WEI ZHANG
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EDUCATION

Ph.D. in EECS, Massachusetts Institute of Technology (MIT) September 2021 - present
Institute for Interdisciplinary Information Sciences, Tsinghua August 2017 - June 2021

RESEARCH

Leveraging The Hints: Adaptive Bidding in Repeated First-Price Auctions
(NIPS 2022 Spotlight)

With the advent and increasing consolidation of e-commerce, digital advertising has very recently replaced traditional advertising as the main marketing force in the economy. In the past four years, a particularly important development in the digital advertising industry is the shift from second-price auctions to first-price auctions for online display ads. This shift immediately motivated the intellectually challenging question of how to bid in first-price auctions, because unlike in second-price auctions, bidding one’s private value truthfully is no longer optimal. Following a series of recent works in this area, we consider a differentiated setup: we do not make any assumption about other bidders’ maximum bid (i.e. it can be adversarial over time), and instead assume that we have access to a hint that serves as a prediction of other bidders’ maximum bid, where the prediction is learned through some blackbox machine learning model. We consider two types of hints: a single point-prediction, and a hint interval (representing a type of confidence region into which others’ maximum bid falls). We establish minimax near-optimal regret bounds for both cases and highlight the quantitatively different behavior between them. We also provide improved regret bounds when the others’ maximum bid exhibits the further structure of sparsity. Finally, we complement the theoretical results with demonstrations using real bidding data.

MEOW: A Space-Efficient Nonparametric Bid Shading Algorithm
(KDD 2021)

Bid Shading has become increasingly important in Online Advertising, with a large amount of commercial. Most approaches for solving the bid shading problem involve estimating the probability of win distribution, and then maximizing surplus. These generally use parametric assumptions for the distribution, and there has been some discussion as to whether Log-Normal, Gamma, Beta, or other distributions are most effective. In this paper, we show evidence that online auctions generally diverge in interesting ways from classic distributions. In particular, real auctions generally exhibit significant structure, due to the way that humans set up campaigns and inventory floor prices. Using these insights, we present a nonparametric method for Bid Shading which enables the exploitation of this deep structure. The algorithm has low time and space complexity, and is designed to operate within the challenging millisecond Service Level Agreements of Real-Time Bid Servers. We deploy it in one of the largest Demand Side Platforms in the United States, and show that it reliably out-performs best in class Parametric benchmarks. We conclude by suggesting some ways that the best aspects of parametric and nonparametric approaches could be combined.

PROGRAMMING

C++/C/Java/Python/Verilog/Matlab

AWARDS
2021-2022, MIT Presidential Fellowship
2017-2018, Tsinghua Comprehensive Merit Scholarship
2018-2019, Scholarship from “Friends of Tsinghua” Organization
2019-2020, First Class Scholarship for Social Work in IIIS
2019-2020, Yao Award Recognition Prize
2017-2020, Scholarship of “Tsinghua Xuetang Talents Program”
2017, Excellent Evaluation for “Tsinghua Lingjun Program”
2017, National College Entrance Examination, 691 points (4th place in Harbin)
2016, Provincial Second Prize in the Chinese Mathematical Olympiad
2016, Provincial Second Prize in the Chinese Chemical Olympiad
2016, Provincial Second Prize in the Chinese Biological Olympiad
2016, First Prize in National English Competition for High School Students
2016, Excellent Student in “Talents Program” for High School Students