

RESEARCH INTEREST

My research interests lie in the intersection of Analysis, Geometry and Topology with possible application to Physics. I exploit tools from Index Theory, Combinatorial Topology, and Parametrised Stable Homotopy Theory to tackle challenging questions in Differential Geometry with the main focus on the spaces and moduli spaces positive scalar curvature metrics and Riemannian metrics with the exceptional holonomy group G_2 and $\text{Spin}(7)$.

RESEARCH AND WORK EXPERIENCE

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| Postdoctoral Researcher , University of Melbourne | Since 2024 |
| <ul style="list-style-type: none">– Conducting innovative and collaborative research on the global topology of moduli spaces of G_2 manifolds and its connection to theoretical physics– Volunteering in teaching by assisting in lectures and organising seminars; Cosupervising Master's students | |
| Postdoctoral Researcher , Albert-Ludwigs Universität Freiburg | 2022-2024 |
| <ul style="list-style-type: none">– Conducting innovative and collaborative research on the global topology of moduli spaces of G_2 manifolds within the Simon Collaboration "Special Holonomy in Geometry, Analysis and Physics"– Volunteering in teaching by assisting in lectures and organising seminars; Cosupervising Master's students | |
| Doctoral Researcher , Georg-August Universität Göttingen | 2017-2022 |
| <ul style="list-style-type: none">– Conducted collaborative research on positive scalar curvature and index theory within Project 09 "Diffeomorphisms and the Topology of Positive Scalar Curvature" of the SPP 2026 "Geometry at Infinity"– Conducted independent research on parametrised stable homotopy theory leading to publication– Presented complex research results on international conferences and in research seminars as invited speaker– Training of Master students and volunteering in teaching by organising and running a seminar on the Atiyah-Patodi-Singer Index Theorem (October 2020 - February 2021) | |
| Doctoral Researcher , Universität Augsburg
Research Stay, Mentor: Prof. Dr. Wolfgang Steimle | 2018-2020 |
| <ul style="list-style-type: none">– Research Project: Isotopy Versus Concordance in Positive Scalar Curvature; subproject of PhD thesis aiming to study positive scalar curvature metrics beyond index theory.– Construction of a novel comparison space and a spectral sequence that measures the difference between the two concepts. (April 2018 - September 2020)– volunteered for teaching by organising and running a seminar for bachelor and master students on simplicial sets. (April - August 2020) | |
| Master Student , Georg-August Universität Göttingen | 2017 |
| <ul style="list-style-type: none">– Computing bordism groups of classifying spaces to answer a question of Edward Witten. | |

EDUCATION

- Ph.D in Mathematics**, Georg-August Universität Göttingen, Grade: 1.0 2017–2022
Supervisors: Prof. Dr. Thomas Schick and Prof. Dr. Wolfgang Steimle
– Thesis: “Concordances in Positive Scalar Curvature and Index Theory”
- M.Sc. in Mathematics**, Georg-August Universität Göttingen, Grade: 1.0 2014–2017
Supervisor: Prof. Dr. Thomas Schick
– Thesis: “Pin Bordism in Low Degrees of Classifying Spaces”
– Major Fields of Study: Differential Geometry and Algebraic Topology
- B.Sc. in Mathematics**, Georg-August Universität Göttingen, Grade: 1.9 2010–2014
Supervisor: Jun.-Prof. Dr. Henrik Seppänen
– Thesis: “Bertini’s Theorem”
– Major Fields of Study: Complex Analysis and Algebraic Geometry

ARTICLES

1. T. Hertl, “Line Bundle Twists for Unitary Bordism are Ghosts”, *Algebraic & Geometric Topology* (25) (2025), 2053–2066.

PREPRINTS

1. T. Hertl, “Moduli Spaces of Positive Curvature Metrics in Dimension Four and Beyond”, <https://arxiv.org/abs/2310.14115>, *October 2023*, accepted for publication in *Mathematische Zeitschrift*
2. D. Crowley, S. Goette, T. Hertl, “Moduli Spaces of G_2 -manifolds may not be contractible”, <https://arxiv.org/pdf/2503.15829>, *March 2025*

STUDENTS

- (2) Isla Lim, (co-supervision with Prof. Dr. Diarmuid Crowley) March 2025 - ??
Master Thesis
- (1) Jan-Bennet Wiskant, (co-supervision with Prof. Dr. Thomas Schick) Sept. 2024 - July 2025
Master Thesis, Title: “Normal Pin⁻-bordism of classifying spaces in low degrees”

TEACHING

- **Instructor**, The University of Melbourne Spring 2025
Seminar on Rational Homotopy Theory
- **Course Designer**, The University of Melbourne Spring 2025
Complex Analysis
- **Co-organiser**, The University of Melbourne Spring 2024 - Spring 2025
(jointly with Prof. Dr. Diarmuid Crowley and Prof. Dr. Marcy Robertson)
Topology Seminar
- **Instructor**, Albert-Ludwigs Universität Freiburg Fall 2023
(jointly with Dr. Jonas Schnitzer)
Seminar on Operads in Algebra, Topology, and Physics
- **Instructor**, Albert-Ludwigs Universität Freiburg Spring 2023
Proseminar on Matrix Groups

