Thomas "Ollie" McDonald (Harvard, Center for Cancer Evolution)

General Lecture: Tools for modeling optimal treatment schedules to delay cancer progression

Acquired drug resistance is an obstacle for the treatment of cancer. Throughout a tumor's life, the possibility of genetic or epigenetic alterations may lead to a subclone resistant to the therapy provided. In some cases, additional therapies are possible to continue treatment. However, it's been shown through modeling that resistance and tumor progression can be delayed by altering the schedule making use of pharmacokinetic parameters and tumor growth data to create an optimal dosing schedule where the drug concentrations may be under the maximum tolerated dose which is typically administered. We will explore the background tools used to create optimal dosing schedules which typically rely on time-inhomogeneous branching process models of growth and methods for elucidating data that can inform these models.

Specialized Lecture

An overview of topics will include the following for single drug and combination models:

- Quick review of simulation of branching process models
- Calculating the Probability of Resistance and Expected Number of Resistant Cells
- Incorporating pharmacokinetic parameters into time-dependent branching process models
- Choosing optimal schedules

Projects

Refining dose schedule optimization through better pharmacokinetic models and drug interactions