe Highschool) — 2019–2021
  Modeling opinion dynamics in a population of mixed decision-making types
- Elisa Heinrich Mora (Minerva Schools at KGI) — 2019–2021
  Computational modeling of income inequality in urban areas
- Jacob Jackson (Brown University) — 2019–2020
  Studying the effect of global connectivity on socio-economic outputs of cities

- Andria Tattersfield (Claremont McKenna College) 2019
  Detecting urban community structures using Yelp data
- Louisa Lee and Siyu Zhang (Northwestern University) 2016
  Clustering analysis of US political ideology surveys

Teaching

- Instructor, "Practical introduction to data science," Complexity Explorer, SFI 2021, on–going
  Design and conduct online open course—design course material, conduct and record lectures, edit videos.
- Lead instructor, Undergraduate Complexity Researcher Program, SFI 2021
  Design and conduct a weekly course for undergraduate research students, including inviting and organizing guest instructors. The goal of the course is for students to gain tacit knowledge for doing research. Topics include building research "taste," how to give a good presentation, and work-life balance. Also contribute to the design of the undergraduate research program as a whole.
- Lecturer, Complex Systems Summer School, SFI 2019
  Design and conduct lecture on dynamical system modeling of social systems. For interdisciplinary student body, including graduate students, post-docs, faculty, and industry representatives from a wide range of disciplines.
- Guest Lecturer, Transforming Cities Mini-course, 2019
  Carnegie Mellon University and University of Pittsburgh
  Design and conduct lecture for interdisciplinary course for graduate and undergraduate students from broad range of majors.
- Teaching Certificate Program, Northwestern University 2016–2017
  Complete semester-long program for teaching training, topics include including setting learning goals, active learning practices, and inclusive learning practices.
- Invited guest lecturer, Northwestern University Undergraduate Math Society 2016
  Invited by undergraduate student club to attract more students to major in math. Design and conduct lecture. Students are undergraduate math majors or prospective math majors.
- Teaching Assistant, Dept. of Mathematics, Northwestern University 2014–2015, 2017
  Design and lead recitation sessions for undergraduate math courses, including calculus and linear algebra.
- Argentine Tango Instructor, NuTango, Northwestern University 2016
  Design and lead weekly dance classes, with focus of relaxing gender norms.
- Teaching Assistant, Dept. of Mathematics, WPI 2011–2013
  Design and lead recitation sessions for undergraduate math courses, including calculus and differential equations.

Industry Positions

Airbnb Inc., San Francisco, CA 2017
Data Scientist Intern

Leadership

- Co-organizer of minisymposium, SIAM Conference on Dynamical Systems 2021
- Founder and organizer, Around Science Discussion Group, SFI 2020
  Organize discussion groups focused on big questions facing academic life. Topics include how to promote work-life balance in academia, and scientists' role in society.

- Organizer, Inaugural NICO Research Jam 2018
  Organize event for seeding new interdisciplinary research collaborations at Northwestern Institute for Complex Systems.
- Chair of Organizing Committee, Chicago Area SIAM Student Conference 2017
  Lead team from 3 universities to organize and raise funds for conference of around 100 participants. Goal is to of bridge the lack of communication among students using similar math techniques in different fields.
- Chapter President, Society for Industrial and Applied Mathematics 2016–2017
- Executive Board, Graduate Leadership and Advocacy Council, Northwestern University 2016–2017
- Co-founder and President, NuTango Northwestern 2015–2017
  Found student group for inclusive community through Argentine Tango dance, focus on relaxing gender norms in partner dance.
- Chapter President, Pi Mu Epsilon US Honorary National Math Society 2012–2013

Science Outreach

- Activity leader, Julia Robinson Mathematics Festival, Santa Fe, NM 2020
- Volunteer, InterPlanetary Festival, Santa Fe, NM 2019
- Volunteer, Brave Initiatives, Chicago IL 2018
- Judge, Northwestern University High School Project Showcase, Evanston IL 2017–2018
- Speaker, Seven Minutes of Science Symposium, Evanston IL 2017
- Volunteer, Grand Prix Challenges, Evanston 5th Ward Middle School, Evanston IL 2016

Referee and Judge Service

- Judge for the Red Sock Award for Best Poster Presentation, SIAM Conference on Dynamical Systems 2021
- Referee for grant proposal, NSF Human Networks and Data Science 2021
- Referee for journal *Science Advances* 2021
- Referee for journal *Crime Science* 2021
- Referee for journal *Chaos: An Interdisciplinary Journal of Nonlinear Science* 2016, 2017, 2020, 2021
- Referee for journal *PLOS ONE* 2020