



# GUILLERMO BERNÁRDEZ GIL

Postdoc Researcher @ UC Santa Barbara

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Google Scholar Profile

## ★ INTERESTS

Topological Deep Learning

Geometric Deep Learning

Graph Neural Networks

Reinforcement Learning

Multi-Agent RL

## ⚙️ TECH SKILLS

Tensorflow & Keras

Pytorch

PyG

PyT

TopoBench

Hydra

Pandas

NumPy

Python

LaTeX

Git

Docker

Jupyter

Cloud Services

## ✓ REFEREES

Prof. Pere Barlet Ros

UPC-BarcelonaTech

pere.barlet@upc.edu

Prof. Albert Cabellos

UPC-BarcelonaTech

albert.cabellos@upc.edu

Prof. Pietro Liò

University of Cambridge

pl219@cam.ac.uk

Prof. Sergio Escalera

Universitat de Barcelona

sescalera@ub.edu

## ☰ SUMMARY

PhD in the area of Machine Learning applied to Computer Networks at Universitat Politècnica de Catalunya (UPC). Previously earned a MSc in Artificial Intelligence from UPC, and a dual BSc in Mathematics and Physics from Universitat de Barcelona (UB).

Co-lead developer of the open-source library [TopoBench](#). My research interests focus on Topological & Geometric Deep Learning, Graph Neural Networks and (Multi-Agent) Reinforcement Learning.

## 📁 WORK EXPERIENCE

Postdoctoral Researcher | [UC Santa Barbara](#)

09/2024 – Present

Santa Barbara, USA

Postdoc at the [Geometric Intelligence Lab](#), led by Prof. Nina Miolane. I carry out research in Topological & Geometric Deep Learning, as well as mentor PhD and MSc students.

PhD Fellow | [Universitat Politècnica de Catalunya](#) | [FI-SDUR Grant](#)

01/2020 – 04/2024

Barcelona, Spain

Member of the Barcelona Neural Networking Center, a pioneering research initiative in the field of Graph Neural Networks (GNNs) applied to Computer Networks. In particular, my research has focused on developing autonomous network optimization mechanisms by means of combining GNNs with (Multi-Agent) Reinforcement Learning techniques.

Visiting Researcher | [University of Cambridge](#)

01/2023 – 07/2023

Cambridge, United Kingdom

Academic visitor at the Department of Computer Science & Technology of the University of Cambridge under the supervision of Prof. Pietro Liò, carrying out fundamental research on Geometric & Topological Deep Learning and focusing on their possible applications to Graph Signal Processing.

AI Researcher | [Computer Vision Center](#)

10/2018 – 11/2019

Barcelona, Spain

Research intern working on my MSc thesis in the field of Off-policy Deep Reinforcement Learning, supervised by Prof. Sergio Escalera and in collaboration with Carles Gelada (former Google Brain and OpenAI employee).

## LANGUAGES

Spanish ● ● ● ● ●  
Catalan ● ● ● ● ●  
English\* ● ● ● ● ●

\* C1 level of the *Common European Framework of Reference for Languages*.


## AWARDS

- 3× Winner of ICML 2023 Topological Deep Learning Challenge.
- Runner-up for the Best Paper Award at IEEE ICNP 2021.
- 2020 FI SDUR Doctoral Fellowship from the Government of Catalonia.
- MSc graduation award for the second highest academic average of the year (9.1/10).
- Award for 2010 University Access Tests top marks in Catalonia (12.96/14).
- High School ended with honors (9.6/10, highest academic average of the year).

## + SKILLS

- Leadership.
- Teamwork experience.
- Reasoning and problem-solving skills.
- Analytical thinking.
- Able to manage multiples priorities.
- Excellent organizational capabilities.
- Good communication and mentoring skills gained through my experience as a teacher and private tutor.
- Always willing to learn.

## Data Scientist & AI Developer | [nixi1](#)

 02/2018 – 11/2018


 Barcelona, Spain

In charge of developing the AI branch behind the chatbot service:

- Obtaining, cleaning and preprocessing large corpora in different languages.
- Design and implementation of both statistical and Machine Learning based models for Natural Language Processing.
- Generation and management of chatbot and user-related databases.

