

# EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

## Inverse Optimization: Closed-Form Solutions, Geometry, and Goodness of Fit

**ABSTRACT** – In classical inverse linear optimization, one assumes a given solution is a candidate to be optimal. Real data is imperfect and noisy, so there is no guarantee this assumption is satisfied. Inspired by regression, this paper presents a unified framework for cost function estimation in linear optimization comprising a general inverse optimization model and a corresponding goodness-of-fit metric. Although our inverse optimization model is nonconvex, we derive a closed-form solution and present the geometric intuition. Our goodness-of-fit metric,  $\rho$ , the *coefficient of complementarity*, has similar properties to  $R^2$  from regression and is quasi-convex in the input data, leading to an intuitive geometric interpretation. While  $\rho$  is computable in polynomial-time, we derive a lower bound that possesses the same properties, is tight for several important model variations, and is even easier to compute. We demonstrate the application of our framework for model estimation and evaluation in production planning and cancer therapy.



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**SPEAKER BIO** – **Dr. Timothy Chan** is the Canada Research Chair in Novel Optimization and Analytics in Health, an Associate Professor in the department of Mechanical and Industrial Engineering, and the Director of the Centre for Healthcare Engineering at the University of Toronto. His primary research interests are in optimization under uncertainty and the application of optimization methods to problems in healthcare, medicine, global engineering, sustainability, and sports. He received his B.Sc. in Applied Mathematics from the University of British Columbia, and his Ph.D. in Operations Research from the Massachusetts Institute of Technology. Before coming to Toronto, he was an Associate in the Chicago office of McKinsey and Company, a global management consulting firm. During that time, he advised leading companies in the fields of medical device technology, travel and hospitality, telecommunications, and energy on issues of strategy, organization, technology and operations.

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**TUESDAY, JANUARY 17, 2017**

**3:30PM – 4:50PM**

USC ANDRUS GERONTOLOGY CENTER (GER), Room 206