

# Andrew D. McRae

EPFL  
Institute of Mathematics

andrew.mcrae@epfl.ch  
admcrac.github.io

<b>Research Interests</b>	High-dimensional statistics and its associated optimization problems Relaxations and nonconvex landscapes for estimation	
<b>Education</b>	<b>Ph.D. in Electrical and Computer Engineering</b>	2017–2022
	Georgia Institute of Technology Thesis: <i>Structured Statistical Estimation via Optimization</i> Advisor: Mark Davenport	
	<b>M.S. in Mathematics</b>	2021
	Georgia Institute of Technology	
	<b>M.S. in Electrical and Computer Engineering</b>	2016
<b>Employment</b>	Georgia Institute of Technology	
	<b>B.S. in Applied Mathematics</b>	2012–2015
	<b>B.S. in Electrical Engineering</b>	
	Georgia Institute of Technology Highest Honor	
	<b>École polytechnique fédérale de Lausanne (EPFL)</b>	2022–Present
<b>Honors</b>	Institute of Mathematics (postdoctoral researcher)	
	<b>Georgia Tech</b>	2017–2022
	School of Electrical and Computer Engineering (GRA/GTA) School of Interactive Computing (GTA)	
	<b>Georgia Tech Research Institute</b>	2016–2017
	Robotics and Autonomous Systems Division (intern and GRA)	
<b>Preprints</b>	<b>Raytheon Missile Systems</b>	Summer 2015
	Systems Test Division (Intern)	
	Georgia Tech CSIP Outstanding Research Award	2022
	Georgia Tech ECE Cleaver Award (best Ph.D. proposal)	2020
	Georgia Tech ARC-TRIAD fellowship	2020
<b>Journal Pubs.</b>	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
	<b>Andrew D. McRae</b> , Pedro Abdalla, Afonso S. Bandeira, and Nicolas Boumal, “Nonconvex landscapes for $\mathbf{Z}_2$ synchronization and graph clustering are benign near exact recovery thresholds,” 2024, arXiv: 2407.13407 [math.OC]	
	Christopher Criscitiello, Quentin Rebjock, <b>Andrew D. McRae</b> , and Nicolas Boumal, “Synchronization on circles and spheres with nonlinear interactions,” 2024, arXiv: 2405.18273 [math.OC]	
	<b>Andrew D. McRae</b> , “Low solution rank of the matrix LASSO under RIP with consequences for rank-constrained algorithms,” 2024, arXiv: 2404.12828 [math.OC]	
	Chiraag Kaushik, <b>Andrew D. McRae</b> , Mark A. Davenport, and Vidya Muthukumar, “New Equivalences Between Interpolation and SVMs: Kernels and Structured Features,” <i>SIAM J. Math. Data Sci.</i> , 2024, forthcoming	

**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

#### **Conf. Pubs.**

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), 17969–18000

**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), 12993–13004

#### **Presentations**

“Benign nonconvexity of Burer-Monteiro SDP factorization for group synchronization,” in *Int. Symp. on Mathematical Programming (ISMP)* (Montreal, July 2024)

“Low rank of the matrix LASSO under RIP with consequences for fast large-scale algorithms,” in *EUROPT Conf. on Advances in Continuous Optimization* (Lund, Sweden, June 2024)

“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)

<b>Teaching</b>	Intro. Artificial Intelligence (CS 3600, Georgia Tech)	Spring 2022
	Intro. Signal Processing (ECE 2026, Georgia Tech)	Fall 2020, Spring 2021
	<i>As a teaching assistant:</i>	
	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
<b>Journal Reviewing</b>	<i>EURASIP J. Advances in Signal Processing</i>	
	<i>IEEE Trans. Information Theory</i>	
	<i>IEEE Trans. Pattern Analysis and Machine Intelligence</i>	
	<i>IEEE Trans. Signal Processing</i>	
	<i>Mathematics of Computation</i>	
<b>Other Service</b>	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