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NUMERICAL METHODS FOR THE VASCULAR SYSTEM IN HEALTH AND DISEASE

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ABSTRACT

The numerical modelling of the vascular system and its pathologies becomes increasingly relevant in clinical practice due to great advances in the field of computational biomechanics and related disciplines. Increasing reliability and accuracy of the developed mathematical tools grants access to otherwise unavailable data to foster the understanding of the vascular system and its intricacies. In this regard, promising fields of application are, e.g., digital twinning, studies on virtual cohorts, patient-specific modelling of surgical procedures or detailed analysis of prototypical configurations [1, 2]. The insights gained through mathematical modelling can guide decision making, allow for comparison of various treatment options or can inspire medical device design.

This mini-symposium focuses on emerging topics in the context of the modelling of the vascular system by means of computational fluid mechanics, solid mechanics, fluid-structure interaction, contact mechanics and more. Hence, potential contributions might contain, but are not limited to topics such as blood flow, tissue modelling, drug transport, electrophysiology, thrombus formation, tissue growth and remodelling, virtual treatment, hemodynamic indicators, patient-specific models, stent deployment, heart valve dynamics, or numerical modelling of pathologies such as aneurysma, dissection, in-stent restenosis and more. The mini-symposium's scope further encompasses reduced order modelling, machine learning techniques, sensitivity analysis, uncertainty quantification and other statistical methods applied to the vascular system. The proposed mini-symposium brings together experts from the involved fields of applied mathematics and biomedical engineering to exchange the latest results and discuss future challenges to advance personalized computational medicine.

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