Curriculum Vitae
Paweł Dłotko

EDUCATION AND DEGREES:

- Professor at Mathematical Institute, Polish Academy of Sciences, February 2023
- Habilitation in Theoretical Computer Science, Warsaw University, 2022
- Ph.D in Computer Science, Institute of Computer Science, Jagiellonian University, January 2012, thesis title: “Reduction algorithms in computational homology and cohomology theory with applications”, advisor – prof. Marian Mrozek
- Master of Science, Institute of Computer Science, Jagiellonian University, June 2007, thesis title: “Approximation of homology of compact spaces”, advisor – prof. Marian Mrozek

EMPLOYMENT:

July 2020-present, Director of Dioscuri Centre in Topological Data Analysis, Mathematical Institute, Polish Academy of Sciences, Warsaw, Poland
January 2017- July 2020, Senior Lecturer in Mathematics, Swansea University, UK
March 2015 – January 2017, postdoctoral researcher in Geometrica Group, Inria, Salcay, France
January 2015 – January 2017, associated professor, Institute of Computer Science, Jagiellonian University (on leave)
January 2013 – January 2015, postdoctoral researcher in prof. Robert Ghrist's group, Department of Mathematics, University of Pennsylvania
October 2011 – January 2015, assistant professor, Institute of Computer Science, Jagiellonian University (partially on leave)

CONSULTATIONS:

Blue Brain Project, EPFL, summer 2014,
EMWorks, computational electromagnetism, 2016,
Member of Committee of Mathematics, Polish Academy of Sciences, 2023-27.

RESEARCH INTERESTS:

Topological data analysis, algorithms and computations
Topological statistics
Computational homology and cohomology theory and applications
Discrete Geometric Approach to Maxwell Equations
Discrete Morse Theory

RESEARCH GRANTS AND AWARDS:

GAP MSCA for doctoral students training (as a part of consortum), 2023-26
M-Era-Net Polimetalomics, ~EUR 500,000, as a part of consortium with Technion and IMEDA, 2022-25
Grant to establish the Dioscuri Centre in Topological Data Analysis, EUR 1.7M, Polish and German Ministry of Science and Higher Education, 2020-25

FORMER RESEARCH GRANTS AND AWARDS:

Polish Ministry of Science and Education grant Doskonała Nauka to Organize conference Applied Topology in Bedlewo (PLN 105,000), 2022
Co-I in 3.2 M GBP EPSRC Grant New Perspectives in Data Science, EP/R018472/1, (0.8M GBP for Swansea node).
Google Research Awards (under PI Marian Mrozek), "Homology for Massive Data Analysis", 2011-2012, (70 000 USD).
Polish Ministry of Science and Higher Education grant for Ph.D students, "Reduction algorithms in computational (co)homology and applications" (PI), 2010-2012, (60 000 PLN)
Start scholarship, Foundation of Polish Science, 2014, (10 000 PLN)
First degree award of the rector of Jagiellonian university (2014)
Third degree award of the rector of Jagiellonian university (2011,2012,2013)
Malopolskie Stypendium Doktoranckie, 2009
Cherish-de placement for topological bone analysis, 2k GBP.
Cherish-de placement for collaboration with Child Mind Institute in New York.
Taking part in Digital Crucible professional developement training, 2018.

COMPLETED PHDs:

Niklas Hellmer, PhD student, 2019-2025,
Davide Gurnari, PhD student, 2020-2025.

SUPERVISION:

Tak-Shing Chan, postdoctoral researcher, Swansea University, 2019-2021.
John Harvey, postdoctoral researcher, Daphny Jackson Fellow, Swansea University, 2019-2021.
Nick Sale, PhD student, 2019-2020 (in Swansea University).
Michał Lipiński, postdoctoral researcher, IMPAN 2021-2023.
Justyna Signerska-Rynkowska, postdoctoral researcher, IMPAN 2021-2024.
Anastasios Stefanou.,postdoctoral researcher, IMPAN 2021 (for 6 months).
Rafal Topolnicki, postdoctoral researcher, IMPAN 2021-2023.
Michał Bogdan, postdoctoral researcher, IMPAN, 2023-25
Jakub Malinowski, PhD student, Wrocław University of Technology, 2023-2027
Marta Marszewska, PhD student, Gdańsk University of Technology, 2024-2028
Mateusz Masłowski, PhD student, Gdańsk University, 2025-30.
Julian Brüggemann, Postdoctoral Researcher, IMPAN, 2024-2026

PUBLICATIONS:

1. Sergei Zorkaltsev, Rafal Topolnicki, Tal-El Carmon, Santhosh Mathesan, Pawel Dlotko, Dan Mordehai, Maciej Haranczyk, Transferable 3D Convolutional Neural Networks for Elastic Constants Prediction in Nanoporous Metals, accepted to Materials & Design
2. Dehingia B, Milewska-Puchała M., Janowski M., Raifee M, Błaut P., Senge J., Walsh D., Piotrowska A., Severino J., Chaudchury D., Abbas M., Montiel-Manriquez R., Jankowska S., Zare P., Huber W., Xu J., Casellas R., Zimmermann T., Dłotko P, Krijgsveld J., Pękowska A., RNA-binding proteins drive the maturation of CTCF-anchored chromatin topology in cell differentiation, , Nature Cell Biology, https://doi.org/10.1038/s41556-025-01735-5
3. Anna Jurek-Loughrey, Padrig Ffitzpatrick and Pawel Dlotko, New Automated Approach to Selection of Mapper Clustering Parameters, Transactions on Knowledge Discovery from Data, accepted
4. Bondita Dehingia, Małgorzata Milewska-Puchała, Marcin Janowski, Mahmoud-Reza Rafiee, Misbah Abbas, Aleksandra Piotrowska, Jan Senge, Piotr Blaut, Dietrich Walsh, Jacqueline Severino, Debadeep Chaudhury, Sajjad Iqbal, Rogelio Montiel-Manriquez, Sylwia Jankowska, Peyman Zare\, Wolfgang Huber, Jianliang Xu, Rafael Casellas, Timo Zimmermann , Paweł Dłotko, Jeroen Krijgsveld, Aleksandra

