Diego Cifuentes

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INTERESTS   Mathematical optimization, computational algebraic geometry, their applications in science and engineering

EDUCATION   **Massachusetts Institute of Technology**, Cambridge, MA, USA

- Ph.D. in Electrical Engineering and Computer Science   Sep 2014 – Jan 2018
  - Thesis: "Polynomial systems: Graphical structure, Geometry, and Applications"
  - Adviser: Prof. Pablo Parrilo
- M.S. in Electrical Engineering and Computer Science   Sep 2012 – Aug 2014
  - Cumulative GPA: 5.0 / 5.0

Universidad de los Andes, Bogotá, Colombia

- B.S. in Mathematics   Aug 2008 – Aug 2012
  - Summa Cum Laude
  - Cumulative GPA: 4.90 / 5.00
- B.S. in Electronics Engineering   Jan 2008 – Aug 2012
  - Summa Cum Laude
  - Cumulative GPA: 4.90 / 5.00

EMPLOYMENT
- Applied Math Instructor, Massachusetts Institute of Technology   Sep 2018 – present
- Postdoctoral Researcher, Max Planck-Institute for Math. in the Sciences   Feb 2018 – Aug 2018

PUBLICATIONS   **PREPRINTS**

- H. Qi, D. Cifuentes, K. Brádler, R. Israel, T. Kalajdzievski, N. Quesada, "Efficient sampling from shallow Gaussian quantum-optical circuits with local interactions" *arXiv:2009.11824*, 2020
- D. Cifuentes, A. Moitra, "Polynomial time guarantees for the Burer-Monteiro method," *arXiv:1912.01745*, 2019
- D. Cifuentes, "A convex relaxation to compute the nearest structured rank deficient matrix," *arXiv:1904.09661*, 2019
- D. Cifuentes, S. Onn, "On the complexity of toric ideals," *arXiv:1902.01484*, 2019
- D. Cifuentes, S. Agarwal, P. Parrilo, and R. Thomas, "On the local stability of semidefinite relaxations," *arXiv:1710.04287*, 2017

JOURNALS

- D. Cifuentes, "On the Burer-Monteiro method for general semidefinite programs," accepted to *Optimization Letters*, *arXiv:1904.07147*, 2019
- D. Cifuentes, K. Ranestad, B. Sturmfels, and M. Weinstein, "Voronoi cells of varieties," *Journal of Symbolic Computation* special issue for *MEGA'19*, 2020
- D. Cifuentes, C. Harris, and B. Sturmfels, "The geometry of SDP exactness in quadratic optimization," *Mathematical Programming*, 182:399–28, 2020
- D. Cifuentes, T. Kahle, P. Parrilo, "Sums of squares in Macaulay2," *Journal of Software for Algebra and Geometry*, 10(1):17–24, 2020
- D. Cifuentes and P. Parrilo, "Sampling algebraic varieties for sum of squares programs," *SIAM Journal on Optimization*, 27(4):2381–2404, 2017
- D. Cifuentes and P. Parrilo, "Chordal networks of polynomial ideals," *SIAM Journal on Applied Algebra and Geometry*, 1(1):73–170, 2017
- D. Cifuentes and P. Parrilo, "Exploiting chordal structure in polynomial ideals: a Gröbner basis approach," *SIAM Journal of Discrete Mathematics*, 30(3):1534–1570, 2016
- D. Cifuentes and P. Parrilo, "An efficient tree decomposition method for permanents and mixed discriminants," *Linear Algebra and its Applications*, 493:45–81, 2016

CONFERENCES

- S. Kumar, D. Cifuentes, S. Gollakota, and D. Katabi, "Bringing cross-layer MIMO to today's wireless LANs," *Proceedings of the ACM SIGCOMM*, Hong Kong, China, 2013

