

Jean Clairambault

Inria & Laboratoire Jacques-Louis Lions, Sorbonne Université, Paris

A modelling view on drug resistance in cancer, reversible or not, and how to circumvent it

Drug-induced drug resistance, the question I am tackling from a theoretical point of view, may be due to biological mechanisms of different natures, local regulation, epigenetic modifications (reversible) or genetic mutations (irreversible), according to the extent to which the genome of the cells in the cell population is affected. The modelling framework of adaptive dynamics I will present corresponds biologically to epigenetic modifications.

I will address an optimal control problem in the context of two populations, healthy and cancer, both endowed with phenotypes evolving with drug pressure, and competing for space and nutrients in a non-local Lotka-Volterra-like way, taking into account a double constraint of limiting unwanted adverse effects and avoiding the emergence of drug resistance.

Time permitting, I will conclude by proposing a list of open challenging questions to modellers and mathematicians about the emergence and evolution of cancer itself.