# BLAKE MASON

bm63@rice.edu

## EDUCATION

**University of Wisconsin, Madison**
**Ph.D. Electrical and Computer Engineering,** December 2020, Advisor: Dr. Robert Nowak

**University of Southern California**
**B.S. Electrical Engineering,** May 2015

**Research Focus**: active learning, multi-armed bandits, metric learning, nearest neighbors, level set estimation

## SELECTED RESEARCH & INDUSTRY EXPERIENCE

**Rice University** | Dept. of Electrical & Computer Engineering 9/21 - Present

- **Active Learning for Knowledge Graphs**

Collaborated with researchers to develop active learning techniques to estimate knowledge graphs for use in intelligent textbooks.

- Benchmarked existing techniques to understand their applicability for use with education data
- Collaborated with practitioners and researchers to develop new data collection methods

- **Theoretical Foundations of Membership Inference**

Applied statistical expertise to develop study the connection between overparametrization in machine learning models and their susceptibility to membership inference attacks.

- Leveraged classical theory to establish the theoretical limits of membership inference
- Demonstrated a fundamental trade-off between model accuracy and membership inference risk
- Experimentally showed this phenomenon in many model classes

**University of Wisconsin — Madison** | Dept. of Electrical & Computer Engineering 8/15 - 9/21

- **Bandit Algorithms for Learning all Epsilon-Good Arms**

Led a project studying a new, more natural bandit objective for crowd-sourcing and scientific applications and designed optimal and computationally efficient algorithms.

- Motivated new multi-armed bandit objective based on scientific discovery and crowd-sourcing applications
- Developed optimal algorithms and comprehensive theory controlling sample complexity
- Tested algorithm against state of the art baselines on large, crowd sourced dataset

- **Metric Learning with Human Data**

Worked under professors in Machine Learning and Educational Psychology through UW Madison's interdisciplinary research program, LUCID, Led a project adapting metric learning techniques to assess individual learning differences in STEM education.

- Applied and compared low dimensional metric learning algorithms to rank visual features present in the molecules by correlation with students' judgments, and access concept knowledge
- Developed novel theory demonstrating the sample complexity, optimality, and convergence rates of low dimensional metric learning algorithms
- Conducted large scale perceptual similarity experiment in chemistry classroom

- **Fast Ordinal Triplet Embedding (FORTE)**

Co-wrote an open-source library of ordinal embedding algorithms in Cython and Python, providing fast implementations of many classical and modern algorithms.

- Analyzed algorithmic performance and quality of results
- Applied FORTE to improve existing data analysis tools used by collaborators

**Amazon** | Seattle, WA | Applied Scientist Intern 6/18 – 8/18

Designed and implemented novel recommendation systems for Amazon Music business in MXNet. Developed novel algorithm for extreme classification. Built prototype of product and demonstrated to senior managers.

- Applied MXNet and Gluon to reduce training time by 35% and decrease codebase by 60%
- Improved new artist discovery for customers
- Increased diversity of recommended music

**The Aerospace Corporation** | El Segundo, CA | Engineering Intern 5/14 – 5/15
Designed and built a testing environment to measure thermo-acoustic transduction in carbon-nanotube transistors. Successfully captured the world's first audio recording of a single molecule, the smallest known loudspeaker.

- Wrote LabView code to automate testing and data-analysis
- Published first author paper and presented at a conference

## SKILLS & INTERESTS

**Programming**: Python (NumPy, Dask, Multiprocessing, Cython, SciPy, pandas), MATLAB, Pyspark, LaTex
**Machine Learning**: Active Learning & Bandits, Ordinal Embedding, Metric Learning, Level Set Estimation
**Interests**: Active learning, human data, sparsity, similarity embeddings, running, choir, writing poetry, folk music

## LEADERSHIP & INVOLVEMENT

**GODDESSES Seminar** | Founder, Organizer 9/17 – 9/18
Founded and led a graduate student only Optimization and Machine Learning speaker series where students can practice scientific communication skills and get feedback on research ideas.

- Coordinate presenters to ensure a variety of topics and viewpoints are shared
- Assist younger students in forming topics and presenting them effectively

**Moneythink** | Co-President, Mentor Captain 8/12 – 5/15
Led the USC chapter of the Chicago-based non-profit *Moneythink*; we trained students to teach financial literacy in local high schools, focussing on personal finance and college.

- Taught weekly course to underserved high school students in financial literacy
- Coordinated the teaching of over 400 students in urban Los Angeles

## SELECTED PUBLICATIONS


**Mason, B.**, Jun, K., & Jain, L. (2022). A Experimental Design Approach for Regret Minimization in Logistic Bandits. *arXiv preprint.* (To appear at 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.**, 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.

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**)