



**POLITECNICO
DI TORINO**

DISMA Dipartimento di
Scienze Matematiche
G. L. Lagrange
ECCELLENZA 2018 • 2022

Thursday the **20 September 2018** at 11:00
Politecnico di Torino, DISMA, Room 7D (third floor)

Simone PEZZUTO

Post-Doc assistant, Member of CCMC at Institute of Computational Science

Towards Multifidelity Models for Data-Assimilation and Uncertainty Quantification in Cardiac Electrophysiology

Prof. Davide Carlo Ambrosi introduce the seminar

Abstract

Heart rhythm disturbances constitute a significant health problem worldwide, and their incidence and severity are growing quickly due to the ageing of the population. Over the last years, the clinical community has shown an increasing interest in computer modelling for tailored and personalised therapies. However, linking the needs of clinicians to what is currently available is not a trivial task. On the one hand, state-of-the-art models, most notably the bidomain model, are physiology-based and hence capable of reproducing experimental observation, making them attractive for the clinical application. On the other hand, those models contain several parameters and require supercomputers for their numerical solution. Therefore, current clinical applicability is limited.

A common approach to address the above issue is the use of simplified (or reduced) models. Based on existing literature, we recently developed an agile yet accurate model, based on the eikonal model, for simulating activation of the heart and corresponding surface ECG. The model runs almost real-time on a desktop computer, hence enabling fast personalisation and virtual intervention. In this talk, Dr Pezzuto will present how he and his colleagues are addressing some clinically relevant questions using this model.

Simplified models are generally designed for substituting the state-of-the-art model, trading physiological accuracy for a lower computational burden. In some cases, however, accuracy is too limited, and we have left to resort the full model. A novel paradigm is to keep them together: reduced models always show some degree of correlation to the high-fidelity model, and thus such correlation can be exploited for improving computation with the full model. The final part of this seminar will focus on this aspect.

Biography

Simone Pezzuto is a postdoctoral researcher at the Institute of Computational Science in Lugano and member of CCMC. He obtained his Master's Degree (2009) and his PhD (2013) in Mathematical Engineering at Politecnico di Milano. After a short postdoctoral position in the same institution, he moved at Simula Research Laboratory, Oslo, in the Cardiac Modeling (CaMo) group, headed by S.T. Wall and supervised by J. Sundnes. He covered such position until the end of 2014 when he eventually moved to his current position in Lugano.

Simone's research at CSCS primarily focuses on cardiac electrophysiology, with a particular interest in atrial fibrillation, ECG imaging, uncertainty quantification. In the past, he has been focusing on cardiac mechanics, with a particular interest in the electromechanical coupling in the heart, which is also the main subject of his PhD thesis.

Save the date for the next event: Tuesday the 25th of September 2018.

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