Lancaster University
MANAGEMENT SCHOOL

Department of
Management Science
Research Seminar

A New Approximate Dynamic Programming Approach to Network Revenue Management with Customer Choice

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Room: Lecture Theatre 4

Abstract: Network Revenue Management models attempt to maximize some reward function when customers buy bundles of multiple resources. The interdependence of resources, commonly referred to as network effects, creates difficulty in solving the problem. The classical technique of approaching this problem has been to use a deterministic LP solution to derive policies for the network capacity problem. Initial success with this method has triggered considerable research in possible reformulations and extensions, and this method has become widely used in many industrial applications. A significant limitation of the applicability of these classical models is the assumption of independent demand. In response to this, interest has arisen in recent years to incorporate customer choice into these models, further increasing their complexity. This development drives current efforts to design powerful and practical heuristics that still can manage problems of practical scope.

In this context, we introduce a new Approximate Dynamic Programming approach to network revenue management models with customer choice by approximating the value function of the Markov decision process with a concave function that is separable across resource inventory levels. This approach reflects the intuitive interpretation of diminishing marginal utility of resource levels and allows for significantly improved accuracy compared to currently available methods. The resulting approximation yields provable tighter bounds than previous approaches and is asymptotically optimal under fluid scaling. Our computational experiments show that our approach results in a good trade-off between solution quality and running time for problem sizes of practical interest. (Joint work with Dr Joern Meissner)

Bio: Arne Strauss is a doctoral candidate at Lancaster University Management School. He holds a Master's degree in mathematics from Virginia Tech (USA) and a diploma in mathematics and business administration from the University of Trier (Germany). The results of his diploma thesis on numerical methods in option pricing have been published in the journal Applied Numerical Mathematics.