Lingfei Wu

Contact Information

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Research Interests

Summary My interdisciplinary research lies in the rising fields of the **Science of Science** and **Computational Social Science**. I use big data, complexity sciences, and AI to understand how science and technology can advance through collaborative teamwork, known as **Team Science and Innovation**. I actively publish papers in prestigious journals including ***Nature***, ***PNAS***, *Scientific reports*, *Physics Review E*, *Journal of Informetrics*, *Poetics*, and others.

Leadership I consulted for leading funding agencies like the National Institutes of Health (NIH), Novo Nordisk Foundation, and John Templeton Foundation on research evaluation, and reviewed grants for the National Science Foundation (NSF) and the Social Sciences and Humanities Research Council of Canada (SSHRC). I regularly review papers for *Nature*, *PNAS*, and *American Journal of Sociology*, and actively contribute to the Science of Team Science Conference (SciTS), the International Conference on the Science of Science and Innovation (ICSSI), and the International Conference for Computational Social Science (IC2S2). I also co-founded the Pitt Initiative on Computational Social Science (PittCSS) uniting faculty and students for interdisciplinary research.

Keywords Team Science and Innovation, Science of Science, Computational Social Science, Network Science, Complexity Sciences, AI for Science, Applied Data Science

Academic Positions

University of Pittsburgh Pittsburgh, PA, USA

2019-Present Assistant Professor, School of Computing and Information

Pitt Initiative on Computational Social Science (PittCSS)

University of Chicago Chicago, IL, USA

2024-Present Affilicated Faculty, Knowledge Lab

2016-2018 Postdoctoral Research Fellow, Department of Sociology

Arizona State University & Santa Fe Institute Tempe, AZ, USA

2014-2015 Postdoctoral Scholar, ASU-SFI Center for Biosocial Complex Systems

Industrial Positions

Tencent Holdings Ltd. Beijing, China

2018-2019 Senior Research Scientist, Tencent Research Institute

Baidu, Inc Beijing, China

2013-2014 Machine Learning Engineer, Department of Personalization and Recommendations

Five Representative Publications

[1] Lin, Y.†, Frey, C. B., & Wu, L. Remote Collaboration Fuses Fewer Breakthrough Ideas. ***Nature***, 2023. (†: mentored student or postdoc)

[2] Xu, F.†, Wu, L., & Evans, J. Flat teams drive scientific innovation. ***PNAS***, 2022.

[3] Wu, L., Wang, D., & Evans, J. A. Large teams develop and small teams disrupt science and technology. ***Nature***, 2019.

[4] Börner, K., Scrivner, O., Gallant, M., Ma, S., Liu, X., Chewning, K., Wu, L., Evans, J. A. Skill discrepancies between research, education, and jobs reveal the critical need to supply soft skills for the data economy. ***PNAS***, 2018.

[5] Lin, Y.†, Evans, J. A., & Wu, L. New directions in science emerge from disconnection and discord. ***Journal of Informetrics***, 2022.

Education

2009-2013 City University of Hong Kong — HongKong, China
Ph.D. in *Media & Communication*

2010-2011 The Australian National University — Canberra, Australia
Visting Scholar at the School of Sociology

2010-2010 Wolfram Research — Bulington, VT, USA
Summer School Student in *Computer Simulation*

2006-2009 Peking University — Beijing, China
Master in *Communication*

2002-2006 China University of Political Science and Law — Beijing, China
B. A. in *Political Science*

Publications (Full List)

Journal Article

[21] Lin, Y.†, Frey, C. B., & Wu, L. (2023). Remote collaboration fuses fewer breakthrough ideas. ***Nature***, 623(7989), 987-991. (†: mentored student or postdoc)

[20] Xu, F.†, Wu, L., & Evans, J. (2022). Flat teams drive scientific innovation. ***Proceedings of the National Academy of Sciences***, 119(23), e2200927119.