- <u>D. Cifuentes</u>, "On the degree-chromatic polynomial of a tree," *DMTCS Proceedings vol. AR, 24th International Conference on Formal Power Series and Algebraic Combinatorics (FPSAC)*, Nagoya, Japan, 2012

AWARDS & SCHOLARSHIPS

Jacobs Presidential Fellowship, EECS, Massachusetts Institute of Technology	2012
Ramón de Zubiría Scholarship, Universidad de los Andes	2010, 11, 12
Biannual Excellence Scholarship, Universidad de los Andes	2009, 09, 10
Top 5, Vojtěch Jarník International Mathematical Competition,	2011
First Prize, International Mathematics Competition for University Students	2010
Gold Medal, Iberoamerican University Mathematical Competition	2009
Quiero Estudiar Scholarship, Universidad de los Andes	2008
National Top Score, over 500.000 students in the Colombian ICFES standarized test	2007
Bronze Medal, International Math Olympiad	2006

TEACHING EXPERIENCE

Lecturer at Massachusetts Institute of Technology

18.200A – Principles of Discrete Applied Mathematics	Fall 2020
18.031 – System functions and the Laplace transform	Winter 2020
18.200A – Principles of Discrete Applied Mathematics	Fall 2019

Teaching Assistant at Massachusetts Institute of Technology

18.200 – Principles of Discrete Applied Mathematics	Spring 2019
18.022 – Vector Calculus	Fall 2018
6.438 – Algorithms for inference	Fall 2017
6.256 – Algebraic Techniques and Semidefinite Optimization	Spring 2016
6.251 – Introduction to Mathematical Programming	Fall 2014
6.042 – Math for Computer Science	Spring 2014

Teaching Assistant at Universidad de los Andes

MATE 1105 – Linear Algebra 1	Spring 2011
MATE 2230 – Complex variable and numerical analysis	Fall 2010

Instructor at Olimpiadas Colombianas de Matemáticas	2010 – 2012

STUDENT MENTORING

Research mentor at Massachusetts Institute of Technology

Majid Marhoumi – "SDP-stability in inequality constrained QCQPs" Undergraduate Research Opportunities Program (UROP)	2020
Alex Wei, Daniel Hong, David Lee – "Optimal solutions and ranks in the maxcut SDP" Program for Research in Mathematics, Engineering, and Science for High School Students (PRIMES)	2020

Undergraduate academic advisor at Massachusetts Institute of Technology

A. Dimitrakakis, P. Lazarevic, Z. Mansour, E. Zhang, A. Yue, A. Komo, R. Wang	2019–2020

TALKS

Seminar 68NQRT, INRIA Online	Jun 2020
Virtual Seminar on Optimization and Related Areas, Online	Mar 2020
Nonlinear Algebra Seminar Online, Online	Feb 2020
Applied Math Department Seminar, UMAss Lowell, Lowell, MA, USA	Feb 2020
Machine Learning Tea Seminar, MIT Cambridge, MA, USA	Feb 2020
SIAM Conference on Applied Algebraic Geometry, Bern, Switzerland	Jul 2019
Discrete Math Days of the NorthEast, UMass, Amherst, Amherst, MA, USA	Apr 2019
Real Algebraic Geometry and Optimization, ICERM, Providence, RI, USA	Oct 2018
Core Computational Methods, ICERM, Providence, RI, USA	Sep 2018
Nonlinear Algebra Bootcamp, ICERM, Providence, RI, USA	Sep 2018
International Symposium of Mathematical Programming, Bordeaux, France	Jul 2018
Oberseminar Optimierung, Leipzig University, Leipzig, Germany	Mar 2018
Latinx in the Mathematical Sciences, UCLA IPAM, Los Angeles, CA, USA	Mar 2018
Optimization Day, Max Panck Institute MiS, Leipzig, Germany	Feb 2018
Simons Institute for the Theory of Computing, Berkeley, CA, USA	Nov 2017

