

ELINA ROBEVA

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Positions	University of British Columbia, <i>Assistant Professor</i> Department of Mathematics	Vancouver, BC July 2019 - present
	Massachusetts Institute of Technology, <i>Statistics Instructor and NSF Postdoctoral Fellow</i> Department of Mathematics	Cambridge, MA Sept 2016 - Jun 2019
Education	University of California at Berkeley, <i>Mathematics Ph.D.</i> Advisor: Bernd Sturmfels	Berkeley, CA Sept 2012 - May 2016
	Harvard University, <i>Master of Arts in Mathematics</i>	Cambridge, MA Sept 2011 - June 2012 GPA 4.00
	Stanford University, <i>B.S in Mathematics with Honors and Distinctions; Minor: Computer Science</i>	Stanford, CA Sept 2007 – June 2011 GPA 4.00
	Sofia High School of Mathematics, <i>Graduated with recognition for outstanding achievements in the area of mathematics</i> <i>National diploma for outstanding achievements from the Minister of Education of Bulgaria</i>	Sofia, Bulgaria June 2007 GPA 6.00/6.00
Awards & Honors	UBC/PIMS Mathematical Sciences Young Faculty Award 2020 SIAM Algebraic Geometry Early Career Prize 2019 Bernard Friedman Memorial Prize in Applied Mathematics (thesis award) 2016 Outstanding Graduate Student Instructor Award (teaching award) 2016 MIT Rising Stars workshop participant 2015 Berkeley Fellowship for outstanding doctoral applicants 2012 Pierce Fellowship for incoming Harvard graduate students 2011 Honorable Mention for the Morgan Prize for Outstanding Research in Mathematics 2011 Undergraduate Research Award in Mathematics 2011 Dean's Award for Academic Accomplishment 2011 J.E.Wallace Sterling Award for Scholastic Achievement 2011 Honorable Mention – top 75 in the Putnam Mathematical Competition 2010 Highbridge Award for Mathematical Problem Solving 2008, 2009 Silver Medal – International Mathematical Olympiad 2007 Silver Medal – International Mathematical Olympiad 2006 Gold Medal – Balkan Mathematical Olympiad 2007 Gold Medal – 2nd Young International Mathematical Convention 2006	Vancouver, BC Bern, Switzerland Berkeley, CA Berkeley, CA Cambridge, MA Berkeley, CA Cambridge, MA Stanford, CA Stanford, CA Stanford, CA Stanford, CA Stanford, CA Stanford, CA Stanford, CA Hanoi, Vietnam Ljubljana, Slovenia Rhodes, Greece Lucknow, India
Research Interests	Mathematical statistics, causality, hidden variable models, tensor decompositions, algebraic statistics, applied algebraic geometry, total positivity, optimization	
Preprints	<i>The Set of Orthogonal Tensor Trains</i> , with Pardis Semnani, <i>arXiv:2110.15479</i> <i>Robust Eigenvectors of Symmetric Tensors</i> , with Tommi Muller and Konstantin Usevich, <i>arXiv:2111.06880</i> <i>Third-order Moment Varieties for Non-Gaussian Graphical Models</i> , with Carlos Améndola, Mathias Drton, Alex Grosdos, and Roser Homs, <i>arXiv:2112.10875</i> <i>Kernel Density Estimation for Totally Positive Random Vectors</i> , with Ali Zartash, <i>arXiv:1910.02345</i>	
Publications	<i>Bimonotone Subdivisions of Point Configurations in the Plane</i> , with Melinda Sun, <i>to appear in Algebraic Statistics</i> , <i>arXiv:2007.00877</i> <i>Learning Linear Non-Gaussian Graphical Models with Multidirected Edges</i> , with Yiheng Liu and Huanqing Wang, <i>to appear in Journal of Causal Inference</i> , 9:1 (2021) 250-263 <i>Orthogonal Decomposition of Tensor Trains</i> , with Karim Halaseh and Tommi Muller, <i>to appear in Linear and Multilinear Algebra</i> . <i>arXiv:2010.04202</i>	

Multi-trek Separation in Linear Structural Equation Models, with Jean-Baptiste Seby, *SIAM Journal on Applied Algebra and Geometry*, 5:2 (2021) pp. 278-303

Optimal Rates for Estimation of Two-Dimensional Totally Positive Distributions, with Jan-Christian Hüter, Cheng Mao, and Philippe Rigollet, *Electronic Journal of Statistics*, 14:2 (2020) pp. 2600-2652