Pękowska, RNA binding proteins mediate the maturation of chromatin 2 topology during differentiation, Nature Cell Biology
5. Anna Jurek-Loughrey, Ciara Loughrey, Sarah Maguire, Pawel Dlotko, Lu Bai, Nick Orr, A novel method for subgroup discovery in precision medicine based on topological data analysis, BMC Medical Informatics and Decision Making, accepted
6. P Dłotko, W Qiu, ST Rudkin, Financial ratios and stock returns reappraised through a topological data analysis lens, The European Journal of Finance 30 (1), 53-77
7. P Dłotko, On the shape that matters−topology and geometry in data science, Eur. Math. Soc. Mag.,(132), 5-13
8. S. Rudkin, W. Qui, P. Dłotko, Return trajectory and the forecastability of Bitcoin returns, FIRE, The Financial Review, December 2024 https://doi.org/10.1111/fire.12420.
9. Paweł Dłotko, Jan Felix Senge and Anastasios Stefanou, Combinatorial topological models for phylogenetic networks and the mergegram invariant, Foundations of Data Science, Volume 7, Issue 2: 617-670. Doi: 10.3934/fods.2024045.
10. Paweł Dłotko, Michał Lipiński, Justyna Signerska-Rynkowska, Testing topological conjugacy of time series, SIADS, Vol. 23, Iss. 4 (2024)10.1137/23M1594728
11. Paweł Dłotko, Davide Gurnari and Radmila Sazdanovic, The Art of Knot Data, Proceedings of Bridges 2024: Mathematics, Music, Art, Architecture, Culture, pp 443-446.
12. Paweł Dłotko, Davide Gurnari, Radmila Sazdanovic, Mapper-type algorithms for complex data and relations, Journal of Computational and Graphical Statistics. https://www.tandfonline.com/doi/abs/10.1080/10618600.2024.2343321
13. Zabidi Abu Hasan, R.U. Gobithaasan, Nur Fariha Syaqina Mohd Zulkepli, Mohd Zaharifudin Muhamad Ali, Kenjiro T. Miura, Paweł Dłotko, Identifying Irregular Rainfall Patterns Using Persistent Homology, Journal of Advanced Research in Applied Sciences and Engineering Technology, https://doi.org/10.37934/araset.34.3.2636
14. Ciara Loughrey, Paweł Dłotko and Anna Jurek-Loughrey, A Mapper-based Classifier for Patient Subgroup Prediction, International Conference on e-Health and Bioengineering, EHB 2023
15. Paweł Dłotko, Niklas Hellmer, Łukasz Stettner, Rafał Topolnicki, Topology-Driven Goodness-of-Fit Tests in Arbitrary Dimensions, accepted to Statistics and Computing.
16. P. Dłotko, D. Gurnari, Euler Characteristic Curves and Profiles: a stable shape invariant for big data problems, GigaScience, 10.1093/gigascience/giad094.
17. Simon Rudkin, Wanling Rudkin Pawel Dlotko, On the topology of cryptocurrency markets, International Review of Financial Analysis, accepted.
18. J. Harvey, B. Chan, T. Srivastava, A. Zarebski, P. Dłotko, P. Błaszczyk, R. Parkinson, L. White, R. Aguas, A. Mahdi, Epidemiological waves - types, drivers and modulators in the COVID-19 pandemic, Accepted to Heliyon,
19. Simon Rudkin, Wanling Qiu, Lucy Barros, P.D. An economic topology of the Brexit vote, Regional Studies, DOI: 10.1080/00343404.2023.2204123,
20. Simon Rudkin, Wanling Qiu, Pawel Dlotko, Uncertainty, volatility and the persistence norms of financial time series, Expert Systems with Applications, https://doi.org/10.1016/j.eswa.2023.119894
21. P. Dłotko, Obrazy funkcji w praktyce, Wydawnictwo Akademia, https://journals.pan.pl/dlibra/show-content?id=125751
22. Simon Rudkin, Don J Webber, Pawel Dlotko, Spatial disparities in infection rates at the dawn of a pandemic: wealthy young workers mattered, SSNR https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4356837
23. R.U. Gobithaasan, Zabidi Abu Hasan, Krithana Devi Selvarajh, Khai-Sam Wong, Shukri Mamat, Mohd Zaharifudin Muhamad Ali, Kenjiro T. Miura and Paweł Dłotko, Clustering Selected Terengganu's Rainfall Stations Based on Persistent Homology, Thai Journal of Mathematics, Special Issue: The 17th IMT-GT ICMSA 2021, Pages 197–211 (2022),
24. Dlotko, P. & Hellmer, N. Bottleneck Profiles and Discrete Prokhorov Metrics for Persistence Diagrams, Discrete & Computational Geometry (2022).

