Katie **Spoon**

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Research

I'm interested in identifying and describing inequalities in social systems such as in health, education and careers, and informing policy decisions that address those inequalities. My PhD research is broadly focused on quantifying barriers to and retention within the scientific and technical workforce for historically excluded populations. I enjoy using a diverse range of data science and social science methods to conduct large-scale, interdisciplinary administrative, survey, network, and text analyses, which often reveal patterns not visible at a smaller scale. My work is also informed by previous research and industry experience in machine learning, AI for social good, computer vision and natural language processing.

Education

2020 —	**Ph.D.** in Computer Science, University of Colorado Boulder Advisors: Aaron Clauset & Dan Larremore
2022 —	**M.A.** in Education Policy, University of Colorado Boulder Advisor: Kevin Welner
2018 — 2019	**M.S.** in Computer Science, Indiana University Bloomington Advisors: David Crandall & Katie Siek Thesis: *Detecting Dyslexia in Handwriting Using Neural Networks*
2015 — 2019	**B.S.** in Computer Science, *Minor*: Math, Indiana University Bloomington

Employment

Summer 2024 (Planned)	**Data Science Fellow** U.S. Census Bureau, *Enhancing Health Data Group* (Remote)
June 2019 — Aug. 2020	**Research Engineer** IBM Research, *Artificial Intelligence Hardware Group* (San Jose, CA)
Sep. 2017 — June 2019	**Research Assistant** Indiana University Computer Vision Lab (Bloomington, IN)
Summer 2018	**Research Intern** IBM Research, *Artificial Intelligence Hardware Group* (San Jose, CA)
Summer 2017	**Research Intern** MIT Lincoln Laboratory, *Machine Learning Group* (Boston, MA)
Aug. 2016 — Sep. 2017	**Software Development Team Lead** Indiana University Kelley School of Business (Bloomington, IN)
Summer 2016	**Research Assistant** NSF Research Experience for Undergraduates (Bloomington, IN)

Honors & Awards

2021-2024 **NSF Graduate Research Fellowship**
$37,000/year and tuition for three years of graduate school in a STEM field.

2019 **National Center for Women in Technology Collegiate Award**
$10,000 award that "recognizes technical contributions to projects that demonstrate a high level of innovation and potential impact."

2019 **Provost's Award for Undergraduate Research and Creative Activity**
Mathematics & Natural Sciences winner, one of five categories total. Recognizes "outstanding achievement in research by undergraduates."

2015-2016 **Emerging Research Scholar, Center of Excellence for Women & Technology**

Publication and Presentation Awards

2024 **Bell Family Endowed Computer Science Scholarship**
"In recognition of outstanding research"

2024 **Research Expo Winner,** CU Boulder Computer Science department

2023 **Publication Recognition Award**, CU Boulder Computer Science department

2019 **Global Challenges Proposal,** Computer Vision and Pattern Recognition
Selected proposal, inaugural Global Challenges workshop (10% accept rate)

2019 **Best Poster Award,** International Conference on Machine Learning

Grants

2022 "Quantifying the origins and impacts of book bans in U.S. schools"
PI, with Isabelle Langrock (co-PI), Jack LaViolette (co-PI) and Marcelo S.O. Goncalves (co-PI)
Russell Sage Foundation & Social Science Research Council, $1,500

Travel Funding: Summer Institute in Computational Social Science full travel funding (June 2022); CVPR Global Challenges Workshop full travel funding (June 2019); ICML AI for Social Good Workshop travel scholarship & registration fee waiver (June 2019); NCWIT annual conference full travel funding (May 2019); Grace Hopper Celebration of Women in Computing travel scholarship (Sep. 2016)

Publications

Journal Articles

2024 Gendered devaluation underlies faculty retention [**Pre-print**]
K. Spoon, J. Mendy, M. Martinez, M. Galesic, D. B. Larremore, A. Clauset, L. A. Rivera. *Under Review.*

2023 Gender and retention patterns among U.S. faculty [**Paper**]
K. Spoon, N. LaBerge, K. H. Wapman, S. Zhang, A. C. Morgan, M. Galesic, B. K. Fosdick, D. B. Larremore, and A. Clauset. *Science Advances.*

2023 Book bans in political context: Evidence from U.S. public schools [**Pre-print**]
I. Langrock*****, J. LaViolette*****, M. S. O. Goncalves*****, **K. Spoon***. *Under Review.*
*****All authors contributed equally and are listed alphabetically*

2021 Towards software-equivalent accuracy on transformer-based deep neural networks with analog

memory devices [**Paper**]
K. Spoon, H. Tsai, A. Chen, M.J. Rasch, S. Ambrogio, C. Mackin, A. Fasoli, A. Friz, P. Narayanan, M. Stanisavljevic, and G.W. Burr. *Frontiers in Computational Neuroscience*.

2021 Noise-resilient DNN: Tolerating noise in PCM-based AI accelerators via noise-aware training
S. Kariyappa, H. Tsai, **K. Spoon**, S. Ambrogio, P. Narayanan, C. Mackin, A. Chen, M. Quereshi, and G.W. Burr. *IEEE Transactions on Electron Devices*.

Conference Papers

2021 Mushroom-type phase change memory with projection liner: An array-level demonstration of conductance drift and noise mitigation
R. L. Bruce, et al. [including **K. Spoon**]. *IEEE International Reliability Physics Symposium (IRPS)*.

2021 Fully on-chip MAC at 14nm enabled by accurate row-wise programming of PCM-based weights and parallel vector-transport in duration-format
P. Narayanan, et al. [including **K. Spoon**]. *Symposium on VLSI Technology*.

2020 Neuromorphic computing with phase change, device reliability, and variability challenges
C. Mackin, et al. [including **K. Spoon**]. *IEEE International Reliability Physics Symposium (IRPS)*.

