Mateo Díaz

Applied Mathematics and Statistics
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Research Interests

I am interested in the interplay between optimization, geometry, and statistics, and its applications to data science, learning, and signal processing.

Education

Cornell University

Ph.D. Applied Mathematics (2016−2021)
Committee: Damek Davis (Advisor), Robert Kleinberg, Adrian Lewis, and James Renegar
Center for Applied Mathematics;

M.S. Computer Science (2016−2018)
Computer Science Department.

Universidad de los Andes

M.S. Mathematics (2014−2016)
B.S. Mathematics (2010−2013)
Department of Mathematics;

B.S. Systems and Computing Engineering (2010−2015)
Systems and Computing Engineering Department.

Employment history

Johns Hopkins University
Assistant Professor (July 2023−)

California Institute of Technology
Postdoctoral Scholar (September 2021−June 2023). Hosts: Venkat Chandrasekaran and Joel Tropp.

Google Research
Research Intern (Fall 2020). Hosts: Miles Lubin and David Applegate.

Rappi (Colombia)
Lead Research Scientist (Summer 2020).

Google Maps
Software Intern (Summer 2019).

wOzy
Co-founder and developer (2010-2015).
I co-founded a video game startup during my undergraduate years.

Publications

Published

PDLP: A Practical First-Order Method for Large-Scale Linear Programming
(with D. Applegate, O. Hinder, H. Lu, M. Lubin, B. O'Donoghue, and W. Schudy)
Mathematical Programming Computation (To appear), 2026.

The radius of statistical efficiency
(with J. Cutler and D. Drusvyatskiy)
Foundations of Computational Mathematics, 2026.

Beyong Scores: Proximal Diffusion Models
(with Z. Fang, S. Buchanan, J. Sulam)
NeurIPS, 2025.
Research spotlight CPAL 2026.

On Transferring Transferability: Towards a Theory for Size Generalization
(with E. Levin, Y. Ma, S. Villar)
Neurips (**Spotlight**), 2025.

Clustering a Mixture of Gaussians with Unknown Covariance
(with D. Davis and K. Wang)
Bernoulli, 2025.

Stochastic approximation with decision-dependent distributions: asymptotic normality and optimality
(with J. Cutler and D. Drusvyatskiy)
Journal of Machine Learning Research, 2024.

Any-dimensional equivariant neural networks
(with E. Levin)
AISTATS, 2024.

Infeasibility detection with primal-dual hybrid gradient for large-scale linear programs
(with D. Applegate, H. Lu, and M. Lubin)
SIAM Journal on Optimization, 2024.

Optimal Convergence Rates for the Proximal Bundle Method
(with B. Grimmer)
SIAM Journal on Optimization, 2023.

Escaping strict saddle points of the Moreau envelope in nonsmooth optimization
(with D. Davis and D. Drusvyatskiy)
SIAM Journal on Optimization, 2022.

Optimization of vaccination for COVID-19 in the midst of a pandemic
(with Q. Luo, R. Weightman, S. T. McQuade, E. Trélat, W. Barbour, D. Work, S. Samanaranayake, B. Piccoli)
Networks and Heterogeneous Media, 2022.

Low-rank matrix recovery with composite optimization: good conditioning and rapid convergence
(with V. Charisopoulos, Y. Chen, D. Davis, L. Ding, D. Drusvyatskiy)
Foundations of Computational Mathematics, 2021.

Practical Large-Scale Linear Programming using Primal-Dual Hybrid Gradient
(with D. Applegate, O. Hinder, H. Lu, M. Lubin, B. O'Donoghue, and W. Schudy),
NeurIPS, 2021.
Beale—Orchard-Hays Prize.

Composite optimization for robust blind deconvolution
(with V. Charisopoulos, D. Davis, D. Drusvyatskiy)
Information and Inference, 2020.

Efficient Clustering for Stretched Mixtures: Landscape and Optimality
(with K. Wang and Y. Yan),
NeurIPS, 2020.

Local angles and dimension estimation from data on manifold
(with A. Quiroz, M. Velasco)
Journal of Multivariate Analysis, 2019.

The nonsmooth landscape of blind deconvolution
NeurIPS Workshop on Optimization for Machine Learning, 2019.

Compressed sensing of data with known distribution
(with M. Junca, F. Rincón, M. Velasco)
Applied and Computational Harmonic Analysis, 2018.

In search of balance: The challenge of generating balanced Latin rectangles
(with C. Gomes, R. Le Bras)
CPAIOR, 2017.

Preprints

Any-Dimensional Invariant Universality
(with S. Yao, E. Levin), *Submitted*, 2026.

μpscaling Small Models: Principle Warm Starts and Hyperparameter Transfer
(with Y. Ma, N. Chen, S. Hayou, D. Kunisky, S. Villar),
Submitted, 2026

Active set identification and rapid convergence for degenerate primal-dual problems
(with P. Izquierdo Lehmann, H. Lu, J. Yang)
Submitted, 2026.

Preconditioned subgradient method for composite optimization: overparameterization and fast convergence
(with L. Jiang, A. G. Labassi)
Submitted, 2025.

