

# 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 in human preference learning, ranking systems, learning from non-metric queries, and representation/embedding/contrastive learning. Additional interests include explainable and fair machine learning.	
EDUCATION	<b>Georgia Institute of Technology</b> <i>Ph.D., Electrical and Computer Engineering</i> Concentration: Digital Signal Processing and Machine Learning Advisor: Dr. Mark Davenport	2019 – 2024 (expected)
	<b>University of Michigan, Ann Arbor</b> <i>B.S.E, Electrical Engineering, Summa Cum Laude</i> Concentration: Digital Signal Processing	2015 – 2019
CONFERENCE PUBLICATIONS	[C3] N. Nadagouda, <b>A. Xu</b> , and M. A. Davenport, “Active metric learning and classification using similarity queries.” <i>Under review</i> , January 2022.	
	[C2] A. 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.”, to appear in <i>Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)</i> , May 2022.	
	[C1] <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>Selected for Spotlight Presentation (4%)</b>	
JOURNAL PUBLICATIONS	[J1] <b>A. Xu</b> , A. Pananjady, M. A. Davenport, “Human perception metric learning from parametric adjustment queries.” <i>In Preparation</i> .	
INDUSTRY EXPERIENCE	<b>Amazon</b> Applied Scientist Intern ( <i>Incoming</i> ), Amazon Style • Research on real-time multi-modal preference learning.	Summer 2022 San Francisco, CA
	<b>Sandia National Laboratories</b> Undergraduate R&D Intern, Flight and Instrumentation Systems Group • Developed features for GUI (C++, Qt Creator) that communicates to FPGA and imaging array via SpaceWire/RMAP. Implemented modular design that incorporated hardware specific communication and file parsing. Optimized testing workflow for hardware changes, which enabled rapid future hardware prototyping. • Implemented internal image processing algorithm (MATLAB). Quantified algorithm accuracy under fixed point and floating point datatypes to determine hardware implementation viability.	Summer 2018 Albuquerque, NM
	<b>General Motors</b> Student Intern, Automated Driving and Active Safety Group • Collaborated with GM and tier 1 supplier to develop and implement supply-chain-wide thermal validation plan for rear view camera coaxial cable. Validation plan was adopted for rear view cameras in all future GM vehicles. • Utilized internal software to de-warp rear view camera images to meet internal and government guidelines. Discovered discrepancy between test vehicle de-warping output and specifications, resulting in re-calibrated software update.	Summer 2017 Warren, MI

## Georgia Institute of Technology, Atlanta, GA

**Advisor:** Mark Davenport

### *Learning from parametric adjustment queries.*

2021 - present

- Investigating robust metric learning under arbitrary human noise models from 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 multiple 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.
- Formulated additive union of subspaces sensor model and blindly estimated sensor gains via orthogonal projection.

## 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

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

**Graduate Teaching Assistant** Fall 2019, Spring 2020, 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

	<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 (UESAB)</b>	2018 - 2019
	<i>Electrical Engineering Representative</i>   University of Michigan	
	<b>Eta Kappa Nu - Beta Epsilon Chapter</b>	2018
	<i>Officer - Historian</i>   University of Michigan	
	<b>ECE Undergraduate Advising Office</b>	2017 - 2018
	<i>Peer Advisor</i>   University of Michigan	
	<b>STEM Society</b>	2017 - 2018
	<i>Laboratory Leader</i>   University of Michigan	
	<b>Eta Kappa Nu - Beta Epsilon Chapter</b>	2018
	<i>Tutoring Chair</i>   University of Michigan	