

STELLE

Seit 2020: Professur für Angewandte Algebra (W2) an der Universität Leipzig

WERDEGANG

2017 - 2020: Juniorprofessur für Diskrete Geometrie an der Freien Universität Berlin; von Juli 2018 bis September 2020 stellvertretende Leitung der Arbeitsgruppe

2017: Mitarbeiter in der Arbeitsgruppe Nonlinear Algebra am Max-Planck-Institut für Mathematik in den Naturwissenschaften, Leipzig

2014 - 2017: Visiting Assistant Professor am Georgia Institute of Technology, Atlanta, GA

ABSCHLÜSSE

- Doktor der Naturwissenschaften (Dr. rer. nat.), summa cum laude, 2014
Betreuer: Claus Scheiderer
- Diplom in Mathematik (1,0), 2010

AUSBILDUNG

- Doktorand an der Universität Konstanz, 2010 - 2014
- Erasmus Student an der Université Paris Diderot Paris VII, 2008/2009
- Student an der Universität Konstanz 2004-2009

FORSCHUNGSINTERESSEN

Algebraische, diskrete, konvexe, reelle Geometrie

- Nichtnegative Polynome und Quadratsummen
- Spektraeder und lineare Matrixungleichungen
- Konvexe, semi-algebraische Mengen

DRITTMITTEL

- MaRDI (Verbundprojekt im Rahmen der NFDI), beteiligt an TA6 (Data Culture and Community Integration)
- DFG Projekt „Geometrie hyperbolischer Polynome“ (mit Daniel Plaumann, TU Dortmund)
- Simons-Berkeley Research Fellowship für das Semesterprogramm *Geometry of Polynomials* am Simons Institute, Berkeley (2019)
- [Pegasus]² Marie Skłodowska-Curie Fellowship der FWO (stattdessen die Stelle an der FU Berlin angetreten)

STIPENDIEN

- Promotionsstipendium der Studienstiftung des deutschen Volkes 10/2011 - 03/2014
- Stipendium der Studienstiftung des deutschen Volkes 09/2008 - 03/2010

LÄNGERE AUFENTHALTE

- Januar - Mai 2019: Simons Institute - Semesterprogramm *Geometry of Polynomials*
- September - Oktober 2018: ICERM - Semesterprogramm *Nonlinear Algebra*
- August - September 2017: MSRI - Semesterprogramm *Geometric and Topological Combinatorics* (Research Membership)
- Mai - Juli 2014: National Institute of Mathematical Sciences in Daejeon, Südkorea - *Thematic Program on Applied Algebraic Geometry*

PUBLIKATIONEN

1. *Adjoints and Canonical Forms of Polypols*, mit Kathlén Kohn, Ragni Piene, Kristian Ranestad, Felix Rydell, Boris Shapiro, Miruna-Stefana Sorea und Simon Telen, Preprint 2021.
<https://arxiv.org/abs/2108.11747>
2. *Do alcoved lattice polytopes have unimodal h^* -vector*, mit Hannah Sjöberg, Preprint, 2021.
<https://arxiv.org/abs/2104.15080>
3. *Families of Faces and the Normal Cycle of a Convex Semi-algebraic Set*, mit Daniel Plaumann und Jannik Lennart Wesner, Preprint 2021.
<https://arxiv.org/abs/2104.13306>
4. *On the Existence of Two View Chiral Reconstructions*, mit Andrew Pryhuber und Rekha Thomas, Preprint, 2020.
<https://arxiv.org/abs/2011.07197>
5. *The Chiral Domain of a Camera Arrangement*, mit Sameer Agarwal, Andrew Pryhuber und Rekha Thomas, Preprint, 2020.
<https://arxiv.org/abs/2003.09265>
6. *Hyperbolic Secant Varieties of M -Curves*, mit Mario Kummer, Preprint, 2020.
<https://arxiv.org/abs/2002.00486>
7. *Maximum Likelihood Estimation for Nets of Conics*, mit Stefan Dye, Kathlén Kohn, und Felix Rydell, erscheint in *Le Matematiche*.
<https://arxiv.org/abs/2011.08989>
8. *Sums of Squares and Quadratic Persistence on Real Projective Varieties*, mit Grigoriy Blekherman, Gregory G. Smith und Mauricio Velasco, erscheint in the *Journal of the EMS*
<https://arxiv.org/abs/1902.02754>

