

Matteo Calafà

Speaking Italian (native), English (fluent), French (fluent), Danish (beginner)

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teocala



Experience

- 3/24 → now **Research assistant**, AARHUS UNIVERSITY, DK.
Studying and implementing physics-informed neural networks for solving the linear elasticity problem in solid mechanics (dept. of mechanical and production engineering, prof. Tito Andriollo, Allan P. Engsig-Karup).
- 10/23 → 2/24 **Computational engineer**, MICROSTUDIO S.R.L, IT.
Developed a C++ and CUDA library for the 3D reconstruction of torsion springs through numerical and computer vision methods. The machine made is now a cutting edge technology in the domain of spring measurement.
- 3/23 → 6/23 **Research collaborator (intern)**, SWISS FEDERAL INSTITUTE OF METROLOGY (METAS), CH.
MSc thesis on the Swiss fountain atomic clock: finite element analysis and Monte Carlo simulations of the background molecular dynamics. Obtained the highest grade from EPFL.
- 9/22 → 2/23 **Simulation specialist (intern)**, KAMSTRUP A/S, DK.
Analysis and C++/MPI implementation of discontinuous Galerkin methods for the simulation of ultrasounds in fluids.
- 2/22 → 6/22 **Teaching assistant**, ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE (EPFL), CH.
Assistant for the course of *Analyse Numérique* (prof. Annalisa Buffa, bachelor in mathematics).

Education

- 2020 → 2023 **École Polytechnique Fédérale de Lausanne (EPFL)**,
Computational Science and Engineering, Master's Degree (Double Degree), GPA – 5.82/6.0.
- 2020 → 2023 **Polytechnic of Milan**,
Mathematical Engineering, Master's Degree, 110/110 cum laude.
- 2017 → 2020 **Polytechnic of Milan**,
Mathematical Engineering, Bachelor's Degree, 109/110.

Specific knowledge

- Languages C++ (STL, MPI, Eigen, deal.II), Python (NumPy, Pandas, SciPy, PyTorch, FeniCS), MATLAB, C, CUDA, Bash shell, R, FreeFem++, Java, C#, HTML, Markdown
- Utilities Git, LaTeX, MS Office, Anaconda, COMSOL, ANSYS Fluent, SolidWorks, Colab, Jupyter Notebook, Docker
- Main uni courses Computational Fluid Dynamics, High Performance Computing, Analysis for PDEs, Numerics for PDEs, Machine Learning, Deep Learning, Monte Carlo Methods, Numerics for SDEs, Computer Vision

Publications

- 10/24 **Characterization of the angular coefficient method on 2D and 3D piecewise smooth boundaries.**
Published in COAM: <https://doi.org/10.1007/s40314-024-02969-z>
- 9/24 **Physics-Informed Holomorphic Neural Networks (PIHNNs): Solving 2D Linear Elasticity Problems.**
Published in CMAME: <https://doi.org/10.1016/j.cma.2024.117406>
- 6/24 **Enhanced RK Discontinuous Galerkin Method for Ultrasound Propagation in Transit-Time Flow Meters.**
ArXiv Preprint: <https://arxiv.org/abs/2406.18342>
- 6/24 **High-order Discontinuous Galerkin Methods for the Monodomain and Bidomain Models.**
ArXiv Preprint: <https://arxiv.org/abs/2406.03045>

Author of libraries

- 3/24 → now PIHNN (**Physics-Informed Holomorphic Neural Networks**), matteocalafa.com/PIHNN.
- 9/21 → 8/22 DUBeat (**High-order Discontinuous Galerkin methods**), matteocalafa.com/DUBeat.

Achievements

- 9/19 **"Students with particular high merits" award**, *PoliMi*, 50% exemption on the university fee.
- 2/19 **"Best first-year students" award**, *PoliMi*, Bachelor scholarship.
- 2/17 **1st place at the national semi-final competition of "Mathematical Games"**, *Bocconi University*.