Research Seminars 2021/2022

José Fernando OLIVEIRA - University of Porto

April 28th, 12pm - 1.15pm / room F037 (Galion Building - Ground Floor) - Campus Cergy

Integrating pricing and capacity decisions in car rental: A matheuristic approach

Abstract: *Pricing and capacity decisions in car rental companies are characterized by high flexibility and interdependence. When planning a selling season, tackling these two types of decisions in an integrated way has a significant impact. This talk discusses the integration of capacity and pricing problems for car rental companies. These problems include decisions on fleet size and mix, acquisitions and removals, fleet deployment and repositioning, as well as pricing strategies for the different rental requests. A mathematical model is presented, which considers the specific dynamics of rentals on the relationship between inventory and pricing as well as realistic requirements from the flexible car rental business, such as upgrades. Moreover, a solution procedure that is able to solve real-sized instances within a reasonable time frame is developed. The solution procedure is a matheuristic based on the decomposition of the model, guided by a biased random-key genetic algorithm (BRKGA) boosted by heuristically generated initial solutions. The positive impact on profit, of integrating capacity and pricing decisions versus a hierarchical/sequential approach, is validated.*

Here is the registration link: https://www.eventbrite.fr/e/billets-omor-seminar-series-with-jose-fernando-oliveira-316257874817

For any information about OMOR events, please send an e-mail to omor@essec.edu.

Fouad EL OUARDIGHI - ESSEC Business School

March 31st, 12pm - 1.15pm / C18 - Campus Cergy

Strategic Control of a Pandemic under International Mobility and R&D Competition with Spillovers

Abstract: *In this paper, we develop a differential game of the current pandemic's dynamics to determine how preventive and therapeutic measures curb its spreading in the context of two neighboring countries. Given the R&D competition among the countries to develop their treatment capability, the exogenous impact of boundaries' control is assessed along with those of preparedness and R&D spillovers. Using the cooperative solution as a benchmark, we investigate non-cooperative (i.e., closed-loop Nash equilibrium) strategies and show how they can be detrimental in various contexts both in terms of effectiveness and efficiency in preventing infections and saving lives.* ***Joint work with B. Kim, C. Van Delft.***

Eugene KHMELNITSKY - Tel Aviv University

February 17th, 12.15pm - 1.30pm / LearningLab

Sharing Profit and Risk in a Partnership

Abstract: *The setting up of a new partnership involves negotiation. Would-be partners must agree on a scheme for dividing uncertain future profits (or losses). We consider partnerships of two or more partners where the negotiated division depends on the partners' attitudes toward risk, their beliefs concerning future profit, and their alternatives (i.e., the disagreement point). V ⓘ ropose several schemes. First, an asymmetric approach starts with one party making a decision that maximizes its expected utility that respects the other's individual rationality. The*

second scheme is symmetric and based on Nash bargaining solution (NBS). The third scheme, motivated by the practice of revenue sharing between mobile app developers and distribution platforms, is two-step. The developer first decides about the quality of the product for any possible terms of revenue sharing. Then, the developer and the platform agree on the NBS. We use the optimal control theory and methods in order to formulate the problem and obtain the optimal contract terms. We show that, in general, the optimal shares can exhibit non-linear and even non-monotone-increasing behavior. We focus on particular cases where the optimal contract takes the form of a linear or piece-wise linear function of the future profit. ***Joint work with Y. Gerchak, T. Avinadav and T. Chernonog.***

Sergei SAVIN - The Wharton School, University of Pennsylvania

January 20th, 4.30pm -5.45pm / Online via zoom

Off-Platform Threats in On-Demand Services

Abstract: *Online platforms that provide on-demand services are often threatened by the phenomenon of leakage, where customer-provider pairs may decide to transact ``off-platform'' to avoid paying the platform commissions. This paper investigates properties of services that make them vulnerable or resistant to leakage. In practice, much attention has been given to platform leakage, with platforms experimenting with multiple approaches to alleviate leakages. Yet, there is a current dearth of studies in the operations literature that systematically analyze the key factors behind platform leakage. Our work fills this gap and answers practical questions regarding the sustainability of platform operations. We develop two game-theoretical models that capture service providers' and customers' decisions whether to conduct their business on or off the platform. In the base model, we assume that customers are equipped with information to select their desired providers on the platform, whereas in the extension, we assume customers a ⓘ ndomly matched with available providers by the platform. Leakage occurs if and only if the value of the counterparty risk from off-platform transactions is neither too small nor too large*

