

# Mateo Díaz

Applied Mathematics and Statistics  
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## Research Interests

I am interested in the interplay between continuous optimization and high-dimensional statistics, and its applications to data science.

## 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). Manager: Alejandro Correa.

### **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*

**Stochastic approximation with decision-dependent distributions: asymptotic normality and optimality**

(with J. Cutler and D. Drusvyatskiy)

*Journal of Machine Learning Research* (In press), 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.

**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***The radius of statistical efficiency**

(with J. Cutler and D. Drusvyatskiy)

*Submitted, 2024.***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.***Clustering a Mixture of Gaussians with Unknown Covariance**

(with D. Davis and K. Wang)

*Submitted, 2021.***Students****Pedro Izquierdo Lehmann**, AMS PhD (2023 - ).**Abdel Ghani Labassi**, AMS PhD (2022 - ).**Daniel Lopez-Castaño**, AMS PhD (2021 - ), co-advised with Soledad Villar.**Jonas Elmerraji**, AMS DEng (2024 - ), co-advised with James C. Spall.**Fengsheng Lin**, Data Science Masters (2023 - ).**Yun You**, Data Science Masters (2023 - ).**Presentations****INFORMS Annual Meeting**, 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 Washthington**, 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.

## Grants and Awards

**Universidad de los Andes: Proyecto Semilla** 1-semester Grant, "*Adquisición compresiva (compressive sensing) de datos con distribución conocida*", Fall 2015.

**Universidad de los Andes: Full-tuition fellowship for Master's Degree**, 2014-2016.

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

## Service

### *Department*

**Thesis committee member:** Diego Fernando Fonseca (PhD Uniandes 2023), and Diego Arevalo Ovalle (Masters Uniandes 2022).

**AMS Data Science Masters Admission Committee** (2024).

**AMS Postdoc Hiring Committee** (2024).

### *Event organization*

**Conference organizing committee:** Optimization Workshop: Theory, Computation, and Applications (2024), and Third Colombian Conference on Applied and Industrial Mathematics (2024)

**Cluster chair:** INFORMS International 2024.

**Minisymposium organizer:** 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, INFORMS Conference on Optimization 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 review panel 2023.

**Journals and Conferences:** Mathematical Programming, SIAM Journal on Optimization, 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 721 Probability Theory II, Spring 2024 (Instructor),

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

### At Cornell:

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, Objective-C, Matlab,  $\LaTeX$ .

## Languages

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