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IMAGE-BASED COMPUTATIONAL MODELS FOR PREDICTING DISEASE PROGRESSION AND FOR RISK STRATIFICATION

Emiliano Votta[1,2], Alberto Redaelli[3], Christian Vergara[4]
[1] Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133, Milan, Italy, emiliano.votta@polimi.it
[2] 3D and Computer Simulation Laboratory, IRCCS Policlinico San Donato, San Donato Milanese (MI), Italy, emiliano.votta@polimi.it
[3] Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133, Milan, Italy, alberto.redaelli@polimi.it
[4] LABS, Dipartimento di Chimica, Materiali e Ingegneria Chimica "Giulio Natta", Politecnico di Milano, Piazza Leonardo da Vinci 32, 20133, Milan, Italy, christian.vergara@polimi.it

MINI-SYMPOSIUM PROPOSAL

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In clinics, predicting disease progression and stratifying the risk of adverse events are pivotal to the optimization of patient management, including the timing and the selection of interventions. In this process, clinicians can exploit advanced medical imaging, yet current approaches to image-based analyses are often suboptimal.

In a broad range of clinically relevant scenarios, image-based predictions can be improved, e.g., in terms of specificity and sensitivity, by personalized computational models that exploit more comprehensively the information yielded by advanced medical imaging to provide a quantitative and highly resolved mechanistic analysis of organs and tissues.

For instance, in the context of cardiovascular disciplines (i.e., cardiology, interventional cardiology, cardiac and vascular surgery, and electrophysiology), aortic wall mechanics can be quantified to infer the risk of aneurysm rupture; wall shear stresses associated to intravascular fluid dynamics can be computed to elucidate the progression of atherosclerosis or post-stenting restenosis; electric conduction and myocardial remodeling can be simulated to predict the risk of cardiac sudden death associated to arrhythmia.

We propose a mini-symposium providing a snapshot of the current advances at the forefront of image-based numerical modeling applied to predicting disease progression and to risk stratification. We propose the mini-symposium to have an emphasis on cardiovascular pathologies, yet being open to studies applied to other clinically relevant fields. These could include, e.g., the study of chronic respiratory disease progression but not limited to this specific field, or the use of computational models to understand neuropathological events related to blood-brain barrier permeability.