Mateo Díaz

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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)
Center for Applied Mathematics,
Committee: Damek Davis (Advisor), Robert Kleinberg, Adrian Lewis, and James Renegar;

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

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

Google Research
Research Intern (Fall 2020). Hosts: Miles Lubin, 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

Journal papers

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.

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

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

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

Conference and Workshop papers

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*, 2020.

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

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

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

Preprints

Clustering a Mixture of Gaussians with Unknown Covariance (with D. Davis and K. Wang)
Submitted, 2021.

Escaping strict saddle points of the Moreau envelope in nonsmooth optimization
(with D. Davis and D. Drusvyatskiy) *Submitted*, 2021.

Optimal Convergence Rates for the Proximal Bundle Method
(with B. Grimmer) *Submitted*, 2021.

Infeasibility detection with primal-dual hybrid gradient for large-scale linear programs
(with D. Applegate, H. Lu, and M. Lubin), *Submitted*, 2021.

Presentations

Seminario de Estadśitica, Control y Optimización at Universidad de los Andes, Bogotá Colombia 2021. Speaker. *Clustering a Mixture of Gaussians with Unknown Covariance*.

Combinatorics and Probability at UC Irvine, Irvine, CA November 2021. Speaker.
Clustering a Mixture of Gaussians with Unknown Covariance.

CMX Seminar at Caltech, Pasadena, CA October 2021. Speaker
Complexity, conditioning, and saddle avoidance in nonsmooth optimization
Clustering a Mixture of Gaussians with Unknown Covariance.

SIAM Conference on Optimization, Virtual July 2021. Speaker.
Infeasibility detection with primal-dual hybrid gradient for large-scale linear programs.

PhD Defense at Cornell University, Ithaca, NY July 2021. Speaker.
Complexity, conditioning, and saddle avoidance in nonsmooth optimization.

2021 MINDS Symposium on the Foundations of Data Science, Baltimore, MD January 2021. Speaker.
Composite optimization for robust low-rank matrix recovery: good conditioning and rapid convergence.

Google Research, New York, NY January 2021. Speaker.
Composite optimization for robust low-rank matrix recovery: good conditioning and rapid convergence.

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

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

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

RPI Applied Math days, Troy NY, April 2019. Speaker.
Composite optimization for robust blind deconvolution.

Young Researchers Workshop (ORIE Cornell), Ithaca NY October 2017. Poster presenter.
A Randomized Algorithm for Quadratic inclusions.

Foundations of Computational Mathematics conference, Barcelona Spain June 2017. Poster Presenter.
Angles and Intrinsic Dimension.

Octava Escuela de Física Matemática, Bogotá Colombia May 2016. Speaker. *A geometrical introduction to origami*.

The 22nd International Symposium on Mathematical Programming, Pittsburgh PA June 2015. Speaker at Contributed Sessions.
Compressed Sensing with an a priori distribution.

Foundations of Computational Mathematics conference, Montevideo Uruguay December 2014. Poster Presenter.
Compressed Sensing with an a priori distribution.

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

Reviewer for: IEEE ISIT, IEEE Transactions on Signal Processing, IEEE Transactions on Information Theory, Mathematical Programming, SIAM Journal on Optimization, NeurIPS, and STOC.

Teaching Experience

At **Cornell**:

ORIE 6340 Mathematics of Data Science, Spring 2021 (Teaching Assistant),

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

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

ORIE 3300 Optimization I, Summer 2017 (Lecturer).

At **Universidad de los Andes** as a Lecturer:

MATE-1105 Linear Algebra, Fall 2012, Spring 2013, Fall 2014,

MATE-1201 Precalculus, Spring 2015,

MATE-2604 Numerical Analysis, Spring 2015.

Programming Skills

C++, Python, Julia, Objective-C, Matlab, LaTeX.

Languages

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

Last updated: January 23, 2022