

Department of Industrial and Systems Engineering

Dr. Gino Lim

Computationally Challenging Optimization Problems
in Intensity Modulated Proton Therapy Treatment Planning

Monday, March 4, 1:50 – 2:40
4002 Emerging Technologies Building



Abstract:

Radiation treatment planning for cancer patients has emerged as a challenging application of mathematical and computational optimization in recent years. The objective of radiation treatment planning is to design a treatment plan that can kill cancerous cells while sparing healthy tissues. Intensity modulated proton therapy (IMPT) is one of the most advanced radiation therapy techniques for cancer patients. However, mathematical models and solution algorithms for optimizing various IMPT treatment variables have not been well addressed. Unlike conventional photon based radiation therapy treatment modalities such as 3D conformal radiation therapy (3DCRT) and intensity modulated radiation therapy (IMRT), IMPT is highly sensitive to uncertainties and its optimization involves very large data sets. Therefore, uncertainty incorporated models and efficient solution algorithms are two key issues in IMPT optimization. In this talk, optimization methods for choosing IMPT treatment beam angles, selecting proton energy levels, and determining intensity profiles will be discussed.

Bio:

Gino Lim is the Chair of Industrial Engineering at the University of Houston. His research interests are in large-scale optimization models and computational algorithms, Operations Research applications in health systems and homeland security. He was the recipient of the Pierskalla Best Paper award (INFORMS) for his pioneering work on Gamma Knife radiotherapy optimization for brain cancer patients. His current research projects include radiation treatment planning, emergency evacuation planning and management, hospital staff scheduling, facility location and relocation problem, and GPU-based parallel computation. He has published over 60 refereed research articles including journal papers and conference proceedings. His research projects of \$10M have been funded by various federal, state, international, and local agencies. He is the founding director of Systems Optimization and Computing Laboratory (SOCL) at the University of Houston. He was the past program chair for 2012 ISERC conference in Orlando, FL and serves as a council member of INFORMS, a program co-Chair of 2013 ISERC doctoral colloquium. Dr. Lim received both his M.S. and Ph.D. degrees in industrial engineering from University of Wisconsin – Madison