Mathematics Department-University of Kansas

Ellis B. Stouffer Colloquium

Combination Therapies for Cancer as Multi-Input Optimal Control Problems: Challenges and Open Problems

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In this talk we shall analyze mathematical models for combination therapies for cancer as optimal control problems. We shall consider combinations of novel treatment approaches like tumor anti-angiogenesis or immunotherapy with traditional treatments, like chemotherapy or radiotherapy. Mathematical models for these therapies become multi-input control problems with each control modeling a separate drug action. There exist various approaches for choosing the objective like minimize the size of the tumor at the end of treatment or to maximize the immunocompetent cell-densities (if included in the model) while keeping side effects low. This leads to optimal control problems with many challenging features due to their multi-input system structure. Analytical and numerical results about the structures of optimal controls will be presented providing insights into dosage and sequencing of the drugs in these treatments. Throughout the lectures, the relations between the obtained mathematical results and medical data will be addressed, indicating challenges and open problems. In particular, a connection between theoretically obtained singular controls and the clinical benefits of metronomic chemotherapy will be discussed as a new important direction being currently explored.

Monday, October 21, 2013

2:30 pm

306 Snow Hall

Aronszajn Seminar Room

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