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9. *Sums of Squares: A real projective story*, mit Grigoriy Blekherman, Gregory G. Smith und Mauricio Velasco.
Notices of the AMS, **68(5)**, 734-747, 2021
 10. *On the Dimensions of the Realization Spaces of Polytopes*, mit Laith Rastanawi und Günter Ziegler.
Mathematika, **67(2)**, 342-365, 2021
 11. *Conic Programming: Infeasibility Certificates and Projective Geometry*, mit Simone Naldi.
Journal of Pure and Applied Algebra, **225(7)**, 22 Seiten, 2021
 12. *Kippenhahn's Theorem for Joint Numerical Ranges and Quantum States*, mit Daniel Plaumann und Stephan Weis.
SIAM Journal on Applied Algebra and Geometry, **5(1)**, 86-113, 2021
 13. *Combinatorial Inscrubability Obstructions for Higher-dimensional Polytopes*, mit Joseph Doolittle, Jean-Philippe Labbé, Carsten Lange, Jonathan Spreer, und Günter Ziegler.
Mathematika, **66(4)**, 927-953, 2020
 14. *Typical and Generic Ranks in Matrix Completion*, mit Daniel Bernstein und Grigoriy Blekherman.
Linear Algebra and its Applications, **585**, 71-104, 2020
 15. *Positive Semidefinite Univariate Matrix Polynomials*, mit Christoph Hanselka.
Mathematische Zeitschrift, **292(1-2)**, 83-101, 2019
 16. *Maximum Likelihood Threshold and Generic Completion Rank of Graphs*, mit Grigoriy Blekherman.
Discrete and Computational Geometry, **61(2)**, 303-324, 2019
 17. *Gram Spectrahedra*, mit Lynn Chua, Daniel Plaumann und Cynthia Vinzant.
In Ordered Algebraic Structures and Related Topics, vol. 697 of Contemporary Mathematics, 81-105. American Mathematical Society, Providence, RI, 2017
 18. *Do Sums of Squares Dream of Free Resolutions?* mit Grigoriy Blekherman und Mauricio Velasco.
SIAM Journal on Applied Algebra and Geometry **1(1)** 175-199, 2017
 19. *Low-Rank Sum-of-Squares Representations on Varieties of Minimal Degree*, mit Grigoriy Blekherman, Daniel Plaumann und Cynthia Vinzant.
International Mathematical Research Notices, **2019(1)**, 33-54, 2019
 20. *Extreme Rays of the Hankel Spectrahedra for Ternary Forms*, mit Grigoriy Blekherman.
Journal of Symbolic Computation **79 (1)**, 23-42, 2017
 21. *Real Ranks with Respect to Varieties*, mit Grigoriy Blekherman.
Linear Algebra and its Applications, **505**, 344-360, 2016

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22. *Computing hermitian determinantal representations of hyperbolic curves*, mit Daniel Plaumann, David E Speyer, und Cynthia Vinzant. International Journal of Algebra and Computation, **25(8)**, 1327-1336, 2015
 23. *Generic Spectrahedral Shadows*, mit Bernd Sturmfels. SIAM Journal on Optimization, **25 (2)**, 1209-1220, 2015
 24. *Algebraic Boundaries of Convex Semi-algebraic Sets*. Research in the Mathematical Sciences, **2 (1)**, 2015
 25. *Algebraic Boundaries of Convex Semi-algebraic Sets*, Dissertation, 2014. <http://nbn-resolving.de/urn:nbn:de:bsz:352-281616>
 26. *Algebraic Boundaries of $SO(2)$ -Orbitopes*. Discrete and Computational Geometry, **50 (1)**, 219-235, 2013

