

Marie-Charlotte Brandenburg

Curriculum Vitæ

Max Planck Institute for Mathematics in the Sciences
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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: *Tropical Positivity and Semialgebraic Sets from Polytopes*
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: *Competitive Equilibrium and Lattice Polytopes*
Advisor: Christian Haase
- 2016 – 2017 **Minodes GmbH**, Data Analyst, Business Intelligence
- 2016 **Freie Universität Berlin**, B.Sc. Mathematics
Bachelor Thesis: *A 4-Simple 4-Simplicial 8-Polytope*.
Advisor: Günter M. Ziegler

Publications

- 2023 **Tropical Positivity and Determinantal Varieties**
with Georg Loho and Rainer Sinn
To appear in *Algebraic Combinatorics*.
[arXiv:2205.14972](https://arxiv.org/abs/2205.14972)
- 2023 **Multivariate Volume, Ehrhart and h^* -Polynomials of Polytopes**
with Sophia Elia and Leon Zhang
Journal of Symbolic Computation, 114:209–230, January 2023.
[doi:10.1016/j.jsc.2022.04.011](https://doi.org/10.1016/j.jsc.2022.04.011)
- 2022 **Competitive equilibrium always exists for combinatorial auctions with graphical pricing schemes**
with Christian Haase and Ngoc Mai Tran
La Matematica. Official Journal of the Association for Women in Mathematics, December 2022
[doi:10.1007/s44007-022-00038-7](https://doi.org/10.1007/s44007-022-00038-7)

- 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

- 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

- 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

- 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 Polytopes**, *Conference for Women in Algebra and Symbolic Computation I* at Technische Universität Kaiserslautern, Germany

Teaching

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| 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 |

Organization

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| Summer 2022 | Nonlinear Algebra Seminar
Research Seminar of the Nonlinear Algebra Group at MPI MiS (Leipzig) |
| 2022 | AlToGeLiS
Consortium for revealing structures of data with algebra, topology, and geometry |
| 2019 | MATH+ Algebraic Geometry Research Retreat
Workshop within the MATH+ Thematic Einstein Semester on Algebraic Geometry |

Extended Stays

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| 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 |