Robust Optimal Control for Medical Treatment Decisions-
an Application to Type 2 Diabetes

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Medical treatment decisions, such as glycemic control for patients with type 2 diabetes, involve complex tradeoffs between the risks and the benefits of treatment. The diversity of treatment options that patients can choose over time and the uncertainty in future health outcomes result in a difficult sequential decision making problem. In this seminar, I will first discuss a new Markov chain-based glycemic control model for comparing the real-world effectiveness and cost of different treatment regimens for individuals newly diagnosed with type 2 diabetes. Second, I will explore the sensitivity of model outcomes with respect to uncertainties in transition probabilities of the underlying Markov chain. Finally, I will present a robust Markov decision process model (RMDP) to optimize medical treatment decisions, provide computationally efficient methods for solving this model, illustrate the application of this model to optimize treatment decisions for glycemic control, and show that robust optimal policies could potentially provide guidance for clinicians and policy makers to make treatment decisions.