25. Reem Khalil, Sadok Kallel, Ahmad Farhat, Paweł Dłotko,Topological Sholl descriptors for neuronal clustering and classification, Plos Computational Biology, 2022.
26. Jan F. Senge, Asghar Heydari Astaraee, Pawel Dłotko, Sara Bagherifard, Wolfram A. Bosbach, Extending Conventional Surface Roughness ISO Parameters using Topological Data Analysis for shot peened surfaces, Scientific Reports, 2022.
27. Pawel Dlotko, Wanling Qiu, Simon Rudkin, Financial ratios and stock returns reappraised through a topological data analysis lens, The European Journal of Finance, DOI: 10.1080/1351847X.2021.2009892, (2021).
28. Reem Khalil, Ahmad Farhat, Paweł Dłotko, Developmental changes in pyramidal cell morphology in multiple visual cortical areas using cluster analysis, Frontiers in Computational Neuroscience, https://doi.org/10.3389/fncom.2021.667696 (2021).
29. Adam Mahdi, Piotr Błaszczyk, Paweł Dłotko, Dario Salvi, Tak-Shing Chan, John Harvey, Davide Gurnari, Yue Wu, Ahmad Farhat, Niklas Hellmer, Alexander Zarebski, Bernie Hogan, Lionel Tarassenko, OxCOVID19 Database, a multimodal data repository for better understanding the global impact of COVID-19, Sci Rep. 2021 Apr 29;11(1):9237. doi: 10.1038/s41598-021-88481-4 (2021).
30. Alexander D.Smith, Paweł Dłotko, Victor M.Zavala, Topological Data Analysis: Concepts, Computation, and Applications in Chemical Engineering, Computers and Chemical Engineering, 146(1):107202, DOI:10.1016/j.compchemeng.2020.107202 (2020).
31. Bartosz Zieliński, Michał Lipiński, Mateusz Juda, Matthias Zeppelzauer, Paweł Dłotko, Persistence bag of words for topological data analysis, Artificial Intelligence Review, vol. 54 (3), 1969-2009 (2021) -- full version of a conference paper.
32. Bartosz Zieliński, Michał Lipiński, Mateusz Juda, Matthias Zeppelzauer, Paweł Dłotko, Persistence bag of words for topological data analysis, Proceedings of the 28th International Joint Conference on Artificial Intelligence (IJCAI 2019), 4489-4495 (2019).
33. Wanling Qiu, Simon Rudkin, Pawel Dlotko, Refining understanding of corporate failure through a topological data analysis mapping of Altman's Z-score model, Expert Systems With Applications, Volume: 156.
34. Bartosz Zielinski, Michal Lipinski, Mateusz Juda, Matthias Zeppelzauer, Pawel Dlotko, Persistence Bag-of-Words for Topological Data Analysis, IJCA2019
35. Y. Lee, S. Barthel, P. Dlotko, M. Mossavit, K. Hess and B. Smit, High-Throughput Screening Approach for Nanoporous Materials Genome Using Topological Data Analysis: Application to Zeolites, J. Chem. Theory Comput. DOI: 10.1021/acs.jctc.8b00253.
36. Ahmed Khebir, Pawel Dlotko, Bernard Kapidani, Ammar Kouki and Ruben Specogna, T-Ω formulation with higher order hierarchical basis functions for non simply connected conductors, Mathematical Problems in Engineering.
37. P. Dlotko, Th. Wanner, Rigorous cubical approximation and persistent homology of continuous functions, Computers and Mathematics with Applications, DOI: 10.1016/j.camwa.2017.11.027.
38. L. Kanari, P. Dlotko; M. Scolamiero; R. Levi; J. C. Shillcock; K. Bellwald Hess; H. Markram, A topological representation of branching neuronal morphologies, Neuroinformatics, Jan;16(1):3-13. doi: 10.1007/s12021-017-9341-1, 2018.
39. P. Dlotko, B. Kapagieri, R. Specogna, Lean cohomology computation for electromagnetic modeling, accepted to IEEE Transaction on Magnetcs, Vol 54, Issue 4, 2018.
40. Michael Wolfgang Reimann, Max Nolte, Martina Scolamiero, Katherine Turner, Rodrigo Perin, Giuseppe Chindemi, Pawel Dlotko, Ran Levi, Kathryn Hess, Henry Markram, „Cliques of Neurons Bound into Cavities Provide a Missing Link between Structure and Function”, Frontiers in Computational Neuroscience.
41. Yongjin Lee, Senja Barthel, Paweł Dłotko, Seyed Mohamad Moosavi, Kathryn Hess, and Berend Smit, Quantifying similarity of pore-geometry in nanoporous materials, Nature

Communications, DOI: 10.1038/ncomms15396, 2017
42. Paweł Dłotko, Bernard Kapidani, Ruben Specogna, TOPOPROCESSOR: An Efficient Computational Topology Toolbox for h-Oriented Eddy Current Formulations, IEEE Transaction on Magnetics, 2017.
43. Bernard Kapidani, Paweł Dłotko, Piergiorgio Alotto, Paolo Bettini, Ruben Specogna, Computation of relative 1-cohomology generators from a 1-homology basis for eddy currents boundary integral formulations, accepted to IEEE Transactions on Magnetics.
44. P. Dłotko, Th. Wanner, "Topological Microstructure Analysis Using Persistence Landscapes.", Physica D, doi:10.1016/j.physd.2016.04.015.
45. P. Bubenik, P. Dłotko, "A persistence landscapes toolbox for topological statistic.", Jounral of Symbolic Computations, doi:10.1016/j.jsc.2016.03.009.
46. P. Dłotko, B. Kapidani, R. Specogna, Fast computation of cuts with reduced support by solving maximum circulation problems, IEEE Transactions on Magnetics, 10.1109/TMAG.2014.2359976
47. G. Henselman, P. Dłotko, „Combinatorial Invariants of Multidimensional Topological Network Data", GlobalSIP 2014:828-832
48. P. Dłotko, R. Specogna, "Topology preserving thinning of cell complexes", IEEE Transactions on Image Processing, DOI:10.1109/TIP.2014.2348799
49. P. Brendel, P. Dłotko, G. Ellis, M. Juda, M. Mrozek, "Computing fundamental groups of point clouds, Applicable Algebra in Engineering", Communication and Computing, Volume 26, Issue 1, pp 27-48
50. H. Wagner, P. Dłotko, "Towards topological analysis of high-dimensional feature spaces", Computer Vision and Image Understanding, Volume 121, April 2014, Pages 21–26
51. P. Dłotko, H. Wagner, "Computing homology and persistent homology using iterated Morse decomposition", arXiv:1210.1429t
52. P. Dłotko, H. Wagner, "Simplification of complexes for persistent homology computations", Homotopy, Homology and Applications, Volume 16, Number 1 (2014), 49-63
53. P. Dłotko, R. Specogna, "Lazy cohomology generators: a breakthrough in (co)homology computations for CEM", IEEE Transactions on Magnetics, vol. 50, issue 2, pp. 577-580
54. G. S. Cochran, Th. Wanner, P. Dłotko, "A randomized subdivision algorithm for determining the topology of nodal sets", SIAM Journal on Scientific Computing, 35(5), B1034–B1054
55. P. Dłotko, R. Specogna, "Physics inspired algorithms for (co)homology computations of three-dimensional combinatorial manifolds with boundary", Computer Physics Communications, 184:10, 2013, pp. 2257-2266
56. P. Dłotko, R. Specogna, "A novel technique for cohomology computations in engineering practice", Computer Methods in Applied Mechanics and Engineering (2013), 253, 2013, pp. 530–542
57. P. Dłotko, R. Specogna, "Cohomology in electromagnetic modeling", Communications in Computational Physics (CiCP), 14:1, 2013, pp. 48-76
58. P. Brendel, P. Dłotko, M. Mrozek, N. Żelazna, "Homology Computations via Acyclic Subspace", Computational Topology in Image Context, LNCS 7309, pp.117-127
59. H. Wagner, P. Dłotko, and M. Mrozek. "Computational Topology in Text Mining", Computational Topology in Image Context, LNCS 7309, pp. 68 – 79
60. H. Wagner, P. Dłotko, and M. Mrozek. "Computational Topology in Text Mining", Computational Topology in Image Context, LNCS 7309, pp. 68 – 79
61. P. Dłotko, "A fast algorithm to compute cohomology group generators of orientable 2-manifolds", Pattern Recognition Letters 33 2012, pp. 1468-1476
62. P. Dłotko, M. Juda, M. M\rozek, R. Ghrist, "Distributed computation of coverage in sensor networks by homological methods", Applicable Algebra in Engineering, Communication and Computing, 23:1 2012, pp. 29-58
63. P. Dłotko, W. G. Kropatsch, H. Wagner "Characterizing Obstacle-Avoiding Paths Using

