

Title: Online Resource Allocation with Supply Costs: Pricing, Competitive Analysis, and Applications

Abstract: Recent years have witnessed a dramatic growth in a variety of on-demand service and resource sharing platforms in computing, communication, transportation, and energy systems (e.g., IaaS clouds, mobility-on-demand systems, and electric vehicle parking/charging platforms, etc.). However, decision-making in such highly dynamic systems/platforms is often hindered by the limited knowledge of future multi-dimensional demand information (e.g., when, where and how much) as customers are usually revealed in a sequential manner and their demand statistics are rarely predictable. Worse yet, customers are usually strategic (i.e., self-interested) and some dimensions of their demand information may be very private. Therefore, it is essential to resort to online decision-making algorithms that require as little future information as possible.

In this talk, we will present our recent progress in online optimization for a general online resource allocation problem. We start with a brief introduction to the state-of-the-art online optimization frameworks, and then present some motivating applications in computing, communication, transportation, and energy systems that fall within the common framework of online resource allocation with supply costs. We will introduce the detailed problem formulation and then show how to design online posted-pricing algorithms that lead to the tightest competitive ratios for this framework. The effectiveness of the proposed online algorithms will be validated by two case studies: online resource auctions in IaaS clouds and real-time electric vehicle charging in smart grid. Finally, we will conclude this talk by sharing potential extensions and future directions of this framework.