Estimation of Monge Matrices, with Jan-Christian Hüter, Cheng Mao, and Philippe Rigollet, *Bernoulli*, 26:4 (2020) pp. 3051-3080

Maximum Likelihood Estimation of Totally Positive and Log-concave Densities, with B. Sturmfels, Ngoc Tran, and C. Uhler, *Scandinavian Journal of Statistics*, 48:3 (2020) 817-844

Nested Covariance Determinants and Restricted Trek Separation in Gaussian Graphical Models, with M. Drton and L. Weihs, *Bernoulli* 26:4 (2020) pp. 2503-2540

Geometry of Log-Concave Density Estimation, with B. Sturmfels and C. Uhler, *Discrete and Computational Geometry* (2018) <https://doi.org/10.1007/s00454-018-0024-y>

Duality of Graphical Models and Tensor Networks, with A. Seigal, *Information and Inference: A Journal of the IMA*, 8:2 (2019) pp. 273-288

Positive Semidefinite Rank and Nested Spectrahedra, with Kaie Kubjas and Richard Robinson, *Linear and Multilinear Algebra*, (2017/10/4), pp.1-23

Determinantal Generalizations of Instrumental Variables, with L. Weihs, B. Robinson, E. Dufrense, J. Kenkel, K. Kubjas, R. McGee II, N. Nguyen, and M. Drton, *Journal of Causal Inference*, 6:1 (2017) ISSN (Online) 2193-3685, <https://doi.org/10.1515/jci-2017-0009>

The Degree of $SO(n)$, with Madeline Brandt, DJ Bruce, Taylor Brysiewicz, and Robert Krone, *Combinatorial Algebraic Geometry, Fields Institute Communications*, 80, Springer, New York, 2017. Editors: Gregory Smith and Bernd Sturmfels

Super-Resolution without Separation, with Geoffrey Schiebinger and Benjamin Recht: *Information and Inference: A Journal of the IMA*, iax006, <https://doi.org/10.1093/imaiai/iax006>

Singular Vectors of Orthogonally Decomposable Tensors, with Anna Seigal, *Linear and Multilinear Algebra*, 65:12 (2017), pp. 2457-2471

Orthogonal and Unitary Tensor Decomposition from an Algebraic Perspective, with Ada Boralevi, Jan Draisma and Emil Horobet, *Israel Journal of Mathematics*, 222:1 (2017), pp 223–260

Decomposing Tensors into Frames, with Luke Oeding and Bernd Sturmfels: *Advances in Applied Mathematics*, 73 (2016), pp. 125-153

Orthogonal Decomposition of Symmetric Tensors: SIAM Journal on Matrix Analysis and Applications, 37 (2016), pp. 86-102

Fixed Points of the EM Algorithm and Nonnegative Rank Boundaries, with Kaie Kubjas and Bernd Sturmfels: *Annals of Statistics*, 43:1 (2015), pp. 422-461

Robust Toric Ideals, with Adam Booher: *Journal of Symbolic Computation*, 68 (2015), pp. 254-264

A Tropical Proof of the Brill-Noether Theorem, with Philip Cools, Jan Darisma and Sam Payne: *Advances in Mathematics* 230 (2012), pp. 759-776

Artificial Intelligence for Bidding Hex, with Sam Payne: *Games of No Chance*, edited by Richard Nowakowski. Mathematical Sciences Research Institute Publications, 63. Cambridge University Press, Cambridge (2015), pp. 207-214

An Extensive Survey of Graceful Trees, Undergraduate Honors Thesis, Stanford University 2011

Work Experience

Google, Inc.

Software Engineering Intern in Research

Worked on identifying users' online behavior and grouping together different online tasks.

Mountain View, CA
May 2013 – Aug 2013

Facebook, Inc.

Software Engineering Intern

Developed new ways of analyzing incoming data in order to surface fake accounts.

