Blake Mason

Machine Learning Researcher

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Department of Electrical and Computer Engineering
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https://blakemas.github.io/

Research Interests

Broad: Machine learning algorithms and adaptive data collection techniques for settings with humans in the loop. Applications include **Learning from preferences, Privacy, Adaptive experimentation, Digital education, Drug Discovery.**

Specific: Multi-armed bandits, Metric learning, Level-set estimation, Membership inference, Experimental design, Active learning from binary feedback, Overparameterized models, Knowledge graphs, Ordinal Embedding.

Work History

Rice University / Postdoctoral Researcher

September 2021- PRESENT, Houston, TX

At Rice, I study defenses and vulnerability to privacy attacks in large machine learning models. I am also leading a team studying active knowledge graph estimation for digital education.

University of Wisconsin – Madison / Postdoctoral Researcher

January 2021 - August 2021, Madison, WI

At UW, I led a team studying active level set estimation with applications to drug discovery. I also helped develop a computationally efficient method for active classification. Finally, I collaborated with researchers developing new methods for active classification from binary feedback and pairwise comparisons.

Amazon / Applied Scientist Intern

June 2018 -August 2018, Seattle, WA

Working as a researcher within Amazon Music, I designed a new method for predicting song preferences combining past listening data with featurizations of audio content. I also rewrote much of the research codebase in MXNet and Gluon to reduce training time by 35% and the size of the codebase by 60%.

The Aerospace Corporation / Engineering Intern

May 2014 - May 2015, El Segundo, CA

I designed and built a testing environment to measure acoustic signals off of carbon nano-tubes. I captured the world's first audio signal from a single molecule and helped design the smallest known loudspeaker.

Education

University of Wisconsin – Madison / Doctorate of Philosophy

August 2015 - December 2020, Madison, WI

Degree: Ph. D. in Electrical and Computer Engineering

Dissertation: "Learning Metrics, Graphs, and Rankings: New Theory and Applications"

Advisor: Robert Nowak

Minor: Math and Computer Science

University of Wisconsin – Madison / Masters of Science

August 2015 - December 2017, Madison, WI

Masters of Science in Electrical and Computer Engineering

University of Southern California / Bachelors of Science

August 2011 - May 2015, Los Angeles, CA

Bachelors of Science in Electrical Engineering with a specialization in digital signal processing. Graduated with highest honors.

Publications

In Preparation:

Tan, J., **Mason, B.**, Javidi, H., & Baraniuk, R. (2022). Parameters or Privacy: A Proveable Tradeoff Between Overparameterization and Membership Inference. *arXiv preprint arXiv:2202.01243*. (Submitted to NeurIPS, 2022).

Tan, J., LeJeune, D., **Mason, B.**, Javidi, H., & Baraniuk, R. (2022). Benign Overparameterization In Membership Inference with Early Stopping. (Submitted to NeurIPS, 2022).

Canal, G., **Mason, B.**, Vinayak, R., & Nowak, R. (2022). One for all: Simultaneous Metric and Preference Learning Over Multiple Users (Submitted to NeurIPS, 2022).

Published:

Alemohammad, S., Babaei, H., Barberan, C. J., Liu, N., Luzi, L., **Mason, B.**, & Baraniuk, R. G. (2022, May). NFT-K: Non-Fungible Tangent Kernels. In *ICASSP 2022-2022 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP)* (pp. 3798-3802). IEEE.

Mason, B., Jun, K., & Jain, L. (2022). A Experimental Design Approach for Regret Minimization in Logistic Bandits. AAAI 2022.

Katz-Samuels, J., **Mason, B.**, Jamieson, K. G., & Nowak, R. (2021). Practical, Provably-Correct Interactive Learning in the Realizable Setting: The Power of True Believers. *Advances in Neural Information Processing Systems*, *34*.

Mason, B., Tripathy, A., & Nowak, R. (2021, December). Nearest neighbor search under uncertainty. In *Uncertainty in Artificial Intelligence* (pp. 1777-1786). PMLR.

Mason, B., Camilleri, R., Mukherjee, S., Jamieson, K., Nowak, R., & Jain, L. (2021). Nearly Optimal Algorithms for Level Set Estimation. *arXiv preprint arXiv:2111.01768*. (To appear at AIStats, 2022)

Jun, K. S., Jain, L., **Mason, B.**, & Nassif, H.. (2021, July). Improved confidence bounds for the linear logistic model and applications to bandits. In *International Conference on Machine Learning* (pp. 5148-5157). PMLR.

