Kat Henneberger

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Skills

Languages & Tools: Python, MATLAB, Git, LaTeX
ML & Data Science: scikit-learn, TensorFlow, PyTorch, Keras, pandas, NumPy, matplotlib

Experience

Graduate Research Assistant *Lexington, KY*
University of Kentucky, Department of Mathematics *May 2022 - May 2025*

- Designed and implemented data reconstruction algorithms for high-dimensional scientific datasets.
- Applied regularization techniques for destriping and deblurring tasks, producing clean labeled data for computer vision and signal processing tasks.
- Engineered scalable tensor decomposition workflows (CUR, 3DTV) for hyperspectral band selection, improving feature labeling efficiency in multimodal datasets.
- Built reproducible data pipelines and documented workflows using MATLAB and Python.

Research Intern *Berlin, Germany*
JCMwave GmbH, Software Company *Summer 2024*

- Reduced FEM execution time by 50% via Bayesian optimization of simulation hyperparameters in a high-performance computing environment.
- Developed surrogate models using neural network ensembles and Gaussian processes to predict optical power flux, achieving <0.0004 median absolute error.
- Built inverse design pipeline using tandem neural networks, accelerating design iterations by 2x.
- Integrated Python-based ETL scripts for simulation data preprocessing and feature extraction; collaborated with physicists and software engineers.

Graduate Teaching Assistant *Lexington, KY*
University of Kentucky, Department of Mathematics *August 2020 - July 2025*

- Provided instructional support for over 600 students across six calculus and applied math courses, including data science and numerical methods.
- Created educational content including problem sets and exam questions, supporting learning and assessment in mathematical modeling and data science.
- Evaluated student understanding and adapted instructional content to improve learning efficiency across diverse academic backgrounds.

Research Intern *Medford, MA*
MGGG Redistricting Lab at Tufts University *Summers 2019 and 2020*

- Conducted research on redistricting fairness using graph theory, Markov Chain Monte Carlo methods, and census-based demographic analysis.
- Used Python and ArcGIS to label spatial features, generate synthetic districting data, and conduct geospatial analysis for fairness research.
- Led an independent project applying topological data analysis to evaluate demographic clustering in urban districting plans.

Education

University of Kentucky, Department of Mathematics *Aug 2020 – May 2025*
PhD (2025), MS (2022)
Dissertation: Regularized Methods for Tensor Recovery and Processing

Bowdoin College *Aug 2016 – May 2020*
BA in Mathematics and Hispanic Studies
Minor: Government and Legal Studies

Publications

- K. Henneberger, and J. Qin, "Hyperspectral Band Selection via Tensor Low Rankness and Generalized 3DTV." Remote Sensing, 2025.
- K. Henneberger, and J. Qin, "Power of ℓ_1-Norm Regularized Kaczmarz Algorithms for High-Order Tensor Recovery." Inverse Problems and Imaging, 2025.
- K. Henneberger and J. Qin, "Hyperspectral Band Selection based on Generalized 3DTV and Tensor CUR Decomposition." 58th Asilomar Conference on Signals, Systems and Computers, pp. 255-259, 2024.
- K. Henneberger and J. Qin, "Log-Sum Regularized Kaczmarz Algorithms for High-Order Tensor Recovery." Association of Women in Mathematics Research Symposium, 2023 (to appear).
- K. Henneberger, L. Huang, and J. Qin, "Hyperspectral Band Selection Based on Matrix CUR Decomposition." In IGARSS 2023-2023 IEEE International Geoscience and Remote Sensing Symposium, pp. 7380-7383. IEEE, 2023.

Presentations and Workshops

Invited Talks

- **SIAM Conference on Computational Science and Engineering**, Fort Worth, TX, March 2025:
  "Log-Sum Regularized Kaczmarz Algorithms for High-Order Tensor Recovery"
- **Joint Mathematical Meetings**, Seattle, WA, January 2025:
  "Hyperspectral Band Selection Based on Generalized 3DTV and Tensor CUR Decomposition"
- **Asilomar Conference on Signals, Systems, and Computers**, Monterey, CA, October 2024:
  "Hyperspectral Band Selection based on Generalized 3DTV and Tensor CUR Decomposition"
- **SIAM Conference on Imaging Science**, Atlanta, GA, May 2024:
  "Log-Sum Regularized Kaczmarz Algorithms for High-Order Tensor Recovery"
- **American Institute of Mathematical Sciences Conference Series on Dynamical Systems and Differential Equations**, Wilmington, NC, May 2023:
  "Hyperspectral Band Selection with Matrix CUR Decomposition"

Workshops

- **JPMorgan Chase & Co. Quantitative Research Virtual Experience Program on Forage**, Virtual, November 2023: Workshop on quantitative research methods
- **SLMath Summer Graduate School on Mathematics of Big Data**, San Jose, CA, July 2023: Sketching and (Multi-)Linear Algebra workshop, hosted at IBM Almaden

Awards and Leadership

University of Kentucky Mathematics Department Fellowship Award *May 2024*

Awarded in recognition of outstanding research by a doctoral student.

Society for Industrial and Applied Mathematics *May 2022 – May 2025*
Chapter President

- Coordinate annual speaking engagements, fostering knowledge transfer from industry mathematicians to academic departments.
- Collaborate across 4 academic departments, enhancing applied mathematics research and development initiatives through partnership programs.

Association for Women in Mathematics *May 2021 – May 2024*
Chapter President

- Fostered an inclusive environment, impacting over 20 female students through mentorship and community initiatives.
- Organized 7 events to celebrate diversity in mathematics, enhancing community engagement and awareness.