PUBLIKATIONEN OHNE PEER-REVIEW

1. Sums of Squares on Projective Varieties, Oberwolfach Report 14/2017. https://www.mfo.de/occasion/1710/www_view

DOKTORANDEN

1. Marie-Charlotte Brandenburg
2. Chiara Meroni (im Rahmen der IMPRS, MPI Leipzig)
3. Laith Rastanawi (betreut gemeinsam mit Günter Rote, FU Berlin)
4. Jannik Wesner (betreut gemeinsam mit Daniel Plaumann, TU Dortmund)

ABGESCHLOSSENE PROMOTIONEN

1. Hannah Sjöberg (betreut gemeinsam mit Günter Ziegler, FU Berlin)

SEMINARVORTRÄGE

- Numerical Algebra and Optimization Seminar, MPI Leipzig
Chirality in Computer Vision (2021)
- Seminar on Nonlinear Algebra, MPI Leipzig
Adjoints and Canonical Forms of Polypols (2021)
- Discrete Mathematics/Geometry Seminar, TU Berlin
Realization Spaces of Polytopes (2020)
- Nonlinear Algebra Seminar Online, Max-Planck Institut Leipzig
Chirality from Multiple Views (2020)
- Algebra, Geometry, Combinatorics Seminar, San Francisco State University
Local Properties of Realization Spaces of Polytopes (2019)
- Introduction to Algebraic Statistics by Bernd Sturmfels, Freie Universität Berlin
The Cone of Sufficient Statistics (eingeladene Vorlesung, 2018)
- Seminar Algorithmische Algebra, Technische Universität Berlin
Quadratic Persistence of Real Projective Varieties (2018)

- Seminar Diskrete Geometrie, Freie Universität Berlin
Matrix Completion Problems from the Geometric Point of View (2017)
- Algebra Geometry Combinatorics Seminar, San Francisco State University
Positive Semidefinite Matrix Completion and Free Resolutions (2017)
- Geometric and Topological Combinatorics Seminar, MSRI, Berkeley
Positive Semidefinite Matrix Completion and Free Resolutions (2017)
- Nonlinear Algebra Seminar, Max-Planck Institut Leipzig
Positive Semidefinite Matrix Completion and Sums of Squares (2017)
- Kolloquium Methods for Discrete Structures, FU Berlin
Positive Semidefinite Matrix Completion (2017)
- Computational Algebra Seminar an der NCSU, Raleigh, NC
Pythagoras Number of Real Projective Varieties (2017)
- TU Eindhoven
Geometry of Sums of Squares (2017)
- TU Berlin
Geometry of Sums of Squares (2017)
- Trends in Optimization Seminar, University of Washington, Seattle, WA
Positive semidefinite matrix completion and sums of squares (2016)
- Seminar Diskrete Geometrie, FU Berlin
Geometry of Sums of Squares (2016)
- Combinatorics Seminar, University of Miami, Miami, FL
Positive semidefinite matrix completion and free resolutions (2016)
- Algebraic Geometry Seminar, University of Illinois, Urbana-Champaign, IL
Sums of Squares on Projective Varieties (2016)
- Algebra Seminar, Osnabrück
Positive Semidefinite Matrix Completion, Sums of Squares, and Free Resolutions (2016)
- Oberseminar Reelle Geometrie und Algebra, Konstanz
Low-Rank Sum-of-Squares Representations on Varieties of Minimal Degree (2016)
- Algebra Seminar, Emory University, Atlanta, GA
Matrix Completion and Free Resolutions (2016)
- Geometry Seminar Texas A&M, College Station, TX
Matrix Completion and Small Schemes (2016)
- Colloquium an der Georgia Southern, Statesboro, GA
Sums of Squares and Projective Varieties (2015)
- Oberseminar Reelle Geometrie und Algebra, Konstanz
Generic Spectrahedral Shadows (2015)
- Oberseminar Diskrete Mathematik, Frankfurt
Generische Projizierte Spektraeder (2015)
- Computational Algebra Seminar an der NCSU, Raleigh, NC
Generic Spectrahedral Shadows (2015)

