



Ad Bidding Model for a Telecom company in US

Business Problem

Our client wanted to develop a framework for competing in RTB auctions for online advertisement placement opportunities. In this engagement, our client wanted a prototype approach for determining the amount to bid on an advertisement placement opportunity, taking into account likelihood that the ad would be viewed, using website, ad placement and user information.

In order to test the solution proposal, Tiger Analytics was contracted to build a bidding model which was entered into an online competition to assess the performance. The competition provided data as well as a framework to test the framework across multiple bids. Key business metrics in order to evaluate the value of the ad slot is whether a user clicks on an ad, and whether the user accesses the ad long enough to qualify as reading the ad (conversion). The competition provided the following objective function,

Maximize the number of clicks + the number of conversions,

that was used to score the various algorithms. Each submission had the stream of 200K bids applied to it under a constrained budget, and was thus scored and ranked versus other users.

Challenge

Several datasets were provided from the competition. The largest of these datasets was approximately 53 million rows by 24 columns. The size of

this dataset limited the set of software that could be used for analysis and required some degree of sampling for modeling.

Another challenge came from the variables themselves, since nearly all of the 24 variables were categorical, and several was unstructured. The large number of parameters complicated model selection.

In addition, users rarely click on ads. The model framework needs to identify cases where a user is more likely to click on ads, even if they are still unlikely to click.

A final challenge is a constraint of both RTB and the submission contest. Since the auction occurs after a user clicks on the website that would be hosting the ads, the resulting algorithms must be very fast (<5ms), in order to run the auction and supply the ads to the website without a noticeable decrease generating the web page.

Solution

We built a framework that used four models. First, we modeled the probability that a given bid price would win an auction (impression) given various characteristics of the individual and ad opportunity. Second, we modeled the probability that an impression would be clicked by a user. Third, we modeled the probability that a clicked ad would result in an impression. These models were combined into a weighting factor. Finally, we determined a price level, multiplied by the weighting factor for a given auction request, that would optimize the number of clicks and impressions subject to the number of bids and a fixed budget.



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Due to the large dataset size, we used Revolution R to import, process, sample and model the data. The results of the models were converted to a Python class for the submission in the contest. We used a variety of statistical methods to select the number of variables, and to limit the number of categorical levels within each variable.

Impact

In a short time period, we developed a bid model that was specific to the problem and showed considerable lift across all phases, from impression to conversion. The framework was submitted, scored, and met the clients acceptance criteria.

About Tiger Analytics

We are an advanced analytics consulting firm. We combine our quantitative modeling expertise with deep understanding of business needs and state-of-the-art technologies to solve complex problems.

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