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Treatment Angle Optimization for Intensity Modulated Radiation Therapy Planning

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ABSTRACT

Cancer is the second leading cause of death and it is blamed for 25% of deaths in theU.S. Treatment options are determined by type and stage of the cancer and include surgery, radiation therapy, and chemotherapy. More than 25% of the cancer patients will benefit from conformal radiation therapy. Therefore, this talk is designed to introduce challenging optimization problems in delivery of radiation for cancer patients. We will focus mainly on Intensity Modulated Radiation Therapy (IMRT) that can be used for various cancer types such as head-and-neck, prostate, breast, and pancreas. The common objective of radiation therapy planning is to achieve tumor control by planning a significant total dose of radiation to the cancerous region to sterilize the tumor without damaging the surrounding healthy tissues. Specifically, we will focus on treatment beam angle optimization for IMRT using mixed integer linear programming. Since such models are very large-scale and require several months of computation time, heuristic based solution methods are often developed for clinical use. We will present two solution methods to overcome the computational difficulties: a local neighborhood search and a clustering approach.