

Place Mathematikon, Ground Floor, Seminar Room B

Date Tuesday, June 27th

Time 6.00 pm

Host Prof. Vincent Heuveline, University Heidelberg

Informatics for Life

Lecture Series



Nagaiah Chamakuri

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"Challenges in Solving Large scale PDE-constrained Optimization"

This talk presents a feasible study of optimal control techniques for cardiac defibrillation based on the bidomain-bath equations posed on a rabbit ventricle geometry. The bidomain model consists of a system of elliptic partial differential equations coupled with a non-linear parabolic equation of reaction-diffusion type, where a set of ordinary differential equations describes the reaction term, modeling ionic transport. Since ODEs describe the ionic currents in the tissue, the PDE part dominates the solving effort. Thus, it is unclear if commonly used splitting methods can outperform a coupled approach by maintaining good accuracy. The results will be presented in the first part based on comparing the coupled solver approach with commonly used splitting schemes to solve more sophisticated physiological models. Consequently, the novel memory-efficient computational technique will be demonstrated to solve the coupled systems of equations. In the second part, the optimal control approach for successful cardiac defibrillation will be shown based on minimizing a properly chosen cost functional depending on the extracellular current as input at the boundary of the bidomain-bath domain.