Cristian Bodnar

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Education

2019-2022 **PhD Machine Learning**, *Fitzwilliam College, University of Cambridge, UK*.
Research in Topological and Geometric Deep Learning supervised by Prof Pietro Liò.
Awarded a Microsoft Research PhD Fellowship (2021).

2018-2019 **MPhil Advanced Computer Science**, *Fitzwilliam College, University of Cambridge, UK*.
Graduated with Distinction and received The Best MPhil Student Award (Ranked 1st out of ∼30 students).

2015-2018 **BSc (Hons) Computer Science**, *University of Manchester, UK*.
International award-winning dissertation: *Text to Image Synthesis using Generative Adversarial Networks*.
Third Year Examinations: First Class (Ranked 2nd out of ∼130 students).
Second Year Examinations: First Class (Ranked 5th out of ∼150 students).
First Year Examinations: First Class (Ranked 5th out of ∼200 students).

Research Experience

Summer 2022 **Research Intern at Microsoft Research**, *Cambridge, UK*.
Research on Graph Neural Networks for materials science supervised by Tian Xie and Marc Brockschmidt.

Autumn 2021 **Research Intern at Twitter Cortex**, *London, UK*.
Research on Topological & Geometric Deep Learning with Michael Bronstein in the Cortex Team.
First author of *Neural Sheaf Diffusion*. Submitted patent application based on the paper.

Summer 2020 **Research Intern at Google Brain**, *Mountain View, California*.
First author of *A Metric Space Perspective on Self-Supervised Policy Adaptation* (ICRA 2021 & RA-L).

Summer 2019 **AI Resident at Alphabet/Google X**, *Mountain View, California*.
Research on Distributional Reinforcement Learning as part of The Everyday Robot Moonshot Project.
First author of a joint paper with Google Brain: Best Systems Paper Finalist Award at RSS 2020.
Pending USA patent application based on the paper.

Prizes and Awards

2021 **Microsoft Research PhD Fellowship**

2020 **Leathersellers' Graduate Scholarship** - Awarded to 4 Fitzwilliam College students each year for excellence in Physical or Biological Sciences, Engineering or Mathematics

2020 RSS 2020 Best Systems Paper Finalist (ranked in top 3 systems papers)

2019 Cambridge Trust PhD Scholarship

2019 Fitzwilliam College Senior Scholarship - In recognition of excellent academic achievements

2019 Fitzwilliam College Graduate Tutors Prize - For achieving a distinction in my Masters degree

2019 **Prize For The Best Cambridge Computer Science MPhil Student**

2018 Honorary citizen of Bistrita-Nasaud County, Romania

2018 **Global Winner in Computer Science at The Undergraduate Awards** - International award for the best research-based undergraduate dissertation

2018 Head of School Award for outstanding contributions to the School of Computer Science (UoM)

2018 Certificate of Excellence from the School of Computer Science (UoM)

2016 Golden Anniversary Prize awarded to Top 5 first year computer science students (UoM)

Selected Publications and Preprints

A full list of publications can be found on my Google Scholar page.

2022 **Sheaf Neural Networks with Connection Laplacians**.
Federico Barbero, **Cristian Bodnar**, H.S. de Ocáriz Borde, Michael Bronstein, Petar Veličković, Pietro Liò
ICML 2022 Workshop on Topology, Algebra, and Geometry in ML

2022 **Neural Sheaf Diffusion: A Topological Perspective on Heterophily and Oversmoothing**.
Cristian Bodnar, Francesco Di Giovanni, B. Chamberlain, P. Liò, M. Bronstein
Preprint 2022 | Short version accepted as spotlight to the GTRL Workshop at ICLR 2022

2021 **Weisfeiler and Lehman Go Cellular: CW Networks**.
Cristian Bodnar*, Fabrizio Frasca*, N. Otter, Y.G. Wang, P. Liò, G. Montúfar, M. Bronstein
NeurIPS 2021

2021 **Weisfeiler and Lehman Go Topological: Message Passing Simplicial Networks**.
Cristian Bodnar*, Fabrizio Frasca*, Yu Guang Wang*, N. Otter, G. Montúfar*, P. Liò, M. Bronstein
ICML 2021

