

Barbara Giunti

Curriculum Vitae

Contact details

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Current position

09/2023 - **University at Albany, SUNY**, Assistant Professor at the Department of Mathematics and Statistics.

Previous positions

12/2020 - **Graz University of Technology**, Postdoc fellow at the Institute of Geometry.

07/2023 Tutor: Prof. Michael Kerber

12/2019 - **University of Modena and Reggio Emilia**, Postdoc fellow in Topological Data Analysis.

11/2020 Tutor: Prof. Claudia Landi

Education

10/2016 - **PhD in Mathematics**, Thesis: *Tame parametrised chain complexes*, Advisors: Prof. Wojciech Chachólski, Prof. Claudia Landi.

12/2019 University of Pavia, Italy

10/2013 - **M.Sc. in Mathematics, 110/110 cum Laude**, Thesis: *Differential equations on graphs*,

10/2015 Advisor: Prof. Paolo Cermelli.

University of Torino, Italy

10/2010 - **Bc. in Mathematics, 103/110**, Thesis: *Best-reply dynamics and differential inclusions*,

07/2013 Advisor: Prof. Paolo Cermelli.

University of Torino, Italy

09/2005 - **Humanistic high school diploma, 100/100.**

07/2010 Liceo Norberto Rosa, Susa, Italy

Publications and preprints

Published **Decomposing filtered chain complexes: geometry behind barcoding algorithms**, Wojciech Chachólski, Barbara Giunti, Alvin Jin, and Claudia Landi, *Computational Geometry: Theory and Applications* (2023)

Published **Average complexity of matrix reduction for clique filtrations**, Barbara Giunti, Guillaume Houry, and Michael Kerber, *ISSAC '22: Proceedings of the 2022 International Symposium on Symbolic and Algebraic Computation*, pages 187–196 (2022)

Published **Invariants for tame parametrised chain complexes**, Wojciech Chachólski, Barbara Giunti and Claudia Landi, *Homology, Homotopy and Applications*, vol. 23(2), pages 183–213, (2021)

Published **Dynamical systems on graphs through the signless Laplacian matrix**, Barbara Giunti and Vincenzo Perri, *Ricerche di Matematica*, vol. 67, pages 533–547 (2018)

- Conference paper **Notes on pivot pairings**, Barbara Giunti, *37th European Workshop on Computational Geometry* (2021)
- Preprint **Cofibrant indecomposables in chain complex valued tame functors indexed by dimension one posets**, Wojciech Chachólski, Barbara Giunti, Claudia Landi, and Francesca Tombari, *arXiv:2301.04079*, (2023)
- Preprint **Keeping it sparse: Computing persistent homology revisited**, Ulrich Bauer, Tahla Bin Masoon, Barbara Giunti, Guillaume Houry, Michael Kerber, and Abhishek Rathod, *arXiv:2211.09075*, (2022)
- Preprint **Amplitudes on abelian categories**, Barbara Giunti, John S. Nolan, Nina Otter, and Lukas Waas, *arXiv:2107.09036*, (2021)

Participation in conferences and workshops

- 31/10–01/11/2022 **Invited talk: Some like it sparse.**
Online Workshop on Computational Persistence 2022
- 15–16/09/2022 **Invited talk: Fantastic barcode algorithms and where to find them.**
Workshop Topology of Data, University of Roma Tor Vergata, Italy
- 20–24/06/2022 **Talk: Average complexity of persistence algorithms for clique filtrations.**
ATMCS 10, University of Oxford, Oxford, UK
- 20–24/06/2022 **Poster: Amplitudes in multiparameter persistence.**
ATMCS 10, University of Oxford, Oxford, UK
- 19–22/06/2021 **Invited talk: Amplitudes on abelian categories.**
Workshop on Metrics in Multiparameter Persistence, Lorentz Center, Leiden, Netherlands
- 26–30/04/2021 **Talk: The amplitude of an abelian category: Measures in persistence theory.**
IMSI Workshop on Topological Data Analysis, Chicago, USA
- 07–09/07/2021 **Talk: Notes on pivot pairings.**
European Workshop on Computational Geometry 2021
- 06–09/01/2021 **Invited talk: Persistence algorithms from filtered chain complexes point of view.**
AMS Special Session on Applied Topology, Joint Mathematical Meeting
- 09–13/07/2019 **Invited talk: Parametrised chain complexes.**
SIAM AG19, Bern, Switzerland
- 17–20/09/2018 **Talk: Classification of filtered chain complexes.**
Joint meeting SIMAI-UMI-PTM, Wrocław, Poland
- 25–29/06/2018 **Poster: Decomposition of filtered chain complexes.**
ATMCS 8, IST Wien, Austria
- 11–14/06/2018 **Talk: Decomposition of filtered chain complexes: Structure theorem and algorithm.**
Computational Geometry 2018 YRF, Renyi Institute, Budapest, Hungary
- 19–23/02/2018 **Poster: Decomposition of persistent chain complexes.**
TAGS - Linking Topology to Algebraic Geometry and Statistics, Max Planck Institute, Leipzig, Germany
- 03–07/07/2017 **Talk: Topology and data science: an introduction to persistent homology.**
Young Topologists Meeting, KTH Stockholm, Sweden

Seminars

- 03/10/2022 **Talk: Chain complexes and persistence theory.**
Womxn in ALGTOP Online Seminar
- 29/04/2022 **Talk: Average complexity of persistence algorithms.**
AATRN Vietoris-Rips online seminar

