Asymptotically Optimal Policies for Dynamic Ambulance Dispatch

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Abstract:
We consider a dynamic ambulance dispatch problem in an emergency medical service system, in which a decision maker sequentially observes call arrivals, modeled as Poisson process, then decides which unit to be dispatched to serve the call, where the service time for each station-location pair follows heterogeneous distributions. Based on the mutual aid policy, a flexible unit with a large cost is always available, which is rarely considered in the literature on dispatch problems. This problem is formulated as a Markov decision process (MDP) while it is intractable due to the curse of dimensionality. We develop two easy-to-implement heuristics from a deterministic linear program and a Lagrangian relaxation, and show their provably near-optimal performances as the arrival rate and the number of units increase. We also analyze the model where the flexible unit is available only if all units are occupied. This model is equivalent to the original one under intuitive conditions and another heuristic policy is therefore proposed. We further examine the performance of the heuristic policies and the bounds on numerical experiments, including a case study based on data from St. Paul, Minnesota.

Biography:
Dr. Tong Wang is an Associate Professor in the Department of Management Science, Antai College of Economics and Management, at Shanghai Jiao Tong University. She received her PhD in Systems Engineering and Engineering Management from the Chinese University of Hong Kong in 2017, and BSc in Applied Mathematics from Nanjing University in 2012. Her research interests lie in operations management, stochastic inventory theory and applications, revenue management, and approximation and data-driven algorithms. Her research has appeared in *Operations Research* and *Production and Operations Management*.

Your attendance is most welcome!

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