Curriculum Vitae

Personal Data

Name	Dr. Matthias Himmelmann
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Education

03/2021 – 01/2025	Institute of Mathematics, **Universität Potsdam**, Germany Ph.D. in Geometry, grade: Summa cum Laude Graduate student at the **Berlin Mathematical School** Thesis title: *Optimization in Geometric Materials*.
04/2018 – 12/2020	Institute of Mathematics, **Freie Universität,** Berlin, Germany M.Sc. in Mathematics, grade: 1.1. Focus on Algebraic Geometry. Thesis: *Generalized PCA for Algebraic Varieties*.
10/2014 - 03/2018	Institute of Mathematics, **Freie Universität**, Berlin, Germany B.Sc. in Mathematics, grade 1.2. Minor in Computer Science. Thesis: *Galois Groups and Fundamental Groups on Riemann Surfaces*.
08/2017 - 12/2017	Semester abroad at **Universitetet i Oslo**, Oslo, Norway.
08/2004 - 06/2013	**Otto Hahn Europaschule**, Hanau, Germany Abitur, grade 1.3 *Advanced Courses*: Mathematics, Politics and Economics.

Professional Experience

06/2025 – today	**Research Associate** Technische Universität Braunschweig, Germany • Research in geometric materials, rigidity theory and polynomial optimization • Lecturer for *Machine Learning with Neural Networks* and *Ramp-Up Mathematics*
01/2025 – 05/2025	**Postdoctoral Fellow** ICERM, Brown University, Providence, Rhode Island, USA • Semester Program on the *Geometry of Materials, Packings and Rigid Frameworks*
03/2021 – 12/2024	**Research Assistant** Universität Potsdam, Germany • Researching the geometry and topology of biological and physical materials • Lecturer for *Mathematical Problem Solving* and *Algorithmic Algebraic Geometry*
05/2018 – 02/2021	**Student Assistant** Fraunhofer-Institut FOKUS, Berlin, Germany • Programming of features for early warning systems using Java/-Script • Design of a machine learning model for geospatial applications
08/2013 – 08/2014	**Bundesfreiwilligendienst** Deutscher Turner-Bund e.V., Frankfurt a.M., Germany

Research Stays

03/2024 – 04/2024	Research Stay at the **RICAM,** Linz, Austria in the context of the Special Semester on Rigidity and Flexibility.
07/2023 – 08/2023	Research Stay at the **Fields Institute,** Toronto, Canada in the context of the Focus Program on Geometric Constraint Systems.

Publications

2025+, submitted	Matteo Gallet, Georg Grasegger, **H.**, Jan Legerský. *PyRigi – a general-purpose Python package for the rigidity and flexibility of bar-and-joint frameworks*.
2025+, submitted	**H.**, Bernd Schulze, Martin Winter. *Rigidity of polytopes with edge length and coplanarity constraints*.
2025+, submitted	**H.**, Martin C. Pedersen, Myfanwy E. Evans, Michael A. Klatt, Philipp W.A. Schönhöfer, and Gerd E. Schröder-Turk. *Amorphous bicontinuous minimal surface models and the superior Gaussian curvature uniformity of Diamond, Primitive and Gyroid surfaces*.
2025	Alex Heaton and **H.** *Computing Euclidean distance and maximum likelihood retraction maps for constrained optimization*. Computational Geometry 126.
2024	Birte Ostermann, **H.** and May Cai. *Empirically Exploring the Space of Monostationarity corresponding to the Dual Phosphorylation Chemical Reaction Network*. Journal of Mathematical Chemistry.
2024	**H.** and Myfanwy E. Evans. *Robust geometric modeling of 3-periodic tensegrity frameworks using Riemannian optimization*. SIAM Journal on Applied Algebra and Geometry 8.2.

Conference Organization

02/2026	*Positivity, Convexity and Symmetry in Rigidity Theory*. TU Braunschweig, Germany. Joint with Martin Winter and Timo de Wolff.
04/2025	*Geometry of Materials*. ICERM, Brown University, Providence, RI, USA. Joint with Zeyuan He, Miranda Holmes-Cerfon, Sabetta Matsumoto, Ileana Streinu, Louis Theran.