- 14/04/2022 **Invited Talk: Persistence modules and amplitudes.**
Online seminar on representation theory of finite-dimensional algebras
- 11/03/2022 **Invited Talk: Amplitudes in multiparameter persistence.**
ATiA seminar, Albany, USA
- 08/03/2022 **Invited talk: Amplitudes in persistence theory.**
Persistence, Sheaves and Homotopy Theory online seminar
- 15/02/2021 **Talk: Persistence decomposition algorithms.**
Journal Club Heidelberg, Heidelberg, Germany
- 21/01/2021 **Invited talk: Filtered chain complexes and persistence algorithms.**
UCLA TDA seminar, Los Angeles, USA
- 09/10/2020 **Invited talk: Invariants for tame parametrised chain complexes.**
Oxford Applied Topology Seminar, Oxford University, UK
- 08/10/2020 **Talk: Persistence theory of parametrised chain complexes.**
Graz Geometry seminar, Graz University of Technology, Austria
- 07/07/2020 **Invited talk: A model category of tame parametrised chain complexes.**
Journal Club Heidelberg, Heidelberg, Germany
- 06/05/2020 **Talk: Invariants for tame parametrised chain complexes.**
AATRN online seminar - Originally accepted as talk at ATMCS9
- 11/02/2020 **Invited talk: Parametrised chain complexes in persistence theory.**
University of Bologna, Italy
- 15/01/2020 **Invited talk: Invariants for tame parametrised chain complexes.**
University of Aberdeen, UK
- 13/01/2020 **Talk: Persistence theory and applications.**
Northumbria University Newcastle, UK
- 26/09/2019 **Talk: Parametrised chain complexes as a model category.**
NTNU, Trondheim, Norway
- 22/03/2019 **Talk: Filtered Chain Complexes: Decomposition and Algorithm.**
TU München, Germany
- 29/10/2018 **Talk: Classification of filtered chain complexes.**
NTNU, Trondheim, Norway
- 20/11/2017 **Invited talk: Introduction to persistence theory.**
Milano Bicocca University, Milano, Italy
- 26/09/2017 **Invited talk: Introduction to zigzag persistence.**
Ruhr-Universität, Bochum, Germany

Supervised master's students

- 2 **Daniel W. Peer**, Master thesis *Injective model category structure on tame parametrised chain complexes*, academic year 2020/2021, co-supervised with Prof. Michael Kerber
- 1 **Guillaume Houry**, Master internship on *Average complexity and sparsity of persistence algorithms*, spring semester 2020/2021, co-supervised with Prof. Michael Kerber

Teaching

- Winter semester 2021/2022 **TA for Complexity theory**, *Institute of Geometry*, Prof. Michael Kerber.
Graz university of Technology
- Spring semester 2020/2021 **TA for Theoretische Informatik I**, *Institute of Geometry*, Prof. Michael Kerber.
Graz University of Technology
- Spring semester 2019/2020 **TA for the research project and mentoring**, *Mentor Prof. Nina Otter*.
Applied Category Theory adjoint school 2020

- Winter semester 2018/2019 **TA for Calculus I**, *Faculty of Electric and Informatics Engineering*, Prof. Fornaro. University of Pavia, Italy
- Spring semester 2017/2018 **TA for Theory of dynamical systems**, *Faculty of Mathematics*, Prof. Marzuoli. University of Pavia, Italy
- Winter semester 2017/2018 **TA for Calculus I**, *Faculty of Edil Engineering and Architecture*, Prof. Fornaro. University of Pavia

Institutional responsibilities

- 09/2021 - **Organising the weekly seminar of the Institute of Geometry, Tu Graz.**
Together with Håvard Bakke Bjerkevik and Joseph Doolittle until September 2022
- 06/2022 - **Mentor of the PhD Student Matthias Söls at Graz University of Technology.**

Service to the community

- 01/02/2023 **Interviewer of Prof. Claudia Landi for the AATRN Interview series.**
<https://www.aatrnet.net/interviews>
- 01/2023 - **Member of the Speaker Selection Committee for the AATRN Seminar Series.**
<https://www.aatrnet.net/seminar>
- 01/2020 - **Maintenance of a public database of real-world applications of TDA, with Dr. Jānis Lasozskis, developed into the search engine DONUT - Database for Original and Non-Theoretical Uses of Topology by Bastian Rieck in 2022.**
<https://donut.topology.rocks>
- YouTube Video *Clear and Compress for persistence algorithm.***
Tutorial-a-thon organised by AATRN

Fellowships and grants

- 9–13/07/2019 **SIAM AG19, Bern, Swizerland, SIAM travel grant.**
- 05/2019 **Visitor at the KTH Royal Institute of Stockholm, INFN travel grant.**
- 02 – 03/2018 **Visitor at the KTH Royal Institute of Stockholm, INdAM travel grant.**
- 03–30/09/2017 **Applied and Computational Topology (2) - Collaboration between experts, HIM, Bonn, Germany, HIM travel grant.**
- 08–12/08/2017 **Applied Algebraic Topology 2017, Sapporo, Japan, Applied Algebraic Topology conference travel grant.**
- 2016–2019 **University of Pavia, PhD fellowship.**

Reviewing

Symposium on Computational Geometry 2022
Homotopy, Homology, and Applications
Computational Geometry Theory and Applications
SIAM Journal on Applied Algebra and Geometry
Journal of Computational Geometry

Programming languages

Python, C++

Languages

- Italian Mother tongue
- English C1, IELTS certification earned on 25/06/2016
- German Good - approximatively B2

French Basic
Norwegian Basic