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Education

Massachusetts Institute of Technology (Cambridge, MA)
Ph.D. Management, 2021 (expected)
M.A. Management Research, 2020
with concentration in quantitative marketing
Committee: Sinan Aral and Juanjuan Zhang (co-chairs), Dean Eckles

New York University (New York, NY)
M.A. Statistics, 2015

University of International Business and Economics (Beijing, China)
B.A. Management, B.A. Economics, 2012

Research

General Interests

Topic: Digital Advertising, Targeting Interventions, Incentive Design

Method: Computer Vision, Reinforcement Learning, Natural Language Processing, Causal Inference

Working Papers

First Law of Motion: Influencer Video Advertising on Douyin
Jeremy Yang, Juanjuan Zhang and Yuhan Zhang

We develop an algorithm to predict the effect of influencer video ads on product sales. We propose the *motion* concept, which captures the pixel-level spatio-temporal interaction between content engagement and product placement in a video. We estimate content engagement as a saliency map by fine-tuning a deep 3D convolutional neural network on video-level engagement. We locate product placement by matching images of the product to each frame of the video with an object detection algorithm. Analogous to a fundamental law in Newtonian mechanics, motion (sales) is generated when the object (product placement) is impressed with a force (content engagement) in the space and time (video). We validate the algorithm with an analysis of 40,000 influencer video ads on Douyin, the Chinese version of TikTok and the largest short video platform in the world. We leverage variation in video posting time to identify the causal effect of video ads on product sales. Videos of higher motion are indeed more effective in driving sales. This effect is sizable, robust, and is more pronounced among impulsive, hedonic, and lower-price products. We trace the mechanism to influencers' incentives to optimize for engagement rather than sales. We discuss how product sellers can use motion to screen video ads pre-launch in a scalable way and also as a novel contractual lever to mitigate the agency problem for greater ROI.

Targeting for Long-Term Outcomes
Jeremy Yang, Dean Eckles, Paramveer Dhillon and Sinan Aral

Under review at ***Management Science***

Winner of the Best Paper Award at the INFORMS Annual Meeting eBusiness Section (2020/11)
Accepted for Presentation at the Quantitative Marketing and Economics (QME) Conference (2020/10)
Accepted for Presentation at the NeurIPS Conference (CausalML Workshop) (2019/12)

Decision-makers often want to target interventions (e.g., marketing campaigns) so as to maximize an outcome that is observed only in the long-term. This typically requires delaying decisions until the outcome is observed or relying on simple short-term proxies for the long-term outcome. Here we build on the statistical surrogacy and off-policy learning literature to impute the missing long-term outcomes and then approximate the optimal targeting policy on the imputed outcomes via a doubly-robust approach. We apply our approach in large-scale proactive churn management experiments at *The Boston Globe* by targeting optimal discounts to its digital subscribers to maximize their long-term revenue. We first show that conditions for validity of average treatment effect estimation with imputed outcomes are also sufficient for valid policy evaluation and optimization; furthermore, these conditions can be somewhat relaxed for policy optimization. We then validate this approach empirically by comparing it with a policy learned on the ground truth long-term outcomes and show that they are statistically indistinguishable. Our approach also outperforms a policy learned on short-term proxies for the long-term outcome. In a second field experiment, we implement the optimal targeting policy with additional randomized exploration, which allows us to update the optimal policy for each new cohort of customers to account for potential non-stationarity. Over three years, our approach had a net-positive revenue impact in the range of $4-5 million compared to *The Boston Globe*'s current policies.

Award no longer Motivates once you are Awarded: A Field Experiment in Online Learning
Fan Bi, Qiang Feng and Jeremy Yang

This paper studies the effect of social recognition and symbolic award on students' effort and performance in an online English course in China. Students are randomly assigned to classes, study the materials and take quizzes on a daily basis. We conduct a two stage randomized experiment in which we first randomly assign classes to two treatment groups (pre-announced private or public award given out every week) and a control group, then within each treated class we randomly assign some students to actually receive the award conditional on their performance in the past week. We find that students who received the award exert *less* effort in the future compared to students with similar past performance but did not receive the award due to randomization. They also do not exert more effort in the future than students with similar past performance in the control group. Students who did not receive the award due to randomization exert more effort and score higher in the future compared to students with similar past performance in the control group. There is no difference between public and private recognition. Taken together, our results suggest that it is the possibility of being awarded (ex ante) that increases future effort and performance, receiving the award (ex post) actually lowers future effort. In other words, symbolic awards do not have a continuing motivating effect after you are awarded.

Uncertainty and Information Diffusion
T. Tony Ke and Jeremy Yang

We investigate how uncertainty affects information diffusion. We analyze a dataset that contains over 2400 rumors about 5 breaking news on Twitter from 2014-2015 where rumors are verified to be true or false at different time. We exploit the difference in the timing of verification to estimate the causal effect of uncertainty reduction on diffusion via difference-in-differences. We find that for some events the verification *decreases* diffusion even for rumors that are true. This motivates a microfounded social learning model on the network that highlights the mechanism through which uncertainty shapes individual's incentive to share and thereby changing the pattern of diffusion.

Selected Publications

Interdependence and the Cost of Uncoordinated Responses to COVID-19
David Holtz, Michael Zhao, Seth G. Benzell, Cathy Y. Cao, M. Amin Rahimiana, Jeremy Yang, Jennifer Allen, Avinash Collis, Alex Moehring, Tara Sowrirajan, Dipayan Ghosha, Yunhao Zhang, Paramveer S. Dhillon, Christos Nicolaides, Dean Eckles and Sinan Aral

Proceedings of the National Academy of Sciences (2020)

Social distancing is the core policy response to COVID-19. But as federal, state and local governments begin opening businesses and relaxing shelter-in-place orders worldwide, we lack quantitative evidence on how policies in one region affect mobility and social distancing in other regions and the consequences of uncoordinated regional policies adopted in the presence of such spillovers. We therefore combined daily, county-level data on shelter-in-place and business closure policies with movement data from over 27 million mobile devices, social network connections among over 220 million of Facebook users, daily temperature and precipitation data from 62,000 weather stations and county-level census data on population demographics to estimate the geographic and social network spillovers created by regional policies across the United States. Our analysis showed the contact patterns of people in a given region are significantly influenced by the policies and behaviors of people in other, sometimes distant, regions. When just one third of a state's social and geographic peer states adopt shelter in place policies, it creates a reduction in mobility equal to the state's own policy decisions. These spillovers are mediated by peer travel and distancing behaviors in those states. A simple analytical model calibrated with our empirical estimates demonstrated that the "loss from anarchy" in uncoordinated state policies is increasing in the number of non-cooperating states and the size of social and geographic spillovers. These results suggest a substantial cost of uncoordinated government responses to COVID-19 when people, ideas, and media move across borders.

Selected Work in Progress

Sequential Paywall Design with Reinforcement Learning

Creative Decay: Predicting Advertisement Half-Life

Activation: The Change of User Intention on TikTok

What Happens to Attribution and Targeting without Apple IDFA