

Alperen Ali Ergür

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Education

2016 PhD in Mathematics - *Texas A&M University, USA*
2011 MS in Mathematics- *Tobb University, Turkey*
2009 BS in Mathematics- *Bilkent University, Turkey*

Employment

Aug 2020-present University of Texas at San Antonio
Assistant Professor
Mathematics Department

Sep 2019-Aug 2020 Carnegie Mellon University, Theoretical Computer Science Group
Postdoctoral Fellow
Mentors: Venkatesan Guruswami and Pravesh Kothari

May 2017-Aug 2019 Technical University of Berlin, Algorithmic Algebra Group
Einstein Postdoctoral Fellow
Mentors: Peter Bürgisser and Felipe Cucker

Aug 2016-May 2017 North Carolina State University, Symbolic Computation Group
Postdoctoral Research Scholar
Mentor: Cynthia Vinzant

Sep 2011-Aug 2016 Texas A&M University, Functional Analysis and Algebraic Geometry Groups
Graduate Research/Teaching Assistant, and REU Instructor
Mentors: Grigoris Paouris and J. Maurice Rojas

Teaching Experience

1. University of Texas at San Antonio

- *Mentoring:*
Jesus Rebollo-Bueno (postdoctoral scholar), Abigail Martinez (M.S. student),
Nina De La Torre, Ian Solis, Chris La Valle (undergraduate students)
- *Courses developed for Mathematics of Data and Computing B.S. degree*
Probability and Computing
Introduction to Optimization (with C. Walton)
(Re)designing two course abstract algebra series with an algorithmic view
- *Courses developed for grad students in Math, CS and Engineering*
Probability Theory and Computing
High Dimensional Probability with Algorithmic Applications
- *Instructor of the Record:*
Linear Algebra, Probability and Computing, Abstract Algebra

2. Technische Universität Berlin

- *Graduate Seminar:* Interior Point Methods in Convex Optimization (with T. de Wolff)
- *Graduate Class:* Effective Algebraic Geometry (with P. Bürgisser, J. Tonelli-Cueto)
- Worked closely with PhD students Josue Tonelli-Cueto and M. Levent Doğan

3. NC State University

- Instructor of the Record for the following courses
Linear Algebra for Science Majors, Calculus for Engineers, Precalculus

4. Texas A&M University

- *Assistant Instructor at Research Experience for Undergraduates Program (REU)*
Mentored eight undergraduate research projects in four summers: 2013-2016
- Recitation Leader for Graduate Algebra, Probability, Advanced Calculus, Calculus

Grants, Awards, etc

2022+	MAA NExt Fellow, 2022 Class
July 2021	NSF-CCF-2110075, Algorithmic Foundations Program, started at 10/01/21 Title: Beyond Worst-Case Analysis for Computing with Polynomials
Jan 2017	Postdoctoral Fellowship by Einstein Foundation
Jun 2015	Travel Grants by University of Trento and Institut Henri Poincare
April 2014	AMS Travel Grant for Graduate Students
Sept 2009	Full Scholarship by Tobb University including tuition and stipend
Sept 2004	Full Scholarship by Bilkent University including tuition and stipend
< 2004	Two Bronze, One Silver Medal in National Math Competitions

Research Interest

Discrete and Convex Geometry, Real Algebraic Geometry, Convex Optimization,
Randomized Numerical Analysis, Theory of Computation

Publications and Preprints

Articles listed below are available at https://arxiv.org/a/ergur_a_1.html

1. Multihomogenous Nonnegative Polynomials and Sums of Squares
Discrete & Computational Geometry, 2018
<https://doi.org/10.1007/s00454-018-0011-3>
2. Probabilistic Condition Number Estimates for Real Polynomials I
(with G. Paouris and J.M. Rojas)
Foundations of Computational Mathematics, 2019
<https://doi.org/10.1007/s10208-018-9380-5>
3. Approximating Nonnegative Polynomials via Spectral Sparsification
SIAM Journal on Optimization, 2019
<https://doi.org/10.1137/17M1121743>
4. Tropical Varieties for Exponential Sums
(with G. Paouris and J.M. Rojas)
Mathematische Annalen, 2020
<https://doi.org/10.1007/s00208-019-01808-5>
5. On the Expected Number of Zeros of Random Fewnomials
(with P. Bürgisser and J. Tonelli-Cueto)
SIAM Journal on Applied Algebra and Geometry (SIAGA), 2019
<https://doi.org/10.1137/18M1228682>
6. Smoothed Analysis for the Condition Number of Structured Real Polynomial Systems
(with G. Paouris and J.M. Rojas)
Mathematics of Computation, 2021
<https://doi.org/10.1090/mcom/3647>
7. On the Complexity of Plantinga-Vegter Algorithm
(with F. Cucker and J. Tonelli-Cueto)
ACM Symposium on Symbolic and Algebraic Computation (ISSAC), 2019
<https://doi.org/10.1145/3326229.3326252>
Discrete & Computational Geometry, 2022
<https://doi.org/10.1007/s00454-022-00403-x>
8. The Rank of Sparse Random Matrices
(with A. Coja-Oghlan, Pu Gao, S. Hettereich, H. Rolvien)
ACM Symposium on Discrete Algorithms (SODA), 2020
<https://doi.org/10.1137/1.9781611975994.35>
Random Structures and Algorithms, 2022
<https://doi.org/10.1002/rsa.21085>
9. The Multivariate Schwartz-Zippel Lemma
(with M. L. Doğan, J. Mundo, E. Tsigaridas)
SIAM Journal of Discrete Mathematics, 2022
<https://doi.org/10.1137/20M1333869>
10. A Polyhedral Homotopy Algorithm for Real Zeros
(with T. de Wolff)
Minor Revision @ Arnold Mathematical Journal