Presentations

09/2025, invited talk	"PyRigi: A toolbox for the rigidity and flexibility of bar-joint frameworks". *The Annual 2025 ÖMG-DMV Meeting*, Johannes Kepler University of Linz, Austria.
08/2025, poster	"Riemannian Optimization over Semialgebraic Sets". *Summer School on Nonlinear Optimization and Combinatorics*, Technische Universität Braunschweig, Germany.
07/2025, invited talk	"Sampling the Space of Monostationarity in the Dual Phosphorylation Network". *SIAM Conference on Applied Algebraic Geometry*, University of Wisconsin, Madison, WI, USA.
06/2025, invited talk	"PyRigi: A general-purpose Python package for the rigidity and flexibility of bar-and-joint frameworks". *Mathematics, Ai and Data Science for Material Innovations (MADSMIN)*, University of Lancaster, UK.
04/2025, invited talk	"Geometric Models for Entanglements in Space". *Geometry of Materials*, ICERM, Brown University, Providence, RI, USA.
02/2025, poster	"Exploring the Homogeneity of Disordered Minimal Surfaces". *Circle Packings, Minimal Surfaces, and Discrete Differential Geometry*, ICERM, Brown University, Providence, RI, USA.

12/2024, invited talk	"Optimization in Geometric Materials". *Discrete Algebra and Geometry Seminar*, Technical University of Eindhoven, the Netherlands.
11/2024, poster	"Exploring the Homogeneity of Disordered Minimal Surfaces". *Gyroid is Everywhere*, Kindai University, Osaka, Japan.
03/2024, invited talk	"Homotopy Continuation Methods for Equilibration and the Computation of Deformation Paths". *Code of Rigidity* during the *Special Semester on Rigidity and Flexibility*, RICAM, Linz, Austria.
02/2024, invited talk	"Exploring Gaussian Curvature Heterogeneity by Modeling Disorder in Minimal Surfaces". *NBIA Workhop: A Copanhagen afternoon on geometry and topology in soft materials*, Niels Bohr Institut, Copenhagen, Denmark.
02/2024, invited talk	"Enhanced Geometrical Design for Cylinder Packings". *Applied Algebra Seminar*, TU Braunschweig, Germany.
09/2023, poster	"Riemannian Optimization and Algebraic Varieties – a Contradiction?" *Conference on Applied Algebra*, Universität Osnabrück, Germany.
08/2023, talk	"Riemannian Optimization on Embedded Manifolds Using Homotopy Continuation." *Workshop on Constraint Systems: Distance Geometry, Structured Polynomials, Matrix Completion and Kinematics*, Fields Institute, Toronto, Canada.
07/2023, talk	"A Tetrahedral Tensegrity Model for Filament Packings." *Workshop on Geometric Constraints: Materials, Graphs and Matroids, Rigidity and Packings*, Fields Institute, Toronto, Canada.
09/2022, poster	"Towards a Robust Tensegrity Model for the Mechanics of Filament Packings." *The Interdisciplinary World of Tangling conference*, Potsdam, Germany.
12/2020, talk	"Generalized Principal Component Analysis for Algebraic Varieties." *Facets of Complexity: Monday Lecture and Colloquium*, TU Berlin, Germany.

Software Projects

2025	DeformationPaths.jl: A package for Approximating Deformation Paths.
2024	PyRigi: A general-purpose Python package for bar-and-joint frameworks.
2022	HomotopyOpt.jl: Riemannian optimization package for polynomial constraints.
2021	Implicit3DPlotting.jl: Plotting implicit space curves and surfaces.
2020	LearnVanishingIdeal.jl: Numerically derives polynomials describing a point cloud.

Teaching

10/2023 – 02/2024	Seminar in "Algorithmic Algebraic Geometry"
04/2022 – 09/2022	Lecturer in "Mathematisches Problemlösen"
02/2020	Tutor for "Computeralgebra"
04/2018 – 09/2018	Mentor for "Linear Algebra for Computer Scientists"
04/2016 – 09/2017	Tutor of "Computer-oriented Mathematics II" and "Mathematics for Geoscientists I and II"

Awards and Grants

2023	Fields Institute Travel Grant, $ 1500
2018	Bachelor's prize of the *Berlin Mathematical Association* for outstanding achievements.
2013	Book Prize of the German Physical Association for extraordinary achievements in the Abitur.

Berlin, October 02, 2025

Matthias Himmelmann