Marcello Massimo Negri

I am a highly motivated PhD student at the University of Basel under the supervision of Volker Roth. Currently, I am working to make machine learning models more *expressive* and *interpretable* at the same time.

As a first result I improved sparsity in Bayesian graphical models with Conditional Matrix Flows (see **NeurIPS** publication). In parallel, we developed a physics-informed deep learning model that conserves the continuity equation by construction (see **ICLR Spotlight** - top 5% papers).

We developed a comprehensive **PyTorch library** of Normalizing Flows named FlowConductor.

EXPERIENCE

Research assistant | **ETH Zürich** (prof. Hofmann) 03.21 - 06.21

I developed a **deep learning emulator** for cosmological simulations in the context of **gravitational wave physics**

Research assistant | **ETH Zürich** (prof. Schweitzer) 06.20 - 03.21

I worked on **data collection**, **processing** and **cleaning** tasks in a Python and Unix environment within 3 research projects

EDUCATION

Ph.D. Machine Learning | **University of Basel** 02.22 - present

Main research: Bayesian inference, generative models, physics-informed ML, sparsity
Other research: image segmentation, diffusion models

M.Sc. Physics (GPA 5.71/6) | **ETH Zürich** 09.19 - 12.21

Thesis topics: **meta-learning** • VAEs • **few-shot learning**
Semester project topics: **time series analysis** • temporal networks

B.Sc. Physics (110/110 cum laude) | **University of Milano** 09.16 - 07.19

Thesis topics: **boosted regression trees** • neural networks • Higgs Boson mass

SIDE PROJECTS

In collaboration with Human Rights Watch we developed a Telegram Bot to detect and monitor village burnings in Darfur, Sudan 10.23 - 12.23

SELECTED PUBLICATIONS

F. Arend Torres, M. Negri, M. Inversi, J. Aellen, V. Roth, *Lagrangian Flow Networks for Conservation Laws,* **spotlight ICLR 24** (pdf, code)

M. Negri, F. Arend Torres, V. Roth, *Conditional Matrix Flows for Gaussian Graphical Models,* **NeurIPS 23 (**pdf, poster, code)

F. Arend Torres, M. Negri, M. Nagy-Huber, M. Samarin, V. Roth, *Mesh-free Eulerian Physics-Informed Neural Networks*, arxiv, 2022 (pdf)

M. Negri, V. Fortuin, J. Stühmer, *Meta-learning richer priors for VAEs,* **AABI 22 (**pdf, poster)

RESEARCH AND SIDE PROJECTS
https://mnegri.netlify.app

GITHUB
https://github.com/marcello-negri

INFO

Born in Italy, 4th January 1998
Living in Basel, Switzerland
Italian, English (C2), German (B1)
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RESEARCH INTERESTS

- Bayesian Inference with Normalizing Flows
- Sparsity and interpretability
- Physics-informed ML

TEACHING & MENTORING

- TA: Bioinformatics Algorithms (dynamic programming, Markov Models, phylogenetic trees)
- Supervision: 5 thesis on UNet, attention, diffusion models

COMPUTER SKILLS

PyTorch, TensorFlow, Scikit-learn, Pandas, NumPy, SciPy

Python, C++, Shell Scripting, LaTeX, R, Mathematica