2014 International Workshop on Data Science and Service Research

CHALLENGES FOR BIG DATA IN OUR SOCIETY: STATISTICAL
ANALYSIS OF LARGE SCALE, HIGH DIMENSIONAL DATA
FOR SOCIO-ECONOMIC PROBLEMS

Abstracts

Date   : July 18, 2014
Time   : 10:00-17:30
Venue   : Graduate School of Education Administration Office 11F Large Conference Room

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Program

Impact of Attribution Metrics on Return on Keyword Investment in Paid Search Advertising

P.K.Kannan (University of Maryland)

This study analyzes the impact of attribution metric used for imputing conversion credit to search keywords on the overall effectiveness of keyword investments in search campaigns. Recently, firms have been experimenting with different attribution metrics to assign conversion credits to search keywords appearing in the consumers' journey to purchase. These attribution-based credits affect a firm's future bidding decision and budget allocation for keywords, and in turn determine the overall return-on-investment of future search campaigns. Using a six-month panel data of several hundred keywords from an online jewelry retailer, we empirically model the relationship among the advertiser's bidding decision, the search engine's ranking decision, and the consumer's click-through and conversion decision, and analyze the impact of the attribution metric used on the overall return-on-investment of paid search advertising. Our analyses account for the simultaneity and endogeneity in the decisions made by the advertiser, the search engine and the consumer. In our data, the focal advertiser changed the attribution metric from last-click attribution to first-click attribution half-way through the data window. This allows us to estimate the impact of the two alternative attribution metrics on budget allocation, which in turn influences returns realized for keyword investments under different attribution regimes. Given the mix of the keywords bid by the advertiser, the results show that the first-click leads to lower overall revenues and this impact is stronger for the more specific keywords. In the policy simulation, we find the advertiser would be able to improve their overall revenue by more than 5% by appropriately changing the attribution metric for individual keywords to account for their actual contribution.

Keywords: attribution metrics, paid search advertising, ROI, keyword specificity, budget allocation, simultaneous equations system.

An Economic Model for Charitable Donations

Jaehwan Kim (Korea University)

This study examines the effect of message characteristics on donation behavior using an economic model of giving behavior. The utility for giving can come from one's own contribution and possibly from the combined contributions of others. Donors are assumed to be constrained utility maximizers, and the message attributes affect the degree to which they react altruistically or egoistically. The model is estimated with data from an incentive-aligned study of South Korean consumers, and implications for message optimization and donor targeting are explored. The study found that for purpose of maximizing the fundraising performance, the ad consisting of recipient-focused message with absence of happiness mood and the presence of arousal in the add is the best, The optimal scheduling of different campaigns moving from altruistic to egoistic motive-emphasizing ad brings enhanced donation performance for non-profit organization.

The Complex Network of Social Media

William Rand (University of Maryland)

The dramatic feature of social media is that it gives everyone a voice; anyone can speak out and express their opinion to a crowd of followers with little or no cost or effort, which creates a loud and potentially overwhelming marketplace of ideas. The good news is that the organizations have more data than ever about what their consumers are saying about their brand. The bad news is that this huge amount of data is difficult to sift through. We will look at developing methods that can help sift through this torrent of data and examine important questions, such as who do users trust to provide them with the information and the recommendations that they want? Which tastemakers have the greatest influence on social media users? Using agent-based modeling, machine learning and network analysis we begin to examine and shed light on these questions and develop a deeper understanding of the complex network of social media.

Is Loyalty Transferable? An Evidence from Partnership Loyalty Program Network

So Young Lee (Hoseo University)
Hyang Mi Kim (KT Economics & Management Research Lab)
Jae Wook Kim (Korea University)

In recent years, there has been a renewed interest on partnership loyalty programs (PLP) run jointly by multiple firms and stores. The present study examines the formation and diffusion of customer loyalty within the PLP network to understand the role of the program within the network. We collected two sets of data from the members of a real-world PLP with a year interval. Our analyses of two data sets show that: (1) loyalty towards a specific store/firm affects loyalty towards the PLP itself, (2) loyalty towards the PLP does transfer to other partner stores and firms in the network, validating the argument that customer loyalty does diffuse through the PLP, (3) loyalty towards the PLP feeds back to the first store (i.e. a specific firm/store). Understanding the loyalty diffusion mechanism within the PLP network can help marketers create effective strategies for relationship-marketing management and support deciding for the right partner with which they can share a loyalty program. Also it can help a potential partner firm in deciding whether to join the PLP network or not.

Keywords: Partnership Loyalty Program, Loyalty Diffusion, Customer Relations Management, Value, Social Exchange Theory, Mere Exposure Theory, Balance Theory

Developing Data Analytics Skills in Japan: Status and Challenge

Hiroshi Maruyama (The Institute of Statistical Mathematics)

Japan needs to develop data analytics talents quickly to catch up with the trends of using data for business decisions. The Ministry of Education, Culture, Sports, Science, and Technology started a three-year project to develop so-called data scientists. This talk reviews the findings of the first year of the project, and discuss the future challenges.

A Large-Scale Marketing Model using Dimension Reduction and Variational Bayes Inference

Tsukasa Ishigaki (Tohoku University)

In this talk, we propose a marketing model that incorporates complete consumer and product datasets, rendering it scalable to large-scale databases. Marketing models accommodating consumer heterogeneity are extended from sampled panelists to the model with entire item categories and consumers. Our study fills a gap between theoretical modeling in academics and practice demanded by direct marketing practitioners. To achieve this goal, we combine the latent variable model for dimensional reduction with a choice model for description of consumer behavior. For computational feasibility, we employ variational Bayes inference that has computational efficiency compared to the resource-intensive Markov chain Monte Carlo inference in large-scale problem. We show that the model is applicable to datasets involving tens of thousands of consumers and hundreds of product items and it is useful for targeting infrequent consumers to predict their choice. In addition, we discuss insights gained from the model that will assist marketing practitioners.

Rich Vehicle Routing Problems and Our Challenges

Akifumi Kira (Tohoku University)

The vehicle routing problem (VRP) is a combinatorial optimization problem which designs optimal delivery or collection routes from one or several depot(s) to a number of geographically scattered customers. It has been extensively studied in the field of Operations Research, transportation, and logistics. Determining the optimal solution is known to be NP-hard, but we can obtain acceptably good solutions by using local search heuristics in many practical settings. However, real-world VRPs have a wide variety of additional constraints, so it is not so easy to develop an algorithm handling these constraints. In this talk, we introduce our challenges to two rich VRPs and show our successful results. One is a case study for the vending machine replenishment. We use a road network data of Miyagi Prefecture (large-scale network) as an instance. The other is a case study for the disaster restoration scheduling of lifeline networks. We propose an indirect search method for handling precedence and synchronization constraints.