VORTRÄGE BEI KONFERENZEN

- Numerical and Probabilistic Nonlinear Algebra, MPI Leipzig
Image Reconstruction and Chirality in Computer Vision (2021)
- Degeneracy Loci and Applications, online
Spectrahedra (2021)
- POEMA 2nd Workshop, online
Kippenhahn's Theorem for Joint Numerical Ranges (2020)
- Workshop Computational Algebra 2020, online
Realization Spaces of Polytopes (2020)
- Opening Conference des Thematic Einstein Semesters Algebraic Geometry, Berlin
Sums of Squares and Projective Varieties (2019)
- ICCOPT, Berlin
Kippenhahn's Theorem in Higher Dimensions (2019)
- SIAM Conference on Applied Algebraic Geometry, Bern, Schweiz
Real Geometry of Matrix Completion (2019)
- BIRS Workshop Geometry of Real Polynomials, Convexity and Optimization, Banff, Kanada
Kippenhahn's Theorem for the Joint Numerical Range (2019)
- Geometry of Polynomials Boot Camp, Simons Institute for the Theory of Computing, Berkeley, CA
Hyperbolic Polynomials and Determinantal Representations I and II (2019)
- Symposium on Discrete Mathematics, TU Graz, Österreich
Graph invariants from positive semidefinite matrix completion (2018)
- GDMV 2018, Paderborn
Sektion Diskrete Mathematik und Computeralgebra
Matrixvervollständigung vom geometrischen Standpunkt (2018)
- Geometrietag 2017, Magdeburg
Quadratic Persistence of Projective Varieties (2017)
- BMS-BGSMath Keynote Lecture, Barcelona
Extension Complexity and the Matching Polytope (2017)
- SIAM Conference on Applied Algebraic Geometry
Minisymposium Convex Algebraic Geometry and Semidefinite Optimization
Sum-of-Squares Representations of Shortest Length (2017)
- Oberwolfach Workshop Real Algebraic Geometry with a View Toward
Moment Problems and Optimization, Oberwolfach
Sums of Squares on Projective Varieties (2017)
- Joint Mathematics Meeting, Atlanta, GA
Special Session on Gaussian Graphical Models and Combinatorial Algebraic
Geometry
Positive Semidefinite Matrix Completion and Algebraic Geometry (2017)

