

# Davide Gurnari



EDUCATION	<b>PhD in Computer Science / Applied Mathematics</b> IM PAN - University of Warsaw, Warsaw, PL	Oct 2020 - Apr 2025
	<b>Master's Degree in Data Science</b> (graduated cum laude) Università degli Studi di Padova, Padova, IT	Oct 2018 - Sep 2020
	<b>Bachelor's Degree in Physics</b> Università degli Studi di Padova, Padova, IT	Oct 2013 - Apr 2017
RELEVANT EXPERIENCES	<b>PhD student</b> October 2020 - April 2025 I worked in the Dioscuri Centre in Topological Data Analysis (TDA). My research focused on developing new and efficient data descriptors, with a strong interest in practical real-world applications. I have successfully collaborated with researchers across industry and academia on interdisciplinary projects in theoretical mathematics, computational biology and materials science.	IM PAN - University of Warsaw Warsaw, PL
	<b>Visiting student</b> August 2024 - September 2024 I visited the Rabadan Lab at Columbia University Irving Medical Center where I applied the TDA visualization techniques that I developed during my PhD to analyze single-cell RNA sequencing datasets.	Columbia University New York City, USA
	<b>Research intern</b> May 2023 - August 2023 I worked with members of Dr. Laxmi Parida's computational genomics team and Prof. Saugata Basu on harmonic persistent homology and its applications, particularly in healthcare and life sciences problems. In addition to a conference paper, this project led to two patent applications.	IBM Research Yorktown Heights, New York, USA
	<b>External collaborator</b> April 2020 - January 2021 I contributed to the OxCOVID19 project, a large, multimodal relational database consisting of information related to the COVID-19 pandemic. I helped design the database to map administrative areas of all countries, at all levels of sub-division, in a coherent way. I wrote code to fetch pandemic, social statistics and weather data.	University of Oxford Oxford, England, UK
	<b>Erasmus+ traineeship</b> March 2020 - June 2020 I worked with Dr. Paweł Dłotko on large-scale computations of Euler Characteristic Curves of high dimensional datasets. This work resulted in my Master's thesis and has been extended in my PhD research.	Swansea University Swansea, Wales, UK
	<b>Research assistant</b> July - August 2019 I worked with Prof. Luciano Serafini in the development of an algorithm for incremental learning of discrete planning domains.	Fondazione Bruno Kessler Trento, IT
PUBLICATIONS	P. Dłotko, D. Gurnari, and R. Sazdanovic, "Mapper-type algorithms for complex data and relations", <i>Journal of Computational and Graphical Statistics</i> (2024) DOI: 10.1080/10618600.2024.2343321	

	<p>P. Dłotko and D. Gurnari, “Euler Characteristic Curves and Profiles: a stable shape invariant for big data problems”, <i>GigaScience</i> (2023) DOI: 10.1093/gigascience/giad094</p> <p>A. Mahdi, P. Blaszczyk, 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”, <i>Scientific Reports</i> (2021) DOI: 10.1038/s41598-021-88481-4</p>
<b>CONFERENCE PAPERS</b>	<p>P. Dłotko, D. Gurnari, and R. Sazdanovic, “The Art of Knot Data”, <i>Bridges</i> (2024)</p> <p>D. Gurnari, A. Guzmán-Sáenz, F. Utro, A. Bose, S. Basu and L. Parida, “Probing omics data via harmonic persistent homology”, <i>RECOMB-CCB</i> (2024)</p>
<b>AWARDS AND SCHOLARSHIPS</b>	<p>IDUB Scholarships “The Challenge of Petabytes”</p> <p>IM PAN Award for Outstanding Scientific Publications in 2023</p> <p>Young Mathematicians Award for the best paper presented at the 51st Conference on Applications of Mathematics, Kościelisko, Sep. 10-16 2023</p> <p>NC State Research Image Contest 2023, First place in the graphics and data visualization category</p> <p>Research scholarship, Dioscuri Centre in Topological Data Analysis, Warsaw, 2020-2024</p> <p>Erasmus+ traineeship scholarship, 2020</p>
<b>RESEARCH SOFTWARE</b>	<p><b>maTiIDA</b> <a href="https://github.com/IBM/matilda">github.com/IBM/matilda</a>  Multipurpose toolkit for Topological Data Analysis. I developed the <b>harmonic</b> module.</p> <p><b>pyBallMapper</b> <a href="https://github.com/dioscuri-tda/pyBallMapper">github.com/dioscuri-tda/pyBallMapper</a>  Python implementation of the BallMapper algorithm, a tool to create graph-based visualization of high-dimensional datasets. Main developer.</p> <p><b>pyEulerCurves</b> <a href="https://github.com/dioscuri-tda/pyEulerCurves">github.com/dioscuri-tda/pyEulerCurves</a>  Python package for parallel computations of Euler Characteristic Curves, a stable, multi-scale topological data descriptor. Main developer.</p>
<b>TECHNICAL SKILLS</b>	<p><b>Python</b>: proficient, in particular <i>NumPy</i>, <i>Scipy</i>, <i>Pandas</i>, <i>GUDHI</i>, <i>Scikit-learn</i>, <i>PyTorch</i> and <i>pySpark</i>;</p> <p><b>C++</b>: working knowledge, experienced in creating Python bindings of C++ code with <i>pybind11</i>;</p> <p><b>R</b>: working knowledge of the standard statistical and ML packages;</p> <p><b>Other</b>: proficient in Unix and CLI tools; experienced in using <i>Slurm</i> on HPC environments; committed to good practices for reproducible research such as version control, docstrings, virtual environments, packaging and distributing projects;</p> <p><b>LaTeX</b>: proficient.</p>
<b>LANGUAGE SKILLS</b>	<p><b>Italian</b>: Native</p> <p><b>English</b>: Fluent</p>
<b>REFERENCES</b>	<p><b>Paweł Dłotko</b> Dioscuri Centre for TDA, IM PAN</p> <p><b>Radmila Sazdanovic</b> Department of Mathematics, North Carolina State University</p> <p><b>Laxmi Parida</b> IBM Research</p>