



Postdoc in Physics-Informed Inverse Problems for Biophotonics

Opportunity: Postdoctoral position at MOX, Dep. of Mathematics, Politecnico di Milano (Italy).

The position is offered within the **ERC Advanced Grant** “*HeartCORE: Boosting predictive concepts on arrhythmogenesis resolving and unifying cardiac electrophysiology and structural remodelling at organ-level*”, funded by the European Union (2.6 M€). The consortium includes: CNR - Consiglio Nazionale delle Ricerche (Project P.I. Leonardo Sacconi), Politecnico di Milano, University of Glasgow, and Università degli studi di Firenze.



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Research topic: The goal of this research is to develop new mathematical and computational methods, based on differential models and/or Machine Learning algorithms, for solving inverse problems arising in cardiac optical imaging. The challenge is to reconstruct three-dimensional maps of electrical activation, including transmural information, from surface optical measurements acquired at multiple wavelengths, each characterized by a different penetration depth.

Forward models describing light propagation and fluorescence emission will be formulated through differential equations, providing the physical basis for the inverse problem. To recover the underlying activation dynamics, the project will explore novel regularization and inference strategies that promote physically consistent solutions. These will rely on differential constraints derived from electrophysiological models of action potential propagation, on data-driven priors learned through Machine Learning, or on hybrid approaches combining both.

By advancing the mathematical framework of physics-informed inverse problems, this research will enable robust and interpretable 3D reconstructions of cardiac electrical activity from complex optical data.

Candidate profile:

- Ph.D. in Applied Mathematics, Scientific Computing, Artificial Intelligence, or related disciplines.
- Experience in Numerical Analysis, Optimization, and Machine Learning is an asset.
- Interest in developing new mathematical formulations at the interface between imaging, physics, and computational modeling.
- Motivation to contribute to interdisciplinary research in an international environment.

Duration: 24-48 months

Contact: Interested candidates are invited to send their expression of interest and CV to francesco.regazzoni@polimi.it