Katie Spoon

PhD Student
University of Colorado, Boulder

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Research interests: I'm interested in (1) identifying and describing inequalities in social systems (currently focusing on higher education and science) using network modeling + data science and (2) designing, implementing, and evaluating interventions to reduce those inequalities. Previous experience in machine learning, AI for social good, computer vision and natural language processing.

Education

Aug 2020 — **Ph.D.** in Computer Science
University of Colorado, Boulder
Advisors: Aaron Clauset & Dan Larremore

Jan 2022 — **M.A.** in Educational Foundations, Policy and Practice
Concentration: Evaluation & Policy Analysis
University of Colorado, Boulder
Advisor: Kevin Welner

Aug 2018 — May 2019 **M.S.** in Computer Science
Indiana University, Advisors: David Crandall & Katie Siek
Thesis: *Detecting Dyslexia in Handwriting Using Neural Networks*

Aug 2015 — May 2019 **B.S.** (with highest honors) in Computer Science, *Minor*: Math
Indiana University

Academic & Industrial Research Experience

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)

May 2018 — Aug 2018 **Research Intern**
IBM Research, *Artificial Intelligence Hardware Group* (San Jose, CA)

May 2017 — Aug 2017 **Research Intern**
MIT Lincoln Laboratory, *Machine Learning Group* (Boston, MA)

Aug 2016 — Sep 2017 **Development Team Lead**
Indiana University Kelley School of Business (Bloomington, IN)

May 2016 — Aug 2016 **Research Assistant**
NSF Research Experience for Undergraduates (Bloomington, IN)

Selected Honors & Awards

2021-2024	**NSF Graduate Research Fellowship** $34,000/year for three years of graduate school in a STEM field, plus tuition for the institution.
2019	**National Center for Women in Technology (NCWIT) Collegiate Award** $10,000 award that "recognizes technical contributions to projects that demonstrate a high level of innovation and potential impact"; full funding to attend and speak at the annual NCWIT conference.
2019	**IU 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 with a presentation of our research projects to the Provost.
2019	**IBM Research Outstanding Team Accomplishment** One of **12/355** worldwide IBM research teams to receive the highest internal award for innovation and global collaboration.
2019	**Teaching Assistant of the Year Nominee** Nominated for and voted for by undergraduate students in the IU Luddy School of Informatics, Computing and Engineering
2019	**CVPR Global Challenge Winner** One of **17/105** selected proposals for the inaugural CVPR Global Challenges workshop; full CVPR funding
2015-2016	**Center of Excellence for Women & Technology Emerging Research Scholar** Scholarship program to encourage women to participate in research

Journal Articles (Peer-Reviewed)

- **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, "Towards Software-Equivalent Accuracy on Transformer-Based Deep Neural Networks with Analog Memory Devices." *Frontiers in Computational Neuroscience*, 15 (2021) [Paper].
- S. Kariyappa, H. Tsai, **K. Spoon**, S. Ambrogio, P. Narayanan, C. Mackin, A. Chen, M. Quereshi, and G.W. Burr, "Noise-Resilient DNN: Tolerating Noise in PCM-based AI Accelerators via Noise-Aware Training." *IEEE Transactions on Electron Devices* 68(9), 4356-4362 (2021) [Link].

Conference Publications (Peer-Reviewed)

- R. L. Bruce, S. G. Sarwat, I. Boybat, C. Cheng, W. Kim, S. R. Nandakumar, C. Mackin, T. Phillip, Z. Liu, K. Brew, N. Gong, I. Ok, P. Adusumilli, **K. Spoon**, S. Ambrogio, B. Kersting, T. Bohnstingl, M. Le Gallo, A. Simon, N. Li, I. Saraf, J. Han, L. Gignac, J. M. Papalia, T. Yamashita, N. Saulnier, G. W. Burr, H. Tsai, A. Sebastian, V. Narayanan, and M. BrightSky. "Mushroom-Type phase change memory

with projection liner: An array-level demonstration of conductance drift and noise mitigation." *2021 IEEE International Reliability Physics Symposium* (IRPS) (2021).

