

# Austin Xu

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CONTACT INFORMATION	Phone: (248) 402-3571 Email: axu77@gatech.edu	<a href="https://austinxu87.github.io/">https://austinxu87.github.io/</a>
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.) for learning.	
EDUCATION	<b>Georgia Institute of Technology</b> <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)
	<b>University of Michigan, Ann Arbor</b> <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] <b>A. Xu</b>, J. Wang, A. D. McRae, A. Pananjady, M. A. Davenport, “Parametric adjustment queries: A new paradigm for human data elicitation with applications to metric learning,” <i>In preparation</i>.</p> <p>[4] <b>A. Xu</b>, M. I. Vasileva, A. Dave, A. Seshadri, “HandsOff: Labeled dataset generation with no additional human annotations,” to appear in <i>Proc. Conf. on Computer Vision and Pattern Recognition (CVPR)</i>, Vancouver, June 2023. <b>Highlight Award (top 2.5% of submissions, 26% conference acceptance rate)</b>. Short version in <i>Neural Information Processing Systems (NeurIPS) SyntheticData4ML Workshop</i>, New Orleans, December 2022.</p> <p>[3] N. Nadagouda, <b>A. Xu</b>, 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. D. McRae, <b>A. Xu</b>, 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] <b>A. Xu</b> 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. <b>Spotlight Presentation (top 4% of submissions, 20% conference acceptance rate)</b>.</p>	
INDUSTRY EXPERIENCE	<b>Duolingo</b> , Pittsburgh, PA <i>AI Research Intern</i>	Incoming, Summer 2023
	<b>Amazon</b> , San Francisco, CA <i>Applied Scientist Intern, Amazon Style</i>	May 2022 - December 2022
	<ul style="list-style-type: none"><li>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 state-of-the-art performance in faces, cars, full-body humans, urban driving domains on semantic segmentation, keypoint detection, depth estimation tasks.</li><li>Project resulted in the first full conference publication for the Amazon Style organization: Paper accepted at CVPR as a Highlight Award (top 2.5% of submissions, top 10% of accepted papers). Workshop version presented at NeurIPS.</li><li>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.</li></ul>	

- 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.

PRESENTATIONS “HandsOff: Labeled dataset generation with no additional human annotation.” May 2023  
 ML Collective Deep Learning: Classics and Trends reading group | Virtual.

“HandsOff: Labeled dataset generation with no additional human annotation.” April 2023  
 Georgia Tech Center for Signal and Information Processing (CSIP) Seminar | Atlanta, GA.

“HandsOff: Labeled dataset generation with no additional human annotation.” December  
 Neural Information Processing Systems (NeurIPS) SyntheticData4ML Workshop | New Orleans, LA.

“Simultaneous Preference and Metric Learning from Paired Comparisons.” Dec. 2020  
 Neural Information Processing Systems (NeurIPS) Spotlight Presentation | 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	<b>Machine Learning at Georgia Tech Fellow</b>   Georgia Institute of Technology.	2021
	<b>President's Fellowship</b>   Georgia Institute of Technology.	2019
	<b>Distinguished Academic Achievement Award</b>   University of Michigan.	2019
	<b>Outstanding Service Award, EECS Dept.</b>   University of Michigan.	2018
	<b>EECS Scholar</b>   University of Michigan.	2018
	<b>Eta Kappa Nu Scholarship</b>   University of Michigan.	2017
	<b>UROP Outstanding Research Presentation Award</b>   University of Michigan.	2017
	<b>James B. Angell Scholar</b>   University of Michigan.	2017
	<b>William J. Branstrom Freshman Prize</b>   University of Michigan.	2016
	<b>Dean's List/University Honors</b>   University of Michigan.	2015 - 2019
SERVICE	<b>Undergraduate Engineering Student Advisory Board</b>	2018 - 2019
	<i>Electrical Engineering Representative</i>   University of Michigan.	
	<b>Eta Kappa Nu - Beta Epsilon Chapter</b>	2018
	<i>Officer - Historian, Tutoring Chair</i>   University of Michigan.	
	<b>ECE Undergraduate Advising Office</b>	2017 - 2018
	<i>Peer Advisor</i>   University of Michigan.	