Understanding viral escape from the cellular immune response using computational modeling

Currently, efforts are underway to develop vaccines for several viral infections, including Human Immunodeficiency Virus type 1 (HIV-1). Development of a vaccine for HIV-1 is a challenge in part because rapid replication and mutation allow the virus to escape from the immune response. In this talk, I will present a computational model that simulates the cellular immune response to viral infection, including viral mutation and escape. The model reproduces the phenomena seen in clinical data from HIV-infected individuals. The results of the model can be used to predict virus and immune system interactions and to suggest conditions under which a vaccine would be most effective. These studies are useful to guide future strategies for the development of vaccines and other preventative or therapeutic interventions.