Cohomology Theory", CAIP (1) (LNCS) 2011: 310-317

64. P. Dłotko, R. Specogna, "Efficient generalized source field computation for h-oriented magnetostatic formulations", European Physical Journal Applied Physics, 53, 2011
65. P. Dłotko, T. Kaczynski, M. Mrozek, Th. Wanner, "Coreduction Homology Algorithm for Regular CW-Complexes", Discrete & Computational Geometry, 46:2, 2011
66. P. Dłotko, R. Specogna, "Critical analysis of spanning tree techniques", SIAM J. Numer. Anal. 48:4, 2010, pp. 1601-1624
67. P. Dłotko, R. Specogna "Efficient cohomology computation for electromagnetic modeling", CMES: Computer Modeling in Engineering & Sciences, 60:3, 2010, pp. 247-278
68. P. Dłotko, R. Specogna, F. Trevisan, "Voltage and current sources for massive conductors suitable with the A-chi Geometric Formulation", IEEE Transactions on Magnetics, vol. 46, 2010, pp. 3069-3072
69. P. Dłotko, R. Specogna, F. Trevisan, "Automatic generation of cuts on large-sized meshes for T-Omega geometric eddy-current formulation", Computer Methods in Applied Mechanics and Engineering, 198, 2009, pp. 3765–3781.

CONFERENCE TALKS:

1 Geometries That Mapper: Topology in Data and Materials, Geometry, Probability and Topology in Applications, The Mathematical Institute, SANU, Belgrade, 30 September 2025
2 Topological data analysis methods in dynamics, Konferencja Zastosowan Matematyki, Koscielisko, 16 Sept 2025
3 Viisualization and Features in Topological Data Analysis, invited lecture, Geometric Realization of AATRN, ISMI, Chicago, 22 Aug 2025.
4 Presentation of Dioscuri Centre in Topological Data Analysis, Workshop on Industrial and Applied Mathematics, Gdańsk Tech Joins ECMI 2025, 6 May 2025
5 TDA meets dynamics, Applied Topology and Dynamical Systems Conference, Gdańsk Tech, January 15 2025
6 Topology in Statistics, Statistics in Topology (2 hours), 49.th Conference Mathematical Statistics, Chęciny, Poland, 11-12 Dec. 2024
7 Feature Extraction and Visualization Methods in TDA, AATRN, 11 Dec 2024, https://www.youtube.com/watch?v=-y2J1JmTzCw&ab_channel=AppliedAlgebraicTopology Network
8 Topological Data Analysis and beyond, XXV International Workshop for Young Mathematicians, "Computational Topology", Jagiellonian University, 22-28 IX 2024 (5 hours lecture)
9 Topologiczne metody wizualizacji danych, 9. Forum of Polish Mathematicians, Invited talk at session Modern methods of data science, 12 Sept 2024.
10 Matematyka kształtu, krótki wstęp do topologicznej analizy danych, 9. Forum of Polish Mathematicians, 11 Sept 2024
11 Dioscuri Centre in TDA group presentation, Dioscuri Centre for Chromatin Biology and Epigenomics, Lab Retreat 9-11.09.2024
12 A topological toolbox in data science, Spires 2024, Oxford, UK, 8 August 2024,
13 Topological features of data, Geometric Data Science Symposium, 9ECM, 15 July 2024, Seville, Spain
14 Invitation to methods of topological data analysis, 10th International Summer School on AI and Big Data, ScaDS.AI, Leipzig, 27 June 2024
15 Topological Data Analysis and Dynamics, Symposium on Nonlinear Analysis, Torun, 19 June 2024
16 Topology and biology: From continuous deformations to data understanding, EMBO Meeting, Nencki Institute, 21 May 2024
17 Topological methods in material analysis and design, 2nd International Seminar on Modelling, Simulation and Machine Learning for the Rapid Development of Porous Materials, IMDEA, Madrid, 6 March 2024

