Optimization Models for Cancer Treatment Using Arc Therapy

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ABSTRACT

During radiotherapy, cancer patients are irradiated with beams of ionizing radiation that kill both cancerous and healthy cells. Treatment, therefore, has to be carefully designed in order to deliver the prescribed radiation dose to the tumor while sparing critical organs and healthy tissue from damage. Recently, radiotherapy delivery using arc therapy has been gaining popularity in clinics, since it has the potential to improve treatment plan quality while shortening treatment time. During this type of therapy, patients can be irradiated from virtually every angle, with a beam whose shape is continuously changing as the radiation source revolves around the patient. Optimizing such a treatment is much more challenging than designing conventional treatments, because natural formulations of this problem are both large-scale and non-convex optimization models. As a result, currently there is little support of this modality in treatment planning software, and the solutions are based on rather weak heuristics. The talk will present a novel optimization model that can be solved approximately using convex optimization methods, and can also be used in multi-criteria treatment planning. Computational results show that the approach provides high quality treatment plans for a variety of cancer types.

Refreshments will be served in Daniels Hall room 428
Student Lounge from 11:00 a.m. to 11:30 a.m.