Abstracts

Mathematical analysis of models for living tissues and tumor growth

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ABSTRACT

With still ongoing inputs from medicine, biology, physics, mechanics and mathematics, models of tissue growth are now well settled. They contain several levels of complexity, both in terms of the biomedical content and mathematical description, from ordinary differential equations to sophisticated partial differential equations. They serve to predict the evolution of cancers in medical treatments, to understand the biological effects that permit tumor growth and, in some cases, their implication in therapies failure.

Based on mathematical analysis, this course aims at providing a hierarchy of the most commonly used models and also some specific questions which involve various mathematical formalisms beyond the usual reaction-diffusion models.

Modelling growth and cell division

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ABSTRACT

It is common that models in Systems Biology describe reaction networks and gene networks in single cells where the consequence of growth and cell division are disregarded. In this tutorial I will introduce and give examples of how the inclusion of cell growth and division leads to a need to adopt models describing molecular dynamics in deterministic and stochastic dynamics. I will also introduce models of growth including models of mechanics and cell-cell interactions. I will further discuss models of cell division, both in terms of when it is time to divide and how the two daughter cells relate to the mother cell. I will use examples from the literature for illustrating the models introduced.