2021 **Neural ODE Processes**.
Alexander Norcliffe*, **Cristian Bodnar***, Ben Day*, Jacob Moss*, Pietro Liò
ICLR 2021

2020 **On Second Order Behaviour in Augmented Neural ODEs**.
Alexander Norcliffe, **Cristian Bodnar**, Ben Day, Nikola Simidjievski, Pietro Liò
NeurIPS 2020

2020 **Deep Graph Mapper: Seeing Graphs through the Neural Lens**.
Cristian Bodnar*, Cătălina Cangea*, Pietro Liò
Topology in Real-World Machine Learning and Data Analysis: Frontiers in Big Data

Invited Talks

Jun 17, 2022 A Hitchhiker's Guide to Complex Geometry Seminar, Cambridge, UK

Apr 29, 2022 Geometrical and Topological Representation Learning Workshop, ICLR 2022

Mar 11, 2022 Mathematical Institute, University of Oxford, UK

Mar 8, 2022 Recent Advances in Graph ML Workshop, Sorbonne Université, Paris, France

Dec 27, 2021 3rd Nepal Winter School in AI, Kathmandu, Nepal

Dec 13, 2021 ELLIS Machine Learning for Molecule Discovery Workshop, Cambridge, UK

Nov 16, 2021 Department of Computer Science, University of Cambridge, UK

Oct 6, 2021 AI + Math Colloquia, Shanghai Jiao Tong University, China

Oct 6, 2021 Topological Data Analysis Seminar, Michigan State University, USA

Sep 7, 2021 The Learning on Graphs and Geometry Reading Group

Jul 16, 2021 Robotics: Science and Systems (RSS)

Jun 30, 2021 TopoNets: Networks beyond pairwise interactions, Networks 2021

May 7, 2021 Geometrical and Topological Representation Learning Workshop, ICLR 2021

Apr 16, 2021 Valence Discovery Graph Neural Networks Research Podcast

Apr 8, 2021 Max Plank Institute for Mathematics in the Sciences, Germany

Mar 8, 2021 Twitter Research, London, UK

Feb 10, 2020 AAAI 2020, New York, USA

Miscellaneous

2019-Present   **Teaching**.
- Lecturer at the Italian Geometric Deep Learning Summer School, Pescara, Italy (2022)
- Mentor for the London Geometry and Machine Learning Summer School (2022)
- Teaching Assistant for the DeepMind GNN Course at Cambridge (2022)
- Teacher at the 3rd Nepal Winter School in AI, Kathmandu, Nepal (2021)
- Teaching Assistant for the Quantum Computing Cambridge Course (2019-2021)
- Teaching Assistant for the Data Science Cambridge Course (2020-2021)
- Teaching Assistant for the Machine Learning & Bayesian Inference Cambridge Course (2020-2021)

Blogposts.
- A new computational fabric for Graph Neural Networks, w/ M. Bronstein & F. Frasca (June 2022).
- Neural Sheaf Diffusion for Deep Learning on Graphs, w/ M. Bronstein & F. Di Giovanni (May 2022).

Media Coverage.
- Famous ML YouTuber Aleksa Gordić covered our Neural Sheaf Diffusion paper.
- The Gradient article also covering my latest work on Topology & Graph Neural Networks.
- Synced article covering my paper on CW Networks.

2019-Present   **Student Supervision**.
- **Part III/MPhil**: Federico Barbero (2022, Cam), Denizhan Akar (2022, Cam), Nishil Patel (2021, Cam), Richard Geng (2021, Cam), Asif Hossain (2021, Cam), Alexander Norcliffe (2020, Cam), Vijja Wichitwechkarn (2020, Cam), Chris Underhill (2020, Cam).
- **Part II/Undergraduate Dissertation**: Christopher Goh (2022, Cam), Teodora Reu (2022, UoM), Denizhan Akar (2021, UoM).

2020-Present   **Community service**.
- **Reviewer**: NeurIPS 2022, ICML 2022, ICLR 2022 (Highlighted reviewer), NeurIPS 2021, ICML 2021 (Top 10% reviewers), TDA and Beyond NeurIPS 2020 Workshop, Graph Representation Learning ICML 2020 Workshop, ICRA 2020.