Palo Alto, CA
June 2010 – Sept 2010**Invited
Talks**

<i>Log-Concave Graphical Models</i> , SIAM Conference on Applied Algebra and Geometry	Online Conference Aug, 2021
<i>Orthogonal and Incoherent Tensor Decompositions</i> , International Conference on Large Scale Computation	Online Conference Jun, 2021
<i>Orthogonal and Incoherent Tensor Decomposition</i> , SIAM Conference on Applied Linear Algebra	Online Conference May, 2021
<i>Orthogonal Tensor Decomposition</i> , First Annual Meeting of Young Bulgarian Mathematicians	Online Conference May, 2021
<i>Learning Totally Positive Densities</i> , High-dimensional Covariance Matrices, Networks and Inequalities	Online Workshop May, 2021
<i>Orthogonal and Incoherent Tensor Decomposition</i> , Codes and Expansions Seminar	Online Seminar May, 2021
<i>Hidden Variables in Non-Gaussian Linear Causal Models</i> , IPAM Workshop on Tensor Algorithms	Online Workshop May, 2021
<i>Density Estimation under Total Positivity and Conditional Independence</i> , UBC/PIMS Colloquium	Vancouver, BC Apr, 2021
<i>Hidden Variables in Linear Causal Models</i> , Number Theory and Algebraic Geometry Seminar, Simon Fraser	Online Seminar Apr, 2021
<i>Estimating Totally Positive Densities</i> , SIAM Conference on Computational Science and Engineering	Online Conference Mar, 2021
<i>Hidden Variables in Linear Causal Models</i> , Algebra in Statistics and Computation Seminar, UW Madison	Online Seminar Feb, 2021
<i>Orthogonal Decomposition of Tensor Trains</i> , Working Geometry Seminar, Texas A&M	Online Seminar Feb, 2021
<i>Orthogonal Decomposition of Tensor Trains</i> , Nonlinear Algebra Seminar Online	Online Seminar Nov, 2020
<i>Hidden Variables in Linear Causal Models</i> , UBC IAM Colloquium	Online Colloquium Nov, 2020
<i>Orthogonal Tensor Decomposition</i> , St Andrews University Pure Mathematics Colloquium	Online Colloquium Oct, 2020
<i>Duality between Graphical Models and Tensor Networks</i> , Joint Statistical Meetings 2020	Online Workshop Aug, 2020
<i>Superresolution Imaging and Total Positivity</i> , Algebraic Statistics 2020	Online Workshop Jun, 2020
<i>Statistical Estimation under Total Positivity</i> , Boise State Mathematics Colloquium	Boise, ID Mar, 2020
<i>Nonparametric Density Estimation of Totally Positive Distributions</i> , MIFODS Workshop, MIT	Cambridge, MA Jan, 2020
<i>Orthogonal Tensor Decomposition</i> , Seminar on Alg. Geom., Simon Fraser University	Vancouver, BC Oct, 2019
<i>Duality of Graphical Models and Tensor Networks</i> , AI and Tensor Factorizations Workshop	Santa Fe, NM Sep, 2019
<i>Orthogonal Tensor Decomposition</i> , SIAM AG Conference, Early Career Prize Lecture	Bern, Switzerland Jul, 2019
<i>Nested Covariance Determinants in Gaussian Graphical Models</i> , SIAM AG Conference	Bern, Switzerland Jul, 2019
<i>Maximum Likelihood Estimation under Total Positivity</i> , Northeastern Pick My Brain Seminar	Boston, MA Mar, 2019
<i>Statistical Estimation under Algebraic Constraints</i> , UW Madison Machine Learning Seminar	Madison, WI Mar, 2019
<i>Statistical Estimation under Algebraic Constraints</i> , UNC Statistics and Optimization Colloquium	Chapel Hill, NC Feb, 2019
<i>Algebraic Structure in Hidden Variable Models</i> , Duke Statistics Colloquium	Durham, NC Feb, 2019
<i>Statistical Estimation under Algebraic Constraints</i> , Stanford Statistics Colloquium	Stanford, CA Jan, 2019
<i>Statistical Estimation under Algebraic Constraints</i> , UBC Mathematics Colloquium	Vancouver, BC Jan, 2019
<i>Maximum Likelihood Estimation under Total Positivity</i> , UBC Mathematics of Information Seminar	Vancouver, BC Jan, 2019
<i>Statistical Estimation under Algebraic Constraints</i> , UC Irvine Mathematics	Irvine, CA Jan, 2019