- Harmony of Real and Complex Algebraic Geometry, Daejeon, Südkorea
Matrix Completion and Free Resolutions I & II (2016)
- AMS Sectional Meeting, Raleigh, NC
Special Session on Applied Algebraic Geometry
More on the Geometry of Positive Semidefinite Matrix Completion (2016)
- ALaNT 4, Telč, Tschechien
Sums of Squares and Positive Semidefinite Matrix Completion (2016)
- GOAL Workshop, Paris, Frankreich
Gaussian Graphical Models and Regularity (2016)
- Applied Algebra Days 3, Madison, WI
Sums of Squares and Maximum Likelihood Estimation (2016)
- AMS Sectional Meeting, Fargo, ND
Special Session on Combinatorial Ideals and Applications
Matrix Completion, Free Resolutions, and Sums of Squares (2016)
- AMS Sectional Meeting, Athens, GA
Special Session on Discrete and Applied Algebraic Geometry
Low rank psd lifts of nonnegative quadratic forms (2016)
- Joint Mathematics Meeting, Seattle, WA
Special Session on Nonlinear Algebra
Real Rank with Respect to Varieties (2016)
- Algebra, Geometry, and Proofs in Symbolic Computation, Fields Institute, Toronto, Kanada
Sums of Squares on Projective Varieties (2015)
- Ordered Algebraic Structures and Related Topics, CIRM Workshop, Luminy, Frankreich
Gram Spectrahedra (2015)
- Third Workshop on Hybrid Methodologies for Symbolic-Numeric Computation (embedded meeting of ICIAM 2015), Beijing, China
Algebraic Boundaries of Convex Sets (2015)
- SIAM Conference on Applied Algebraic Geometry, Daejeon, Südkorea
Generic Spectrahedral Shadows (2015)
- Nonlinear Algebra, Berlin
Gram Spectrahedra (2015)
- Optimization and Algebraic Geometry, Daejeon, Südkorea
Extreme Rays of the Hankel Spectrahedra for Ternary Forms (2014)
- Polyhedra, Lattices, Algebra and Moments, Singapur
Extreme Rays of Cones of Moment Matrices for Ternary Forms (2014)
- SIAM Conference on Applied Algebraic Geometry, Fort Collins, CO
Algebraic Boundaries of Convex Semi-algebraic Sets (2013)
- SIAM Conference on Applied Algebraic Geometry, Raleigh, NC
The Algebraic Boundary of $SO(2)$ -Orbitopes (2011)

- Real Algebraic Geometry, Rennes, Frankreich
SO(2)-Orbitopes (2011)
- Real Algebra, Geometry and Convexity, Leipzig
SO(2)-Orbitopes (2011)

ORGANISATION

- Minisymposium „Convex Algebraic Geometry“ während SIAM Conference on Applied Algebraic Geometry 2021, mit Greg Blekherman und Cynthia Vinzant, College Station, TX, USA (2021)
- Fall School des Thematic Einstein Semester on Algebraic Geometry - Varieties, Polyhedra, Computation, mit Daniele Agostini, Thomas Krämer, Marta Panizzut an der FU Berlin (2019)
- Real Applied Algebraic Geometry, mit Mario Kummer und Bernd Sturmfels an der TU Berlin (2019)
- Convexity Day am MPI Leipzig, mit Thomas Wannerer (2019)
- Minisymposium „Algebraic Methods for Convex Sets“ während SIAM Conference on Applied Algebraic Geometry 2019, mit Greg Blekherman, Daniel Plaumann, Yong Sheng Soh und Dogyoon Song in Bern, Schweiz (2019)
- Besuch von Rekha Thomas als Gast des Graduiertenkollegs Facets of Complexity an der FU Berlin (Juni 2019)
- Berlin-Leipzig Seminar on Algebra, Geometry, and Combinatorics
Zweitägige Konferenz an der FU Berlin, mit Christian Haase (2017)
- Reading Group on Real Algebraic Geometry, mit Mario Kummer und Kristin Shaw, am MPI Leipzig (2017)
- Joint Mathematics Meeting in Atlanta, GA
Special Session on Gaussian Graphical Models and Combinatorial Algebraic Geometry (2017)
- Minisymposium “Polynomial Optimization and Moments” während SIAM Conference on Applied Algebraic Geometry 2015 in Daejeon, Südkorea

LEHRE

Vorlesungen

- Algebra I (U Leipzig 2021/22)
- Reelle Algebra und Geometrie (U Leipzig 2021)
- Lineare Algebra II (U Leipzig 2021)
- Riemannsche Flächen und algebraische Kurven (U Leipzig 2020/21)
- Lineare Algebra I (U Leipzig 2020/21)
- Lineare Algebra II (FU Berlin 2020)
- Lineare Algebra I (FU Berlin 2019/20)
- Mathematisches Panorama/Panorama der Mathematik (FU Berlin 2018/19)
- Diskrete Geometrie III (FU Berlin 2018/19)

