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Reduced Order Modeling of Blood Flow

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Image-based blood flow modeling has become a cornerstone in cardiovascular research and has recently gained regulatory approval and clinical adoption for diagnosis of cardiovascular disease. This technology combines medical imaging with advanced computational fluid dynamics modeling to predict flow and pressure in regions of the cardiovascular system. Toward the same goal, I will discuss combining medical imaging with simplified, reduced-order modeling (ROM) of blood flow. These ROM developments enable new possibilities to use modeling for timely decision support in clinical settings, and improve the abilities to perform data assimilation, optimization, parameter tuning, uncertainty quantification and sensitivity analysis in cardiovascular modeling applications. I will discuss the underlying methodologies, and comparison of our ROM approaches against current states-of-the-art.