Centralized Routing in Ride-hailing Networks

In ride-hailing networks, where should drivers go after dropping off passengers? This paper studies first best and second best routing plans. The first best is the set of routes that minimizes the number of cars needed to satisfy a given demand pattern, and the second best incorporates additional incentive compatibility constraints for drivers to voluntarily follow the plan. The first best routing plan is not incentive compatible because drivers may prefer to wait around drop-off locations. Only after enough cars have accumulated (i.e., it takes sufficiently long to get the next ride) will they drive empty to other locations. Applying our model to ride-hailing data in San Francisco, we show that centralized routing can reduce the number of cars by about 30% while maintaining the same level of service.

Xuanming Su