Roberto Boghetti

Martigny, Switzerland
rboghetti@gmail.com

Professional Experience

EPFL & Idiap Research Institute — Lausanne & Martigny, CH
Research Assistant — *Jun. 2021 – Present*

- Worked for the project Eguzki on the simulation and optimization of thermal networks:
  - Developed PyDHN, a NetworkX-based Python library, achieving **45% lower error in thermal dynamics estimations** compared to leading commercial tools on experimental data and up to **17.5% faster hydraulic calculations**
  - Built the solver of the simulation tool Eguzki, used by engineering firms to **optimize 20+ thermal networks**
  - Conceptualized, developed and tuned a **physics-constrained graph neural network** for hydraulic state estimation in thermal networks achieving errors <0.001 kg/s (below sensor tolerance) on unseen layouts using **PyTorch Geometric**
- Co-developed HeatLearn, a convolutional model based on U-Net trained with **TensorFlow** to predict urban heat demand from land-use map. Achieved the accuracy of engineering methods using less data. Formerly deployed on EnerMaps
- Participating in the IEA Annex 84, Demand Management of Buildings in Thermal Networks (from Nov. 2023)
- Completed 20+ reviews for Q1 journals, including Environmental modelling & software, Energy and buildings, MethodsX

Satom SA — Monthey, CH
Intern — *Jun. 2023 – Nov. 2023*

- Developed a pipeline to estimate the hourly energy demand of buildings at urban scale **under different renovation policies and climate change scenarios**, achieving a <5% error against cumulative annual data
- Modelled 2024-2050 energy demand evolution scenarios for Monthey's thermal network, including future extensions
- Analysed network extension projects, solved bottlenecks, conducted preliminary studies for energy storage integration

Idiap Research Institute — Martigny, CH
Research Intern — *Dec. 2020 – May 2021*

- Worked on the project LUCIDELES to develop a control system for blinds and lights in office spaces:
  - Built a pipeline for processing and storing real-time data of 4 weather stations with **MQTT, PostgreSQL, SQLAlchemy**
  - Developed a **LightGBM** model for illuminance and glare probability predictions. Deployed it using Docker within a smart blinds and lights control system in 3 offices, leading to daily energy savings on lighting of up to 75%
- Built a data pipeline for thermal network analysis that reads **geospatial and temporal data** from PostgreSQL, creates tool-specific input files for 5 different simulation tools, executes simulations, analyses results and KPIs
- Conducted a **sensitivity analysis** of the simulation tool CitySim, built a calibration workflow using **differential evolution**

Research Trainee — *Jan. 2019 – Mar. 2019*

- Benchmarked ML models on predicting building energy needs, created novel indicators to represent urban features
- Built a pipeline to automate CitySim simulations that **reduces simulation time by up to 97%** without loss of accuracy by dividing the input area in smaller overlapping zones and simulating them in parallel

Education

EPFL — Lausanne, CH
Ph. D. candidate in Electrical Engineering – Advised by Dr. J. M. Odobez and Dr. J. H. Kämpf — *Jun. 2025 (Expected)*

Awarded the **EPFLglobaLeaders fellowship**, part of the Marie Skłodowska-Curie Actions (92.880 EUR granted, the call had a 2.5% acceptance rate). Completed an additional Leadership Training Programme (7 ECTS). Co-authored 13 publications

University of Pisa — Pisa, IT
Master's degree in Building Engineering and Architecture (M. Eng. + M. Arch.) — *Feb. 2020*

Teaching

- Led labs in EPFL's EE-311 course "Fundamentals of machine learning" with 50+ students
- Authored and assisted lab on graph learning for EPFL's EE-559 course "Deep learning" with 150 students
- Supervised one semester project at EPFL on the development of a k-hops graph neural network for simulating thermal grids and one Master's thesis at the University of Pisa on estimating indoor environmental quality through text mining
- Gave guest lecture on ML at the workshop "Sustainability of urban landscapes" (Polytechnic University of Turin, 2021)

Side projects

- Co-organized Idiap's "Perspectives on AI" workshop series, a total of 4 day-long events for 100 participants (2023 – 2024)
- Member of the university team for Solar Decathlon ME 2018, led working groups and ensured technical compliance

Skills

Main skills: machine learning, data science, energy simulations, technical writing, data visualization, teaching
Programming languages: Python, SQL. Limited experience in debugging C++ and Fortran code
Frameworks and tools: PyTorch, TensorFlow, Slurm, Weight & Biases, Pandas, PostgreSQL, PostGIS, QGIS