[19] Wu, L., Kittur, A., Youn, H., Milojević, S., Leahey, E., Fiore, S. M., & Ahn, Y. Y. (2022). Metrics and mechanisms: Measuring the unmeasurable in the science of science. ***Journal of Informetrics***, 16(2), 101290.

[18] Lin, Y.†, Evans, J. A., & Wu, L. (2022). New directions in science emerge from disconnection and discord. ***Journal of Informetrics***, 16(1), 101234.

[17] Linzhuo, L., Lingfei, W., & James, E. (2020). Social centralization and semantic collapse: Hyperbolic embeddings of networks and text. ***Poetics***, 78, 101428.

[16] Xu, H., Zhang, Z., Wu, L., & Wang, C. J. (2019). The Cinderella Complex: Word embeddings reveal gender stereotypes in movies and books. ***PLoS ONE***, 14(11), e0225385.

[15] Wu, L., Wang, D., & Evans, J. A. (2019). Large teams develop and small teams disrupt science and technology. ***Nature***, 566(7744), 378-382.

[14] Börner, K., Scrivner, O., Gallant, M., Ma, S., Liu, X., Chewning, K., Wu, L., & Evans, J. A. (2018). Skill discrepancies between research, education, and jobs reveal the critical need to supply soft skills for the data economy. ***Proceedings of the National Academy of Sciences***, 115(50), 12630-12637.

[13] Wu, L., & Wang, C. J. (2016). Tracing the attention of moving citizens. ***Scientific Reports***, 6(1), 33103.

[12] Wang, C. J., Wu, L., Zhang, J., & Janssen, M. A. (2016). The collective direction of attention diffusion. ***Scientific reports***, 6(1), 34059.

[11] Wang, C. J., & Wu, L. (2016). The scaling of attention networks. ***Physica A: Statistical Mechanics and its Applications***, 448, 196-204.

[10] Wu, L., Baggio, J. A., & Janssen, M. A. (2016). The role of diverse strategies in sustainable knowledge production. ***PLoS ONE***, 11(3), e0149151.

[9] Zhang, J., Li, X., Wang, X., Wang, W. X., & Wu, L. (2015). Scaling behaviours in the growth of networked systems and their geometric origins. ***Scientific Reports***, 5(1), 9767.

[8] Li, X., Wang, X., Zhang, J., & Wu, L. (2015). Allometric scaling, size distribution and pattern formation of natural cities. ***Palgrave Communications***, 1(1), 1-11.

[7] Wu, L., Zhang, J., & Zhao, M. (2014). The metabolism and growth of web forums. ***PLoS ONE***, 9(8), e102646.

[6] Wu, L., & Ackland, R. (2014). How Web 1.0 fails: the mismatch between hyperlinks and clickstreams. ***Social Network Analysis and Mining***, 4, 1-7.

[5] Zhang, J., & Wu, L. (2013). Allometry and dissipation of ecological flow networks. ***PLoS ONE***, 8(9), e72525.

[4] Wu, L., & Zhang, J. (2013). The decentralized flow structure of clickstreams on the web. ***The European Physical Journal B***, 86, 1-6.

[3] Wu, L., & Zhang, J. (2011). Accelerating growth and size-dependent distribution of human online activities. ***Physical Review E***, 84(2), 026113.

[2] Wu, L., (2011). The accelerating growth of online tagging systems. ***The European Physical Journal B***, 83, 283-287.

[1] Wu, L., Cai, Y., & Liu, D. (2011). Online shopping among Chinese consumers: An exploratory investigation of demographics and value orientation. ***International Journal of Consumer Studies***, 35(4), 458-469.

Book Chapter

[2] Wu, L. (2015). The Stream of Beautiful Attention. In J. Zhang (Ed.), *The Ultimate in Science: A Casual Talk on Artificial Intelligence* (Chapter 9). Beijing: People's Posts and Telecommunications Press.

