Industrial & Systems Engineering
Seminar Announcement

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Dynamic Optimization in Radiotherapy

State-of-the-art methods for optimizing cancer treatment over several weeks of external beam radiotherapy take a static-deterministic view of the treatment planning process, mainly focusing on spatial distribution of dose. Recent progress in quantitative functional imaging as well as mathematical models of tumor response to radiotherapy is increasingly enabling treatment planners to monitor/predict a patient’s biological response over weeks of treatment. In this talk, we introduce Dynamic Biologically Conformal Radiation Therapy (DBCRT), a mathematical framework intended to exploit these emerging technological and biological modeling advances to design patient-specific radiation treatment strategies that dynamically adapt to the spatiotemporal evolution of a patient’s biological response over several treatment sessions in order to achieve the best possible health outcome. More specifically, we propose a discrete-time stochastic control formalism where we use the patient’s biological condition to model the system state and the beam intensities as controls. Three simple approximate control schemes will be discussed and compared for efficiency. Numerical simulations on computer-generated test cases will be presented. Time-permitting, optimal stopping extensions of our models will also be discussed.

Tuesday, January 25, 2011
12:30 – 1:20 p.m.
Loew Hall, Room 202