## EDUCATION

### Doctor of Philosophy, PhD | [Universitat Politècnica de Catalunya](#)


 2020 – 2024

 Barcelona, Spain

- *Cum Laude* Award and International Doctorate mention.
- Carried out fundamental research in Graph Neural Networks and Reinforcement Learning applied to Computer Networks, under the supervision of Prof. Pere Barlet and Prof. Albert Cabellos.
- 6-month research stay at the University of Cambridge under the supervision of Prof. Pietro Liò working on Geometric & Topological Deep Learning.
- Dissertation: "*Multi-Agent Graph Learning-based Optimization and its Applications to Computer Networks*".

### MSc in Artificial Intelligence | [Universitat Politècnica de Catalunya](#)

 2016 – 2019

 Barcelona, Spain


- Second highest academic average of the year (9.1/10)
- Specialized in Deep Learning, Natural Language Processing and Computer Vision.
- Dissertation: "*Log-Distributional Approach for Learning Covariate Shift Ratios*".

### PGCert in Data Science & Big Data | [Universitat de Barcelona](#)

 2016

 Barcelona, Spain


### BSc in Mathematics | [Universitat de Barcelona](#)

 2010 – 2016

 Barcelona, Spain

- Minor in Physics.
- Dissertation: "*Monetary Measures of Risk and their Applications to Conic-Finance*".

### BSc in Physics | [Universitat de Barcelona](#)

 2010 – 2016

 Barcelona, Spain

- Minor in Fundamental Physics.
- Dissertation: "*Fundamental Constants of Nature and their Possible Time Variation*".

## ABOUT ME

- I worked as a Teaching Associate Professional for an academic year (Mathematics, +30 adult students).
- Private tutor of Mathematics and Physics for more than 10 years.
- I love practicing sport since I was a child, both individually (swimming, taekwondo, tennis, CrossFit) and in teams (football, basketball). Currently I am into calisthenics and BJJ.
- Class B driver's license; I have my own car.
- Pleasure Craft and Personal Watercraft skipper's license.
- Willing to travel and relocate.

## RESEARCH OUTCOMES

### Patents

- **(published)** G. Bernárdez, J. Suárez-Varela, M. Ferriol, B. Wu, S. Xiao, X. Cheng, L. Wenjie, L. Fenglin, P. Barlet-Ros, and A. Cabellos-Aparicio. "*Devices and Methods for Autonomous Distributed Control of Computer Networks*". Huawei Technologies Co., LTD.
  - Int. PCT Application Number PCT/CN2021/091915, filed in May 6th 2021.
  - Patent Publication Number WO2022232994A1, published in Nov. 10th 2022.
- **(published)** G. Bernárdez, J. Suárez-Varela, X. Shi, S. Xiao, X. Cheng, P. Barlet-Ros, and A. Cabellos-Aparicio, "*Device and Method for an Agent for Dynamically Adapting an Explicit Congestion Notification Configuration in a Network System*". Huawei Technologies Co., LTD.
  - Int. PCT Application Number PCT/CN2022/138121, filed in Dec. 9th 2022.
  - Patent Publication Number WO2024119513A1, published in June 13th 2024.

### Conference Papers

- **(under review)** G. Bernárdez, M. Ferriol-Galmés, C. Güemes-Palau, M. Papillon, P. Barlet-Ros, A. Cabellos-Aparicio, N. Miolane "*Ordered Topological Deep Learning: a Network Modeling Case Study*", submitted to SIGKDD 2025.
- **(under review)** M. Papillon, G. Bernárdez, C. Battiloro, N. Miolane "*TopoTune: A Framework for Generalized Combinatorial Complex Neural Networks*", submitted to ICML 2025.
- **(under review)** L. Cornelis, G. Bernárdez, H. Jeong, N. Miolane "*When Machine Learning Gets Personal: Understanding Fairness of Personalized Models*", submitted to ICML 2025.
- G. Bernárdez, J. Suárez-Varela, A. López, B. Wu, S. Xiao, X. Cheng, P. Barlet-Ros, and A. Cabellos-Aparicio, "*Is Machine Learning Ready for Traffic Engineering Optimization?*", in IEEE 29th International Conference on Network Protocols, 2021.
  - Oral presentation at the Main Conference program.
  - Runner-Up for the Best Paper Award.
- G. Bernárdez, L. Telyatnikov, E. Alarcón, A. Cabellos-Aparicio, P. Barlet-Ros, and P. Liò, "*Topological Network Traffic Compression*", in Proceedings of the 2nd Graph Neural Networking Workshop, ACM CoNEXT 2023.
  - Oral presentation at the Workshop program.

