

EPSTEIN INSTITUTE SEMINAR ▪ ISE 651

Logistical Challenges at Mass Participation Events: Operations Research Models for Marathon Planning

ABSTRACT – Mass participation events bring a host of significant planning and implementation challenges. The organizers of the Chicago Marathon have developed a holistic approach to event planning, referred to as the Chicago Model, which brings together major organizations (e.g., race organizers, fire and police departments, emergency management, Red Cross) to coordinate preparation and response for the event and surrounding areas. In this talk, I will present (i) a brief overview of our ongoing research project to expand the capabilities of the Chicago Model through operations research methodologies and (ii) a more detailed look at marathon course design. As part of our efforts to formalize course design, we introduce the Lock-Free Arc Tour Problem (LFATP), a novel tour finding problem which ensures that the resulting tour does not block access to certain critical vertices. For endurance events, such as a marathon, a key consideration in course design is the proximity to medical care. Equally important, the course itself should not lock hospitals and other critical facilities within the course, thereby reducing access for the general public. The LFATP is formulated as a mixed integer linear program, addressing both considerations. Valid inequalities from the literature are adapted to the LFATP and new valid inequalities are derived from locking properties. The chosen objective function results in a clustered cost structure, yielding excessive sub-tour formation and causing standard branch-and-cut approach to fail. For this reason, we introduce two approaches based on a provably stronger disjunctive programming formulation, where each sub-problem is obtained by fixing the visit orders in which required arcs are visited. These approaches are promising for similar tour finding problems with visit requirements and length restrictions. A case study from the Bank of America Chicago Marathon is provided.



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SPEAKER BIO – Dr. Karen Smilowitz is a Professor in the Department of Industrial Engineering and Management Sciences at Northwestern University and holds a joint appointment with the Northwestern University Transportation Center. Dr. Smilowitz is currently a Charles Deering McCormick Professor of Teaching Excellence. Dr. Smilowitz studies modeling and solution approaches for logistics and transportation systems in both commercial and non-profit applications, working with transportation providers, logistics specialists and a range of non-profit organizations. She is currently leading the Northwestern Initiative on Humanitarian and Non-Profit Logistics. Dr. Smilowitz received a CAREER award from the National Science Foundation and a Sloan Industry Studies Fellowship. She received her Ph.D. in Civil and Environmental Engineering from the University of California, Berkeley and her BSE in Civil Engineering and Operations Research from Princeton University.

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3:30PM – 4:50PM

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