18 Shaping up your data; how tools of algebraic topology help to understand complex phenomena? 2nd TES Workshop on Mathematics of Small Data Analysis, ZUSE Institute, Berlin 17 Jan. 2024,
19 Data, their shape, and beyond, Geotop-A Congerence, Merida, Mexico 13 Jan 2024
20 Topological methods in medical diagnostics, 1sza Konferencja Obrazowania Cyfrowego i Wirtualnej Rzeczywistości, Warsaw, 25.11.2023
21 Introduction to Topological Data Analysis (3 hours), Workshop on Mathematics for Industry, Warsaw University of Technology, September 2023
22 Data, their shape, and what we can learn from it, MPI Lead Net, Berlin, 2023
23 Topological visualization methods, ECMI 2023, Wroclaw, June 2023.
24 Topological data analysis, methods and computations, Topology and Dynamical Systems in Action - Summer school 2023
25 Matematyka 5.0, paliwo przyszłości, Silesian University of Technology, first lecture in a series Science for a better future, May 2023,
26 Topology for Society, Mathematics for Society 2022: Health, Industry and Sustainable Development, Gdańsk University of Technology, November 23–25, 2022.
27 Mapper algorithms and their extensions, ComPer Workshop, 2022.
28 Why should data scientists care about topology?, Topology of Data in Rome, Tor Vergata, Rome, Italy, 16.09.2022
29 Topologia Przemysłowa, 50. Konferencja Zastosowań Matematyki, Kościelisko, 13.09.2022
30 Kilka słów o topologii stosowanej, 50. Konferencja Zastosowań Matematyki, Kościelisko, 12.09.2022
31 Industrial topology, PL-Maths-In meeting, 23 May 2022, Będlewo, Poland
32 Shapes and their meaning in biology, DTMB 2022, Tampa, FL, 10 May 2022.
33 Computational topology: from theory to practice, Baby Steps Beyond the Horizon: Mathematics for Students, 05.09.2021 - 10.09.2021 Będlewo (4 hours of lecture for students)
34 Computational topology tools in material science, Special Session of Mathematics in Material Science, BAMC, April 2021.
35 “From local to global, computationally”, SIAM CSE Minisymposium on Emerging Directions in Computational Topology (online).
36 “Topology in Action”, Second Symposium on Machine Learning and Dynamical Systems, Fields Institute (online event), September 2020.
37 “Topology of dynamics and dynamical topology”, Workshop on higher order interactions in networks, Oxford, UK, 9.9.2019.
38 “Dynamika, Topologia oraz nauka o danych”, conference to celebrate 100 years of Polish Mathematical Society, Krakow, Poland, 6.9.2019.
39 “Geometry and topology of data”, LMS Applied Algebra and Geometry Meeting, Swansea, 22 August 2019.
40 “Topology (of) matter”, “Structure in the micro world”, TGDA@OSU, Columbus, OH, 29 May 2019.
41 “Mapper algorithm and its variations”, Dagstuhl Seminar nr. 19212, 22 May 2019.
42 “Mapper and beyond - topological tools for data exploration”, Persistent homology workshop , Xi’an Jiaotong-Liverpool University, Suzhou, China, 8 December 2019.
43 “Computational topology with Gudhi”, ATMCS 8, June 2018, IST-Austria.
44 “A few simple stories on topology in action”, Applied Algebraic Topology Research Network, online seminar, 24 Oct 2017 https://www.youtube.com/watch?v=SaaJ3upkO0g
45 “Persistent homology in practice, the case study”, OMG-DVM Congress, Salzburg, 14.09.2017.
46 Representations of persistence and time varying persistence : past, present and future, Dahstuhl seminar on Topology, Computations and Data Analysis, Dagstuhl, Germany, 18.07.2017.
47 Short online Gudhi presentation on Topological Data Analysis, Theory and Applications,

organized at Macalaster College.

48 “Directed clique topology”, 17w5043 - Topological Methods in Brain Network Analysis, Banff Research Center, Canada, 11 May 2017.

49 “Computational topology with Gudhi”, 17w5043 - Topological Methods in Brain Network Analysis, Banff Research Center, Canada, 9 May 2017.

50 Computational Algebra, Topology and Applications, Computational Algebra, Topology and Applications, 3C in G Workshop on Computational Algebra, Cambridge, UK, 18 April 2017

51 Data, Shape, Computations and Science, Computational and Statistical Aspects of Topological Data Analysis, The Alan Turing Institute, 23 March 2017 (invited talk)

52 Applied, computational topology, Topological Data Analysis and Related Topics, Tohoku University, Advanced Institute for Material Research, Sendai, Japan, 10.02.2017.

53 Computational topology with Gudhi library, Topological Data Analysis and Related Topics, Tohoku University, Advanced Institute for Material Research, Sendai, Japan, 9.02.2017.

54 Persistent homology to analyze network structures, Newton Institute Satellite Workshop: Future Directions in Network Mathematics, Newton Institute and Royal Academy of Sciences, London, UK, 22 November 2016.

55 Topological data analysis - from diagrams to information, from information to knowledge. UK applied topology research meeting, Southmpton, UK, 21 November 2016.

56 Gudhi is in statistics and machine learning, Gudhi wokrshop, Porqueroles, France, 18 Oct 2016.

57 Gudhi library demonstration, SIAM Central States Section, Little Rock, AR, 2 Oct 2016.

58 Computational topology and computational electromagnetism, SIAM Central States Section, Little Rock, AR, 2 Oct 2016.

59 Persistent homology -- stable topological description of data, Interdyscyplinary Colloquim in topology, Popmalona, Spain, 1 September 2016.

60 “Multifiltrations in practice, the case study.”, Workshop in statistics and applications of multidimensional persistence, EPFL, Lausanne, 26 August 2016.

61 “Geometry understanding in higher dimensions, the Gudhi library”, ATMCS 7 2016, Torino, Italy, 25 July 2016.

62 “Applied and computational topology. From applications to software and back (continuously). IST-Austria, 29 June 2016

63 “Applied and computational topology. From applications to software and back (continuously). PRIP, TU-Vienna, 28 June 2016.

64 “Geometry understanding in higher dimensions, the Gudhi library”, SOCG 2016, Boston,. USA, 15 June 2016.

65 Neuro-combinatorics, poster presentation, Second internaltional conference on mathematical neuroscience, Juan-les-Pines, France, 30 May 2016.

66 “Introduction to neurotopology”, recorded presentation for Stanford cs379c class (by Tom Dean), 25 April 2016.

67 “Topology in material analysis”, EPFL, Sion, 20 April 2016.

68 “Rigorous computation of sublevel sets of smooth function”, Inria Sophia-Antipolis, 15 April 2016.

69 “Introduction to neurotopology”, Accelerating Applied Algebraic Toplogy 2016, Aalborg, 14 April 2016.

