Manuel Madeira

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About Me

I am a 3rd-year PhD student at EPFL under the supervision of Pascal Frossard and Dorina Thanou. My interests gravitate around generative modelling, graph deep learning and their applications in enabling scientific discoveries. I have proposed novel generative frameworks for graphs and developed methods that incorporate domain knowledge to enhance the controllability and performance of graph generation. Recently, I have also begun exploring vision and language foundational models in the context of digital pathology.

Education

2022 - Present
PhD. in Machine Learning (Expected Graduation: December 2026)
École Polytechnique Fédérale de Lausanne, Switzerland

2018 - 2019 (Fall)
Exchange student in Computer Science
Tsinghua University, China

2018 - 2021
MSc. in Biomedical Engineering
Instituto Superior Técnico, Portugal
GPA: 19 / 20 (**1st** in class), Thesis: 20/20

2015 - 2018
BSc. in Biomedical Engineering
Instituto Superior Técnico, Portugal
GPA: 19 / 20 (**1st** in class and **1st** ever to attain such grade)

Research Experience

Sep 2022 - Present
Doctoral Assistant at EPFL
Studied the incorporation of structural constraints into graph discrete diffusion models and developed the first discrete flow matching model for graphs. Employed these methods in real-world applications, including molecular generation and digital pathology.

Sep 2021 - Aug 2022
Machine Learning Researcher at Inductiva Research Labs
Conducted research on deep learning based approaches to solve partial differential equations. Deployed physics-informed neural networks to model heat diffusion and coastal dynamics and analysed their generalization to arbitrary domains.

Mar 2021 - Jun 2021
Research Internship at Institute for Systems and Robotics
Supervisors: Renato Negrinho, João Xavier, and Pedro Aguiar
Researched on L-smoothness exploitation for first-order stochastic optimization methods with theoretical developments on algorithmic analysis.

Sep 2019 - Feb 2020
Research Internship at IST-ID
Transcribed interviews on health technologies assessment in Portugal for the Medi-value Project.

Awards and Honors

2022-23 **EDIC PhD Fellowship**, by EPFL
2016-18 **1st ranked student in Biomedical Engineering BSc**, by Instituto Superior Técnico
2015-20 **Diploma of Academic Excellence (Top 10%)**, by Instituto Superior Técnico
2009-15 **Best student in high school**, by Crédito Agrícola

Publications

[1] A. Carballo-Castro, **MM**, Y. Qin, D. Thanou, and P. Frossard. **Generating Directed Graphs with Dual Attention and Asymmetric Encoding**. In: ArXiv. 2025.

[2] S. Öğüt, C. Vincent-Cuaz, **MM**, et al. **Benchmarking Instance-Level Learnability and Interpretability in Multiple Instance Learning**. In: Under Review. 2025.

[3] B. Chen*, C. Vincent-Cuaz*, L. A. Schoenpflug*, **MM***, et al. **Revisiting Automatic Data Curation for Vision Foundation Models in Digital Pathology**. In: MICCAI. 2025.

[4] O. Zaghen, **MM**, L. Toni, and P. Frossard. **Graph Discrete Diffusion: a Spectral Study**. In: *DeLTa and XAI4Science Workshops*. ICLR. 2025.

[5] L. Sbicego, S. Öğüt, **MM**, Y. Qin, D. Thanou, and P. Frossard. **On the Role of Graph Structure in Graph Neural Networks**. In: *ICBINB Workshop*. Selected for PMLR Proceedings. ICLR. 2025.

[6] Y. Qin*, **MM***, D. Thanou, and P. Frossard. **DeFoG: Discrete Flow Matching for Graph Generation**. In: Oral Presentation (Top 1%). ICML. 2024.

[7] **MM**, C. Vignac, D. Thanou, and P. Frossard. **Generative Modelling of Structurally Constrained Graphs**. In: NeurIPS. 2024.

[8] **MM**, D. Thanou, and P. Frossard. **Tertiary Lymphoid Structures Generation through Graph-based Diffusion**. In: *GRAIL Workshop*. MICCAI. 2023.

[9] S. Moalla*, **MM***, L. Riccio*, and J. Lee*. **[Re] Reproducibility Study of Behavior Transformers**. In: *ML Reproducibility Challenge 2022*. Outstanding Paper Award (Honorable Mention). ReScience C. 2023.

[10] **MM**, R. Negrinho, J. Xavier, and P. M. Aguiar. **COCO Denoiser: Using Co-Coercivity for Variance Reduction in Stochastic Convex Optimization**. In: *OPT Workshop*. NeurIPS. 2021.

Talks

Inductiva Machine Learning for Science & Engineering Summer School, Porto, Portugal, 2025. *An Introduction to Graph Neural Networks.*

Applied Machine Learning Days, Lausanne, Switzerland, 2025. *Constrained Graph Generative Models in Science.*

DataMakers Fest, Porto, Portugal, 2023. *Generative Models in Science: A Peek into Graph Diffusion Models for Digital Pathology.*

Teaching Experience

Teaching Assistant for:

- Network Machine Learning (Lead TA in 2024/2025)
- Probability and Statistics
- Practice of Object-Oriented Programming
- Analysis I
- Histology

Supervised 4 students.

Software Skills

Languages:	Python, Matlab, Java, Mathematica, R
Frameworks:	PyTorch, Keras, Tensorflow, Pandas, Scikit-learn, NumPy, CVX, CVXPY/CVXOPT, Abaqus
Misc:	Unix, Git, Docker, Kubernetes, SLURM, Run:AI

Extracurricular Activities

2023	Attended Cambridge Ellis Unit Summer School on Probabilistic Machine Learning
2022 - Present	Co-organizer of Deep Learning Sessiong Portugal
2021	Attended Lisbon Machine Learning Summer School
2009-21	Competitive football player (national level)
2015	National finalist in Biology Olympiad

Languages

Portuguese:	Native
English:	C2, TOEFL iBT: 114 / 120
Spanish:	A2
French:	A2
Chinese:	Elementary (Tsinghua course)

Personal Interests

Football, CrossFit, Ski, Reading, Cinema

Community Service

Reviewer for NeurIPS and ComBayNS Workshop (IJCNN)