11. Functional Norms, Condition Numbers, and Numerical Algorithms in Algebraic Geometry
(with F. Cucker, J. Tonelli-Cueto)
Accepted @ Forum Mathematics Sigma
12. Beyond Worst-Case Analysis for Root Isolation Algorithms
(with J. Tonelli-Cueto, E. Tsigaridas)
ACM Symposium on Symbolic and Algebraic Computation, (ISSAC), 2022
<https://doi.acm.org?doi=3476446.3535475>
13. On the Bit Complexity of Computing Chow Forms
(with M. L. Doğan, E. Tsigaridas)
14. Approximate Low-Rank Decomposition for Real Symmetric Tensors
(with J. Rebollo-Bueno, P. Valettas)
Jupyter Notebook https://alpergur.xyz/energy_increment.ipynb

Some Talks

- May 2022** Real Algebraic Geometry and Optimization Seminar, Purdue University
- Jul 2021** Mathematical Congress of Americas, Buenos Aires, Argentina
- Jun 2021** Effective Methods in Algebraic Geometry, MEGA 2021, Tromsø Norway
- Sept 2020** Data Seminar, U Missouri Columbia
- Mar 2020** ACO Seminar, Carnegie Mellon University
- Jul 2019** SIAM Conference on Applied Algebraic Geometry 2019, Bern
- Jun 2019** Effective Methods in Algebraic Geometry (MEGA) 2019, Madrid
- Apr 2019** Computational Geometry Workshop, Schloss Dagstuhl, Germany
- Feb 2019** Universität Bonn, Theoretical Computer Science Seminar
- Nov 2018** Goethe Universität Frankfurt, Applied Discrete Mathematics Seminar
- Oct 2018** U Missouri Columbia, Convex Geometry Seminar
- Mar 2018** Emerging Trends in Geometric Functional Analysis, Banff Creativity Centre
- Dec 2017** Methods on Discrete Structures Lecture Series, TU Berlin
- Nov 2017** Algebra Meets Numerics Workshop, Berlin Academy of Sciences
- Mar 2017** U Michigan Ann Arbor, Analysis and Probability Seminar
- July 2016** Geometric Functional Analysis Concentration Week, Texas A&M
- Apr 2016** MIT, LIDS Seminar
- Apr 2016** Georgia Tech, Algebra Seminar
- Mar 2016** Univ of Chicago, Scientific Computing Seminar
- Mar 2016** NC State University, Symbolic Computation Seminar
- Dec 2015** Colorado State University, FRAGMENT Seminar
- Oct 2015** Technical University of Munich, Applied Geometry Seminar, Germany
- Sept 2015** University of Athens, Convex Geometric Analysis Seminar, Greece

Service

- 2021+** Organizer, Geometry, Probability, and Computing Seminar
A student accessible research seminar co-organized with G. Paouris and P. Valettas
Resources available at [http://alpergur . xyz/gpcseminar . html](http://alpergur.xyz/gpcseminar.html)
- 2023** PC Member, ACM Symposium in Algebraic Computation (ISSAC 2023)
- 2020-23** Member of the Committee to design Mathematics of Computation and Data:
New B.S. degree jointly offered by Math and CS departments of UTSA
- Nov 2021** Organizer, SIAM TX-Louisiana Section Meeting Minisymposia:
with J. M. Rojas and F. Sottile, Algorithmic Algebra and Geometry (4 sessions)
- July 2021** Organizer, Mathematical Congress of Americas Minisymposia:
with D. Armentano, M. Bender, and J. Tonelli Cueto,
Numeric-Symbolic Computation with Polynomials (3 Sessions)
- July 2019** Organizer, SIAM Applied Algebraic Geometry Minisymposia:
with P. Lairez, G. Malajovich, and J. Tonelli Cueto,
Numerical Methods for Structured Polynomial System Solving (4 sessions)
- Fall 2017** Organizer, Algorithmic Algebra OberSeminar, with P. Bürgisser, TU Berlin
- Mar 2016** Organizer, Lecture Series on Stable Polynomials, Boğaziçi-METU
- Jan 2016** Organizer, Combinatorial Algebraic Geometry Workshop, Nesin Math Village
with Ö. Kışisel, H. Güntürkün, and Ö. Öztürk
- Nov 2014** Member of Power Team, Texas A&M High School Contest

References

- Teaching** Timothee Bryan (Term Assistant Professor of Mathematics, George Mason University)
Peter Bürgisser (Professor of Algorithmic Algebra, Technical University of Berlin)
Felipe Cucker (Professor of Mathematics, City University of Hong Kong)
Pravesh Kothari (Assistant Professor of Computer Science, Carnegie Mellon University)
Grigoris Paouris (Professor of Mathematics, Texas A&M University)
J.Maurice Rojas (Professor of Mathematics and Computer Science, Texas A&M University)
Cynthia Vinzant (Assistant Professor of Mathematics, University of Washington, Seattle)