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 how to leverage these to enable scientific discoveries. In my research, I have proposed new generative frameworks for graphs and developed methods that leverage domain knowledge to enhance the controllability and performance of graph generation.

Education

2022 - Present — PhD. in Machine Learning (Expected Graduation: 12/2026)
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.

Publications

[1] Y. Qin*, **MM***, D. Thanou, and P. Frossard. **DeFoG: Discrete Flow Matching for Graph Generation**. In: arXiv. 2024.

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

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

[4] 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.

[5] **MM**, R. Negrinho, J. Xavier, and P. M. Aguiar. **COCO Denoiser: Using Co-Coercivity for Variance Reduction in Stochastic Convex Optimization**. In: *OPT2021 Workshop*. NeurIPS. 2021.

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

Teaching Experience

- Network Machine Learning
- Probability and Statistics
- Practice of Object-Oriented Programming
- Analysis I
- Histology

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, RunAI

Extracurricular Activities

2023 Attended Cambridge Ellis Unit Summer School on Probabilistic Machine Learning

2022- 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, Reading, Cinema