- P. Narayanan, S. Ambrogio, A. Okazaki, K. Hosokawa, H. Tsai, A. Nomura, T. Yasuda, C. Mackin, S. C. Lewis, A. Friz, M. Ishii, Y. Kohda, H. Mori, **K. Spoon**, R. Khaddam-Aljameh, N. Saulnier, M. Bergendahl, J. Demarest, K. W. Brew, V. Chan, S. Choi, I. Ok, I. Ahsan, F. L. Lie, W. Haensch, V. Narayanan, and G. W. Burr. "Fully on-chip MAC at 14nm enabled by accurate row-wise programming of PCM-based weights and parallel vector-transport in duration-format." *2021 Symposium on VLSI Technology* (2021).
- C. Mackin, P. Narayanan, S. Ambrogio, H. Tsai, **K. Spoon**, A. Fasoli, A. Chen, A. Friz, R. M. Shelby, and G. W. Burr. "Neuromorphic Computing with Phase Change, Device Reliability, and Variability Challenges." *2020 IEEE International Reliability Physics Symposium* (IRPS) (2020).
- 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. "Reducing the Impact of Phase-Change Memory Conductance Drift on the Inference of large-scale Hardware Neural Networks." 65th *IEEE International Electron Devices Meeting* (IEDM) (2019). **(2nd/98 papers)**

Workshop Presentations

- **K. Spoon**, S. Ambrogio, P. Narayanan, H. Tsai, C. Mackin, A. Chen, A. Fasoli, A. Friz, and G.W. Burr. "Accelerating Deep Neural Networks with Analog Memory Devices." *International Memory Workshop* (2020) (*Oral*).
- **K. Spoon**, D. Crandall, K. Siek, and M. Fillmore. "Can We (and *Should We*) Use AI to Detect Dyslexia in Children's Handwriting?" AI for Social Good Workshop, *NeurIPS* (2019) [Paper].
- **K. Spoon**. "A Proposal to Detect Dyslexia in Handwriting." Computer Vision for Global Challenges Workshop, *Computer Vision and Pattern Recognition* (CVPR) (2019) (*Oral*).
- **K. Spoon**, D. Crandall, and K. Siek. "Towards Detecting Dyslexia in Handwriting Using Neural Networks." AI for Social Good Workshop, *International Conference on Machine Learning* (ICML) (2019) (*Oral*) **(best poster award)** [Paper] [Poster].

Book Chapters

- **K. Spoon**, S. Ambrogio, P. Narayanan, H. Tsai, C. Mackin, A. Chen, A. Fasoli, A. Friz and G.W. Burr. "Accelerating Deep Neural Networks with Analog Memory Devices." in *Storage & AI* Ed. C. Zambelli, Springer (in preparation).

Teaching

F 2019	**Professional Development Teaching Assistant** IBM Research Upskilling Class on Deep Learning
Sp 2019	**Lead Teaching Assistant** CS C343: Introduction to Data Structures & Algorithms
Sp 2018, F 2018	**Teaching Assistant** CS C343: Introduction to Data Structures & Algorithms
F 2016, Sp 2017, F 2017	**Teaching Assistant** CS C241: Discrete Mathematics for Computer Science

Service

- McNair Scholars Graduate Student Mentor, 2021-present
- CU Boulder Computer Science PhD Application Mentor, 2020-present
- Bold Center Mentor for Underrepresented First-Year Undergraduate Students, 2020-present
- Lead Student Ambassador, IU School of Informatics, Computing and Engineering, 2017-2019
- Development Intern, Serve IT Nonprofit Technology Clinic, 2016-2017

Invited Talks

- *Towards Detecting Dyslexia in Children's Handwriting using* AI, American Handwriting Analysis Foundation Annual Conference (Nov. 2019)

Other Professional Activities

- Computing Research Association (CRA) Grad Cohort for Women Workshop Attendee, 2021

Appearances in Media

- *Communications of the* ACM, "Can AI detect dyslexia?" (Sept. 2020).
- *Big Ten Network*, "Indiana University student sets her sights on speeding dyslexia diagnostics." (May 2019).
- *IU Provost's Office*, "IU senior's research on AI software to detect dyslexia earns Provost's Award" (April 2019).
- *IU Luddy School of Informatics, Computing and Engineering*, "Speeding the process" (Feb. 2019).

Graduate Coursework

Sp 2022	EDUC 6211 Education Law and Litigation Workshop CSCI 5828 Foundations of Software Engineering
F 2021	CSCI 5352 Network Analysis and Modeling EDUC 8710 Measurement in Survey Research EDUC 6250 Higher Education in the U.S.
Sp 2021	CSCI 5446 Chaotic Dynamics APPM 5560 Markov Processes EDUC 6210 Education Policy and The Law
F 2020	STAT 5530 Mathematical Statistics
Sp 2019	STAT 432 Applied Linear Models II STAT 670 Exploratory Data Analysis
F 2018	CSCI 505 Applied Algorithms CSCI 561 Advanced Database Concepts
Sp 2018	CSCI 657 Computer Vision