- Diskrete Geometrie II (FU Berlin 2018)
- Diskrete Geometrie I (FU Berlin 2017/2018)
- MATH-4150 Introduction to Number Theory (GT 2017)
- MATH-8803-sin Algebraic Curves (GT 2016)
- MATH-2552 Differential Equations (GT 2016)
- MATH-1552 Integral Calculus (GT 2015)
- MATH-4150 Introduction to Number Theory (GT 2015)
- MATH-2403 Differential Equations (GT 2014)

Seminare

- Seminar Themen in Algebra und Geometrie (U Leipzig 2021/22)
- Seminar Real Algebraic Geometry and Optimization (FU Berlin 2019)
- Proseminar Panorama der Mathematik (Storytelling in der Mathematik) (FU Berlin 2019)
- Themen aus der Zahlentheorie und algebraischen Geometrie (Konstanz 2010/2011)

Sommerschulen

- Summer School on Hyperbolic Polynomials, Sums of Squares, and Optimization, Georgia Institute of Technology, mit Greg Blekherman, Daniel Plaumann und Cynthia Vinzant (2018)
- Summer School on Real Algebraic Geometry and Optimization, Georgia Institute of Technology, mit Greg Blekherman und Mauricio Velasco (2016)

SERVICE

- Gutachten: Alexander von Humboldt Stiftung, verschiedene Zeitschriften (unter anderem DCG, IMRN, Journal of Algebra, Linear and Multilinear Algebra, SIOPT, SIAGA)
- Gremienarbeit: Tutorenauswahlkommission (FU Berlin; Juni 2018 bis September 2020), Besetzungskommissionen (für zwei Postdoc-Stellen), BMS Committee (Oktober 2019 bis September 2020), Einstellungskommission für Postdocs in der Nonlinear Algebra Gruppe am MPI MiS in Leipzig (2020)

KONFERENZTEILNAHMEN (AUSWAHL)

- SIAM Conference on Applied Algebraic Geometry, College Station, TX, USA (2021)
- Oberwolfach Workshop „Real Algebraic Geometry with a View toward Hyperbolic Programming and Free Probability (2020)
- SIAM Conference on Applied Algebraic Geometry, Bern, Schweiz (2019)
- BIRS Workshop Geometry of Real Polynomials, Convexity and Optimization, Banff, Kanada (2019)
- Simons Workshops Geometry of Polynomials (2019)

- SIAM Conference on Applied Algebraic Geometry, Atlanta (2017)
- Real Algebraic Geometry with a View Toward Moment Problems and Optimization, Oberwolfach Workshop (2017)
- Joint Mathematics Meeting in Atlanta, Georgia (2017)
- Joint Mathematics Meeting in Seattle, Washington (2016)
- Algebra, Geometry, and Proofs in Symbolic Computation, Fields Institute, Toronto, Kanada (2015)
- Ordered Algebraic Structures and Related Topics, CIRM Workshop, Luminy, Frankreich (2015)
- Algebraic Vision, Berlin (2015)
- SIAM Conference on Applied Algebraic Geometry, Daejeon, Südkorea (2015)
- Real Algebraic Geometry with a View to Systems Control and Free Positivity, Oberwolfach (2014)
- SIAM Conference on Applied Algebraic Geometry, Fort Collins, Colorado (2013)
- Workshop Polynomial Optimisation, Isaac Newton Institute, Cambridge, UK (2013)
- Structured Function Systems and Applications, Oberwolfach (2013)
- SIAM Conference on Applied Algebraic Geometry, Raleigh, North Carolina (2011)
- Real Algebraic Geometry, Rennes, Frankreich (2011)
- BIRS Workshop Convex Algebraic Geometry, Banff, Kanada (2010)

SPRACHEN

Deutsch (Muttersprache)
Englisch (fließend)
Französisch (gut)

POSTADRESSE

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ANSCHRIFT

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Lebenslauf

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