Austin Xu

CONTACT INFORMATION

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https://austinxu87.github.io/

RESEARCH INTERESTS

Interested human preference learning, recommender systems, ranking systems, and learning from non-metric queries. Broadly interested in leveraging the learned representations of foundational models (generative models, large language models, etc.) in novel tasks, such as preference learning.

EDUCATION

Georgia Institute of Technology Aug. 2019 - May 2024 (expected)

PhD in Electrical and Computer Engineering

Concentration: Digital Signal Processing and Machine Learning
Advisor: Dr. Mark Davenport
GPA: 4.00/4.00

University of Michigan, Ann Arbor Sept. 2015 - May 2019

BSE in Electrical Engineering, Summa Cum Laude

Concentration: Digital Signal Processing
GPA: 3.98/4.00

PUBLICATIONS

[6] **A. Xu**, A. Pananjady, M. A. Davenport, "Human perception metric learning from parametric adjustment queries." *In preparation.*

[3] **A. Xu**, M. Vasileva, A. Seshadri, "HandsOff: Labeled dataset generation with no additional human annotations." *Under review.* November 2022. Short version to appear in *Neural Information Processing Systems (NeurIPS) SyntheticData4ML Workshop*, New Orleans, December 2022.

[4] **A. Xu**, B. Martin-Urcelay, M. Newquist, N. Nadagouda, P. Guan, M. A. Davenport, A. McRae, S. Karnik, "PLATO: Pairwise Localization via Augmented Text-image Optimization." *Under review.* October 2022.

[3] N. Nadagouda, **A. Xu**, and M. A. Davenport, "Active metric learning and classification using similarity queries." to appear in *Neural Information Processing Systems (NeurIPS) Workshop on Human in the Loop Learning*, New Orleans, December 2022

[2] A. McRae, **A. Xu**, J. Jin, N. Nadagouda, N. Ahad, P. Guan, S. Karnik, M. A. Davenport, "Delta distancing: A lifting approach to localizing items from user comparisons.", in *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)*, Singapore, May 2022.

[1] **A. Xu** and M. A. Davenport, "Simultaneous Preference and Metric Learning from Paired Comparisons.", in *Proc. Conf. on Neural Information Processing Systems (NeurIPS)*, Online, December 2020. **Selected for Spotlight Presentation (top 4% of submissions)**

INDUSTRY EXPERIENCE

Amazon, San Francisco, CA May 2022 - Present

Applied Scientist Intern, Amazon Style

- Investigated pixel-wise labeled synthetic dataset generation with generative adversarial networks (GANs). Leveraged GAN inversion to utilize existing labeled images for label generator training. Achieved SOTA performance in faces, cars, full-body humans, urban driving domains on semantic segmentation, keypoint detection, depth estimation tasks. Publication submitted to CVPR, workshop version accepted at NeurIPS.
- Developed variance-maximization algorithm for selecting initial items to be shown to users for binary like/dislike ratings (cold start problem). Experimented combinations of CLIP and model embeddings to determine embedding to maximize inter-and intra-category variance.
- Designed and implemented data fidelity experiments which exposed recommendation model embedding flaws. Findings potentially result in massive simplification of training pipeline and user experience.
- Skills: Python, PyTorch, AWS EC2/S3

Sandia National Laboratories, Albuquerque, NM — May 2018 - Aug. 2018
Undergraduate R&D Intern, Flight and Instrumentation Systems Group

General Motors, Warren, MI — May 2017 - Aug. 2017
Student Intern, Automated Driving and Active Safety Group

Research Experience

Georgia Institute of Technology, Atlanta, GA
Advisor: Mark Davenport

Learning from parametric adjustment queries. — 2021 - present
- Investigating robust metric learning under non-parametric human noise models from novel parametric adjustment queries. Developing sample complexity guarantees using techniques from high-dimensional statistics and low-rank matrix sensing.

Deep metric learning from nearest-neighbor queries. — 2020 - 2022
- Developed information-theoretic criterion for adaptive selection of a novel nearest neighbor query. Query responses directly improve learned embeddings, allowing for direct application of adaptive query selection to both active deep metric learning (DML) and active classification.
- Implemented DML experiments (python) which outperformed recent active DML approaches on synthetic and real-world datasets (food-100, Georgia Tech graduate student admissions).

Simultaneous preference and metric learning from paired comparisons. — 2019 - 2020
- Developed novel joint ideal point and Mahalanobis metric estimation algorithm from paired comparisons. Utilized alternating minimization to iteratively refine initial estimates.
- Implemented ideal point estimation on synthetic and real-world datasets (Georgia Tech graduate student admissions), resulting in interpretable learned metrics and ideal points.

University of Michigan, Ann Arbor, MI
Advisor: Laura Balzano
- Investigated use of order-weighted L1 (OWL) norm for determining relevant features for learning human preferences from paired comparisons. Characterized effects parameter tuning for OWL norm for promoting group sparsity.
- Developed algorithm to perform blind sensor calibration for data drawn from time-varying low-rank subspaces. Alternated sensor gain learning via Total Least Squares and subspace estimation via GROUSE. Achieved $< 5\%$ sensor calibration error with good initialization.

Presentations

"Simultaneous Preference and Metric Learning from Paired Comparisons," Spotlight Presentation at 2020 Conference on Neural Information Processing Systems (NeurIPS) | Virtual

Workshops

Gene Golub SIAM Summer School: "Theory and Practice of Deep Learning" — 2021
African Institute for Mathematical Sciences (AIMS) | Virtual

Teaching Experience

Head Graduate Teaching Assistant — Spring 2022
Statistical Machine Learning (ECE 6254) | Georgia Institute of Technology

Graduate Teaching Assistant — Fall 2019 - Summer 2020
Professional and Technical Communications (ECE 3005) | Georgia Institute of Technology

Instructional Aide — Fall 2018, Winter 2019
Discrete Mathematics (EECS 203) | University of Michigan

AWARDS

Machine Learning at Georgia Tech Fellow | Georgia Institute of Technology — 2021
President's Fellowship | Georgia Institute of Technology — 2019
Distinguished Academic Achievement Award | University of Michigan — 2019
Outstanding Service Award, EECS Dept. | University of Michigan — 2018
EECS Scholar | University of Michigan — 2018
Eta Kappa Nu Scholarship | University of Michigan — 2017
UROP Outstanding Research Presentation Award | University of Michigan — 2017

James B. Angell Scholar | University of Michigan 2017
William J. Branstrom Freshman Prize | University of Michigan 2016
Dean's List/University Honors | University of Michigan 2015 - 2019

SERVICE

Undergraduate Engineering Student Advisory Board 2018 - 2019
Electrical Engineering Representative | University of Michigan
Eta Kappa Nu - Beta Epsilon Chapter 2018
Officer - Historian, Tutoring Chair | University of Michigan
ECE Undergraduate Advising Office 2017 - 2018
Peer Advisor | University of Michigan