70 “Persistence landscape toolbox – a tool for topological statistics”, ACAT meeting, IST-Austria, 7 July 2015

71 "Applied computational topology, where we should go now?", GETCO 2015, Aalborg, April 7 2015

72 Applied Computational Topology, Mini-course (20 hours in total), EPFL, 2-5 February 2015

73 “Topological data analysis, the new frontier”, TU Graz, 22 January 2014

74 “Topological sensor networks “, MAA General Contributed Paper Session on Interdisciplinary Topics in Mathematics, Joint Mathematical Meetings 2015, San Antonio, TX, USA
75 “Persistent homology as a practical characteristic of scalar valued functions defined on topological spaces”, AMS Special Session on Topological Measures of Complexity: Inverse Limits, Entropy, and Structure of Attractors, Joint Mathematical Meetings 2015, San Antonio, TX, USA (invited talk)
76 “Topological sensor networks” (invited talk), Workshop on Topological Systems: Communication, Sensing, and Actuation, Institute of Mathematics and Applications, Minneapolis, MA, USA, March 2014
77 “Homological coverage repair in sensor networks”, MURI ANTIDOTE PI Meeting, MIT, Boston, MA, 23 January 2014
78 “Algebraic topology in computational electromagnetism”, MAA General Contributed Paper Session on Modeling and Applications of Mathematics, Joint Mathematical Meetings 2014, Baltimore, MD, USA, January 2014
79 “Computational topology via Discrete Morse Theory” (invited talk), AMS Special Session on Computability in Geometry and Topology, Joint Mathematical Meetings 2014, Baltimore, MD, USA, January 2014
80 “Persistence Simplification with Iterated Morse Complex Decomposition” (invited talk), SIAM Algebraic Geometry, Fort Collins, CO, USA, August 2013
81 “Persistence Simplification with Iterated Morse Complex Decomposition” (invited talk), SIAM Algebraic Geometry, Fort Collins, CO, USA, August 2013
82 “Computational (co)Homology in Electromagnetic Modelling and Material” (invited talk) Analysis, SIAM Algebraic Geometry, Fort Collins, CO, USA, August 2013
83 “Discrete Morse Theory and Computational Homology” (invited talk), Applied Computational Algebra 2012, Malaga, Spain, July 2013
84 “Computational (co)homology: applications and recent progress in computations”, ATMCS 2012, Edinburgh, UK, July 2012
85 “Computational (co)homology: applications and recent progress in computations”, DyToComp 2012 – Dynamics, Topology and Computations, Bedlewo, Poland, June 2012
86 “Applications of computational homology and cohomology theory”, Joint Mathematics Meetings 2012, AMS Session on Algebraic Topology, Boston, MA, USA, January 2012
87 “Cohomology in electromagnetic modelling” (invited talk), Joint Mathematics Meetings 2012, AMS Special Session on Generalized Cohomology Theories in Engineering Practice, Boston, MA, USA, January 2012
88 “Applications of Computational (co)homology”, Workshop on Computational Topology, Fields Institute, Toronto, Canada, November 2011
89 “Computational Homology and Cohomology theory in Maxwell's equations and material science”, The 17th International Conferences on Applications of Computer Algebra (ACA 2011), Computer Algebra in Algebraic Topology and its applications, Houston, TX, USA, June 2011
90 “Applications of computational homology and cohomology theory”, The 17th International Conferences on Applications of Computer Algebra (ACA 2011), Computer Algebra in Algebraic Topology and its applications, Houston, TX, USA, June 2011
91 “A fast Algorithm to Compute Cohomology Group Generators of Orientable 2-manifolds”, 3rd International Workshop on Computational Topology in Image Context, Chipiona, Spain, November 2010
92 “Distributed Computing of Coverage in Sensor Networks by Homological Methods”, 3rd International Workshop on Computational Topology in Image Context, Chipiona, Spain, November 2010
93 “Distributed computing of coverage in sensor networks by homological methods”, Algebra

and Topology: Methods, Computation, and Science (ATMCS 2010), Munster, Germany, June 2010

94 "Homology and cohomology reduction algorithms and applications", Math-Info 2010 Towards new interactions between mathematics and computer science, Topological Methods For The Study Of Discrete Structures, Marseille, France, March 2010

95 "On some applications of the coreduction homology algorithm", Second de Brún Workshop on Computational Algebra, Galway, Ireland, June 30 - July 2009

96 "A homological criterion for the coverage problem in the sensor network", Dynamics, Topology and Computations, Bedlewo, Poland, June 2009

97 "Computational homology and cohomology theory in the electromagnetism", Dynamics, Topology and Computations, Bedlewo, Poland, June 2009

98 "A homological algorithm for the automatic generation of cuts suitable for T-Omega eddy-current geometric formulation", 5th Workshop on Advanced Computational Electromagnetics (ACE'09), Accademia dei Lincei, Rome, January 2009

TALKS IN SEMINARS OUTSIDE MY UNIVERSITY:

1. Topological statistics - how to summarize shape of data?, Mathematical Statistics and Other Probabilistic Applications Seminar, 8 May 2025
2. Topology in material physics, Soft Matter & Complex Systems, Warsaw University, 21 April 2025
3. An introduction to methods of Topological Data Analysis, Dioscuri Centre in TDA, Warsaw, Poland, Helmholtz Munich, 19 March 2025
4. Topological data analysis, methods and tools, Seminarium Instytutu Podstaw Informatyki PAN 20 January 2025
5. What is the shape of things? Impan Colloquium, 15 May 2024,
6. Introduction to TDA, with some emphasis on the methods that can be applied for dynamical systems, Dynamics and Thermodynamics of Large Interacting Systems, IMPAN, 22.03.2024.
7. From Euler number to statistics and back. Tangential approach to Topological Data Analysis, Geometry and Topology Seminar, NCSU, Raleigh, USA, 9 Jan. 2024,
8. Data, their shape, and what we can learn from it, Statistics Seminar, Linkoping, Sweden, 21.11.2023,
9. Topological finance, i.e. how mathematics may help conscious finance, HSBC Krakow, 22 June 2023
10. Applied and computational topology, tools and perspectives, Departmental Seminar, Institute of Mathematics, Silesian University of Technology
11. Invitation to Topological Data Analysis, Departmental Seminar, Department of Mathematics, Warsaw University of Technology, May 2023
12. Topological signatures of porosity, IMDEA Colloquim
13. "Przygody matematyka", popular science talk for highschools, "Days of mathematics", Katowice, March 2023
14. Topological methods in data analysis, Departmental Colloquium, University in Białystok, 16 March 2023
15. Applied and computational topology in DioscuriTDA Centre - a brief overview, Computational Mathematics Seminar, Jagiellonian University, Kraków, Poland, 2.3.23
16. Topology in action - abstract mathematics applied in sciences Math-Curriculum, University of Bremen, 20.12.2022.
17. Data, their shape and relations; what can we gain by understanding it? Seminar of Faculty of Applied Physics and Mathematics, Gdansk University of Technology, 3 December 2022.
18. Symbolic dynamics and topology; a few ideas on reconstruction of dynamics from finite time series, TAMD 2021 Workshop, Gdansk, December 2022.
19. Shapes in biology, how mathematics helps to quantify information about structure of data, Seminar of Nęcki Institute, 20 October 2022,

