GUILLERMO BERNÁRDEZ GIL

PhD Graduate - Machine Learning Researcher

guille_gbg@hotmail.com | +34 633168541 | Barcelona, Spain
guillermobernardez | gbg141 | 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
- 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

Recently completed a PhD in the area of Machine Learning applied to Computer Networks at Universitat Politècnica de Catalunya (UPC). Previously, I obtained a MSc in Artificial Intelligence from UPC, and a dual BSc in both Mathematics and Physics from Universitat de Barcelona (UB).
My research interests focus on Topological & Geometric Deep Learning, Graph Neural Networks and (Multi-Agent) Reinforcement Learning.

WORK EXPERIENCE

PhD Candidate | Universitat Politècnica de Catalunya

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 in 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 employee).

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.
- Analyze stored data and extract meaningful conclusions from it.

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.

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"*.

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.
  - International PCT Application Number PCT/CN2021/091915, filed in May 6th 2021.
  - Patent Publication Number WO/2022/232994, published in November 10th 2022.
- **(filed)** 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.
  - International PCT Application Number PCT/CN2022/138121, filed in December 9th 2022.

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.

Journal Articles

- 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)**, vol. 9, no. 2, pp. 494–506, 2023.
- **(under review)** 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"*, submitted to Computer Networks Journal **(JCR Q1)**.

Conference Papers

- 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 2021 IEEE 29th International Conference on Network Protocols (ICNP). IEEE, 2021, pp. 1–11.
  - 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 2023 (GNNet), ACM CoNEXT 2023.
  - Oral presentation at the Workshop program.
- G. Bernárdez, L. Telyatnikov, E. Alarcón, A. Cabellos-Aparicio, P. Barlet-Ros, and P. Liò, *"Topological Graph Signal Compression"*. Extended Abstract accepted at the 2nd Learning on Graphs Conference 2023 (LoG).
  - Oral presentation at the Main Conference program.

Other Publications

- **(under review)** Á. López-Cardona, G. Bernárdez, P. Barlet-Ros, and A. Cabellos-Aparicio, *"Proximal Policy Optimization with Graph Neural Networks for Optimal Power Flow"*, submitted to the 22nd IEEE Mediterranean Electrotechnical Conference (IEEE MELECON) 2024.
- **(under review)** 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"*, submitted to the 41st International Conference on Machine Learning (ICML) 2024.
- Co-author of *"The Graph Neural Networking Challenge: a Worldwide Competition for Education in AI/ML for Networks"*, in SIGCOMM Computer Communications Review ***(CCR)***, 51, 3 (July 2021), 9–16.
- Co-author of *"ICML 2023 Topological Deep Learning Challenge: Design and Results"*, in Topological, Algebraic and Geometric Learning Workshops 2023. PMLR, 2023. p. 3-8.

Invited Talks

- 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.
- Guest Speaker at a seminar of HuPBA research group at 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).