This talk has two parts. The first part will introduce the concept of inverse optimization and present some recent advances in the theory of inverse optimization. The second part will introduce radiation therapy treatment planning for cancer and illustrate how inverse optimization can be used to improve the planning process.

We generalize the standard method of solving inverse optimization problems to allow for the solution of inverse problems that would otherwise be ill posed or infeasible. In multiobjective linear optimization, given a solution that is not a weakly efficient solution to the forward problem, our method generates objective function weights that make the given solution a near-weakly efficient solution. Our generalized inverse optimization model specializes to the standard model when the given solution is weakly efficient and retains the complexity of the underlying forward problem.

Intensity-modulated radiation therapy (IMRT) treatment planning typically combines multiple criteria into a single objective function by taking a weighted sum. The authors propose a statistical model that predicts objective function weights from patient anatomy for prostate IMRT treatment planning. This study provides a proof of concept for geometry-driven weight determination.

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