[1] Wu, L. (2014). *Data Mining in Social Science*. eBook.

Grants

2023-2028 **National Science Foundation: Science of Science Program (CAREER)**

PI, "How Does Core Scientific Knowledge Advance? Understanding Team Innovation at the Foundations of Sciences." $565,087

2020 - 2021 **Richard King Mellon Foundation**

PI, "Sideline to Frontline: Data-driven Technologies to Reskill Displaced Workers for Healthcare Economy and Beyond." $100,000

2020 - 2023 **National Science Foundation: Information & Intelligent Systems**

Co-PI, "Quantifying Hyperlocal Digital Disadvantage: A Path to Supporting Digital Participation." $196,271

2016 - 2026 **Kaifeng Foundation: Complexity Science Program**

PI, "Complex Systems, Geometry, and Machine Learning Workshops." $442,930

2020 - 2021 **Pitt Institute for Cyber Law, Policy, and Security**

PI, "Measuring Worldviews: A Map of Stubborn Social Skills." $6,500

2018 - 2019 **Tencent Research Institute: Computational Social Science Program**

PI, "Tencent & Tsinghua AI and Public Policy Workshops." $43,700

2018 - 2021 **National Science Foundation: Social, Behavioral and Economic Sciences**

Senior personnel, "Understanding Team Success and Failure." $592,772

2014 - 2016 **Australian Research Council: Discovery Program**

Senior personnel, "Understanding Online Attention and User-generated Content Creation." $225,000

Selected Awards & Honors

2023 NSF CAREER Award, *National Science Foundation*

2023 Oxford Martin Fellowship, *University of Oxford*

2010 Richard King Mellon Award, *Richard King Mellon Foundation*

2019 Top 100 Most-Discussed Papers Across All Sciences, *Altmetric*

2009 Best Student Paper Award, *Chinese Association for Journalism and Communication*

2009 Student Travel Award, *Agricultural and Applied Economics Association Conference*

2008 P&G Best Student Paper Award, *China Marketing Research Association*

2006 China National Petroleum Corporation Scholarship, *Peking University*

2002 National Scholarship, *Chinese Ministry of Education*

Teaching Experiences

2019-Present Lecture, Information Visualizatio (INFSCI 2415), University of Pittsburgh

M.S. in Information Science program

B.S. in Information Science program

2022-Present Lecture, Data Mining Visualization (INFSCI 1530/2160), University of Pittsburgh

M.S. in Information Science program

B.S. in Data Science program

B.S. in Computational Social Science program

2020-2021 Lecture, Computational Social Science Doctoral Seminar (INFSCI 3350), University of Pittsburgh

Ph.D. in Information Science program

Open Science & Software

2016 Wu, L., & Wang, C.J., **scholarNetwork**

This Python package is designed to assist researchers in web-scraping, analyzing, and visualizing collaboration networks based on Google Scholar data. It is built upon BeautifulSoup and NetworkX and integrated into pip, the standard tool for installing Python packages.

Reference manual: https://pypi.org/project/scholarNetwork/

Invited Talks and Visits

2024 National Bureau of Economic Research

2023 Santa Fe Institute

2023 Tsinghua University, Department of Computer Science and Technology

2023 Nanjing University, School of Information Management

2023 Zhejiang University, Department of Sociology

2023 University of California, Irvine, Paul Merage School of Business

2022 Carnegie Mellon University, Institute for Software Research

2022 Complexity Science Hub Vienna, Austria

2021 Peking University, The Office of Scientific Research

2020 UC Davis, Computational Communication Research Lab

2019 Nanjing University, School of Journalism & Communication

2019 Pew Research Center

2018 Northwestern University, Kellogg School of Management

2018 Harvard Kennedy School, The Growth Lab

2018 Kaifeng Foundation

2018 National Opinion Research Center

2019 Tencent Research Institute

2018 National Natural Science Foundation of China

2016 GESIS Leibniz Institute for the Social Sciences

2016 Volkswagen Foundation

2011 Nanyang Technological University, School of Communication and Information

2011 The Commonwealth Scientific and Industrial Research Organisation, Australia

2011 Australian National University, Demographic & Social Research Institute

2010 Wolfram Research

Services

Grant Reviewer and Consultant

National Science Foundation | U.S. Department of Energy | The Social Sciences and Humanities Research Council of Canada | Novo Nordisk Fonden | John Templeton Foundation

