Andrew D. McRae

EPFL
Institute of Mathematics

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Research Interests

High-dimensional statistics and its associated optimization problems
Relaxations and nonconvex landscapes for estimation

Education

Ph.D. in Electrical and Computer Engineering 2017–2022
Georgia Institute of Technology
Thesis: *Structured Statistical Estimation via Optimization*
Advisor: Mark Davenport

M.S. in Mathematics 2021
Georgia Institute of Technology

M.S. in Electrical and Computer Engineering 2016
Georgia Institute of Technology

B.S. in Applied Mathematics 2012–2015
B.S. in Electrical Engineering
Georgia Institute of Technology
Highest Honor

Employment

École polytechnique fédérale de Lausanne (EPFL) 2022–Present
Institute of Mathematics (postdoctoral researcher)

Georgia Tech 2017–2022
School of Electrical and Computer Engineering (GRA/GTA)
School of Interactive Computing (GTA)

Georgia Tech Research Institute 2016–2017
Robotics and Autonomous Systems Division (intern and GRA)

Raytheon Missile Systems Summer 2015
Systems Test Division (Intern)

Honors

Georgia Tech CSIP Outstanding Research Award	2022
Georgia Tech ECE Cleaver Award (best Ph.D. proposal)	2020
Georgia Tech ARC-TRIAD fellowship	2020
SPARS workshop finalist for Best Student Paper Award	2019
Georgia Tech President's Fellowship	2017–2021
Georgia Tech ECE Cleaver Award (highest prelim score)	2016
Georgia Tech Faculty Honors (perfect GPA), eight semesters	2012–2015

Preprints

Chiraag Kaushik, **Andrew D. McRae**, Mark A. Davenport, and Vidya Muthukumar, "New Equivalences Between Interpolation and SVMs: Kernels and Structured Features," 2023, arXiv: 2305.02304 [stat.ML]

Journal Publications

Andrew D. McRae and Nicolas Boumal, "Benign Landscapes of Low-Dimensional Relaxations for Orthogonal Synchronization on General Graphs," *SIAM J. Optim.* 34, no. 2 (2024): 1427–1454

Andrew D. McRae, Justin Romberg, and Mark A. Davenport, "Optimal convex lifted sparse phase retrieval and PCA with an atomic matrix norm regularizer," *IEEE Trans. Inf. Theory* 69, no. 3 (2023): 1866–1882

Andrew D. McRae and Mark A. Davenport, "Low-rank Matrix Completion and Denoising Under Poisson Noise," *Inform. Inference.* 10, no. 2 (2021): 697–720

Conference Publications

Austin Xu, **Andrew D. McRae**, Jingyan Wang, Mark A. Davenport, and Ashwin Pananjady, "Perceptual adjustment queries and an inverted measurement paradigm for low-rank metric learning," in *Proc. Conf. Neural Inf. Process. Syst. (NeurIPS)* (New Orleans, December 2023)

Andrew D. McRae, Austin Xu, Jihui Jin, Namrata Nadagouda, Nauman Ahad, Peimeng Guan, Santhosh Karnik, and Mark A. Davenport, "Delta Distancing: A Lifting Approach to Localizing Items from User Comparisons," in *Proc. IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)* (Singapore, May 2022)

Andrew D. McRae, Santhosh Karnik, Mark A. Davenport, and Vidya Muthukumar, "Harmless interpolation in regression and classification with structured features," in *Proc. Int. Conf. Artif. Intell. Statist. (AISTATS)* (Virtual conference, March 2022)

Andrew D. McRae, Justin Romberg, and Mark A. Davenport, "Sample Complexity and Effective Dimension for Regression on Manifolds," in *Proc. Conf. Neural Inf. Process. Syst. (NeurIPS)* (Virtual conference, December 2020)

Presentations

"Sparse phase retrieval and PCA: an optimal convex approach and practical nonconvex algorithm," in *Workshop on Nonsmooth Optimization and Applications (NOPTA)* (Antwerp, April 2024)

"Group synchronization and graph clustering via (benignly) nonconvex optimization," in *Georgia Tech Machine Learning Seminar* (Atlanta, Georgia, April 2024)

"Benign nonconvexity in group synchronization and graph clustering," in *UCLouvain INMA Seminar* (Louvain-la-Neuve, Belgium, November 2023)

"Benign nonconvexity in overparametrized group synchronization," in *ETH Zurich DACO Seminar* (Zurich, October 2023)

"The rank-relaxed optimization landscape for orthogonal group synchronization on a general graph," in *Found. Comput. Math. Conference* (Paris, June 2023)

"Delta Distancing: A Lifting Approach to Localizing Items From User Comparisons," in *IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)* (Singapore, May 2022)

"Harmless interpolation in regression and classification with structured features," in *Int. Conf. Artif. Intell. Statist. (AISTATS)* (Virtual conference, March 2022)

"An Atomic Matrix Norm Regularizer for Sparse Phase Retrieval and PCA," in *Georgia Tech ACO Student Seminar* (Atlanta, Georgia, September 2021)

"Risk bounds for regression and classification with structured feature maps," in *IFDS-MADLab Work. on Statistical Approaches to Understanding Modern ML Methods* (Madison, Wisconsin, August 2021)

"Sample complexity and effective dimension for regression on manifolds," in *Conf. Neural Inf. Process. Syst. (NeurIPS)* (Virtual conference, December 2020)

"Low-rank Matrix Completion and Denoising Under Poisson Noise," in *IAS Work. on Missing Data Challenges in Computation, Statistics and Applications* (Virtual conference, September 2020)

"Sample Complexity and Effective Dimension for Regression on Manifolds," in *Bernoulli-IMS One World Symp.* (Virtual conference, August 2020)

"Effective Dimension in Sample-complexity Bounds for Hilbert Space Regression," in *Int. Conf. High-Dimensional Probability* (Virtual conference, June 2020)

"Low-rank Matrix Completion and Denoising Under Poisson Noise," in *Rice University DSP Seminar* (Houston, Texas, October 2019)

"Low-rank Matrix Completion and Denoising Under Poisson Noise," in *Work. on Signal Processing with Adaptive Sparse Structured Representations (SPARS)* (Toulouse, France, July 2019) (**finalist for Best Student Paper Award** for extended abstract)

Teaching Experience

Intro. Artificial Intelligence (CS 3600, Georgia Tech)	Spring 2022
Intro. Signal Processing (ECE 2026, Georgia Tech)	Fall 2020, Spring 2021
As a teaching assistant:	
Linear Algebra (Math 111, EPFL)	Fall 2023
Theory of Stochastic Calculus (Math 431, EPFL)	Fall 2022
Convex Optimization (ECE special topics, Georgia Tech)	Spring 2019
Statistical Machine Learning (ECE 6254, Georgia Tech)	Spring 2018
Adv. Digital Signal Processing (ECE 6250, Georgia Tech)	Fall 2017
Intro. Signal Processing (ECE 2026, Georgia Tech)	Spring 2016
Calculus III (Math 2401, Georgia Tech)	Spring 2015
Calculus II (Math 1502, Georgia Tech)	Fall 2014

Journal Reviewing

IEEE Trans. Signal Processing
IEEE Trans. Information Theory
IEEE Trans. Pattern Analysis and Machine Intelligence
EURASIP J. Advances in Signal Processing

Conference Reviewing

Int. Conf. Artificial Intelligence and Statistics (AISTATS)
IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)

Other Service

Team leader and jury member for Int. Math. Competition (IMC)	2023
Reviewer of Ph.D. program applications for Georgia Tech ECE	2022
Officer, Eta Kappa Nu (Beta Mu Chapter)	2015–2017