▪ Optimization Seminar, Princeton University, Princeton, NJ, USA	Oct 2017
▪ MIC Seminar, Courant Institute, New York City, NY, USA	Oct 2017
▪ Workshop for Young Researchers, Cornell University, Ithaca, NY, USA	Oct 2017
▪ Coloquio de Matemáticas, Universidad de los Andes, Bogotá, Colombia	Aug 2017
▪ Coloquio Latinoamericano de Álgebra, Quito, Ecuador	Aug 2017
▪ SIAM Conference on Applied Algebraic Geometry, Atlanta, GA, USA	Jul 2017
▪ Macaulay2 tutorial, Georgia Tech, Atlanta, GA, USA	Jul 2017
▪ SIAM Conference on Optimization, Vancouver, Canada	May 2017
▪ Algebraic Statistics Workshop, Oberwolfach, Germany	Apr 2017
▪ Algebra Seminar, Georgia Tech, Atlanta, GA, USA	Apr 2017
▪ LIDS Student Conference, MIT, Cambridge, MA, USA	Feb 2017
▪ Joint Mathematics Meeting, Atlanta, GA, USA	Jan 2017
▪ AMS Sectional Meeting, North Carolina State University, Raleigh, NC, USA	Nov 2016
▪ SIAM Annual Meeting, Boston, MA, USA	Jul 2016
▪ SIAM Conference on Discrete Mathematics, Atlanta, GA, USA	Jun 2016
▪ AMS Sectional Meeting, University of Georgia, Athens, GA, USA	Mar 2016
▪ LIDS Student Conference, MIT, Cambridge, MA, USA	Jan 2015
▪ CACAO Seminar, Department of Mathematics, UC Davis, Davis, CA	Nov 2014

PROFESSIONAL AFFILIATIONS

Member of Society for Industrial and Applied Mathematics (SIAM)
▪ SIAM activity groups on "Optimization", "Algebraic Geometry", and "Data Science"
Member of Institute for Operations Research and the Management Sciences (INFORMS)
▪ INFORMS Optimization Society

SERVICE

Seminar co-organizer
▪ "Seminar on Algebra, Statistics, and Optimization", *MIT*	Spring 2019

Session co-organizer
▪ "Low rank models and applications" at *Fields Institute*'s thematic program	Jun 2021
▪ "Semidefinite programming" at *INFORMS Annual Meeting' 20*	Nov 2020
▪ "Structured polynomial equations and applications" at *SIAM Annual Meeting' 16*	Jul 2016

Reviewer
▪ AMS Book Chapter	2019
▪ European Journal of Operational Research	2019
▪ Mathematical Programming	2017
▪ International Symposium on Symbolic and Algebraic Computation	2018, 20
▪ SIAM Journal on Applied Algebra and Geometry	2018, 20
▪ SIAM Journal on Mathematics of Data Science	2020
▪ SIAM Journal on Optimization	2018

Leadership & Volunteering
▪ Officer of MIT Colombian Association	Sep 2013 – Aug 2014
▪ Coordinator of Olimpiadas Colombianas de Matemáticas	Jan 2012 – Jun 2012
▪ Volunteer for math tutoring low income children at Fundación FUNICAF	Jun 2010 – Jul 2010
▪ Volunteer for arts tutoring low income children at Universidad Minuto de Dios	Jun 2009 – Jul 2009
▪ Volunteer for math tutoring abandoned children at Centro San Jerónimo	Feb 2006 – Apr 2006

REFERENCES

▪ Prof. Pablo Parrilo, MIT, parrilo@mit.edu
▪ Prof. Bernd Sturmfels, UC Berkeley & MPI MiS, bernd@berkeley.edu
▪ Prof. Ankur Moitra, MIT, moitra@mit.edu
▪ Prof. Rekha Thomas, U. Washington, rrthomas@uw.edu
▪ Prof. Michel Goemans (teaching), MIT, goemans@math.mit.edu

[*Compiled on 2020-10-08*]