Austin Xu

CONTACT INFORMATION

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https://austinxu87.github.io/

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

Georgia Institute of Technology, Atlanta, GA

Ph.D., Electrical and Computer Engineering — Aug. 2019 – Present
Concentration: Digital Signal Processing and Machine Learning — GPA: 4.0
Advisor: Dr. Mark Davenport
President's Fellow, ML@GT Fellow

University of Michigan, Ann Arbor, MI

B.S.E, Electrical Engineering, Summa Cum Laude — Sept. 2015 – May 2019
Concentration: Digital Signal Processing — GPA: 3.98

CONFERENCE PUBLICATIONS

[C4] **A. Xu**, A. Pananjady, M. A. Davenport, "Human Preference Metric Learning from Parametric Adjustment Queries." *In Preparation.*

[C3] 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." *Under review*, January 2022.

[C2] N. Nadagouda, **A. Xu**, and M. A. Davenport, "Active Selection of Nearest Neighbor Queries for Learning Embeddings." *Under review*, January 2022.

[C1] **A. Xu** and M. A. Davenport, "Simultaneous Preference and Metric Learning from Paired Comparisons." *Proc. Conf. on Neural Information Processing Systems (NeurIPS)*, Online, December 2020. **Selected for Spotlight Presentation (4%)**

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" — July 2021
African Institute for Mathematical Sciences (AIMS) | *Muizenberg, South Africa*

RESEARCH EXPERIENCE

Georgia Institute of Technology, Atlanta, GA
Advisor: Mark Davenport — Aug. 2019 – Present

- Investigating robust metric learning under arbitrary human noise models using low-rank matrix sensing techniques.
- Developed novel joint ideal point and Mahalanobis metric estimation algorithm from paired comparisons. First work in ideal point localization to consider non-Euclidean distances to quantify preferences, allowing for weighted feature interactions. Algorithm generated interpretable learned metrics and ideal points for real-world paired comparison preference data.
- Developed information-theoretic criterion for adaptive selection of a novel nearest neighbor query. Query responses directly improve learned embeddings, allowing for out-of-box application of adaptive query selection to both active deep metric learning (DML) and active classification. Implemented DML experiments which outperformed recent active DML approaches on multiple real-world datasets.

University of Michigan, Ann Arbor, MI
Advisor: Laura Balzano — Sept. 2018 – Aug. 2019

- 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.

Industry Experience

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

- Developed features for GUI 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. [C++, Qt Creator].
- Implemented internal image processing algorithm. Quantified algorithm accuracy under fixed point and floating point datatypes to determine hardware implementation viability. [Matlab].

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

- 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.

Teaching Experience

Graduate Teaching Assistant Aug. 2019 - Aug. 2020
Professional and Technical Communications (ECE 3005) | *Georgia Institute of Technology*

- Held individual consultations with 20+ undergraduate students to develop their technical communication skills. Provided constructive feedback on resumes, technical documents, and presentations.
- Interfaced with students during 15 hours of weekly office hours, graded assignments, and assisted with in-class activities.

Instructional Aide Sept. 2018 - May 2019
Discrete Mathematics (EECS 203) | *University of Michigan*

- Interacted with groups of 20+ undergraduate students during weekly recitation section and office hours. Effectively answered questions, explained concepts, and solved guided practice problems. Achieved an instructor evaluation of 4.7/5.0.
- Managed group of 16 graders. Created weekly grading assignments and rubrics, proofread homework solutions, and enforced grading timeline.
- Created homework and exam problems in collaboration with 18 other staff members. Half of individually created exam problems were used on exams, which was highest rate among IAs.

AWARDS

Machine Learning at Georgia Tech Fellow | Georgia Institute of Technology May 2021
President's Fellowship | Georgia Institute of Technology Aug. 2019
Distinguished Academic Achievement Award | University of Michigan Mar. 2019
Outstanding Service Award, EECS Dept. | University of Michigan Feb. 2018
EECS Scholar | University of Michigan Feb. 2018
Eta Kappa Nu Scholarship | University of Michigan April 2017
UROP Outstanding Research Presentation Award | University of Michigan Mar. 2017
James B. Angell Scholar | University of Michigan Mar. 2017
William J. Branstrom Freshman Prize | University of Michigan Mar. 2016
Dean's List/University Honors | University of Michigan All Semesters

SERVICE

Undergraduate Engineering Student Advisory Board (UESAB) Sept. 2018 - May 2019
Electrical Engineering Representative | University of Michigan

Eta Kappa Nu - Beta Epsilon Chapter Sept. 2018 - Dec. 2018
Officer - Historian | University of Michigan

ECE Undergraduate Advising Office Sept. 2017 - Dec. 2018
Peer Advisor | University of Michigan

STEM Society Sept. 2017 - Dec 2018
Laboratory Leader | University of Michigan

Eta Kappa Nu - Beta Epsilon Chapter Jan. 2018 - May 2018
Tutoring Chair | University of Michigan