

Marie-Charlotte Brandenburg

Curriculum Vitæ

Max Planck Institute for Mathematics in the Sciences
Inselstr. 22
04103 Leipzig
marie.brandenburg@mis.mpg.de
mariebrandenburg.github.io

Education and Professional Experience

2023 – today	Max Planck Institute for Mathematics in the Sciences , Postdoctoral Researcher Research Group: Mathematical Machine Learning (Guido Montúfar)
2020 – 2022	Max Planck Institute for Mathematics in the Sciences , Ph.D. Student Ph.D. Thesis: <i>Tropical Positivity and Semialgebraic Sets from Polytopes</i> Advisor: Rainer Sinn Research Group: Non-Linear Algebra (Bernd Sturmfels)
2019 – 2020	Berlin Mathematical School Freie Universität Berlin , Ph.D. Student Advisor: Rainer Sinn Research Groups: Discrete Geometry and Topological Combinatorics (Günter M. Ziegler, Rainer Sinn, Matthias Beck) and Discrete Methods in Algebraic Geometry (Christian Haase)
2019	Freie Universität Berlin , M.Sc. Mathematics Master Thesis: <i>Competitive Equilibrium and Lattice Polytopes</i> Advisor: Christian Haase
2016 – 2017	Minodes GmbH , Data Analyst, Business Intelligence
2016	Freie Universität Berlin , B.Sc. Mathematics Bachelor Thesis: <i>A 4-Simple 4-Simplicial 8-Polytope</i> . Advisor: Günter M. Ziegler

Publications

2023	Tropical Positivity and Determinantal Varieties with Georg Loho and Rainer Sinn <i>Algebraic Combinatorics</i> , 6(4):999-1040, August 2023 10.5802/alco.286
2023	Competitive equilibrium always exists for combinatorial auctions with graphical pricing schemes with Christian Haase and Ngoc Mai Tran <i>La Matematica (Official Journal of the Association for Women in Mathematics)</i> , 2:1–30, March 2023 doi:10.1007/s44007-022-00038-7
2023	Multivariate Volume, Ehrhart and h^*-Polynomials of Polytopes with Sophia Elia and Leon Zhang <i>Journal of Symbolic Computation</i> , 114:209–230, January 2023. doi:10.1016/j.jsc.2022.04.011

- 2022 **Intersection Bodies of Polytopes**
with Katalin Berlow, Chiara Meroni and Isabelle Shankar
Contributions to Algebra and Geometry, 63(2):419–439, June 2022.
[doi:10.1007/s13366-022-00621-7](https://doi.org/10.1007/s13366-022-00621-7)
- 2021 **Investigation of hydro-mechanical processes in fluid-saturated fractured rock based on numerical model generation**
with Nele Pollmann, Julia Gallas, Lucas Witte and Tobias Backers
IOP Conference Series: Earth and Environmental Science, 833(1):012107, August 2021.
[doi:10.1088/1755-1315/833/1/012107](https://doi.org/10.1088/1755-1315/833/1/012107)

Preprints

- 2023 **The Best Ways to Slice a Polytope**
with Jesús A. de Loera and Chiara Meroni
[arXiv:2304.14239](https://arxiv.org/abs/2304.14239)
- 2023 **Intersection Bodies of Polytopes: Translations and Convexity**
with Chiara Meroni
[arXiv:2302.11764](https://arxiv.org/abs/2302.11764)
- 2022 **Combinatorics of Correlated Equilibria**
with Benjamin Hollering and Irem Portakal
[arXiv:2209.13938](https://arxiv.org/abs/2209.13938)

Published Conference Contributions

- 2022 **Extended Abstract: Competitive equilibrium always exists for combinatorial auctions with graphical pricing schemes**
with Christian Haase and Ngoc Mai Tran
In: L.F. Tabera Alonso (ed.), *Discrete Mathematics Days 2022*, pp. 64 – 70. Editorial Universidad de Cantabria, Santander, June 2022
[doi:10.22429/Euc2022.016](https://doi.org/10.22429/Euc2022.016)

Invited Conference Talks

- February 2023 **Tropical Geometry and Neural Networks**, *Tropical Geometry in Applications* at Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany
- September 2022 **Tropical Positivity and Determinantal Varieties**, *Geometry meets Combinatorics in Bielefeld* at Universität Bielefeld, Germany
- July 2022 **Tropical Positivity and Determinantal Varieties**, *Matroids, Ordered Structures, Arrangements in Combinatorics (MOSAIC)* at University of Manchester, England
- March 2022 **Intersection Bodies of Polytopes**, *Combinatorial Coworkspace* at Goethe-Universität Frankfurt, Germany
- March 2022 **The Positive Tropicalization of Low Rank Matrices**, *Discrete and Convex Day* at Freie Universität Berlin, Germany
- March 2022 **Competitive Equilibrium and Lattice Polytopes**, *Mini-Symposium on Lattice Polytopes* at KTH Royal Institute of Technology in Stockholm, Sweden and University of Nottingham, England

