

# 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)
- *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 Dogan

### 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

**Nov 2021** MAA NExt Fellow, 22

**July 2021** NSF-CCF-2110075, Algorithmic Foundations directory, starting 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](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>  
Full version to appear in Discrete & Computational Geometry
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>  
Full version Minor Revision @ Random Structures and Algorithms
9. The Multivariate Schwartz-Zippel Lemma  
(with L. Dogan, J. Mundo, E. Tsigaridas)  
To appear in SIAM Journal of Discrete Mathematics
10. A Polyhedral Homotopy Algorithm for Real Zeros  
(with T. de Wolff)  
Under Review @ Arnold Mathematical Journal
11. Functional Norms, Condition Numbers, and Numerical Algorithms in Algebraic Geometry  
(with F. Cucker, J. Tonelli-Cueto)  
Minor Revision @ Forum Mathematics Sigma
12. A Near-Optimal Expected Boolean Complexity Bound for Descartes Solver  
(with J. Tonelli-Cueto, Elias Tsigaridas)

## Some Talks

- Jul 2021** Mathematical Congress of Americas, Buenos Aires, Argentina
- Jun 2021** Effective Methods in Algebraic Geometry, MEGA 2021, Tromso 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
- 2020+** Member of the Committee to design Mathematics of Computation and Data:  
New B.S. degree jointly offered by Mathematics and Computer Science departments
- July 2021** Organizer, Mathematical Congress of Americas Minisymposia:  
Numeric-Symbolic Computation with Polynomials
- July 2019** Organizer, SIAM Applied Algebraic Geometry Minisymposia:  
Numerical Methods for Structured Polynomial System Solving
- Fall 2017** Organizer, Algorithmic Algebra OberSeminar, TU Berlin
- Jan 2016** Organizer, Combinatorial Algebraic Geometry Workshop, Nesin Math Village
- 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 )