

Arizona State University  
Fulton School of Engineering  
Department of Industrial Engineering  
**FALL 05-SPRING 06 SEMINAR SERIES**

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**Martin Puterman**

UBC Centre for Health Care Management and Sauder School of Business  
University of British Columbia, Vancouver, Canada

**Title:** **Dynamic Scheduling of a Diagnostic Facility Using Approximate Dynamic Programming**  
*Joint work with Jonathan Patrick, and Maurice Queyranne*

**Date:** **December 7, 2005 (Wed)**

**Time:** **11:00 am**

**Place:** **Goldwater Center GWC 510**

**Abstract:**

Each day a random number of requests for diagnostic imaging arrive at a radiology department. Requests are distinguished by priority and each priority has a different allowable wait time. The challenges are that capacity is limited and the demand by priority class is variable so that high priority patients, who require more timely service, may arrive several days after lower priority patients have been scheduled. Hence, each day, the resource manager must determine how many patients of each priority class to assign to an appointment on a specific day in the future.

We formulate the resource manager's problem as a Markov decision process (MDP) with a state space which represents the number of open slots each day over a fixed horizon and the number of patients of each priority waiting to be assigned. Since the enormous state space makes direct solution impossible, we use an approximation to the linear programming (LP) formulation of the MDP. In this approximation the number of variables is reduced significantly through approximating the value function. We then solve the dual of the LP using column generation. The value function rather than the optimal policy is provided to the resource manager who each day solves a simple optimization problem to determine the best allocation of patients to slots. The efficacy of this policy is assessed through simulation and comparison to several other policies.

This work is based on a study of CT scanning operations at Vancouver General Hospital. Our talk will begin with a discussion of that work, its results, its impact and the challenges we faced in carrying it out. We will also provide an overview of LP based approximate dynamic programming.

**Bio:**

Martin L. Puterman is Advisory Board Professor of Operations in UBC's Sauder School of Business and Director of the newly formed Centre for Health Care Management at UBC. He was founder and director of the Centre for Operations Excellence at UBC and the Biostatistical Consulting Service at BC Children's Hospital. He has consulted widely on health care operations, statistical modeling, inventory control, forecasting, operations management and management strategy.

His research was recognized with through the receipt of the prestigious Lanchester Prize from INFORMS for his book Markov Decision Processes. He received the Canadian Operations Research Society (CORS) Award of Merit in 2005, the CORS Practice Prize in 2002 and 2005 and the 2003 INFORMS case prize for his case on forecasting and staff scheduling for the Whistler-Blackcomb Ski School. He has served on the editorial boards of Mathematics of Operations Research, Operations Research, Management Science and The Journal of the American Statistical Association.

He has a PhD in Operations Research and an MS in Statistics from Stanford University and AB in Mathematics from Cornell.

For further information about the seminar series, or to be added to the seminar announcement e-mail list, please contact Dr. Esma Gel <esma.gel@asu.edu>.