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RECENT ADVANCES IN COMPUTATIONAL METHODS FOR THE CARDIOVASCULAR SYSTEM

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ABSTRACT

The numerical modeling of the cardiovascular system and its pathologies has become increasingly relevant in clinical practice, driven by significant advances in computational biomechanics and related disciplines. The growing reliability and accuracy of developed numerical tools grant access to new data, deepening our understanding of the cardiovascular system and its complexities. The insights gained from mathematical modeling can guide decision-making, enable the comparison of treatment strategies, and inspire the design of medical devices [1, 2].

This mini-symposium focuses on emerging topics in cardiovascular system modeling, from methodology development to clinical translation, by means of physics-based and data-driven approaches. The scope ranges from classical continuum-mechanics-based methods to reduced order modeling including machine learning techniques, sensitivity analysis, uncertainty quantification, and other statistical methods applied to the cardiovascular system. Potential contributions may cover, but are not limited to, blood flow, tissue modeling, drug transport, electrophysiology, thrombus formation, tissue growth and remodeling, virtual treatment, hemodynamic indicators, patient-specific models, medical device modeling, stent deployment, heart valve dynamics, and numerical modeling of pathologies such as aneurysm, dissection, and in-stent restenosis.

The proposed mini-symposium aims to bring together experts across many fields, including applied mathematics and biomedical engineering, to bridge the engineering-clinical interface through exchange of the latest results and discuss future challenges to advance personalized computational medicine. We seek to cultivate a dynamic and forward-thinking environment in the biomechanics and cardiovascular modeling community to foster discussion, encourage interdisciplinary collaboration, and inspire innovation.

REFERENCES

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