Jeremy Z Yang

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Education

Massachusetts Institute of Technology (Cambridge, MA)
Ph.D. Management, 2021 (expected)
M.A. Management Research, 2020
Committee: Juanjuan Zhang and Sinan Aral (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: Content Strategy, Creator Economy, Algorithmic Products, MarTech

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

Working Papers

First Law of Motion: Influencer Video Advertising on TikTok (Job Market Paper)
Jeremy Yang, Juanjuan Zhang and Yuhan Zhang

This paper develops an algorithm to predict the effect of influencer video advertising on product sales. We propose the concept of *motion*, a summary statistic that captures the extent to which a product is advertised in the most engaging parts of a video. We locate product placement with an object detection algorithm, and estimate pixel-level engagement as a saliency map by fine-tuning a deep 3D convolutional neural network on video-level engagement data. Motion is then defined as the pixel-level, engagement-weighted advertising intensity of a video. We validate the algorithm with nearly 40,000 influencer video ads on TikTok, 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 indeed lift more sales. This effect is sizable, robust, and more pronounced among impulsive, hedonic, and lower-price products. We trace the mechanism to influencers' incentives to promote themselves rather than the product. We discuss how various stakeholders in entertainment commerce can use the motion metric in a scalable way to optimize content, align incentives, and improve efficiency.

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

[Paper] [Slides] [Talk] [Lecture] [Tweet] [Media]

Minor revision at *Management Science*

Winner of the Best Paper Award at the INFORMS Annual Meeting (eBusiness Section) (2020/11)
Nominated for the Best Student Paper Award at WISE (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 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. 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 the 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.

Identification and Bias-Amplification:
Latent Space Approach to Social Contagion on Observational Networks
Jeremy Yang

Social contagion or peer effect is hard to identify empirically using observational networks due to endogeneity in tie formation. The latent space models have been proposed under the assumption of assortative mixing as a method of modeling the underlying tie generating process and adjusting for unobserved homophily. However, Pearl (2009, 2010) suggested that adjusting for one observed confounder might actually increase the net bias by amplifying the bias introduced by an unobserved confounder. I use latent space models to estimate social contagion from a classic dataset on the diffusion of medical innovation (Coleman et al., 1957, 1966). Then, I extend Pearl's framework to a nonlinear system and use simulation to demonstrate that latent space adjustment can sometimes amplify the net bias, and it should therefore be used with caution.

Uncertainty and Information Diffusion
T. Tony Ke and Jeremy Yang

We analyze a dataset that contains over 2400 rumors on Twitter that are verified to be true or false at different time. We find that for some events the verification *decreases* diffusion even for rumors that are true. We build a social learning model on network to investigate how uncertainty shapes individuals' incentive to share and thereby offer a potential explanation to why rumors might diffuse more than true news even when the substance is held fixed.

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. 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.

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.

How Do Successful Scholars Get their Best Research Ideas? An Exploration
Cathy Cao, Xinyu Cao, Matthew Cashman, Madhav Kumar, Artem Timoshenko, Jeremy Yang, Shuyi Yu, Jerry Zhang, Yuting Zhu and Birger Wernerfelt
Marketing Letters (2019)

We interview 24 marketing professors to ask how they got the ideas for 64 of their papers. More than three quarters of the papers were inspired by holes in the literature, by a "stylized fact" that the current literature cannot explain, or by an interaction with a manager. The rest fall into several smaller categories that to a large extent can be seen as special cases of the three big ones. We describe how papers from each of the three big categories help move the literature forward. We also illustrate the range of situations contained in each category by way of several examples.

Selected Work in Progress

Sequential Paywall Design with Reinforcement Learning

Attribution and Targeting without Apple IDFA

The Shape of Humor

Conference and Seminar Presentations

First Law of Motion: Influencer Video Advertising on TikTok

Marketing Innovation (MBA Core) Guest Lecture (MIT, 2021/5)

Marketing Seminar (Peking University, 2021/3)

Global Center For Big Data in Mobile Analytics (Temple, 2020/12)

Conference on AI/ML (NYU, CMU & Temple, 2020/12)

Human Cooperation Lab (MIT, 2020/11)

Conference on Digital Experimentation (MIT, 2020/11)

Marketing Seminar (MIT, 2020/11)

Marketing Innovation (MBA Core) Guest Lecture (MIT, 2020/11)

Harvard Business School Digital Doctoral Workshop (Harvard, 2020/11)

PhD Seminar (MIT, 2020/5)

Targeting for Long-Term Outcomes

American Economic Association Annual Meeting (Virtual, 2021/1)

Workshop on Information Systems and Economics (Virtual, 2020/12)

Inference and Statistics Reading Group (Lyft, 2020/12)

INFORMS Annual Meeting (Virtual, 2020/11)

Analytics Lab Guest Lecture (MIT, 2020/11)

Quantitative Marketing and Economics (Stanford & UCLA, 2020/10)*

International Conference on Computational Social Science (MIT, 2020/7)

Initiative on the Digital Economy Annual Conference (MIT, 2020/5)

Marketing Seminar (MIT, 2020/5)

NeurIPS CausalML Workshop (Vancouver Convention Center, 2019/12)

Harvard Business School Digital Doctoral Workshop (Harvard, 2019/12)

Conference on Digital Experimentation (MIT, 2019/11)

Advances on Field Experiments (University of Chicago, 2019/7)

INFORMS Marketing Science (University of Roma Tre, 2019/6)*

Award No Longer Motivates Once You Are Awarded: A Field Experiment in Online Learning

PhD Seminar (MIT, 2020/10)

Organizational Economics Lunch (MIT, 2020/10)

Uncertainty and Information Diffusion

Marketing Seminar (MIT, 2017/11)

* Presented by co-author

Teaching

Guest Lecturer

> **Marketing Innovation** (MBA Core)
> - Rahul Bhui, Spring 2021

> **Analytics Lab** (Master of Business Analytics)
> - Sinan Aral and Abdullah Almaatouq, Fall 2020

> **Marketing Innovation** (MBA Core)
> - Juanjuan Zhang, Fall 2020

Teaching Assistant

> **Experimental Design and Analysis** (PhD)
> - Dean Eckles, Fall 2019

> **Analytics Lab** (Master of Business Analytics)
> - Erik Brynjolfsson and Abdullah Almaatouq, Summer and Fall 2019

> **Data, Model and Decision** (MBA)
> - David Gamarnik, Summer 2018, 2019

> **Marketing Strategy** (MBA)
> - Birger Wernerfelt, Fall 2018

> **Singularity** (MBA)
> - John Little, Fall 2018

> **Macroeconomic Policy** (MBA)
> - Roberto Rigobon, Summer 2018

> **Managing Technological Innovation and Entrepreneurship** (MBA)
> - Catherine Tucker and Pierre Azoulay, Summer 2018

> **Digital Marketing** (MBA)
> - Sinan Aral, Fall 2017

Honors and Awards

Winner of American Statistical Association Best Dissertation Proposal (Marketing Section) (2021)

Winner of INFORMS Annual Meeting Best Paper Award (eBusiness Section) (2020)

Finalist of WISE Best Student Paper Award (2020)

NBER Digital Tutorial Fellow (2020, 2021)

AMA-Sheth Foundation Doctoral Consortium Fellow (2020)

INFORMS Marketing Science Doctoral Consortium Fellow (2016, 2020)

MIT Graduate Fellowship (2015-2021)

First Prize of National Biology Olympiad in Hubei Province, China (2008)

Hobbies

Sports Analytics, Tennis, Stand-up Comedy, Video and Board Games, Singing

References

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