Physics-Based and Data-Driven Models for PDEs

Alfio Quarteroni[1,2]

[1]*Politecnico di Milano, Milan, Italy*
[2]*Ecole Polytechnique Federale de Lausanne, Lausanne, Switzerland*

Corresponding/Presenting author: alfio.quarteroni@polimi.it

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In this talk I will present a mathematical model that is suitable to simulate the cardiac function, thanks to its capability to describe the interaction between electrical, mechanical, and fluid-dynamical processes occurring in the heart. The model comprises a system of nonlinear differential equations (either ordinary and partial) featuring a multi-physics and multi-scale nature. Efficient numerical strategies are devised to allow for the analysis of both heart function and dysfunction. These strategies rely on both classical physics-based numerical discretization methods and machine-learning (data-driven) algorithms, as well as on their interplay.

Acknowledgements

The work presented in this talk is part of the project iHEART that has received funding from the European Research Council (ERC) under the European Unions Horizon 2020 research and innovation programme (grant agreement No 740132).