<i>Statistical Estimation under Algebraic Constraints</i> , Caltech CMS Frontiers	Pasadena, CA Jan 2019
<i>Maximum Likelihood Estimation under Total Positivity</i> , U of Utah Stochastics Seminar	Salt Lake City, UT Dec, 2018
<i>Orthogonal Tensor Decomposition</i> , U of Utah Mathematics Colloquium	Salt Lake City, UT Dec, 2018
<i>Maximum Likelihood Estimation under Total Positivity</i> , WORDS Workshop, Fuqua School of Business	Durham, NC Dec, 2018
<i>Orthogonal Tensor Decomposition</i> , Duke Applied Math Seminar	Durham, NC Nov, 2018
<i>Maximum Likelihood Estimation under Total Positivity</i> , CU Boulder Applied Math Seminar	Boulder, CO Nov, 2018
<i>Graphical Models from the Perspective of Algebra and Geometry</i> , ICERM Nonlinear Algebra Bootcamp	Providence, RI Sep, 2018
<i>Maximum Likelihood Estimation under Total Positivity</i> , SIAM Annual meeting minisymposium	Portland, OR July, 2018
<i>Maximum Likelihood Estimation under Total Positivity</i> , Brandeis University	Waltham, MA Mar, 2018
<i>Maximum Likelihood Estimation under Total Positivity</i> , UMass Amherst	Amherst, MA Feb, 2018
<i>Maximum Likelihood Estimation under Total Positivity</i> , Applied Math Seminar at Johns Hopkins University	Baltimore, MD Feb, 2018
<i>Maximum Likelihood Estimation under Total Positivity</i> , Applied Math Seminar at Duke	Durham, NC Jan, 2018
<i>Maximum Likelihood Estimation under Total Positivity</i> , CAM Seminar at University of Chicago	Chicago, IL Jan, 2018
<i>Maximum Likelihood Estimation under Total Positivity</i> , Microsoft Research	Redmond, WA Nov, 2017
<i>Maximum Likelihood Estimation under Total Positivity</i> , CMO Oaxaca, Beyond Convexity workshop	Oaxaca, Mexico Oct, 2017
<i>Decomposing Tensors into Frames</i> , SIAM-AG	Atlanta, GA Aug, 2017
<i>Orthogonal Tensor Decomposition</i> , CBMS workshop on Tensors	Auburn, AL Jul, 2017
<i>Geometry of Log-Concave Density Estimation</i> , Oberwolfach MFO Algebraic Statistics Meeting	Oberwolfach, Germany Apr, 2017
<i>Geometry of Log-Concave Density Estimation</i> , Joint Math Meetings	Atlanta, GA Jan, 2017
<i>Superresolution without Separation</i> , MIT LIDS Seminar	Cambridge, MA Sep, 2016
<i>The Geometry of Positive Semidefinite Rank</i> , AMS Special Session	Salt Lake City, UT Apr, 2016
<i>Orthogonal Tensor Decomposition</i> , ETH Zürich	Zürich, Switzerland Nov, 2015
<i>Superresolution without Separation</i> , SIAM AG 2015	Daejeon, South Korea Aug, 2015
<i>Orthogonal Tensor Decomposition</i> , SIAM AG 2015	Daejeon, South Korea Aug, 2015
<i>The Geometry of Positive Semidefinite Rank</i> , SIAM AG 2015	Daejeon, South Korea Aug, 2015
<i>The Geometry of Positive Semidefinite Rank</i> , GOAL workshop	Berkeley, CA May 2015
<i>Super-Resolution Imaging and Tchebychev Systems</i> , Seminar in Computational Algebraic Geometry	Berkeley, CA Mar 2015
<i>Orthogonal Tensor Decomposition</i> , Tensors in Computer Science and Geometry	Berkeley, CA Nov 2014
<i>Orthogonal Tensor Decomposition</i> , Computational Algebraic Geometry Seminar	Berkeley, CA Oct 2014
<i>Orthogonal Tensor Decomposition</i> , Benjamin Recht's Group Meeting	Berkeley, CA Oct 2014
<i>Robust Toric Ideals</i> , Western Fall Sectional AMS Meeting	San Francisco, CA Oct 2014
<i>Orthogonal Tensor Decomposition</i> , Western Fall Sectional AMS Meeting	San Francisco, CA Oct 2014
<i>Orthogonal Tensor Decomposition</i> , AMS Meeting Eau-Claire	Eau-Claire, WI Sep 2014
<i>Orthogonally Decomposable Tensors</i> , Workshop on the Method of Moments and Spectral Learning, ICML 2014	Beijing, China Jun 2014