value of the counterparty risk from off-platform transactions is neither too small nor too large. Across models, platforms tend to be more immunized against leakage as customer valuations for service increase or their waiting costs decrease. In the base model, platforms with larger provider pool sizes tend to be more immunized against leakage. In the extension, platforms that feature higher proportions of high quality providers or lower heterogeneity in service quality are more resistant to leakage. Finally, by comparing the degree of leakage or the platform's expected profit between both settings, we find that neither model of perfect information nor the imperfect information setting dominates the other for all parameter combinations. Our results provide guidance to existing platform managers or entrepreneurs who are considering ``platforming'' their services. Namely, based on a few key features of the operating environment, managers can assess the severity of the threat of platform leakage for their specific business context. In addition, our results suggest how redesigning the waiting process and upskilling providers can help a platform build resistance to leakage. They also suggest conditions under which revealing provider quality information to customers can help to curb leakage. ***Joint work with Eryn He, Joel Goh, and C.P. Teo.***

Alberto SANTINI - ESSEC Business School

December 15th, 11am-12.15pm / LearningLab (KLAB)

The Time-Bomn 0-1 Knapsack Problem

Abstract: *The Time-Bomb 0–1 Knapsack Problem is a stochastic variation of the classical Knapsack Problem in which some of the items to pack are time bombs: they have a probability to explode and, if some of them does, the entire content of the knapsack is lost. In the considered version of the problem, we must decide which items to pack to maximise the expected profit of the knapsack. I will use this problem to present a variety of methodological approaches which an interested participant might want to have in their toolbox: we start with a highly non-linear*

integer formulation, then present an algorithm to solve its continuous relaxation based on the classical Frank-Wolfe algorithm, proceed by exploring other bounding techniques, and finally present a dynamic programming algorithm and a combinatorial branch-and-bound algorithm. In the meanwhile we will prove some interesting properties of the problem (e.g., its NP-completeness).

Alberto SANTINI - ESSEC Business School

December 1st 2021, 12pm-1pm / LearningLab (KLAB)

New challenges in Supply Chain Optimisation

Abstract: *In this seminar I will describe problems arising in vehicle routing, logistics and supply chain optimisation. Some of these problems have led to publications, other are subject of on-going research and others represent future research possibilities. I will give a brief overview of each of them and shortly discuss possible solution methods. The problems are diverse and include: can we learn how to decompose large vehicle routing instances to improve the performance of heuristic algorithms? How do we route a vehicle which is under (a stochastic) probability of being assaulted by robbers? Can we remove delivery vans from city streets by moving some parcels on public transport?*

Danny SEGEV - Tel-Aviv University

November 18th 2021, 12pm-1pm / Online via zoom

Sequential MNL Model: Algorithmic Frameworks for Product Recommendation

Displays

Abstract: *We consider assortment optimization under the Sequential Multinomial-Logit choice model, recently proposed by Liu et al. (2020) to capture a multitude of applications, ranging from appointment scheduling in hospitals, restaurants, and fitness centers to product recommendation in e-commerce settings. In this problem, the purchasing dynamics of customers sequentially unfold over T stages. Within each stage, the retailer selects an assortment of products to make available for purchase, with the intent of maximizing expected revenue. However, the caveat is that each product can be offered in at most one stage. Moving from one stage to the next, the customer either purchases one of the currently offered products according to MNL preferences and leaves the system, or decides not to make any purchase at that time. In the former scenario, the retailer gains a product-associated revenue; in the latter scenario, the customer progresses to the next stage. We focus our attention on the most general formulation of this problem, in which purchasing decisions are governed by a stage-dependent MNL choice model, reflecting the notion that customers' preferences may change from stage to stage due to updated perceptions, patience waning over time, etc. Our main contribution comes in the form of a strongly polynomial-time approximation scheme (PTAS) for the sequential assortment problem in its utmost generality.*

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