‘Designing Technology Adoption Strategies in the Presence of Network Effects’

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Abstract

I will discuss the design of optimal policies that can be used to help drive adoption of technologies with positive network effects, either among consumers or within members of an organization. A buyer's decision to buy an item is often influenced by the set of other buyers that own the item and the price at which the item is offered. The influence that others exert on a buyer is rooted in any number of relationships, for example: social ties, like a friendship; organizational rank, as in a manager-employee relationship; or even a commercial relationship, like a customer-seller relationship. I will investigate how such networks of influence can be used to market technologies more effectively. I will focus on the algorithmic question of finding adoption-maximizing and profit-maximizing marketing strategies and study the problems in two main cases: with and without price discrimination. In the case where price discrimination is allowed, I will identify a family of strategies called seeding strategies that are based on the following idea: first, offer the item for free to a carefully chosen set of buyers; then extract revenue from the remaining buyers using a 'greedy' pricing strategy. I will show why such strategies are reasonable and then show how to use recently developed set-function maximization techniques to find the right set of buyers to influence. In the case where price discrimination is not allowed and positive network externalities exist, my goals are to maximize the adoption and profit by choosing a sequence of publicly available prices for the item. I will
show that the problems can be solved in polynomial-time and provide algorithms based on dynamic programming to do it.

I will also contrast the efficacy of optimal discriminatory and non-discriminatory policies, arguing that discriminatory pricing is rarely much better at extracting revenue or driving adoption than non-discriminatory pricing. Indeed, non-discriminatory strategies, which are simpler to compute and implement next to their discriminatory counterparts, achieve nearly the same revenue and market adoption for most influence networks; when they do not, I find that the results are not robust to small perturbations. Finally, I will illustrate my findings about the power of non-discriminatory pricing policies on adoption data from a mobile social networking application, finding that non-discriminatory pricing yields more than 90% of the revenue and nearly 95% of the adopters obtained by optimal discriminatory pricing.