

NIKLAS HELLMER

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Dioscuri Centre for Topological Data Analysis \diamond Institute of Mathematics

Polish Academy of Sciences \diamond ul. Śniadeckich 8, 00-656 Warsaw, Poland

EDUCATION

Polish Academy of Sciences and University of Warsaw, Warsaw, PL

PhD in Mathematics

Oct. 2020 – present

Swansea University, Swansea, UK

PhD studies in Mathematics¹

Jan. 2020 – Sep. 2020

University of Bonn, Bonn, DE

Master of Science in Mathematics

Oct. 2017 – Sep. 2019

Bachelor of Science in Mathematics

Oct. 2014 – Sep. 2017

AWARDS AND HONORS

PhD Scholarship, Swansea University, 2020.

PhD Scholarship, Doctoral School of Exact and Natural Sciences, Warsaw, 2020.

PhD Scholarship, Dioscuri Centre for Topological Data Analysis, Warsaw, 2020.

Stipend for internship abroad from University of Warsaw's "Excellence Initiative – Research University" programme (IDUB - POB3), 2023.

PUBLICATIONS

Published Articles

- [1] A. Mahdi, P. Błaszczuk, P. Dłotko, D. Salvi, T.-S. Chan, J. Harvey, D. Gurnari, Y. Wu, A. Farhat, N. Hellmer, A. Zarebski, B. Hogan, and L. Tarassenko, "OxCOVID19 Database, a multimodal data repository for better understanding the global impact of COVID-19," *Scientific Reports*, vol. 11, no. 1, pp. 1–11, 1 Apr. 29, 2021, ISSN: 2045-2322. DOI: [10.1038/s41598-021-88481-4](https://doi.org/10.1038/s41598-021-88481-4).
- [2] P. Dłotko and N. Hellmer, "Bottleneck Profiles and Discrete Prokhorov Metrics for Persistence Diagrams," *Discrete Comput Geom*, May 2023, ISSN: 1432-0444. DOI: [10.1007/s00454-023-00498-w](https://doi.org/10.1007/s00454-023-00498-w).
- [3] P. Dłotko, N. Hellmer, L. Stettner, and R. Topolnicki, "Topology-driven goodness-of-fit tests in arbitrary dimensions," in, *Stat Comput*, vol. 34, no. 1, p. 34, Nov. 2023, ISSN: 1573-1375. DOI: [10.1007/s11222-023-10333-0](https://doi.org/10.1007/s11222-023-10333-0).

Preprints

- [4] T. Fleckenstein and N. Hellmer, *When do two distributions yield the same expected euler characteristic curve in the thermodynamic limit?* 2024. arXiv: [2401.04580](https://arxiv.org/abs/2401.04580) [[math.PR](#)].

In Preparation

- [5] N. Hellmer, J. Hebda-Sobkowicz, R. Zimroz, A. Wylomańska, and P. Dłotko, "Damage identification in rolling element bearings using topological data analysis," 2024.
- [6] N. Hellmer and J. Spaliński, "Multineighbor bifiltrations," *In preparation*, 2024.

¹Withdrawn to move with supervisor Paweł Dłotko to his new position in Warsaw.

PRESENTATIONS

Talks

[New Metrics for Persistence Diagrams](#). Second Symposium on Machine Learning and Dynamical Systems, online due to COVID-19, Fields Institute, Toronto, Sep 29, 2020.

[A Discrete Prokhorov Metric for Persistence Diagrams](#). Asia Pacific Seminar on Applied Topology and Geometry, online due to COVID-19, Feb 26, 2021.

A Discrete Prokhorov Metric for Persistence Diagrams. Meeting of the Oxford-Liverpool-Swansea centre for TDA, online, 19 Mar, 2021.

A Discrete Prokhorov Metric for Persistence Module. Workshop on Metrics in Multiparameter Persistence, Lorentz Centre Leiden, online, 21 Jul, 2021.

A Discrete Prokhorov Metric for Persistence Module. Applied Topology in Będlewo, 8 July, 2022.

Topology of Random Geometric Complexes and Applications in Statistical Hypothesis Testing. 3rd Workshop on Topological Methods in Data Analysis, Heidelberg/online, 30 September, 2022.