2019 Reducing the impact of phase-change memory conductance drift on the Inference of large-scale hardware neural networks
S. Ambrogio, M. Gallot, **K. Spoon**, H. Tsai, C. Mackin, M. Wesson, S. Kariyappa, P. Narayanan, C.C. Liu, A. Kumar, A. Chen, and G.W. Burr. 65th *IEEE International Electron Devices Meeting (IEDM)*.
Ranked 2nd/98 papers.

Workshop Papers

2020 Accelerating deep neural networks with analog memory devices
K. Spoon, S. Ambrogio, P. Narayanan, H. Tsai, C. Mackin, A. Chen, A. Fasoli, A. Friz, and G.W. Burr. *International Memory Workshop*.

2019 Can we (and *should we*) use AI to detect dyslexia in children's handwriting? [**Paper**]
K. Spoon, D. Crandall, K. Siek, and M. Fillmore. AI for Social Good Workshop, *NeurIPS*.

2019 Towards detecting dyslexia in children's handwriting using neural networks [**Paper**]
K. Spoon, D. Crandall, and K. Siek. AI for Social Good Workshop, *International Conference on Machine Learning (ICML)*.

Book Chapters

2022 Accelerating deep neural networks with analog memory devices
K. Spoon, S. Ambrogio, P. Narayanan, H. Tsai, C. Mackin, A. Chen, A. Fasoli, A. Friz and G.W. Burr. In *Machine Learning & Non-Volatile Memories*. Ed. C. Zambelli, Springer.

Talks

Quantifying the origins and impacts of book bans in U.S. schools

International Conference on Computational Social Science, *Contributed*	July 2023

Explaining gendered retention patterns in academia

(Planned) University of Colorado Boulder Academic Leadership Conference, *Invited*	Aug 2024
Academic Analytics Research Center, *Invited*	Feb 2024
University of Colorado Boulder Office of Faculty Affairs, *Invited*	Dec 2023
Atlanta Conference on Science & Innovation Policy, *Contributed*	May 2023
Women in Network Science & Diversify NetSci Satellite, *Contributed*	July 2022
International Conference on Computational Social Science, *Contributed*	July 2022
International Conference on the Science of Science & Innovation, *Contributed*	June 2022

Accelerating deep neural networks
International Memory Workshop, *Invited* May 2020

Towards detecting dyslexia in children's handwriting using neural networks
American Handwriting Analysis Foundation, *Invited* Nov 2019
Computer Vision for Global Challenges Workshop, CVPR, *Contributed* June 2019
AI for Social Good Workshop, ICML, *Contributed* June 2019

Posters

Mapping U.S. education pathways to scientific and technical careers
(Planned) American Educational Research Association Annual Meeting Apr 2024

Explaining gendered retention patterns in academia
International Conference on Computational Social Science July 2023

The elite undergraduate backgrounds of U.S. professors
International Conference on Computational Social Science July 2022
International Conference on the Science of Science & Innovation June 2022

Towards detecting dyslexia in children's handwriting using neural networks
AI for Social Good Workshop, NeurIPS Dec 2019
AI for Social Good Workshop, ICML, **Best poster award.** [Poster] June 2019

Work in Progress

The earnings gap in academia
Leading a collaboration with the U.S. Census Bureau Center for Economic Studies to link faculty employment records with detailed restricted-use demographic and earnings information over time to study earnings gaps in academia across gender, race, parenthood, and institution.

Mapping U.S. education pathways to scientific and technical careers
As the thesis for my education policy degree, I am leading a data linkage project with restricted-use data from the U.S. Census Bureau and college and careers data from the National Center for Science and Engineering Statistics to measure how access to STEM careers differs for students from different geographic and demographic backgrounds, and for those who took different educational pathways to their jobs.

Teaching

F 2019 **Professional Development Teaching Assistant**
IBM Research Upskilling Class on Deep Learning

F 2018, Sp 2019 **Lead Graduate Teaching Assistant**
CS C343: Introduction to Data Structures & Algorithms

Sp 2018 **Undergraduate Teaching Assistant**
CS C343: Introduction to Data Structures & Algorithms

F 2016, Sp 2017, F 2017 **Undergraduate Teaching Assistant**
CS C241: Discrete Mathematics for Computer Science

Undergraduate Research Mentoring

- Joanna Mendy — CU Sociology & Political Science — 2022-2023
- Maria Martinez — CU Political Science & Ethnic Studies — Summer 2022
- Swag Das — CU Computer Science — Spring 2022
- Jordan Roos — CU Biomedical Engineering — Spring 2022

Service

- CU Computer Science PhD Application Mentor — 2020-present
- You're @ CU Graduate Student Mentor — 2022-present
- McNair Scholars Graduate Student Mentor — 2021-2022
- CU Engineering Mentor for Underrepresented First-Year Undergraduates — 2020-2022
- Lead Ambassador, IU Luddy School of Informatics, Computing & Engineering — 2016-2019
- Software Development Intern, Serve IT Nonprofit Technology Clinic — 2016-2017

Reviewing: Research Policy, Social Policy & Administration, eLife, Proceedings of the ACM on Interactive, Mobile, Wearable and Ubiquitous Technologies

Other Professional Activities

- **Atlanta Academy on Science and Innovation Policy** at Georgia Tech — 2024
- **Data Institute**, National Center for Education Statistics (NCES) — 2024
  Selected participant. Competitive 6-month training program funded by NCES.
- **Summer Institute in Computational Social Science** at Duke University — 2022
  Selected participant. Funded by the Russell Sage Foundation.
- **Grad Cohort for Women Workshop**, Computing Research Association (CRA) — 2021
  Attendee.