

Abstract: This talk will address and analyze a HIV in-host model with a discrete time delay which represents the incubation period, ie, the time between the new infection of a CD4+T cell and the time it becomes infectious.

After, an optimal control problem is proposed and studied, where HIV treatment and immunotherapy are described by two control functions, subject to time-delays. In addition the process is subject to a state constraint on the number of effector cells. The main goal is to find the optimal combination of HIV treatment and immunotherapy that maximizes the concentration of uninfected CD4+T cells and immune response cells (CTL) and keep the side effects as low as possible. The necessary optimality conditions of the Maximum Principle for time-delayed optimal control problems with state constraints, is discussed. In particular, we obtain an explicit formula of the multiplier associated with the state constraint. Solutions for the non-delayed and delayed control problem are computed numerically, applying discretization and nonlinear programming methods.

This is a joint work with Professor Helmut Maurer [1].

[1] Cristiana J. Silva, Helmut Maurer, Optimal control of HIV treatment and immunotherapy combination with state and control delays, Optim Control Appl Meth . 2020 ;41:537-554