3 - Determining Mobile Communication Operators' Efficiency by using DEA
Ahmet Aktas, İzzettin Temiz

Mobile communication technologies have shown great improvements in the last 20 years. Operators are making new investments to compete against their rivals and to increase the number of their customers. As a result of these investments, a positive change of efficiency is expected. In this study, an application of Data Envelopment Analysis (DEA) has been done in order to determine efficiency of mobile communication operators in Turkey. Efficiency of each operator is calculated for 6 periods of three-months between January 2012 and July 2013. Efficiency change of operators has also been analysed.

4 - Efficiency and Seasonality in the Portuguese Post Offices and Postal Distribution Centers
Sérgio Santos, Carla Amado, Ana Fadísta

This study uses Data Envelopment Analysis (DEA) to assess the efficiency of Portuguese post offices and Postal Distribution Centers (PDCs) and to explore the extent to which seasonality impacts on their performance. To this effect, we use data from 85 post offices and 44 PDCs. The results indicate that whilst there is a remarkable variation in the performance of the units assessed, seasonality seems to play an important role in explaining this variation, indicating that, in order to remain efficient, some units may need to adjust their capacity according to the season.

■ TB-15
Tuesday, 10:30-12:00 - Room 125

Pricing and Consumer Behavior: Modeling and Estimation

Stream: Revenue Management II
Invited session
Chair: *Ozalp Ozer*

1 - Markdown or Everyday-Low-Prices? The Role of Consumer Regret and Availability Misperception
Ozalp Ozer, Karen Zheng

We study a seller's optimal pricing and inventory strategies when consumers' purchase decisions are affected by anticipated regret and misperception of product availability. We show that these behavioral factors reinstate the profitability of markdown over everyday-low-price, in sharp contrast to prior studies. We quantify that ignoring these behavioral factors can lead to excessive profit losses. We determine that pricing offers the seller additional means to leverage consumers' behavioral issues, while mitigating potential consequences of mis-calibrating behavioral issue.

2 - Optimal Reference Pricing for Healthcare Procedure Payments
Victoire Denoyel, Laurent Alfandari, Aurelie Thiele

In reference pricing (RP), a payer determines a maximum amount for a procedure; patients who select a provider charging more pay the difference. This has strong potential in costs reduction for payers, quality increase for patients and visibility for high-value providers. Inspired by a CalPERS program, we use robust optimization to set reference price and providers subject to it. We develop a MIP payer decision model to fill the gap of quantitative insights on RP due to price, quality and geographic coverage. Preliminary results give promising leads on pitfalls and benefits of this policy.

3 - Customer Behavior Modeling in Revenue Management Systems using a Global Optimization Approach
Shadi Sharif Azadeh, Gilles Savard

In revenue management systems it is necessary to precisely predict demand of each product at a given time. This could be a challenging task, as registered bookings are censored to booking limits. In order to have a precise forecasting model, uncensoring methods are applied to unconstrain the registered data. We propose an optimization model to estimate the demand of each product at a given time as well as the product utilities for customers arriving from different segments. We introduce an algorithm that takes availability constraints into account.

4 - Behavioral Anomalies in Consumer Wait-or-Buy Decisions and Their Implications for Markdown Management
Nikolay Osadchiy, Anton Ovchinnikov, Manel Baucells

Deciding whether to buy an item at a regular price or wait for a markdown a consumer trades-off the delay in getting an item, the likelihood of getting it and the magnitude of savings — all of which are prone to behavioral anomalies/regularities. We propose a model that incorporates such anomalies and analytically solve the consumer wait-or-buy problem. Through a behavioral study estimate the model parameters and numerically show that accounting for the behavioral anomalies a firm would offer larger markdowns yet generate higher revenue compared to the current literature's predictions.

■ TB-16
Tuesday, 10:30-12:00 - Room 127

Structure Learning and Applications

Stream: Intelligent Optimization in Machine Learning and Data Analysis
Invited session
Chair: *Ivan Reyer*

1 - Mixing Hopfield Neural Network and Probabilistic Model Method
Diana Vasilieva, Yuri Mikhailov

We introduce our modification of Hopfield neural network (HNN) architecture. While using original Hopfield network we found some cases where resulting values can be ambigious. To solve that problem we added probabilistic model (PM) and developed mixing method of these two approaches. As a result we got better results than original Hopfield network.

2 - Bayesian Sample Size Estimation for Patient Classification Survey
Anastasia Motrenko

We seek to increase the quality of classification of Cardio-Vascular Disease patients. As a part of research, arises the problem of determining the minimum sample size necessary for statistical significance of classification. Previously, we proposed a method of sample size determination that involved comparing empirical distributions, evaluated on different subsets of a sample. To measure similarity, the Kullback-Leibler distance was used. We now investigate further the features of this distance and provide some theoretical background for the method.

3 - A Machine-Learning Paradigm that Includes Point-wise Constraints
Giorgio Gnecco, Marco Gori, Stefano Melacci, Marcello Sanguineti

The classical framework of learning from examples is enhanced by the introduction of hard point-wise constraints, i.e., constraints, on a finite set of examples, that cannot be violated. They arise, e.g., when imposing coherent decisions of classifiers acting on different views of the same pattern. Constrained variational calculus is exploited to derive a representer theorem that provides a description of the functional structure of the solution. The general theory is applied to learning from hard linear point-wise constraints combined with classical supervised pairs and loss functions.

4 - Structure Learning and Forecasting Model Generation
Vadim Strijov, Mikhail Kuznetsov, Anastasia Motrenko

The aim of the study is to suggest a method to forecast a structure of a regression model superposition, which approximates a data set in terms of some quality function. The problem: algorithms of model selection are computationally complex due to the large number of models. The solution: we developed a model structure forecasting algorithm based on previously selected models.