

Austin Xu

CONTACT INFORMATION	Phone: (248) 402-3571 Email: axu77@gatech.edu	https://austinxu87.github.io/
RESEARCH INTERESTS	Interested in studying human data elicitation from both empirical and theoretical perspectives by leveraging contemporary generative models, high-dimensional statistics, and convex optimization.	
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>[5] A. Xu, A. D. McRae, J. Wang, A. Pananjady, M. A. Davenport, “Perceptual adjustment queries: An inverted measurement paradigm for low-rank metric learning,” <i>Under review at NeurIPS</i>. Short version to appear in <i>International Conference on Machine Learning (ICML) Many Facets of Preference Learning Workshop</i>, Honolulu, July 2023.</p> <p>[4] N. Nadagouda, A. Xu, and M. A. Davenport, “Active metric learning and classification using similarity queries, to appear in <i>Conference on Uncertainty in Artificial Intelligence (UAI)</i>, Pittsburgh, August 2023. (31% conference acceptance rate) Short version in <i>Neural Information Processing Systems (NeurIPS) Workshop on Human in the Loop Learning</i>, New Orleans, December 2022.</p> <p>[3] A. Xu, M. I. Vasileva, A. Dave, A. Seshadri, “HandsOff: Labeled dataset generation with no additional human annotations,” to appear in <i>IEEE/CVF Conference on Computer Vision and Pattern Recognition (CVPR)</i>, Vancouver, June 2023. Highlight Award (top 2.5% of submissions, 26% conference acceptance rate). Short version in <i>Neural Information Processing Systems (NeurIPS) SyntheticData4ML Workshop</i>, New Orleans, December 2022.</p> <p>[2] A. D. 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>IEEE International Conference 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>Conference on Neural Information Processing Systems (NeurIPS)</i>, Online, December 2020. Spotlight Presentation (top 4% of submissions, 20% conference acceptance rate).</p>	
INDUSTRY EXPERIENCE	Duolingo , Pittsburgh, PA <i>AI Research Intern, Personalization Lab</i>	May 2023 - August 2023
	<ul style="list-style-type: none">• Developed a zero-shot framework for personalizing user learning content based on user directed inputs.• Bridged distributional mismatch between user inputs and learning content by generating hypothetical exercises aligned with learning content distribution for retrieval. Leveraged GPT-4 to generate exercises conditioned on user input.• Optimized multilingual sentence similarity space by contrastively finetuning BERT, resulting in a sentence representation space amenable for cross-lingual retrieval.• Work in preparation for conference submission.	

Amazon, San Francisco, CA

May 2022 - December 2022

Applied Scientist Intern, Amazon Style

- Developed novel framework for pixel-wise labeled synthetic dataset generation with generative adversarial networks (GANs). Leveraged GAN inversion to utilize existing labeled images for label generator training. Achieved state-of-the-art performance in faces, cars, full-body humans, urban driving domains on semantic segmentation, keypoint detection, depth estimation tasks.
- Paper accepted at CVPR as a Highlight Award (top 2.5% of submissions, top 10% of accepted papers). Workshop version presented 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 shortcomings. Findings handed off to management for review, potentially leading to a massive simplification of training pipeline and user experience.

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.

TALKS

“HandsOff: Labeled dataset generation with no additional human annotation.”

– ML Collective Deep Learning: Classics and Trends reading group | Virtual.

June 2023

– GT Center for Signal and Information Processing (CSIP) Seminar | Atlanta, GA.

April 2023

– NeurIPS SyntheticData4ML Workshop | New Orleans, LA.

Dec. 2022

“Simultaneous Preference and Metric Learning from Paired Comparisons.”

Dec. 2020

– NeurIPS Spotlight Presentation | Virtual.

WORKSHOPS	Gene Golub SIAM Summer School: “Theory and Practice of Deep Learning.” African Institute for Mathematical Sciences (AIMS) Virtual.	2021
TEACHING EXPERIENCE	Head Graduate Teaching Assistant Statistical Machine Learning (ECE 6254) Georgia Institute of Technology.	Spring 2022
	Graduate Teaching Assistant Professional and Technical Communications (ECE 3005) Georgia Institute of Technology.	Fall 2019 - Summer 2020
	Instructional Aide Discrete Mathematics (EECS 203) University of Michigan.	Fall 2018, Winter 2019
AWARDS	Machine Learning at Georgia Tech Fellow Georgia Institute of Technology. President’s Fellowship Georgia Institute of Technology. Distinguished Academic Achievement Award University of Michigan. Outstanding Service Award, EECS Dept. University of Michigan. EECS Scholar University of Michigan. Eta Kappa Nu Scholarship University of Michigan. UROP Outstanding Research Presentation Award University of Michigan. James B. Angell Scholar University of Michigan. William J. Branstrom Freshman Prize University of Michigan. Dean’s List/University Honors University of Michigan.	2021 2019 2019 2018 2018 2017 2017 2017 2016 2015 - 2019
SERVICE	Undergraduate Engineering Student Advisory Board <i>Electrical Engineering Representative</i> University of Michigan. Eta Kappa Nu - Beta Epsilon Chapter <i>Officer - Historian, Tutoring Chair</i> University of Michigan. ECE Undergraduate Advising Office <i>Peer Advisor</i> University of Michigan.	2018 - 2019 2018 2017 - 2018