

Austin Xu

CONTACT INFORMATION	Phone: (248) 402-3571 Email: axu77@gatech.edu	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 <i>PhD in Electrical and Computer Engineering</i> Concentration: Digital Signal Processing and Machine Learning Advisor: Dr. Mark Davenport GPA: 4.00/4.00	Aug. 2019 - May 2024 (expected)
	University of Michigan, Ann Arbor <i>BSE in Electrical Engineering, Summa Cum Laude</i> Concentration: Digital Signal Processing GPA: 3.98/4.00	Sept. 2015 - May 2019
PUBLICATIONS	<p>[6] A. Xu, A. Pananjady, M. A. Davenport, “Human perception metric learning from parametric adjustment queries.” <i>In preparation</i>.</p> <p>[5] A. Xu, M. Vasileva, A. Seshadri, “HandsOff: Labeled dataset generation with no additional human annotations.” <i>Under review</i>. November 2022. Short version in <i>Neural Information Processing Systems (NeurIPS) SyntheticData4ML Workshop</i>, New Orleans, December 2022.</p> <p>[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.” <i>Under review</i>. October 2022.</p> <p>[3] N. Nadagouda, A. Xu, and M. A. Davenport, “Active metric learning and classification using similarity queries.” in <i>Neural Information Processing Systems (NeurIPS) Workshop on Human in the Loop Learning</i>, New Orleans, December 2022</p> <p>[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 <i>Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)</i>, Singapore, May 2022.</p> <p>[1] A. Xu and M. A. Davenport, “Simultaneous Preference and Metric Learning from Paired Comparisons.”, in <i>Proc. Conf. on Neural Information Processing Systems (NeurIPS)</i>, Online, December 2020. Selected for Spotlight Presentation (top 4% of submissions)</p>	
INDUSTRY EXPERIENCE	Duolingo , Pittsburgh, PA <i>AI Research Intern</i>	Incoming, Summer 2023
	Amazon , San Francisco, CA <i>Applied Scientist Intern, Amazon Style</i>	May 2022 - December 2022
	<ul style="list-style-type: none">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 **Head Graduate Teaching Assistant** Spring 2022
EXPERIENCE 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
	<i>Electrical Engineering Representative</i> University of Michigan	
	Eta Kappa Nu - Beta Epsilon Chapter	2018
	<i>Officer - Historian, Tutoring Chair</i> University of Michigan	
	ECE Undergraduate Advising Office	2017 - 2018
	<i>Peer Advisor</i> University of Michigan	