

# PhD Student Position in “Computational Biomedicine” Title: “Efficient discretization methods for the microscale bidomain model”

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The Center for Computational Medicine in Cardiology (CCMC), Università della Svizzera italiana, is seeking for a highly motivated PhD student to develop innovative numerical discretization strategies to robustly solve on exascale HPC systems the cell-by-cell bidomain model of cardiac electrophysiology at subcellular scale. A strong background in numerical analysis and computational science is requested.

## The MICROCARD project

The PhD student will join the EuroHPC MICROCARD consortium, a multi-disciplinary and international team with the ambitious goal of simulating a cell-by-cell electrophysiology model of the heart at organ-scale. The PhD will benefit from the opportunity to work and collaborate with leading experts in the field of cardiac modeling, large-scale numerical simulations, deep learning, and high-performance computing (HPC) systems.

Further information may be found at the official website ([www.microcard.eu](http://www.microcard.eu)).

## Institutional environment

The position is funded by the Center for Computational Medicine in Cardiology (CCMC). The CCMC, headed by Prof. Rolf Krause and Prof. Angelo Auricchio, brings advanced numerical methods in multiscale modeling, uncertainty quantification and artificial intelligence to the needs of clinical practitioners. Built upon the multi-disciplinary competences brought by its founder members at the Euler Institute and Cardiocentro Ticino, the CCMC is unique of its kind in Switzerland and is a key member of the large EU projects like MICROCARD.

## Your challenges

- To understand the mathematical and numerical difficulties associated with the cell-by-cell bidomain model.
- To identify criticalities in standard spatial discretization approaches that shall be addressed to ensure a good balance between accuracy and scalability.
- To work in synergy with other scientists from the MICROCARD consortium in the definition of optimal time integration approaches, preconditioners, and task-based parallel implementation.
- To understand the physiological background the model and compare it the classical homogenized bidomain model, also in terms of numerical solution.
- To attend and to present your research activity at international conferences.
- To publish your findings in international, peer-reviewed journals.
- To assist in teaching activities of the Euler Institute.
- To actively contribute and collaborate within the MICROCARD consortium for the success of the project.

**Your profile**

- You have a strong background in applied mathematics.
- You have a strong interest in numerical analysis and HPC.
- You have experience in computational science with programming environments (C, C++, Python) and HPC computing (MPI, OpenMP, CUDA).
- You hold a master's degree in applied mathematics or computational science.
- Some experience in cardiac modeling is welcome but not strictly necessary.

**We offer** a 3-year PhD position in a multidisciplinary, international and inspiring environment. The position is full-time and salary in accordance to regulations of Università della Svizzera italiana.

**The position opens now and should be finalized by in September 2021.**

**For further information**, please don't hesitate to contact Dr. Simone Pezzuto (simone.pezzuto@usi.ch).

**How to apply**

Interested candidates must send their application documents (cover letter, CV, description of research interests and experience, names of at least two academic references), preferably as single PDF file, to Prof. Rolf Krause (rolf.krause@usi.ch) and Dr. Simone Pezzuto (simone.pezzuto@usi.ch).

Lugano, 19 July, 2021