

# Benjamin Matthias Ruppik

## Short biography

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✉ [benjamin.ruppik@hhu.de](mailto:benjamin.ruppik@hhu.de)

✉ [bruppikmath@gmail.com](mailto:bruppikmath@gmail.com)

[www.bruppik.de](http://www.bruppik.de)

ben300694

## Employment

January 2022–2024 **Postdoctoral Researcher: Topological Data Analysis in Natural Language Processing**,  
*Heinrich-Heine-Universität Düsseldorf, Dialog Systems and Machine Learning, Building 25.12.01, Universitätsstraße 1, 40225 Düsseldorf.*

## Education

October 2018 – June 2022 **PhD student in Mathematics, specializing in Low-dimensional topology;**  
**Thesis: ‘Casson-Whitney unknotting, Deep slice knots and Group trisections of knotted surface type’,** advised by Arunima Ray and Peter Teichner;  
**member of the Bonn International Graduate School of Mathematics;**  
**funded by the International Max Planck Research School on Moduli Spaces,**  
*Max-Planck-Institute for Mathematics, Vivatsgasse 7, 53111 Bonn,*  
*Graduation: June 2022.*

2016 – 2018 **Master of Science in Mathematics**, *University of Bonn.*

2013 – 2016 **Bachelor of Science in Mathematics**, *University of Bonn.*

## Papers and Preprints

Daniel Kasprowski, Johnny Nicholson, Benjamin Ruppik:

‘Homotopy classification of 4-manifolds whose fundamental group is dihedral’

To appear: Algebraic and Geometric Topology, arXiv:2011.03520

Michael Klug, Benjamin Ruppik:

‘Deep and shallow slice knots in 4-manifolds’

Proc. Amer. Math. Soc. Ser. B 8 (2021), 204–218, doi:10.1090/bproc/89, arXiv:2009.03053

Jason Joseph, Michael Klug, Benjamin Ruppik, Hannah Schwartz:

‘Unknotting numbers of 2-spheres in the 4-sphere’

J. Topology 14.4 (2021), 1321–1350, doi:10.1112/topo.12209, arXiv:2007.13244

Daniel Kasprowski, Mark Powell, Benjamin Ruppik:

‘Homotopy classification of 4-manifolds with finite abelian 2-generator fundamental groups’

Submitted, arXiv:2005.00274

## Recent Talks

2021-07-07 ‘Fundamental groups of knotted surface complements’,  
MPIM Bonn Visit of the Fachbeirat (virtual).

2021-06-25 ‘Casson-Whitney unknotting numbers’,  
BIGS Bonn Lightning Talk session (virtual).

2021-05-13 ‘Homotopy classification of 4-manifolds with dihedral fundamental group’,  
Geometric Topology Grad and Postdoc Seminar (GT GAPS) (virtual).

2021-02-10 ‘Group trisections and smoothly knotted surfaces’,  
shared talk with Sarah Blackwell and Vincent Longo in the Virtual Trisectors Meeting.

- 2021-01-20 'Unknotting 2-knots with Finger- and Whitney moves',  
Building bridges seminar (virtual).
- 2020-11-05 'Casson-Whitney unknotting numbers of knotted 2-spheres in the 4-sphere',  
Iowa Topology Seminar (virtual).
- 2020-04-02 'Deeply slice knots',  
Geometric Topology Grad and Postdoc Seminar (GT GAPS) (virtual).
- 2019-06-14 'Stable classification of 4-manifolds',  
reporting on my master thesis in the LKS-Seminar (organized by Stefan Friedl and Clara Löh) at the university of Regensburg.

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## Recent Conferences & Travel

- 2021-09 MATRIX-MFO Tandem Workshop ID 2136a: Invariants and Structures in Low-Dimensional Topology, September 5–11, 2021;  
Talk: 'Concordances in  $(\text{non-orientable } 3\text{-manifold}) \times [0, 1]$ '.
- 2021-07 Tech Topology Summer School on 4-Manifolds, online, July 26–30, 2021;  
TA for Aru Ray's course 'Topological 4-manifolds: the disc embedding theorem and beyond',  
Recorded Lightning Talk: 'Casson-Whitney unknotting numbers'.
- 2021-07 Young Topologists Meeting 2021, online, July 5–16, 2021.
- 2021-06 TopFlavours (Topology in Distinct Flavours) 2021, online, June 17–18, 2021;  
Talk: 'Group trisections and smoothly knotted surfaces'.
- 2021-06 Nearly Carbon Neutral Geometric Topology Conference, online, June 14–25, 2021;  
Postcard from a Geometric Topologist: 'Pushing Seifert surfaces into the 4-ball'.
- 2021-05 Summer Trisectors Workshop 2021, online, May 27–June 5, 2021.
- 2021-04 GTA: Philly 2021 Temple Graduate Student Conference in Algebra, Geometry, and Topology,  
online, May 21–23, 2021;  
Talk: 'Unknotting 2-Knots with Finger- and Whitney Moves'.
- 2021-04 2021 Graduate Student Topology and Geometry Conference, online, April 9–11, 2021;  
Talk: 'Homotopy classification of 4-manifolds whose fundamental group is dihedral'.
- 2021 AIM Online Research Community on 4-dimensional topology;  
Lightning Talk: 'Deep and shallow slice knots in 4-manifolds',  
Research group '4-dimensional perspective on the untwisting number',  
Learning group 'Corks'.
- 2020-12 Winter Trisectors Workshop 2020, online, December 7–11, 2020.
- 2020-12 Georgia Tech Topology Conference, online, December 4–6, 2020;  
Lightning Talk: 'Deep and shallow slice knots in 4-manifolds'.

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## Teaching and Service

- 2022 **Master Seminar: Word embedding spaces**, HHU, Düsseldorf.
- 2021 **External PhD representative**, Max-Planck-Institute for Mathematics, Bonn.
- April 2019 **Study group on Milnor invariants**, (co-organized with Danica Kosanović).
- October 2014 – **Teaching assistant**, MATHEMATICAL INSTITUTE OF THE UNIVERSITY OF BONN, Bonn.
- September 2020 Employed as tutor for the lectures *Analysis I, II*, *Linear Algebra I, II*, *Introduction to Algebra (Galois theory)*, *Introduction to Geometry and Topology*, *Topology I, II (Homology & Cohomology)*, *Algebraic Topology I, II (Introduction to Stable Homotopy Theory; Orthogonal Spectra)*

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## Experience

- April 2018 – **Student associate**, INSTITUTE OF COMPUTER SCIENCE III, Bonn.
- September 2018 Semantic segmentation of RGB-images and point clouds captured by a Velodyne LiDAR;  
ben300694/semanticLabelingTool