Academic Journal Reviewer

General Audience Science (2024–), Nature Human Behaviour (2022–), Proceedings of the National Academy of Sciences

(PNAS) (2024–), PNAS Nexus (2024–), Scientific Reports (2023–), PLoS ONE (2021–), EPJ Data Science (2023–)

Science of Science: Journal of the Association for Information Science and Technology (2019–), Quantitative Science Studies (2022–), Scientometrics (2024–), Journal of Informetrics (2024–), Aslib Journal of Information Management (2023–)

Physics: Physical Review X (2024–), Physica A (2015–)

Sociology: American Journal of Sociology (2023–)

Conference Reviewer, Panel Chair, and Organizer

International Conference on the Science of Science and Innovation (ICSSI) | International Conference on Computational Social Science (IC2S2) | International Society for Scientometrics and Informetrics (ISSI) | International Science of Team Science Conference (SciTS) | Network Science Society Annual Conference (NetSci) | The Web Conference (WWW) | Conference on Complex Systems (CCS)

University Service

School Faculty Council Committee: Member (2024)

Master's Program Admissions Committee: Member (2023-Present)

Student Awards and Scholarships Committee: Member (2022)

Ad hoc Committee on Evaluation of Teaching Effectiveness: Member (2021)

Tenure-Track Faculty Search Committee: Member (2020)

Mentorship & Advising

Ph.D. Students

Lulin Yang (ongoing)

Yiling Lin (ongoing)

Zak Risha (joint with Erin Walker, University of Pittsburgh)

Postdocs or Research Assistants

Jiaxin Pei (RA, Faculty job placement: National University of Singapore, Business School)

Haochuan Cui (Postdoc, Faculty job placement: Nanjing University, iSchool)

Fengli Xu (Postdoc joint with James Evans, University of Chicago,
Faculty job placement: Tsinghua University, Electrical Engineering Deptment)

Rongqian Ma (RA, Faculty job placement: IU Bloomington, iSchool)

Linzhuo Li (RA, Faculty job placement: Zhejiang University, Sociology Deptment)

Di Tong (RA, PhD program placement: MIT, Sloan School of Management)

Huimin Xu (RA, PhD program placement: UT Austin, iSchool)

Selected Media Coverage

Personal Interview

- *Science*: Larger teams worsen academic career prospects. By Katie L. Burke.
- *Sage*: Ask a Resercher: Lingfei Wu on Computational Social Science. By Sage Research Methods.
- *BrainforBusiness*: Why has the Internet not led to an upsurge in innovation? By Laurence Knell.
- *NIH NINDS*: Thriving in Team Science. By Lauren E. Ullrich.

Research Coverage

2019 *Nature* Paper "Large teams develop and small teams disrupt science and technology"

- *The New York Times*: Can Big Science Be Too Big? By Benedict Carey.
- *The Atlantics*: Small Teams of Scientists Have Fresher Ideas. By Ed Yong.
- *Forbes*: It Takes More Than Members To Make A Team. By Bill Fischer.
- *Harvard Business Review*: When Small Teams Are Better Than Big Ones. By Dashun Wang and

James A. Evans

- *MIT Technology Review*: How behemoth companies quash innovation by hindering startups. By Carl Benedikt Frey.
- *The Scientist*: Bigger Is Not Always Better for Team Science. By Ruth Williams.
- *Physics World*: Avoid large groups to be a disruptive scientist. By Michael Allen.
- *Entrepreneur*: Why Size Matters For a Working Team. By Pooja Singh.
- *The Conversation*: Want disruptive research? Go small instead of big. By Viviane Callier.
- *The Japan Times*: Big teams rarely come up with innovations. By Faye Flam.
- *The Globe and Mail*: What's in a team? Advisors find benefits of scale, planning and client experience. By Anna Sharratt.

