

# Barbara Giunti | Curriculum Vitae

## Contact details

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## Current position

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### Postdoc fellow at the Institute of Geometry

Graz University of Technology

December 2020 -

Tutor: Prof. Michael Kerber

## Previous positions

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### Postdoc fellow in Topological Data Analysis

University of Modena and Reggio Emilia

December 2019 - November 2020

Tutor: Prof. Claudia Landi

## Education

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### PhD in Mathematics - Thesis: Tame parametrised chain complexes

University of Pavia

October 2016 - December 2019

Advisors: Prof. Wojtek Chachólski, Prof. Claudia Landi

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

Torino University - Potsdam Universität

October 2013 - October 2015

Advisor: Prof. Paolo Cermelli

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

University of Torino

October 2010 - July 2013

Advisor: Prof. Paolo Cermelli

### Humanistic high school diploma, 100/100

Liceo Norberto Rosa, Susa (Italy)

September 2005 - July 2010

## Publications and preprints

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

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

(Conference paper) **Notes on pivot pairings**, Barbara Giunti, 37th European Workshop on Computational Geometry 2021

(Preprint) **Average complexity of matrix reduction for clique filtrations**, Barbara Giunti, Guillaume Houry, and Michael Kerber, arXiv:2111.02125, (2021)

(Preprint) **Amplitudes on abelian categories**, Barbara Giunti, John S. Nolan, Nina Otter, and Lukas Waas, arXiv:2107.09036, (2021)

(Preprint) **Decomposing filtered chain complexes: geometry behind barcoding algorithms**, Wojciech Chachólski, Barbara Giunti, Alvin Jin, and Claudia Landi, arXiv:2012.01033, (2020)

## Participation in conferences and workshops

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- (Accepted) talk: Average complexity of persistence algorithms for clique filtrations**  
*ATMCS 10* 20-24 June 2022  
University of Oxford, Oxford, UK
- (Accepted) poster: Amplitudes in multiparameter persistence**  
*ATMCS 10* 20-24 June 2022  
University of Oxford, Oxford, UK
- Invited talk: Amplitudes on abelian categories**  
*Workshop on Metrics in Multiparameter Persistence* 19-22 July 2021  
Lorentz Center, Leiden, Netherlands
- Talk: The amplitude of an abelian category: Measures in persistence theory**  
*Workshop on Topological Data Analysis* 26-30 April 2021  
IMSI, Chicago, USA
- Talk: Notes on pivot pairings**  
*European Workshop on Computational Geometry 2021* 7-9 April 2021  
S. Petersburg, Russia
- Invited talk: Persistence algorithms from filtered chain complexes point of view**  
*AMS Special Session on Applied Topology* 6-9 January 2021  
Joint Mathematical Meeting
- Invited talk: Parametrised chain complexes**  
*SIAM AG19* 9-13 July 2019  
Bern, Switzerland
- Talk: Classification of filtered chain complexes**  
*Joint meeting SIMAI-UMI-PTM* 17-20 September 2018  
Wrocław, Poland
- Poster: Decomposition of filtered chain complexes**  
*ATMCS 8* 25-29 June 2018  
IST, Wien, Austria
- Talk: Decomposition of filtered chain complexes: Structure theorem and algorithm**  
*Computational Geometry 2018, Young Researchers Forum* 11-14 June 2018  
Renyi Institute, Budapest, Hungary
- Poster: Decomposition of persistent chain complexes**  
*TAGS - Linking Topology to Algebraic Geometry and Statistics* 19-23 February 2018  
Max Planck Institute, Leipzig, Germany
- Talk: Topology and data science: an introduction to persistent homology**  
*Young Topologists Meeting* 3-7 July 2017  
KTH, Stockholm, Sweden

## Seminars

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- (Scheduled) Talk: *Average complexity of persistence algorithms* 29 April 2022  
AATRN Vietoris-Rips online seminar
- (Scheduled) Invited Talk: *Persistence modules and amplitudes* 14 April 2022  
FD online seminar
- Invited Talk: *Amplitudes in multiparameter persistence* 11 March 2022  
ATiA seminar, Albany, USA
- Invited talk: *Amplitudes in persistence theory* 8 March 2022  
PHST online seminar
- Talk: *Persistence decomposition algorithms* 15 February 2021  
Journal Club Heidelberg, Heidelberg, Germany
- Invited talk: *Filtered chain complexes and persistence algorithms* 21 January 2021  
UCLA TDA seminar, Los Angeles, USA
- Invited talk: *Invariants for tame parametrised chain complexes* 9 October 2020