20. On the shape of data and relations, GEOTOP-A seminar, 11 October 2021.
21. Interview at the RDC Radio (outreach talk), 9 November 2021.
22. Mild introduction to Topological Data Analysis, NUI Galway, 4 November 2021.
23. From dynamics to topology and applications, Semhol Seminar, IMPAN, 25.Oct.2021.
24. Introduction to Topological Data Analysis, University of Reading, 19 October 2021.
25. Topological Data Analysis, a few practical cases, Yeshiva University, NYC, online lecture, June 2021.
26. Invitation to Applied and Computational Topology, Institute of Applied Mathematics, Warsaw University, 26 November 2020.
27. 6 hours lecture series on Applied and Computational Topology, Università degli Studi di Roma "Tor Vergata", invited by Paolo Salvatore
28. Dynamics and topology, Geometry and Topology Seminar, Poznan, Poland, 14. Jan 2020.
29. Dynamics and topology, Computational Mathematics Seminar, Krakow, Poland, 9. Jan 2020.
30. Topology in Action, American University of Sharjah, UAE, 8. Jan 2020
31. Topology in Action, Faces of Complexity, Berlin, 16 Dec. 2019.
32. Topology and geometry for shape description, Machine Learning Group, Jagiellonian University, Krakow, Poland.
33. On Topological Descriptors of Matter, LISMO group, EPFL, Sion, July 2019.
34. A few (un)related stories on TDA, Alan Turing Institute, 16.06.2019
35. Topological signal processing, S&P Global, NYC, 3 May 2019.
36. Topological methods in data analysis, IBM Thomas J. Watson Research Center, NY, USA, 1 May 2019.
37. On the shape of data, Child Mind Institute, NYC, 30 April 2017.
38. Topological signal processing, University of Udine, 19 December 2019.
39. Topology in Action, Queens University, Belfast, 16 November 2018.
40. Discrete nerve complex and decorated persistence diagrams, TU Graz, 30 August 2018.
41. Geometry and topology: tools to understand materials, bones, alloys (and more)..., University of Liverpool, 15 May 2018.
42. Applied and computational topology - theory, algorithms, applications and beyond., Math Departmental colloquium, Strathclyde University, 18 April 2018.
43. Applied and computational topology - theory, algorithms and applications., 14 March 2018, University of Aberdeen.
44. Topological bone analysis, University of Exeter, 30 January 2018.
45. Applied and computational topology - from theory, though algorithms, to solutions of real problems, Ohio State University, 17 January 2018.
46. Applied and computational topology - from theory, though algorithms, to solutions of real problems, Princeton University, January 16 2018.
47. Computational topology in practice: neuroscience, dynamics and porous materials, Pennsylvania State University, 9 Jan. 2018.
48. Practical problems, theory and computations: A few simple stories on topology in action., Cardiff Topology seminar, 26 Oct 2017
49. Persistent homology in practice: the case study, IST-Austria, 13 September 2017.
50. Persistence descriptors of physics: from theory to rigorous conclusions., Queen Marry University, London, 15 June 2017.
51. Industrial topology: From Maxwell's equations to CO_2 filters and human brain – University of Navarra, Papmalona, Spain, 31 August 2016.
52. Introduction to Neurotopology, Inria, Sophia-Antipolis, 10.03.2016.
53. Applied and computational topology, 29/07/2015, Universit`a di Udine, Udine, Italy
54. Cubical complexes and beyond, Inria Sophia, 3 June 2015
55. Cubical complexes, statistical topology and distributed computations, Nagoya University,

20/05/2015 Nagoya, Japan
56. Cubical and statistical topology, Geometrica meeting, 21/04/2015 Porquerolles Island
57. Topology and rigorous computations, KTH, 21 March 2015
58. Topological Data Analysis – the new frontier, January 22 2015, Institute of Geometry, TU Graz
59. Topological Data Analysis – the new frontier, January 8 2015, Topology Seminar, UC Davis, CA, USA
60. Computational topology – the new frontier, September 2014, North Carolina State University, Raleigh, NC, USA
61. Discrete Morse Theory and Persistent Homology, Geometry, Topology and Data Seminar, Ohio State University, Columbus, OH, USA, May 2014
62. Computational aspects of (persistent) homology From discrete to continuous and back, EPFL, Lausanne, Switzerland, March 2014
63. Discrete Morse Theory and Persistent homology, Tulane University, New Orleans, LA USA, April 2013
64. Computational topology, Institute for Advanced Studies, Princeton, NJ, USA, March 2013
65. (Persistent) homology via iterated Morse complex construction", INRIA, Saclay, France, November 2012
66. Forman's discrete Morse Theory, Mathematics and Computer Science Dept. Adam Mickiewicz University, Poznań, Poland, April 2012
67. Topologia obliczeniowa – algorytmy i zastosowania (Computational topology, algorithms and applications), Mathematics and Computer Science Dept. Adam Mickiewicz University, Poznań, Poland, April 2012
68. Applications of Computational Topology, Google, Kraków, Poland, June 2011
69. Dyskretne Geometryczne Podejście do Równań Maxwella (DGA): O zastosowaniu topologii obliczeniowej w numerycznym rozwiązywaniu równań Maxwella (in polish) (Discrete Geometric aproach to Maxwel's equations - topology in EM modelling), ABB Research Center, Kraków, Poland, November 2010

SOFTWARE LIBRARIES:

BallMapper R package, https://cran.r-project.org/web/packages/BallMapper/index.html
Persistence Landscape Toolbox. A toolbox for topological statistics (public domain, available online)
ThinIt software, a toolbox to computations of skeletons of solid models in 2,3 and 4 dimensions (public domain, available online)
Implementation of cubical complex, persistence representations and various other packages for Gudhi library (public domain, available with Gudhi 1.3.0 or higher, http://gudhi.gforge.inria.fr/).
TOPPROCESSOR, efficient toolkit for EM modeling, part of EMWorks solver, https://www.emworks.com/

TEACHING EXPERIENCE:

DS3 Theory and Software Tutorial, 4 January 2021, https://dioscuri-tda.org/Paris_TDA_Tutorial_2021.html
Methods of Algebra and Calculus, Swansea University, 2018-19-20.
Introduction to topological data analysis (with examples in python), December 2018, Xi'an Jiaotong-Liverpool University, Suzhou, China (4 hours).
Topological Data Analysis, 6 hour tutorial (with computational examples), Data Science Summer School, Ecole Politechnique, Paris, June 2018 (8 hours).
Numerical Methods with Matlab, MA262, Swansea University, 2017, 2018.
Computational Mathematics MA162 Swansea University, 2017, 2019.

Programming languages, laboratory (C/C++, C#, object oriented programming, many times each year from 2007 to 2012).
Point set and computational topology, laboratory (2012).
Introduction to computer science, lecture (2007, 2008).
Introduction to C#, laboratory (2007).

OUTREACH:

Organization of mathematical exhibition, Swansea Science Festival 2018, 2019.
Presentation on National Science Museum in London, 27 March 2019.
Presentations on Masterclassess (UK level 9 and 10) on Geometry, topology and cryptography (2018-19)
Masterclasses for Neath-Port Talbot (30 Jan) and Gover (11 Feb), 2020.
Presentation at Warsaw Science Festival, September 2020-21.
Science Picknick, German Embassy in Warsaw, May 2023

RESEARCH VISITS:

Child Mind Institute, S&P Globals, IBM at Yorktown Hills, May 2019.
Univesity of Udine, Ruben Specogna, December 2018.
Pennsylvania State University, Vladimir Itskov, January 2018.
April 2016, EPFL (Genve, Lausanne, Sion), invited by Berend Smit, Kathryn Hess and Henry Markram.
July 2015, Udine, invited by Ruben Specogna
February, April, August 2015, EPFL, invited by Kathryn Hess
November 2014, Cleveland State University, invited by Peter Bubenik
March 2014, Blue Brain Project, EPFL, Switzerland, invited by Henry Markram
March 2013, Tulane University, New Orleans, USA, invited by Rafal Komendarczyk
November 2012, INRIA Saclay, France, invited by Frederic Chazal
March 2011, Department DIEGM (Dipartimento di Ingegneria Elettrica, Gesionale e Meccanica), Unit of Electrical Engineering, University of Udine, Italy. Invited by Ruben Specogna
February - March 2011, Wien, Austria, Pattern Recognition and Image Processing (PRIP). Invited by Walter G. Kropatsch
March 2008, Department DIEGM (Dipartimento di Ingegneria Elettrica, Gesionale e Meccanica), Unit of Electrical Engineering, University of Udine, Italy. Invited by Francesco Trevisan and Ruben Specogna

REVIEWS FOR JOURNALS:

Applicable Algebra in Engineering Communications and Computing, Applied Numerical Mathematics, Ars Combinatoria, Computational Geometry: Theory and Applications, Computer Vision and Image Understanding, Discrete and Computational Geometry, ICML, International Journal of Computational Geometry and Applications, Journal of Computer and System Sciences, Journal of Applied and Computational Topology, Journal of Intelligent Information Systems, Hacettepe Journal of Mathematics, Mathematical Methods in the Applied Sciences, Mathematical Problems in Engineering, European Symposium on Algorithms, Pattern Recognition Letters, PLOS One, Siam Review, Signal Processing, Symposium on Computational Geometry, 27th ACM Symposium on Parallelism in Algorithms and Architectures, Topological Methods in Nonlinear Analysis.

Reviewer of EU projects (in 2012 and 2013).

Evaluator for the call 2014 and 2015 FET-OPEN - Novel Ideas for Radically new technologies– Research and Innovation Actions.
MS committees in Jagiellonian University. PhD committee in University of Malaga, University of Glasgow, TU Berlin.
PC member of DataMod 2016 conference, TopoInVis 2019, 2022

ORGANIZED CONFERENCES:

Applied Topology in Bedlewo 2013. Organized together with Wacław Marzantowicz and Grzegorz Graff. It hosted 120 participants and was the first conference in Poland dedicated entirely to applications of topology. .
Joint Mathematiccal Meetings, 2016, Organization of a special session in Applied and Computational Topology. Together with Nicholas Scoville and Matthew Wright.
Applied Topology in Bedlewo 2017. Organized together with Wacław Marzantowicz and Zbigniew Blaszczyk. We hosted 100 participants from all over the world.
Dragon Applied Topology Conference in Swansea (~80 participants).
A special session on a joint meeting of Polish-Italian Mathematical Society (~15 participants).
SIAM Conference on Mathematical Aspects of Materials Science - MS 21, member of a program committee.
British Applied Mathematics Colloquium, special session on Material Science, cooraganized with Vitaliy Kurlin, April 2021.
Workshop on TDA and Medical Data in Gdansk, 1.-3.12.2021. Jointly organized with Gdansk Tech
IMPAR: Joint Workshops on the Intersection of Statistical Mechanics, Topology and Geometry, 30.3. - 2.4.2022. Jointly organized with Imperial College, London.
4th (Virtual) International Conference on Trauma Surgery Technology 2022, dedicated to Mathematics in Medical Diagnostics, 23 April 2022.
Pl-Maths-In meeting- 22-25 May 2022
Applied Topology in Bedlewo 2022, Bedlewo, Poland, 90 participants,
Applied and Combinatorial Topology, Dagstuhl Seminar, 25.02-01.03. 2024,
Meeting of Polish Applied Mathematicians, Bedlewo, 26-29.06.2024