ABSTRACT

We study scheduling of jobs on a highly utilized resource when the processing durations are stochastic and there are significant underage (resource idle-time) and overage (job waiting and/or resource overtime) costs. Our work is motivated by surgery scheduling and physician appointments. We consider several extensions and applications.

In the first manuscript, we determine an optimal appointment schedule (planned start times) for a given sequence of jobs (surgeries) on a single resource (operating room, surgeon). Random processing durations are integers and given by a discrete probability distribution. The objective is to minimize the expected total underage and overage costs. We show that an optimum solution is integer and can be found in polynomial time.

In the second manuscript, we consider the appointment scheduling problem under the assumption that the duration probability distributions are not known and only a set of independent samples is available, e.g., historical data. We develop a sampling-based approach and determine bounds on the number of independent samples required to obtain a provably near-optimal solution with high probability.

In manuscript three, we focus on determining the number of surgeries for an operating room in an incentive-based environment. We explore the interaction between the hospital and the surgeon in a game theoretic setting, present empirical findings on surgery durations and suggest incentive schemes that the hospital may offer to the surgeon to reduce its idle time and overtime costs.

In manuscript four, we consider an application to inventory management in a supply chain context. We introduce advance multi-period quantity commitment with stochastic characteristics (demand or yield) and describe several real-world applications. We show these problems can be solved as special cases of the appointment scheduling problem.

In manuscript five, an appendix, we develop an alternate solution approach for the appointment scheduling problem. We find a lower bound value, obtain a subgradient of the objective function, and develop a special-purpose integer rounding algorithm combining discrete convexity and non-smooth convex optimization methods.

BIOGRAPHICAL NOTES

| Academic Studies: | B.Sc., Middle East Technical University, 2000 |
| | M.Sc., University of British Columbia, 2002 |

Current Position:	Assistant Professor,
	Richard Ivey School of Business,
	University of Western Ontario

GRADUATE STUDIES

Field of Study: Management Science

Selected Courses		Instructors
COMM 682	Supply Chain Management	Dr. M. Queyranne
COMM 682	Health Care Operations Research	Dr. M. Puterman
COMM 691	Applied Contract Theory	Dr. R. Winter
COMM 693	Seminar in Research Methodology	Dr. R. Winter
MATH 507	Measure Theory and Integration	Dr. J. Feldman
COMM 671	Theory of Finance	Dr. A. Kraus
COMM 612	Inventory Theory	Dr. Y. Gerchak
ECON 500	Economics	Dr. P. Ghosh
COMM 583	Forecasting and Time Series Analysis	Dr. E. Cope
COMM 581	Statistical Methodology	Dr. E. Cope
EPSE 506	College and University Teaching	Dr. S. Faber

SELECTED AWARDS

- Second prize for the Informs MSOM Student Paper Competition
- Runner-up for the Informs Computing Student Paper Competition
- Canadian Operational Research Society (CORS) Practice Prize
- Honourable mention for Informs Bonder Scholarship in Health Services
- Honourable mention for CORS Student Paper Competition
- PGSD3 NSERC Scholarship
- Dean Earle D MacPhee Memorial Fellowship
- UBC Lusztig Fellowship
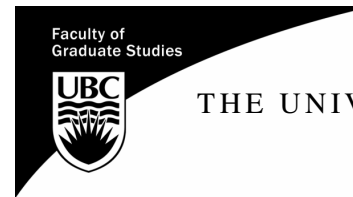
SELECTED PUBLICATIONS

- "Appointment scheduling with discrete random durations," in Proc. Symposium on Discrete Algorithms (SODA), NY, 2009 (with M. Queyranne)
- "Surgical block scheduling in a system of hospitals: an application to resource and wait list management in a BC health authority," Health Care Man. Sci., 10: 269-282, 2007 (with P. Santibanez and D. Atkins)
- "The 90-10 Rule; OR models help improve passenger flows and customer service at Vancouver international airport," ORMS Today, 30-2: 26-29, 2003 (with D. Atkins, B. Kluczny, A. Parkinson, M.L. Puterman)
- "Production planning in JS McMillan: catch allocation tool design," Information Systems and OR, 41-3: 235-244, 2003 (with M.L. Puterman)
- "Predictive modelling of video packet delay in IP networks," in Proc. IEEE Int. Conf. Image Processing, GA, 2006 (with A.C. Begen and Y. Altunbasak)
- "Web hosting service level agreements," Proc. PIMS Industrial Problem Solving Wksp. 2001 (with A. King, M. Cojocaru, E. Fowler, Y. Ganjali, J. Lai, T. Lee, C. Navasca, D.Ryan)

SELECTED PRESENTATIONS

- "Appointment scheduling with discrete random durations" (with M. Queyranne)
  - OR Applied to Health Services Conference, Toronto, ON, 2008
  - Symposium on Discrete Algorithms (SODA), New York, NY, 2009
  - Informs Annual Meeting, invited session, San Diego CA, 2009
- "A sampling-based approach to appointment scheduling" (with R. Levi and M. Queyranne)
  - Informs Annual Meeting, invited session, Washington DC, 2008
  - Informs-CORS, invited session, Toronto ON, 2009
- "Incentive-based surgery scheduling: determining optimal number of surgeries" (with C. Ryan and M. Queyranne)
  - Informs Annual Meeting, sponsored session, San Diego CA, 2009
- "Appointment Scheduling and Applications"
  - OR & Lean Health Care, invited tutorial, Vancouver, BC 2009
- "Surgical block scheduling in a system of hospitals: an application to resource and wait list management in a BC health authority" (with P. Santibanez and D. Atkins)
  - SIAM Conference on Discrete Mathematics, Victoria, BC, 2006
  - POMS Annual Meeting, Chicago, IL, 2005

SUPERVISORY COMMITTEE

Dr. Maurice Queyranne, Supervisor (Business Administration)
Dr. Martin Puterman (Business Administration)
Dr. Mahesh Nagarajan (Business Administration)
Dr. Ralph Winter (Business Administration)

Faculty of Graduate Studies

UBC

THE UNIVERSITY OF BRITISH COLUMBIA

PROGRAMME

The Final Oral Examination
For the Degree of

DOCTOR OF PHILOSOPHY
(Business Administration)

MEHMET ATILLA BEGEN

B.Sc., Industrial Engineering, Middle East Technical University, 2000
M.Sc., Management Science, University of British Columbia, 2002

Wednesday, March 31, 2010, 4:00 pm
Room 200, Graduate Student Centre

"Appointment Scheduling with Discrete Random Durations and Applications"

EXAMINING COMMITTEE

Chair:
Dr. Michael Peters (Economics)

Supervisory Committee:
Dr. Maurice Queyranne, Supervisor (Business Administration)
Dr. Ralph Winter (Business Administration)
Dr. Mahesh Nagarajan (Business Administration)

University Examiners:
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Dr. Steven Shechter (Business Administration)

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