2023 *Nature* Paper "Remote collaboration fuses fewer breakthrough ideas"

- *Scientific American*: Collaborating in Person May Spark More Innovative Research. By Simon Makin.
- *Forbes*: Remote Work Reduces Innovation. How To Increase Innovation Wherever You Work. By Tracy Brower.
- *Fortune*: The CEO of a major co-working company says bosses need to create a 'third place' for employees if they want a meaningful office culture. By Trey Williams.
- *The Hill*: Do we really need shared physical offices to collaborate at work? By Gleb Tsipursky.
- *Aviation Week*: Why Boeing Headquarters Should Move Back to Seattle. By Garrett Reim.
- *Nature News*: What science says about hybrid working—and how to make it a success. By David Adam.
- *Physics World*: Get offline and meet in person to make breakthroughs, claims study. By Laura Hiscott.
- *Physics Magazine*: Disruptive Discoveries More Likely between Scientists Who Meet Face to Face. By Katherine Wright.
- *University of Oxford News*: Remote collaborations deliver fewer scientific breakthroughs. By Amjad Parkar.
- *The Tribune (India)*: Scientists working remotely less likely to make breakthroughs than those on-site. By Press Trust of India.
- *Times Higher Education*: Remote collaboration leads to less innovative science. By Jack Grove.
- *Axios*: Remote collaborators don't generate as many breakthrough scientific ideas. By Alison Snyder.

2022 *PNAS* Paper "Flat teams drive scientific innovation"

- *Fortune*: The CEO of a major co-working company says bosses need to create a 'third place' for employees if they want a meaningful office culture. By Trey Williams.
- *The Conversation*: Why Meta's embrace of a 'flat' management structure may not lead to the innovation and efficiency Mark Zuckerberg seeks. By Amber Stephenson.
- *China Science Daily*: What Influences the Innovation Capacity of Research Teams? By Bin Chen.

2018 *PNAS* Paper "Skill discrepancies between research, education, and jobs reveal the critical need to supply soft skills for the data economy"

- *The Conversation*: How to fix the gap between school and work in South Africa. By Kobus Maree.
- *OECD Forum*: Demand for AI skills in jobs: Evidence from online job postings. By Mariagrazia Squicciarini and Heike Nachtigall.
- *Sina*: Small Town Decline and Middle-Class Empty Nest: What Other Social Impacts Will AI Bring? By Liu Peiyuan and Yan Penggao.
- *Complexity Science*: In an Age of Workplace Automation, Being Human Matters. By Santa Fe Institute.

- *Open Science*: Learning as Part of a Community Is a Powerful Skill. By Open Science MOOC.

2019 *PLoS ONE* Paper "The Cinderella Complex: Word embeddings reveal gender stereotypes in movies and books"

- *Analytics India Magazine*: This AI Tool Corrects Gender Bias In Portrayal Of Females In Movies. By Shraddha Goled.

2013 *European Physical Journal B* Paper "The Decentralized Flow Structure of Clickstreams on the Web"

- *EurekAlert!*: Predicting collective online behavior. By Springer.

2011 *European Physical Journal B* Paper "The accelerating growth of online tagging systems"

- *Science Daily*: Online activity grows in a similar pattern to those of real-life networks. By Springer.

Computer and Communication Skills

Computing	Python, R, Mathematica, MATLAB, Stata, SPSS, SQL, HLM
Visualization	Adobe Illustrator, D3, Processing
Typesetting	LaTeX, MS Office, Markdown
Language	English, Chinese Mandarin