Contributed Conference Talks

- November 2023 **Combinatorial and Algebraic Approaches to Deep Learning**, *Annual Meeting of the DFG Priority Program Theoretical Foundations of Deep Learning* at Ludwig-Maximilians-Universität München, Germany
- July 2022 **Competitive Equilibrium Always Exists**, *Discrete Mathematics Days* at University of Cantabria, Santander, Spain
- June 2022 **The Positive Tropicalization of Low Rank Matrices**, *VII Encuentro Colombiano de Combinatoria (ECCO)* at Universidad de los Andes, Pontificia Universidad Javeriana, and Universidad Sergio Arboleda in Bogotá, Colombia
- December 2021 **Intersection Bodies of Polytopes**, *Conference for Women in Algebra and Symbolic Computation II* at Technische Universität Kaiserslautern, Germany

Research Seminar Talks

- June 2023 **The Best Ways to Slice a Polytope**, *Research Seminar Nonlinear Algebra* at Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany
- May 2023 **Competitive Equilibrium and Lattice Polytopes**, *Postdoc and Graduate Student Seminar* at ICERM - Institute for Computational and Experimental Research in Mathematics, Providence, RI, USA
- October 2022 **Competitive Equilibrium and Lattice Polytopes**, *Mathematical Operations Research Seminar* at University of Twente, Netherlands
- August 2022 **Tropical Positivity and Determinantal Varieties**, *Copenhagen-Jerusalem Combinatorics Seminar* at University of Copenhagen, Denmark and Hebrew University of Jerusalem, Israel
- May 2022 **The Positive Tropicalization of Low Rank Matrices**, *Research Seminar Algebra* at Friedrich-Schiller-Universität Jena, Germany
- May 2022 **The Positive Tropicalization of Low Rank Matrices**, *Research Seminar Algebra and Geometry* at Universität Osnabrück, Germany
- March 2022 **Competitive Equilibrium and Lattice Polytopes**, *Research Seminar Discrete Mathematics and Geometry* at Technische Universität Berlin, Germany
- February 2022 **Intersection Bodies of Polytopes**, *Colloquium of the Graduate School "Facets of Complexity"* at Freie Universität Berlin, Germany
- November 2021 **Intersection Bodies of Polytopes**, *Research Seminar Nonlinear Algebra* at Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany
- May 2021 **The Positive Tropicalization of Low Rank Matrices**, *Research Seminar Nonlinear Algebra* at Max Planck Institute for Mathematics in the Sciences, Leipzig, Germany
- July 2020 **Multivariate Volume, Ehrhart and h^* -Polynomials of Polytopes**, *Research Seminar Discrete Geometry* at Freie Universität Berlin, Germany
- October 2019 **Competitive Equilibrium and Lattice Polytopes**, *Research Seminar Algebra and Geometry* at Otto-von-Guericke-Universität Magdeburg, Germany
- December 2018 **Product-Mix Auctions, Competitive Equilibrium and Lattice Polytopes**, *Colloquium of the Graduate School "Facets of Complexity"* at Freie Universität Berlin, Germany

Posters

December 2019 **Multivariate Volume, Ehrhart and h^* -Polynomials of Polytropes**, *Conference for Women in Algebra and Symbolic Computation I* at Technische Universität Kaiserslautern, Germany

Teaching

2020 **Linear Algebra II**
Teaching Assistant for a class for first-year math students at Freie Universität Berlin, Germany

2019 **Panorama der Mathematik**
Teaching Assistant for a class for first-year math teachers in training at Freie Universität Berlin, Germany

2018 **Geometry**
Teaching Assistant for a class for advanced bachelor and early master students at Freie Universität Berlin, Germany

Services

Refereed for

Advances in Geometry
FPSAC '22 – Formal Power Series and Algebraic Combinatorics
Linear and Multilinear Algebra
Scientific Reports
SIAM Journal on Optimization

Conferences / Seminars organized

October 2023 **Chow Lectures**
Conference at MPI MiS (Leipzig) with June Huh as keynote speaker

September 2023 **Hodge and K-Theory meet Combinatorics**
Workshop at Bernoulli Center, EPFL (Lausanne)

Summer 2022 **Nonlinear Algebra Seminar**
Research Seminar of the Nonlinear Algebra Group at MPI MiS (Leipzig)

2019 **MATH+ Algebraic Geometry Research Retreat**
Workshop within the MATH+ Thematic Einstein Semester (Berlin) on Algebraic Geometry

Extended Stays

June 2019 – September 2019 **Max Planck Institute for Mathematics in the Sciences**, Leipzig, Germany
Research Group: Nonlinear Algebra

January 2019 – February 2019 **Simons Institute for the Theory of Computing**, Berkeley, CA, USA
Program: Geometry of Polynomials