Physics-based and data-driven mathematical models for the simulation of the cardiocirculatory system

Alfio Quarteroni Politecnico di Milano and EPFL, Lausanne

Abstract

This series of lectures will focus on machine learning (the computers' ability to learn based on training from large data sets) and computational science (the use of mathematical models originated from fundamental principles of physics) in solving mathematical problems of interest in real life. Similarities and differences, potentials and limitations will be discussed, as well as the enormous possibilities offered by their synergistic use. The driving application will be the simulation of the cardiac function and the circulatory system.

Numerical approximation will be based on the finite element method. Benchmark test cases and clinical problems will be addressed, and several examples of collaborations with cardiologists will be highlighted and thoroughly discussed.

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- 3. Core mathematical models of the cardiac function grounded on physics-based laws
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