Miguel Lejeune
Department of Decision Sciences
George Washington University
Time and location: 11:00 a.m.-12:00 p.m. on Friday, Sep 23th, 2022; Room S121 PBB

Title: Drone-Network Design Queueing MINLP Model for Time-Sensitive Medical Events

Abstract: We develop a new queueing optimization model for the design of a drone network aimed at providing a quick response to time-sensitive medical events. The problem is motivated by the delivery of automated external defibrillators to out-of-hospital cardiac arrests and naloxone to opioid overdoses. The network is modeled as a collection of M/G/1 and M/G/K queues in which the drone service times and the arrival of OHCA requests at drone bases are random variables whose distribution parameters are determined endogenously. The model takes the form of an integer nonlinear model with fractional and bilinear terms and minimizes the average response time which is conducive to maximizing the chance of survival of patients. We derive a mixed-integer linear programming (MILP) reformulation and propose a modular solution method that features a warm-start and an optimality-based bound tightening (OBBT) module embedded in a branch-and-cut algorithm. In particular, we propose four new MILP and feasibility OBBT models that can derive multiple bounds at once. We use real-life data from Virginia Beach (i) to ascertain the computational efficiency of our approach, and (ii) to analyze the impact of drone-based delivery on response time and probability of survival of patients.

Speaker's bio sketch:
Miguel Lejeune is a Full Professor of Decision Sciences (GWSB) and of Electrical and Computer Engineering (SEAS) at the George Washington University (GWU). Prior to joining GWU, he was a Visiting Assistant Professor in Operations Research at Carnegie Mellon University. He held visiting positions at Carnegie Mellon University, Georgetown University, the University of California – Irvine, and the Foundation Getulio Vargas in Rio de Janeiro.

He is the recipient of the 2019 Koopman Award of the INFORMS Society, the 2020 Dean's Best Senior Faculty Research Award (George Washington School of Business), a CAREER/Young Investigator Research Grant from the Army Research Office, and the IBM Smarter Planet Faculty Innovation Award.

Miguel Lejeune's areas of expertise include stochastic programming, distributionally robust optimization, and data-driven optimization with applications in finance, supply chain management, health care, and energy. His research is currently funded by three grants from the National Science Foundation, one from the Office of Naval Research, one from the DUKE Energy Innovation Fund, and several others from GWU.