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-   University of Texas at San Antonio
present   *Assistant Professor*

Computer Science Department (25 %) Mathematics Department (75 %)

Sep 2019-   Carnegie Mellon University, Theoretical Computer Science Group
Aug 2020   *Postdoctoral Fellow*

Mentors: Venkatesan Guruswami and Pravesh Kothari

May 2017-   Technical University of Berlin, Algorithmic Algebra Group
Aug 2019   *Einstein Postdoctoral Fellow*

Mentors: Peter Bürgisser and Felipe Cucker

Aug 2016-   North Carolina State University, Symbolic Computation Group
May 2017   *Postdoctoral Research Scholar*

Mentor: Cynthia Vinzant

Sep 2011-   Texas A&M University, Functional Analysis and Algebraic Geometry Groups
Aug 2016   *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 (postdoc, 2022 → Lecturer @ Sevilla, Spain)
     Josue Tonelli-Cueto (postdoc, 2023 → Postdoc @ John Hopkins Applied Math)
     Abigail Martinez (M.S. student, 2022)
     Ian Solis (undergrad researcher, 2022 → Southwest Research Institute)
     Nina De La Torre, (undergrad researcher, 2023 → Grad School @ UT Austin)
     Chris La Velle, (undergrad researcher, 2023 → Grad School @ UTSA)

   - *Student-accessible research seminar on Geometry, Probability, and Computing*
     Resources available at `http://alpergur.xyz/gpcseminar.html`

   - *New Course Design and Redesign*
     Probability and Computing
     Introduction to Optimization (with C. Walton)
     (Re)designing two course abstract algebra series with an algorithmic view
     Algorithmic Foundations of Data Science (currently under development)

   - *Instructor of the record @ UTSA Main Campus:*
     Linear Algebra, Probability and Computing, Abstract Algebra,
     Algebra and Number Systems (intro to proofs), Calc 2

   - *Instructor of the record @ UTSA School of Data Science:*
     Probability and Computing, Algorithmic Foundations of Data Science (24)

2. Technische Universität Berlin

   - *Seminar:* Interior Point Methods in Convex Optimization (with T. de Wolff)

   - *Graduate Class:* Effective Algebraic Geometry (with P. Bürgisser, J. Tonelli-Cueto)

3. NC State University

   - Instructor of the Record: Linear Algebra for Science Majors, Calculus, Precalc

4. Texas A&M University

   - *Assistant Instructor @ Research Experience for Undergraduates Program (REU)*
     Mentored *eight* undergraduate research projects in four summers: 2013-2016
     7 Students → grad school @ MIT, Harvard, Chicago, Notre Dame, Brown, UIUC
     Two students won NSF gradaute fellowship.

   - Recitation Leader for Graduate Algebra, Probability, Advanced Calculus

Grants, Awards, etc

2023+   MAA NExt Fellow, 2023 Class

Oct 2021   NSF-CCF-2110075, Algorithmic Foundations Program

            Title: Beyond Worst-Case Analysis for Computing with Polynomials

Jan 2017   Postdoctoral Fellowship by Einstein Foundation

2014-2015 Travel Grants by University of Trento, Institut Henri Poincare, and AMS

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

Real Algebraic Geometry, Convex Geometry, Randomized Numerical Algorithms, Optimization, Theory of Computation

Publications and Preprints

Google scholar: `https://scholar.google.com/citations?user=u6wvoesAAAAJ&hl=en&oi=ao`

Journal Papers

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)
   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)
   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)
    Arnold Mathematical Journal, 2022
    `https://doi.org/10.1007/s40598-022-00219-w`

11. Functional Norms, Condition Numbers, and Numerical Algorithms in Algebraic Geometry
    (with F. Cucker, J. Tonelli-Cueto)
    Forum Mathematics Sigma, 2022
    `https://doi.org/10.1017/fms.2022.89`

12. Approximate Real Symmetric Tensor Rank
    (with J. Rebollo-Bueno, P. Valettas)
    Arnold Mathematical Journal, 2023
    `https://doi.org/10.1007/s40598-023-00235-4`
    Jupyter Notebook for the code: `https://alpergur.xyz/energy_increment.ipynb`

Conference Papers

13. Plantinga-Vegter Algorithm Takes Average Polynomial Time
    ACM Symposium on Symbolic and Algebraic Computation (ISSAC), 2019
    `https://doi.org/10.1145/3326229.3326252`

14. The Rank of Sparse Random Matrices
    (with A. Coja-Oghlan, Pu Gao, S. Hettereich, H. Rolvien)
    ACM Symposium on Discrete Algorithms (SODA), 2020
    `https://epubs.siam.org/doi/pdf/10.1137/1.9781611975994.35`

15. 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`

Preprints

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

16. On the Complexity of Chow and Hurwitz Forms
    (with M. L. Doğan, E. Tsigaridas)

17. The Geometry of Rank Drop in a Class of Face-Splitting Matrix Products
    (with S. Agarwal, E. Connelly, R. Thomas)

18. On the Number of Real Zeros of Random Sparse Polynomial Systems
    (with Mate Telek, Josue Tonelli-Cueto)

Papers in Preparation

19. On the Number of Iterations of the DBA Algorithm
    (with F. Brüning, A. Driemel, H. Röglin)

20. Accuracy and Stability of Algorithms for Computing the Fundamental Matrix
    (with S. Agarwal, E. Connelly, R. Thomas)

21. Toric Compactifications for Analytic Combinatorics
    (with T. George, S. Gillen, S. Melczer, R. Pemantle)

22. A Metric Geometry Approach to Extension Complexity
    (with G. Paouris, P. Valettas)

23. Preconditioning Multivariate Polynomials via Riemannian Optimization
    (with M.L. Doğan, E. Tsigaridas)

Selected Talks

Nov 2022   Algebraic Geometry and Complexity Theory Workshop, Polish Academy of Sciences

May 2022   Real Algebraic Geometry and Optimization Seminar, Purdue University

April 2022 Workshop on Analytical Combinatorics, AIM, San Jose, CA

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, Switzerland

Jun 2019   Effective Methods in Algebraic Geometry (MEGA) 2019, Madrid, Spain

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 (BIRS), Canada
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
2023	PC Member, ACM Symposium in Algebraic Computation (ISSAC 2023)
March 23	Panelist, NSF CCF Directory
	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)
April 2020	Panelist, NSF CCF Directory
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 Real Stable Polynomials, Boğaziçi-METU
Jan 2016	Organizer, Combinatorial Algebraic Geometry Workshop, Nesin Math Village
	with Ö. Kişisel, 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)