Defective feedback pathways that link the various sub-systems involved in vascular and cardiac physiology can be primary factors in the onset and progression of disease. A mathematical/computational multi-physics approach is therefore necessary in order to elucidate the dynamical complexity of the underlying biological system and to address questions that so far evade experimental investigation. This novel approach can provide a comprehensive tool for the study of a broad range of regulatory physiological mechanisms operating at multiple scales.

We will use the modelling framework to study the fundamental mechanisms responsible for the onset and progression of cardiovascular disease and establish an in silico system for the non-invasive test and design of novel drugs.

The project will develop and validate a model of arterial smooth muscle, endothelium, and wall-blood flow interface in a robust multi-scale formulation, incorporating image-based patient-specific arterial geometries. It will also study the dynamics of large-scale cellular entrainment and synchronization in arterial smooth muscle cells and cardiac myocytes.

“We are constructing a virtual cardiovascular system for the development and testing of novel pharmacological agents.”

Prof Nithiarasu is a very active researcher in the area of computational biomedical engineering.

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