- **Teaching Assistant**, Albert-Ludwigs Universität Freiburg Fall 2022
Anaylsis III
- **Teaching Assistant**, Georg-August Universität Göttingen Fall 2021
Ordinary Differential Equations (B.Mat.0030.Mp)
- **Instructor**, Georg-August Universität Göttingen and Universität Augsburg Fall 2020
(jointly with Prof. Dr. Thomas Schick and Dr. Artem Nepechiy)
Oberseminar on the Atiyah-Patodi-Singer Index Theorem (M.Math.4914)
- **Instructor**, Universität Augsburg Spring 2020
(jointly with Prof. Dr. Wolfgang Steimle)
Seminar on Simplicial Sets.
- **Tutor**, Universität Augsburg Fall 2019 –Spring 2020
Linear Algebra I and II
- **Tutor**, Georg-August Universität Göttingen Fall 2016 –Spring 2017
Algebraic Topology I and II
- **Tutor**, Georg-August Universität Göttingen Spring 2016
Functional Analysis
- **Tutor**, Georg-August Universität Göttingen Fall 2015
Mathematical Models of Physics
- **Tutor**, Georg-August Universität Göttingen Spring 2015
Analysis II
- **Tutor**, Georg-August Universität Göttingen Spring 2014
Mathematics for Physicist
- **Tutor**, Georg-August Universität Göttingen Fall 2013
Analysis III

SCIENTIFIC TALKS

- (31) “ G_2 Moduli Spaces May Have Holes” December 2025
Gauge-Theory and String Geometry, Australian National University (ANU), Canberra, Australia
- (30) “ G_2 Moduli Spaces May Have Holes” July 2025
Arbeitsgruppen-Seminar Ammann, University of Regensburg, Regensburg, Germany
- (29) “ G_2 Moduli Spaces May Have Holes” July 2025
Gauge Theory Seminar, Humbolt University, Berlin, Germany
- (28) “ G_2 Moduli Spaces May Have Holes” July 2025
Oberseminar Differentialgeometrie, University of Hamburg, Hamburg, Germany
- (27) “Concordances and Bordism of Positive Scalar Curvature Metrics” June 2025
Oberseminar Differentialgeometrie, University of Freiburg, Freiburg, Germany
- (26) “ G_2 Moduli Spaces May Have Holes” June 2025
Oberseminar Geometrie und Topologie, University of Göttingen, Göttingen, Germany
- (25) “ G_2 Moduli Spaces May Have Holes” May 2025
Differential Geometry Seminar, University of Adelaide, Adelaide, Australia
- (24) “The Holonomy Groups of Symmetric Spaces” May 2025
TOPS, University of Adelaide, Adelaide, Australia
- (23) “Topological Methods in G_2 -geometry” March 2025
AIM Workshop “New directions in G_2 geometry”, AIM, Los Angeles, USA
- (22) “Moduli Spaces of Positive Curvature Metrics” March 2025

- (21) “Concordances in Positive Scalar Curvature and Index Theory” December 2024
Joint Meeting of the AMS, AustMS, and NZMS, Auckland, New Zealand
- (20) “On the Global Topology of G_2 Moduli Spaces” September 2024
The Geometry of Moduli Spaces in String Theory, MATRIX Institute, Creswick, Australia
- (19) “On the Global Topology of G_2 Moduli Spaces” June 2024
Workshop on topology, representation theory and higher structures, Isle of Skye
- (18) “On Moduli Spaces of G_2 Holonomy Metrics” May 2024
Final Simons Collaboration Meeting, Durham, North Carolina
- (17) “Moduli Spaces of Positive Curvature Metrics” May 2024
Oberseminar Differentialgeometrie, University of Augsburg
- (16) “Moduli Spaces of G_2 manifolds may have holes” April 2024
Bath Algebra, Geometry and Number Theory Seminar, University of Bath
- (15) “Moduli Spaces of G_2 Holonomy Metrics” April 2024
Bavarian Topology Meeting, University of Regensburg
- (14) “Moduli spaces of Positive Curvature Metrics” March 2024
Online Differential Geometry Seminar, YMSC Tsinghua University
- (13) “Moduli spaces of Positive Curvature Metrics” February 2024
Oberwolfach Workshop 2408 “Analysis, Geometry and Topology of Positive Scalar Curvature Metrics”
- (12) “On Homotopy Groups of (Observer) Moduli Spaces of G_2 Manifolds” February 2024
ULB geometry seminar, Université libre de Bruxelles
- (11) “Moduli Spaces in Riemannian Geometry” September 2023
Annual Meeting of the German Math Society, TU Ilmenau
- (10) “Moduli Spaces of Positive Curvature Metrics” September 2023
“Developments in Modern Mathematics”, University of Goettingen
- (9) “Concordances in Positive Scalar Curvature and Index Theory” July 2023
“Seminar Differentialgeometrie und Geometrische Analysis”, HU Berlin
- (8) “Line Bundle Twists for Unitary Bordism are Ghosts” April 2023
“Topology Seminar”, University of Melbourne
- (7) “Concordances in Positive Scalar Curvature and Index Theory” November 2022
“Oberseminar Topologie”, WWU Münster
- (6) “Positive Scalar Curvature from a Concordance Viewpoint” June 2022
“Dirac Operators in Topology, Geometry, and Representation Theory”, Cortona
- (5) “Positive Scalar Curvature from a Concordance Viewpoint” May 2022
“Oberseminar Topologie”, University of Fribourg
- (4) “Cubical Approximations for Positive Scalar Curvature Metrics” December 2021
“Arbeitsgruppenseminar”, University of Regensburg
- (3) “Cubical Approximation for Positive Scalar Curvature Metrics” September 2021
DMV-ÖMV Jahrestagung 2021 - Sektion 09, Geometrie und Topologie
- (2) “Cubical Models for Positive Scalar Curvature” November 2020
“Oberseminar Geometrie”, University of Augsburg
- (1) “Cubical Approximation for Positive Scalar Curvature Metrics” April 2019
SPP 2026 - Geometry at Infinity, WWU Münster, Germany