Oxford Applied Topology Seminar, Oxford University, UK	
Talk: <i>Persistence theory of parametrised chain complexes</i> Graz Geometry seminar, Graz University of Technology, Austria	8 October 2020
Invited talk: <i>A model category of tame parametrised chain complexes</i> Journal Club Heidelberg, Heidelberg, Germany	7 July 2020
Talk: <i>Invariants for tame parametrised chain complexes</i> AATRN online seminar - Originally accepted as talk at ATMCS9	6 May 2020
Invited talk: <i>Parametrised chain complexes in persistence theory</i> University of Bologna, Italy	11 February 2020
Invited talk: <i>Invariants for tame parametrised chain complexes</i> University of Aberdeen, UK	15 January 2020
Talk: <i>Persistence theory and applications</i> Northumbria University Newcastle, UK	13 January 2020
Talk: <i>Parametrised chain complexes as a model category</i> NTNU, Trondheim, Norway	26 September 2019
Talk: <i>Filtered Chain Complexes: Decomposition and Algorithm</i> TU München, Germany	22 March 2019
Talk: <i>Classification of filtered chain complexes</i> NTNU, Trondheim, Norway	29 October 2018
Invited talk: <i>Introduction to persistence theory</i> Milano Bicocca University, Milano, Italy	20 November 2017
Invited talk: <i>Introduction to zigzag persistence</i> Ruhr-Universität, Bochum, Germany	26 September 2017

## Supervised master's students

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2: **Daniel W. Peer**, Master thesis *Injective model category structure on tame parametrised chain complexes*, academic year 2020/2021 (to be defended), co-supervised with Prof. Michael Kerber

1: **Guillaume HouCry**, Master internship on *Average complexity and sparsity of persistence algorithms*, spring semester 2020/2021, co-supervised with Prof. Michael Kerber

## Teaching

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<b>TA for Complexity theory</b> Graz university of Technology, Prof. Michael Kerber	<b>Institute of Geometry</b> Winter semester 2021/2022
<b>TA for Theoretische Informatik I</b> Graz University of Technology, Prof. Michael Kerber	<b>Institute of Geometry</b> Spring semester 2020/2021
<b>TA for the research project and mentoring</b> Mentor Prof. Nina Otter	<b>ACT adjoint school 2020</b> Spring semester 2019/2020
<b>TA for Calculus I</b> University of Pavia, Prof. Fornaro	<b>Faculty of Electric and Informatics Engineering</b> Fall semester 2018/2019
<b>TA for Theory of dynamical systems</b> University of Pavia, Prof. Marzuoli	<b>Faculty of Mathematics</b> Spring semester 2018
<b>TA for Calculus I</b> University of Pavia, Prof. Fornaro	<b>Faculty of Edil Engineering and Architecture</b> Fall semester 2017/2018

## Community outreach

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Invited for interviewing Prof. Claudia Landi for the AATRN Interview series

<https://www.aatrnet.net/interviews>

## Organising the weekly seminar of the Institute of Geometry, Tu Graz

Together with Håvard Bakke Bjerkevik and Joseph Doolittle

September 2021 -

## Maintenance of a public database of real-world applications of TDA, with Dr. Jānis Lasozskis

<https://www.zotero.org/groups/tda-applications>

## YouTube Video *Clear and Compress for persistence algorithm*

Tutorial-a-thon organised by AATRN

## Fellowships and grants

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### SIAM travel grant

SIAM AG19, Bern, Switzerland

9-13 July 2019

### INFN travel grant

Visitor at the KTH Royal Institute of Stockholm

24 April – 31 May 2019

### INdAM travel grant

Visitor at the KTH Royal Institute of Stockholm

2 February – 30 March 2018

### HIM travel grant

Applied and Computational Topology (2) - Collaboration between experts

3–30 September 2017

HIM, Bonn, Germany

### Applied Algebraic Topology conference travel grant

Applied Algebraic Topology 2017, Sapporo, Japan

8–12 August 2017

### member of the Gruppo Nazionale per la Fisica Matematica

GNFM - Istituto Nazionale di Alta Matematica

2017–2019

### member of the Istituto Nazionale di Fisica Nucleare

INFN

2017–2019

### PhD fellowship

University of Pavia

2016–2019

## Reviewing

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Symposium on Computational Geometry 2022

Homotopy, Homology, and Applications

Computational Geometry Theory and Applications

## Programming languages

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Python

C++

## Languages

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**Italian:** Mother tongue

**English:** C1, IELTS certification on June 25th, 2016

**German:** Good - approximatively B2

**French:** Basic

**Norwegian:** Basic