NORTH CAROLINA STATE UNIVERSITY

OPERATIONS RESEARCH PROGRAM
SEMINAR SERIES

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4:30PM-5:45PM

In-Person: 2321 Fitts-Woolard Hall

Dr. Donald Warsing
Associate Professor of Operations and Supply Chain Management
Department of Business Management
North Carolina State University
don_warsing@ncsu.edu

Title
Multi-objective Optimization of Testing Protocols to Screen for COVID-19

Abstract

Combining multi-objective simulated annealing (MOSA) with an epidemiological computational engine to determine individual flows within a closed testing system, we develop a methodology to generate optimal testing protocols for COVID-19 in congregate settings. Our method applies to screening tests for any infectious disease and can be deployed in a wide variety of settings where individuals regularly congregate. For our implementation, the epidemiological computational engine is based on a SEIR (Susceptible-Exposed-Infected-Recovered) model that appeared in published work in the early months of the COVID-19 pandemic. The archive-based MOSA algorithm is adapted from published work on evolutionary computing. We employ these computational tools in an example setting of public schools in North Carolina, and we find that optimal protocols — based on objectives to minimize overall infections, minimize overall testing cost, and minimize overall false negative outcomes — are robust with regard to the testing regime across school districts. We also explore the behavior of the solutions under various levels of environment-driven infection risks and virus transmission rates.

Biography

Dr. Donald Warsing is an Associate Professor of Operations and Supply Chain Management in the Poole College of Management at North Carolina State University, and is also a member of the Operations Research faculty at NC State. Prior to joining NC State, Don served on the faculty of the Smeal College of Business at Pennsylvania State University and also worked for IBM Corporation in roles spanning from industrial engineering to manufacturing management. His research concerns the development of tools and policies for effectively managing inventory, logistics, and business operations, and studying the way in which various management practices contribute to improved performance outcomes. Don's work has been published in *Production and Operations Management*, the *Journal of Operations Management*, *Decision Sciences*, and the *European Journal of Operational Research*, among other academic publications. He is also the co-author of a graduate-level textbook, *Supply Chain Engineering: Models and Applications*, which won the Institute of Industrial Engineers' 2013 IIE/Joint Publishers Book-of-the-Year Award. At NC State, Dr. Warsing currently teaches courses in operations analysis at both the undergraduate and MBA levels. He has also taught courses in production planning, logistics, and supply chain management, and he frequently serves on master's and Ph.D. committees in Industrial Engineering and Operations Research.