CONFERENCES AND WORKSHOPS ATTENDED

- “Applications of Topological Data Analysis to Mathematical Biology ” November 2024
MATRIX-Institute, Creswick, Australia
- “Riemannian Topology Meeting” November 2023
Conference; Fribourg, Switzerland
- “Special Holonomy: Progress and Open Problem 2023” September 2023
Conference; Stony Brook, USA
- “Seventh Annual Meeting” of the Simons Collaboration September 2023
Conference; Simons Center, New York, USA
- “Geometric flows and related topics” July 2023
British Isles Graduate Workshop, Scotland
- “Der Umkehrsatz von Nash-Moser” June 2023
Blockseminar; Pöwessin, Germany
- “Geometric Analysis” March 2023
Conference; Regensburg, Germany
- “Algebraic Geometry, Gauge Theory and the Swampland Conjectures” January 2023
Conference; Oxford, UK
- “Global Analysis on Manifolds” September 2022
Conference; Freiburg, Germany
- “Dirac Operators in Topology, Geometry, and Representation Theory” June 2022
Conference/Workshop; Cortona, Italy
- “Konvexe Integration” May 2022
Blockseminar; Kloster Frauenwört am Chiemsee, Germany
- “Foliations, pseudodifferential operators and groupoids” March 2022
Winter School; Göttingen, Germany
- “Das Positive-Masse-Theorem” July 2021
Blockseminar; Pöwessin, Germany
- “Cellular E_k -algebras” May 2021
Oberwolfachseminar; Online
- “Dirac Operatoren und Skalarkrümmung” Oktober 2020
Blockseminar; Pöwessin, Germany
- “Geometry of Scalar Curvature” July 2019
Conference/Workshop; Cortona, Italy
- “Curvature and Global Shape” November 2019
Conference; Münster, Germany
- “Harmonic Maps” June 2018
Blockseminar; Srní, Czech Republic
- “Augsburg-Fribourg-Karlsruhe Riemannian Topology Meeting” November 2018
Conference; Fribourg, Switzerland
- “Young Topologist Meeting” July 2018
Conference; Copenhagen, Denmark
- “Selberg’s Trace Formula” June 2018
Blockseminar; Pöwessin, Germany
- “International Conference of Manifolds, Groups, and Homotopy” June 2018
Conference; Isle of Skye, Scotland

- “On Global Differential Geometry” May 2018
Summer School and Conference; AIMS-Institute, M’Bour, Senegal
- “Lower Curvature Bounds” November 2017
Oberwolfach Seminar; Oberwolfach, Germany
- Young Topologist Meeting July 2017
Conference; Stockholm, Sweden
- “Coarse Index Theory” September 2016
Summer School; Freiburg, Germany
- “Manifolds and K-Theory” July 2015
Summer School; Freiburg, Germany

SERVICE WORK

- Reviewer for zbMATH Open since 2022
- Volunteer Open Day University of Melbourne 18th Aug 2024
- Referee for *Geometry & Topology*

PROGRAMMING LANGUAGES

- **Java:** Working experience
- **C:** Working experience
- **Python:** Familiar with
- **R:** Familiar with

LANGUAGES

- **German:** native
- **English:** C1-level (IELTS with score 8)
- **Spanish:** basic

REFERENCES

Prof. Dr. Thomas Schick
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