Mason, B., Jain, L., Tripathy, A., & Nowak, R. (2020). Finding All {\epsilon}-Good Arms in Stochastic Bandits. In *Advances in neural information processing systems (NeurIPS)*.

Mason, B., Tripathy, A., & Nowak, R. (2019). Learning Nearest Neighbor Graphs from Noisy Distance Samples. In *Advances in neural information processing systems (NeurIPS)*.

Mason, B., Rau, M. A., & Nowak, R. (2019). Cognitive Task Analysis for Implicit Knowledge About Visual Representations With Similarity Learning Methods. *Cognitive Science*, *43*(9), e12744.

Sen, A., Patel, P., Rau, M, **Mason, B.**, Nowak, R., Rogers, T., and Zhu, X. "Machine Beats Human at Sequencing Visuals for Perceptual-Fluency Practice." *International Educational Data Mining Society* (2018).

Sen, A., Patel, P., Rau, M.A., **Mason, B.**, Nowak, R., Rogers, T.T. and Zhu, J.. "For Teaching Perceptual Fluency, Machines Beat Human Experts." CogSci. 2018

Nobles, J., Hamoudi, A., Nowak, R., Landau, E., Baron, A., Brittingham, J., & **Mason, B**. (2018, April). Socioeconomic Variability in Human Fecundity. In *PAA 2018 Annual Meeting*. PAA.

Nobles, J., Hamoudi, A, Nowak, R., Landau, E., Baron, A., Brittingham, J., **Mason, B**. "Place-Based Variation in Early Pregnancy Loss: Evidence from Population Data." Reproductive Sciences. Vol. 25.

Mason, B., Jain, L., & Nowak, R. (2017). Learning low-dimensional metrics. In *Advances in neural information processing systems (NeurIPS)* (pp. 4139-4147).

Rau, M., **Mason, B**., and Nowak, R. D. How to model implicit knowledge? Similarity learning. methods to assess perceptions of visual representations. In *Proceedings of the 9th International Conference on Educational Data Mining*, 2016. (**best paper nominee**)

Mason, B., Rau, M., Jain, L., and Nowak, R., "Modeling Perceptional Fluency with Visual Representations". (2016). *33rd International Conference on Machine Learning - Workshop Publication*.

Mason, B., Chang, S. W., Chen, J., Cronin, S. B., & Bushmaker, A. W. (2015). Thermoacoustic transduction in individual suspended carbon nanotubes. *ACS nano*, *9*(5), 5372-5376.

Awards

LUCID Fellowship, University of Wisconsin – Madison, 2015-18

NSF GRFP Honorable Mention, Fall 2017

Best Paper honorable mention, Education and Data Mining Society Conference, 2016

NSF GRFP Honorable Mention, Fall 2015

Innovative Signal Analysis Fellowship, 2015

Wisconsin Distinguished Graduate Fellowship, 2015

Presidential Scholarship, University of Southern California, 2011-15

Provost Research Fellowship, University of Southern California, 2012-15

Leadership Activities

GODDESSES SEMINAR / University of Wisconsin – Madison

September 2017- September 2018, Madison, WI

I founded and was the first organizer for a talk series for graduate students aimed at developing scientific communication skills in a friendly environment.

LUCID / University of Wisconsin – Madison

September 2016- September 2018, Madison, WI

I served on the communications board for the LUCID interdisciplinary graduate training program at UW Madison. My role was to connect students to resources for building interdisciplinary communication skills.

Moneythink / University of Southern California

August 2012- May 2015, Los Angeles, CA

I served as the president of the Moneythink USC chapter, a non-profit dedicated to teaching financial literacy in underserved schools. I taught a weekly high-school course and organized teaching schedules for over 400 students in Urban Los Angeles.

Software and Programming

Programming: Python (NumPy, Multiprocessing, SciPy, Pandas), Pytorch (beginner), MXNet (beginner), MatLab, Pyspark (beginner), Cython.

FORTE - Fast Ordinal Triplet Embedding: I co-wrote the FORTE (https://github.com/lalitkumarj/FORTE) python library which provides highly optimized methods for ordinal embedding and has been used as a baseline for multiple algorithms. It implements several standard objectives in Cython as well as several optimization methods. It is designed to easily compare different embedding techniques and new methods.