Operations Research and Engineering Management
Dissertation Defense

HEURISTICS FOR CAPACITY ALLOCATION AND QUEUE ASSIGNMENT IN CONGESTED SERVICE SYSTEMS WITH STOCHASTIC CUSTOMER DEMAND AND IMMOBILE SERVERS

**Ph.D. Dissertation
Presented by
Adam Q. Colley
Advisor: Eli Olinick**

**Wednesday, March 2nd, 2022
3:00 pm to 5:00 pm
Caruth 384**

Abstract
We propose easy-to-implement heuristics for a problem referred to in the literature as the facility location problem with immobile servers, stochastic demand, and congestion, or the service system design problem. The problem is typically posed as one of allocating capacity to a set of M/M/1 queues to which customers with stochastic demand are assigned with the objective of minimizing a cost function composed of a fixed capacity-acquisition cost, a variable customer-assignment cost, and an expected-waiting-time cost. The expected-waiting-time cost results in a

non-linear term in the objective function of the standard binary programming formulation of the problem. Thus, the solution approaches proposed in the literature are either sophisticated linearization or relaxation schemes, or metaheuristics. In this study we demonstrate that an ensemble of straight-forward, greedy heuristics can find high-quality solutions in less than one second of CPU time. In many cases, our heuristic approach finds solutions of the same or better quality than those found with expensive, state-of-the art mathematical programming software, in particular a commercial non-linear MIP solver given a five-minute time limit.

Biography
Adam Q. Colley is a doctoral candidate in Operations Research at the Operations Research and Engineering Management Department. His research interests are heuristics, reliability, speed, and optimization. He received his Master's Degree in Business Administration from Keller Graduate School of Management in 2010 and a Bachelor's Degree in Computer Information Systems from DeVry University in 2009. He is currently owns a consulting company named Boundless Integrations LLC.