

Rajan Batta: Research Profile

My research philosophy is that of being problem motivated—that is, given a relevant, interesting, real-world application, develop and analyze mathematical models for the related problem. Of particular interest is the creation of novel, innovative application areas for Operations Research techniques. My solid Engineering background coupled with an excellent, in-depth knowledge of a broad range of Operations Research techniques give me the tools that are necessary for effectively performing this type of research activity.

Recent Research Summary

I work in the following research areas:

Pothole Repair

Pothole repair is a significant problem after the winter season. This research is concerned with scheduling of pothole repairs in a way that minimizes the impacts of safety hazards and flow disruption to the impacted public, while maintain equity in the inconvenience caused. A PhD student, Fatemeh Arabi, is working in this area, co-supervised with Jamie Kang.

Hazardous Materials Routing/Logistics

Recent work on hazardous materials routing was supported by the National Science Foundation and by Erie County. Two doctoral students (Masoumeh Talsimi and Tolou Esfandeh) have recently completed doctoral dissertations in this area, co-supervised with Changyun Kwon. An MS student, Harshavardhan Vemupati, just finished working in this area, co-supervised with Joy Bhadury. Have a visiting student from France, Melanie Braga Tavares, who is currently working in this area.

Routing/Scheduling for Search Missions

Recent work in the area of routing/scheduling for search missions was supported by two grants from the Office of Naval Research. One of the recently graduated doctoral students (Mike Moskal) worked in the area of routing for search over micro-grids, which includes elements of prize collection and movement planning between micro-grids. The other doctoral student, Yan Xia, who recently graduated, explored the value of the price of anarchy in decentralized Markov decision processes, when reward has uncertainties associated with it. Yan's work was co-supervised with Rakesh Nagi.

Convoy and Tugboat Routing

A doctoral student (Azar Sadeghnejad) is working in this area, co-supervised by Moises Sudit. The general problem is that of routing convoys (long sets of vehicles that move together) in both peacetime and war time settings. A key feature is the separation in time and space of the convoys. Her current work relates to tugboat scheduling in a harbor.

School Bus Routing

Several elements of school bus routing were explored, including overbooking of buses, special education bus routing, and studying the impact of pickup restrictions and policies. This work was initially supported by the Williamsville School District. A doctoral student (Hernan Caceres) recently completed his doctoral dissertation in this area, co-supervised with Qing He.

Gasoline Supply Logistics

Two aspects were explored. The first relates to supply of gasoline after a natural disaster has occurred. This is supported by the University Transportation Research Center in CUNY. A doctoral

student, Xiaoping Li, is working on this topic, co-supervised with Changhyun Kwon. The other aspect relates to regular gasoline supply. A doctoral student, Yan Cheng-Hsu, worked in this area and recently graduated, co-supervised with Jose Walteros.

Electric Vehicle Routing and Location of Charging Stations

The problem of modeling charging station capacity when considering routing of electric vehicles and location of charging stations is being explored. A doctoral student, Nan Ding, worked in this area and recently graduated, co-supervised with Changhyun Kwon.

Evacuation Planning

This research focuses on efficient management of the evacuation process, which include reaching appropriate evacuation targets by zones, managing traffic congestion in the impacted area, and maintaining equity of access for elderly and physically challenged individuals. Recent work is with a recently graduated MS student (Rahul Swamy) and a visiting PhD student (Sarah Dian), both co-supervised with Jamie Kang.

Disaster Relief Supply in a Mountainous Area

This research focuses on providing relief supplies to an impacted area after a natural disaster. The area being modeled is in mountainous territory and requires supply delivery using porters who travel on trails, in conjunction with helicopters who deliver supplies to porters at strategic supply points. Recent work is with a recently graduated MS student, Abhinav Khare, co-supervised with Jamie Kang.

Grocery Store Layout Optimization

This research focuses on optimization of a grocery store layout, with the aim of maximizing impulse item sales, while keeping customer inconvenience under control. Various aspects of the problem are being studied. Recent work is with a doctoral student, Jessica Dorismond, co-supervised with Jose Walteros.