

How Much is Your Attention Worth? Analysis of Prices in LinkedIn Advertising Network

[Short talk]

Chaolun Xia
Rutgers University
cx28@cs.rutgers.edu

Saikat Guha
Microsoft Research, India
saikat@microsoft.com

S. Muthukrishnan
Rutgers & MS, India
muthu@cs.rutgers.edu

ABSTRACT

Online advertising is one of the pillars in the Internet industry. An online ad network allows advertisers to bid on reaching specific audience through its targeting language. Google AdWords¹, the largest online ad network for instance, allows advertisers to target audiences based on search terms, the website (publisher) that the user browses, and simple user demographics (gender, age group, location). The price is set by a second-price auction [3]. Other online ad networks, specifically that run by Facebook, LinkedIn, Twitter and other Online Social Networks (OSNs), offer much finer targeting controls.

These OSNs contain detailed information shared directly by the user. This includes detailed educational records about the user, past and present employment experience, significant life events like changes in marital status or having a baby. This helps OSNs start to be in a position to offer advertisers significantly more control in precisely targeting their audience. LinkedIn, for instance, allows advertisers to target a software engineer in Microsoft, or a user who masters C++ but works in the medical industry.

Facing a variety of user segments, advertisers need guidance to compile and tune their ad campaigns. Fortunately, Facebook [1] and LinkedIn [2] satisfy the core of advertisers' need by providing *bid suggestion* which is a function that, for any targeting condition, shows the suggested bid to win the auction and the number of users satisfying the condition. This is exciting because 1) suggested bids provide an economic view, i.e. the amount of money an advertiser has to pay to reach audience of their target, and 2) for the first time in the history of advertising, these prices are now transparent for very fine characteristics of users.

Motivated by this observation, we study the question *how much is the attention of a user worth*. We approach this problem by tapping into the bid suggestion function extensively. We present comprehensive analyses of suggested bids in LinkedIn with the following contributions.

First, we created a crawler and ran it for more than 100 days. As a result, we harvest a large dataset consisting of 188,260 suggested bids over 450 distinct targeting conditions (of 8 common attributes) from LinkedIn.

Second, we present detailed analyses of suggested bids from LinkedIn. We analyze their temporal and spatial prop-

erties, and investigate their distributions over a variety of user attributes related to career. We discover many consistent results of suggested bids from LinkedIn. They are generally stable over time. The suggested bids of 50 states in the US negatively correlate with per capita GDP and income of the states; the suggested bids of users from different industries vary a lot, and they negatively correlate with per capita GDP of the industries. The suggested bids of users with specific skills are positively correlated with the demand-to-supply ratios of the skills in the labor market in LinkedIn. We also observe that the user working for a larger company or with a higher position in the company is set with a higher suggested bid. Detailed results could be found in the working paper copy².

We also crawled suggested bids from Facebook [4], and find that the suggested bids from these two OSNs have a moderate positive correlation. Besides, we observe that users with high or low income have higher suggested bids than users with median income. To find out reasons for the bias, it is interesting to study this open question: what ads are shown to OSN users with what attributes?

Assuming that the suggested bid is the actual cost to reach a qualifying user, we study how advertisers can use these suggested bids strategically. As a future work, we formulate the targeting problem for advertisers' point of view. We show through data analysis that targeting subsets of users is a viable approach, and then we propose a greedy algorithm to help advertisers reach up to 40% more target audience.

The above targeting strategy takes advantage of the arbitrage among the costs to target different user sets. Although it benefits advertisers, it might hurt OSNs, e.g. in terms of revenue. Therefore, our another future work includes devising a revenue maximizing pricing which eliminates any potential arbitrage for the OSNs' point of view.

1. REFERENCES

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¹<https://adwords.google.com/>

²<http://paul.rutgers.edu/~cx28/papers/linkedin.pdf>