IS-1: Efficient control methods for stochastic Boolean networks

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The development of efficient methods for finding intervention strategies that can direct a system from an undesirable state into a more desirable state is an important problem in systems biology. The identification of potential interventions can be achieved through mathematical modeling by finding appropriate input manipulations that represent external interventions in the system. This talk will describe a stochastic modeling framework generalized from Boolean networks, which will be used to formulate an optimal control problem. The optimal control method requires a set of control inputs, each representing the silencing of a gene or the disruption of an interaction between two molecules. Several methods from Markov decision processes can be used to generate an optimal policy that dictates the action to be taken at each state. However, the computational complexity of these algorithms limits the applications of standard algorithms to small models. This talk will discuss alternate methods that can be used for large models.