### Journal Articles

- **(under review)** L. Telyatnikov, G. Bernárdez, M. Montagna, M. Carrasco, et al. "*TopoBench: A Framework for Benchmarking Topological Deep Learning*", submitted to Data-Centric Machine Learning Research, 2025.
- L. Telyatnikov, M.S. Bucarelli, G. Bernárdez, O. Zaghen, S. Scardapane and P. Liò, "*Hypergraph Neural Networks through the Lens of Message Passing: A Common Perspective to Homophily and Architecture Design*", Transactions on Machine Learning Research, 2025.
- G. Bernárdez, J. Suárez-Varela, A. López, X. Shi, S. Xiao, X. Cheng, P. Barlet-Ros, and A. Cabellos-Aparicio, "*MAGNNETO: A Graph Neural Network-based Multi-agent System for Traffic Engineering*", IEEE Transactions on Cognitive Communications and Networking (**JCR Q1**), 2023.
- G. Bernárdez, J. Suárez-Varela, X. Shi, S. Xiao, X. Cheng, P. Barlet-Ros, and A. Cabellos-Aparicio, "*GraphCC: A practical Graph Learning-based Approach to Congestion Control in Datacenters*", Computer Networks Journal (**JCR Q1**), 2025.

## Other Publications

- First author of "[ICML Topological Deep Learning Challenge 2024: Beyond the Graph Domain](#)", in Geometry-grounded Representation Learning and Generative Modeling Workshop (GRaM) at ICML 2024. PMLR, 2024.
- F.H. Caralt, G. Bernárdez, I. Duta, E. Alarcón, P. Liò. "[Joint Diffusion Processes as an Inductive Bias in Sheaf Neural Networks](#)", in Geometry-grounded Representation Learning and Generative Modeling Workshop (GRaM) at ICML 2024. PMLR, 2024.
- G. Bernárdez, L. Telyatnikov, E. Alarcón, A. Cabellos-Aparicio, P. Barlet-Ros, and P. Liò, "[Topological Graph Signal Compression](#)". Extended abstract accepted as oral presentation at the 2nd Learning on Graphs Conference (LoG) 2023.
- Á. López-Cardona, G. Bernárdez, P. Barlet-Ros, and A. Cabellos-Aparicio, "[Proximal Policy Optimization with Graph Neural Networks for Optimal Power Flow](#)", to appear in the 14th International Conference on Data Science, Technology and Applications, 2025.
- Co-author of "[TopoX: a suite of Python packages for machine learning on topological domains](#)", in Journal of Machine Learning Research, 2024.
- Co-author of "[The Graph Neural Networking Challenge: a Worldwide Competition for Education in AI/ML for Networks](#)", in SIGCOMM Computer Communications Review, 2021.
- Co-author of "[ICML 2023 Topological Deep Learning Challenge: Design and Results](#)", in Topological, Algebraic and Geometric Learning Workshops 2023. PMLR, 2023.

## Invited Talks

- Invited speaker at the [Geometric Intelligence Workshop](#) held at the Department of Mathematics at UNAM, in Mexico City. Delivered a tutorial on the [TopoBench](#) library, introducing attendees to practical usage and capabilities of the repository (31/03/2025).
- Invited speaker at the [3rd Graph Neural Networking Workshop](#), as part of ACM CoNEXT 2024 held at UC Los Angeles. The talk addressed the intersection of Topological Deep Learning and Computer Network Modeling (09/12/2024).
- Co-main organizer and presenter of the [Topological Deep Learning Challenge 2024: Beyond the Graph Domain](#) at the 2024 GRaM Workshop, ICML 2024, Vienna (27/07/2024).
- Guest Speaker at a seminar hosted by the [HuPBA research group](#) at the University of Barcelona, invited by Prof. Sergio Escalera. The talk focused on my research in the fields of Graph Neural Networks and Topological Deep Learning (15/11/2023).
- Invited speaker in an AI Research Group Talk at the Computer Laboratory of the University of Cambridge, presenting my PhD dissertation. [Official link here](#) with the description and recording of the talk (08/11/2025).