Invariant Kernels: Rank Stabilization and Generalization Across Dimensions
(with D. Drusvyatskiy, J. Kendrick, R. R. Thomas)
Submitted, 2025.

Controlling the False Discovery Rate in Subspace Selection
(with V. Chandrasekaran)
Submitted, 2024.

Robust, randomized preconditioning for kernel ridge regression
(with E. Epperly, Z. Frangella, J. Tropp, and R. Webber)
Submitted, 2023.

Grants and Awards

Sloan Research Fellowship in Mathematics, 2026.

NSF Mathematical Foundations of AI, 2025 (PI).

NSF CAREER Award, 2025.

Beale—Orchard-Hays Prize (Mathematical Optimization Society), 2024.

Universidad de los Andes: Fellowship for Master's Degree, 2014-2016.

Ecopetrol: "Bachilleres por Colombia" Scholarship, 2010-2014.
Full scholarship for undergraduate studies given to the best ICFES score (SAT equivalent) in each State.

Students

Pedro Izquierdo Lehmann, AMS PhD (2023 -).

Abdel Ghani Labassi, AMS PhD (2022 -).

Daniel Lopez-Castaño, AMS PhD (2021 -), co-advised with Soledad Villar.

Ian McPherson, AMS (2025 -), co-advised with Mauro Maggioni.

Jonas Elmerraji, AMS DEng (2024 -), co-advised with James C. Spall.

Shengtai Yao, AMS Masters (2025).

Fengsheng Lin, Data Science Masters (2025).

Yun You, Data Science Masters (2024).

Presentations

DSI/Statistics Colloquium (University of Chicago), Chicago, IL, February 2026.

Optimization and ML Seminar (Universidad de la Republica), Montevideo, Uruguay, December 2025.

Statistics Seminar (University of Maryland), College Park, MD, November 2025.

Workshop on Mathematical Analysis and Machine Learning (University of Pittsburgh), Pittsburgh, PA, November 2025.

Nonlinear Analysis Seminar (North Carolina State University), Remote, November 2025.

IDeAS Seminar (Princeton University), Princeton, NJ, September 2025.

International Conference on Continuous Optimization (ICCOPT), Los Angeles, CA, Jul 2025.

INFORMS Applied Probability Society, Atlanta, GA, Jul 2025.

Modeling and Optimization: Theory and Applications (MOPTA), Ponta Delgada, Portugal, Jun 2025.

Portuguese American Workshop on Optimization (PAOW), Horta, Portugal, Jun 2025.

Workshop: Optimization and learning: theory and applications, Montreal, Canada, May 2025.

Optimization and Statistical Learning Workshop (Columbia University), New York, NY, April 2025.

Optimization Workshop: Theory, Algorithms, and Applications, Bogotá, Colombia, December 2024.

SIAM Mathematics of Data Science Conference, Atlanta, GA, October 2024.

INFORMS Annual Meeting, Seattle, WA, October 2024.

Applied Mathematics Seminar (University of Washington), Seattle, WA, October 2024.

26th International Symposium on Mathematical Theory of Networks and Systems, Cambridge, UK, August 2024.

11th World Congress in Probability and Statistics, Bochum, Germany, August 2024.

International Symposium on Mathematical Programming, Montreal, Canada, July 2024.

INFORMS International, Medellín, Colombia, June 2024.

3rd Colombian Conference on Applied and Industrial Mathematics, Bucaramanga, Colombia, June 2024.

Artificial Intelligence and Statistics, Valencia, Spain, May 2024. **Poster**.

Industrial and Systems Engineering Seminar (Lehigh University), Bethlehem, PA, April 2024.

Statistics Institute Seminar (Universidad de la República), Montevideo, Uruguay, March 2024.

SIAM Parallel Processing for Scientific Computing, Baltimore, MD, March 2024.

Algebra and Cryptography Seminar (Stevens Institute), Hoboken, NJ, February 2024.

Operations Reserach Seminar at the Tepper School of Business (Carnegie Mellon University), Pittsburgh, PA, December 2023.

Data Science Week, Purdue University, Fort Wayne, IN, November 2023. **Keynote Speaker**.

Jornadas de Probabilidad (Universidad Nacional de Colombia), Bogotá, Colombia, November 2023.

INFORMS Annual Meeting, Phoenix, AZ, October 2023.

International Congress on Industrial and Applied Mathematics, Tokyo, Japan, August 2023.

Modeling and Optimization: Theory and Applications, Bethlehem, PA, August 2023

SIAM Conference on Optimization, Seattle, WA, June 2023.

Workshop at University of Wasthington, Seattle, WA, June 2023.

Statistics Seminar (University of Wisconsin-Madison), Madison, WI, April 2023.

Probability and Statistics Seminar (University of Southern California), Los Angeles, CA, February 2023.

US-Mexico Workshop on Optimization and Applications, Huatulco, Mexico January 2023.

Workshop on Scientific Machine Learning, Santiago, Chile November 2022.

Quantitative Methods seminar at Krannert School of Management (Purdue University), West Lafayette, IN October 2022.