Orthogonally Decomposable Tensors, Optimization and Algebraic Geometry Daejeon, South Korea
 Jun 2014
Fixed Points of the EM Algorithm and Nonnegative Rank Boundaries, Computer Science Seminar, U Washington
 Seattle, WA
 May, 2014
Fixed Points of the EM Algorithm and Nonnegative Rank Boundaries, Applications of Real Algebraic Geometry
 Helsinki, Finland
 Mar 2014
A Tropical Proof of the Brill-Noether Theorem, Joint Mathematical Meeting
 Boston, MA
 Jan 2012
How to win in Bidding Hex. Stanford Undergraduate Math Organization speaker series
 Stanford, CA
 May 2011

Teaching Experience

Instructor and course design Vancouver, BC
UBC Math 605D Tensor Decompositions and Their Applications; a graduate student topics course
 Fall, 2020

Instructor Vancouver, BC
UBC Math 307 Applied Linear Algebra; Math 303 Introduction to Stochastic Processes
 2019-2020

Instructor Cambridge, MA
MIT IDS.136 / 6.244 Graphical Models: A Combinatorial, Algebraic and Geometric Perspective
 Co-taught together with Caroline Uhler
 Spring, 2019

Instructor and course design Cambridge, MA
MIT IDS.S21 / 6.248 Graphical Models: A Combinatorial, Algebraic and Geometric Perspective
 Developed and co-taught a new class together with Caroline Uhler
 Spring, 2016

Teaching Assistant Cambridge, MA
MIT 18.03 Introduction to Differential Equations
 Fall 2016

Graduate Student Instructor Berkeley, CA
Math 10B Methods of Mathematics: Calculus, Statistics, and Combinatorics
 Teaching discussion for two sections of 25 students each. Course instructor: Bernd Sturmfels.
 Spring 2015

Math Circle Lecturer 2012 - 2021
 Semesterly lectures to advanced math high-school students at UC Berkeley and UBC

Center for Teaching and Learning – Stanford University Stanford, CA
Appointment Tutor for Academic Years 2008-2011
 Meeting students in individual appointments and helping them in Mathematics and Computer Science.
 Apr 2008 – June 2011

Stanford Math Department Stanford, CA
Grader
 Grading homework for various mathematics classes: Math 42, 51H, 52H, 108, 121.
 Jan 2008 – June 2011

Advanced Math Group in High School Sofia, Bulgaria
Group leader
 Organized and taught a series of lectures in advanced mathematics to prepare younger students for Mathematical Olympiads. A few of them participated successfully at the IMO.
 Sept 2006 – May 2007

Academic Service

BIRS Oaxaca Workshop Organizer Oaxaca, Mexico
Computations and Data in Algebraic Statistics
 Sep 2021

IPAM Semester Long Program Organizer Los Angeles, CA
Tensor Methods and Emerging Applications to the Physical and Data Sciences
 Mar - Jun, 2021

Minisymposium Organization

- ❑ **SIAM AG Meeting: Theory and Methods for Tensor Decomposition**, Bern, Switzerland
 Jul 2019
- ❑ **SIAM AG Meeting: Graphical Models** Bern, Switzerland
 Jul 2019
- ❑ **Joint Statistical Meetings: Algebraic Methods in Statistics** Vancouver, BC
 Jul 2018
- ❑ **SIAM Annual Meeting: Theoretical Challenges in Tensor Decomposition** Portland, OR
 Jul 2018

Seminar Organization

- ❑ **Algebraic Statistics Online Seminar: A worldwide virtual seminar series** Online seminar
 Jun 2020 – present
- ❑ **MIT Seminar on Applied Algebra and Geometry: organizer and founder** Cambridge, MA
 2017 – 2018

**Students
and
Postdocs**

Graduate Students

- Pardis Semnani (UBC)**
- Reza Sadoughian (UBC)**
- Mateusz Faltyn (UBC)**
- Bakytzhan Kurmanbek (UBC)**
- Damara Gagnier (UBC)**
- Jean-Baptiste Seby (MIT)**

Undergraduate Students

- Alex Dong (UBC)**
- Jai Grewal (UToronto)**
- Tommi Muller (UBC)**
- Karim Halaseh (UBC)**
- Yiheng Liu (UBC)**
- Huanqing Wang (UBC)**
- Ali Zartash (MIT)**
- Melinda Sun (MIT)**

Postdocs

- Marina Garrote-López (UBC)**