Statistical hypothesis tests with Euler characteristic curves. Mathematics for Society, Gdańsk University of Technology, November 2022.

Damage identification in rolling element bearings using topological data analysis. Minisymposium on Topological Data Analysis at the 22nd ECMI Conference on Industrial and Applied Mathematics, Wrocław, 26-30 Jun, 2023.

Damage identification in rolling element bearings using topological data analysis. 51st Conference on Applications of Mathematics, Kościelisko, 10-16 Sep, 2023.

TDA meets Signal Processing. BIGS Young Researcher Networking: Meeting on Topology and Applications, Bielefeld, 18-22 Sep, 2023.

Topology-Driven Goodness-of-Fit Tests in Arbitrary Dimensions. Math and Statistics Colloquium University of Michigan, Dearborn. 23 Oct, 2023.

Topology-Driven Goodness-of-Fit Tests in Arbitrary Dimensions. Applied Topology Seminar, Technical University Munich. 7 Nov, 2023.

[Topology-Driven Goodness-of-Fit Tests in Arbitrary Dimensions](#). Applied Algebraic Topology Research Network Seminar, online. 13 Dec, 2023.

Posters

A Discrete Prokhorov Metric for Persistence Diagrams. Workshop on Topological Data Analysis at IMSI, Chicago, online, April 2021.

A Discrete Prokhorov Metric for Persistence Diagrams. Young Topologists Meeting 2021, Stockholm, online, July 2021.

A Discrete Prokhorov Metric for Persistence Diagrams. Second Graduate Student Conference: Geometry and Topology meet Data Analysis and Machine Learning (GTDAML2021), online, July/August 2021.

Topology of Random Geometric Complexes with Applications to Statistical Hypothesis Testing. Young Topologists Meeting 2022, Copenhagen, 19 Jul, 2022.

EXTENDED SCIENTIFIC VISITS

Helmholtz-Zentrum, Munich, DE

AIDOS lab for AI and Health, hosted by Bastian Rieck

Sep. 2023 – Dec. 2023

TEACHING

Teaching Assistant, Analysis I

University of Bonn

winter term 2016/17

Graded homework and held biweekly recitation and problem classes for 20 students.

Teaching Assistant, Analysis II

University of Bonn

summer term 2018

Graded homework and held weekly recitation and problem classes for 20 students.

Student Demonstrator, Matlab (MA-162)

Swansea University

lent term 2020

Graded homework and held weekly Matlab tutorial classes for 80 students.

Group instructor, Mathematical Analysis 2 for Economists

University of Warsaw

summer term 2021

Posed and graded homework; held biweekly online recitation and problem classes for 25 students.

Group instructor, Linear Algebra for Economists

University of Warsaw

winter term 2021/22

Posed and graded tests; held biweekly recitation and problem classes for 20 students.

Group instructor, Invitation to TDA

University of Warsaw

summer term 2022

Posed theoretical and programming homework; held weekly recitation and problem classes for 15 students.

Group instructor, Mathematical Analysis for Economists

University of Warsaw

winter term 2022/23

Posed and graded homework; held biweekly online recitation and problem classes for 28 students.

SERVICE AND OUTREACH

[*Computing the Bottleneck Distance*](#). Youtube tutorial contributed to the AATRN tutorial-athon, March 2021.

Refereeing

Discrete & Computational Geometry, Foundations of Data Science

OTHER QUALIFICATIONS

Languages

English: C1

French: A1

Latin: Latinum

Programming

advanced: Python, L^AT_EX

basic: R, C-like languages, Matlab

libraries: numpy, pandas, scikit-learn, gudhi

OTHER ACTIVITIES AND NON-ACADEMIC POSITIONS

University Politics

Member of the student parliament of the University of Bonn 2016-2018

Member of the student parliament's budget committee 2017-2019

Head of the budget committee 2019

REFERENCES

Paweł Dłotko

Dioscuri Centre for TDA

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Bastian Grossenbacher Rieck

Institute of AI for Health

Helmholtz München

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85764 Neuherberg, DE

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