INFORMS Annual Meeting, Indianapolis, IN October 2022.

SIAM Conference on Mathematics of Data Science, San Diego, CA September 2022.

International Conference on Continuous Optimization, Bethlehem, PA July 2022.

2nd Colombian Congress of Applied and Industrial Mathematics (MAPI 2), Medellin, Colombia June 2022.

Workshop on Robustness and Resilience in Stochastic Optimization and Statistical Learning, Erice, Italy May 2022.

INFORMS Optimization Society Conference, Greenville, SC March 2022.

Seminario de Estadística, Control y Optimización (Universidad de los Andes), Bogotá Colombia 2021.

Combinatorics and Probability at UC Irvine, Irvine, CA November 2021.

CMX Seminar at Caltech, Pasadena, CA October 2021.

SIAM Conference on Optimization, Virtual July 2021.

PhD Defense at Cornell University, Ithaca, NY July 2021.

2021 MINDS Symposium on the Foundations of Data Science, Baltimore, MD January 2021.

Google Research, New York, NY January 2021.

SIAM Conference on Optimization, Hong Kong, China May 2020. (**Cancelled**)

SIAM Conference on Mathematics of Data Science, Cincinnati, OH May 2020. (**Cancelled**)

INFORMS Optimization Society Conference, Greenville, SC. March 2020. (**Postponed**)

RPI Applied Math days, Troy NY, April 2019.

Young Researchers Workshop (ORIE Cornell), Ithaca NY October 2017. Poster presenter.

Foundations of Computational Mathematics conference, Barcelona Spain June 2017. Poster Presenter.

Octava Escuela de Física Matemática, Bogotá Colombia May 2016.

The 22nd International Symposium on Mathematical Programming, Pittsburgh PA June 2015. Contributed Sessions.

Foundations of Computational Mathematics conference, Montevideo Uruguay December 2014. Poster Presenter.

Service

Department

Thesis committee member: Pedro Radamacher (Masters Universidad Catolica de Chile 2025), Shihong Wei (PhD JHU-AMS 2024), Diego Fernando Fonseca (PhD Uniandes 2023), and Diego Arevalo Ovalle (Masters Uniandes 2022).

AMS Hiring Committee (2025-2026).

AMS Data Science Masters Admission Committee (2024).

AMS Postdoc Hiring Committee (2024).

Event organization

Conference organizing commitee: Statistics and Data Scince Workshop 2025 (Colombia); Optimization Workshop: Theory, Computation, and Applications 2024 (Colombia); and DeepMath 2024.

Cluster chair: INFORMS International 2024; and Third Colombian Conference on Applied and Industrial Mathematics 2024.

Minisymposyum organizer: INFORMS Optimization Society 2026; ICCOPT 2025; World Congress in Probability and Statistics 2024; ISMP 2024; INFORMS 2023; MOPTA 2023; SIAM Conference on Optimization 2023; SIAM Mathematics of Data Science 2022; INFORMS 2022; ICCOPT 2022; and INFORMS Optimization Society 2020 (Cancelled).

Seminar organizer: AMS Seminar at Johns Hopkins 2024-2025; CMI Student/Postdoc seminar at Caltech 2021-2023; and Optimization seminar at Cornell 2018-2020.

Reviewer

Grants: NSF (panelist) 2026, 2025, 2023; Department of Energy (reviewer) 2024.

Journals and Conferences: Mathematical Programming, SIAM Journal on Optimization, Mathematics of Operations Research, INFORMS Journal on Optimization, INFORMS Journal on Computing, Journal of Machine Learning Research, NeurIPS, Symposium on Theory of Computing (STOC), IEEE International Symposium on Information Theory, IEEE Transactions on Signal Processing, IEEE Transactions on Information Theory, and Optimization and Engineering.

Teaching Experience

At **Johns Hopkins University**:

AMS 747 Mathematics of Data Science, Fall 2025 (Instructor),

AMS 762 Nonlinear Optimization II, Spring 2025 (Instructor),

AMS 761 Nonlinear Optimization I, Fall 2023, Fall 2024 (Instructor),

AMS 721 Probability Theory II, Spring 2024 (Instructor).

At **Cornell University**:

ORIE 6340 Mathematics of Data Science, Spring 2021 (TA),

ORIE 5270 Big Data Technologies, Spring 2020 (Instructor),

ORIE 6125 Computational Methods in Operations Research, Spring 2020 (Instructor),

ORIE 3300 Optimization I, Summer 2017 (TA).

At **Universidad de los Andes**:

MATE-1201 Precalculus, Spring 2015 (TA),

MATE-2604 Numerical Analysis, Spring 2015 (TA),

MATE-1105 Linear Algebra, Fall 2012, Spring 2013, Fall 2014 (TA),

MATE-3410 Differential Geometry Fall 2013 (TA),

MATE-1214 Integral Calculus Fall 2013 (TA),

ISIS-1206 Data Structures Spring 2012 (TA).

Programming Skills

C++, Python, Julia, Rust, Matlab, LaTeX.

Languages

Fluent: English, Portuguese, and Spanish (native).

Last updated: February 26, 2026