On the causality of advertising

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AdKDD'19
Advertisers (incl. 1000+ Brands)

20,000

Countries

95+
<table>
<thead>
<tr>
<th>Marketing Goals</th>
<th>Awareness</th>
<th>Consideration</th>
<th>Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Generate interest in your products or services</td>
<td>Get people to consider your products or services</td>
<td>Encourage interested people to purchase</td>
</tr>
<tr>
<td>Ad Objectives</td>
<td>Brand Awareness</td>
<td>Traffic: Web, App</td>
<td>Conversion: Web, App</td>
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<td></td>
<td>Video Views</td>
<td>App Installs</td>
<td>Store Conversions</td>
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<tr>
<td>Optimization</td>
<td>Reach</td>
<td>Visits</td>
<td>Purchase (Conversions)</td>
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<tr>
<td></td>
<td>Views</td>
<td>Installs</td>
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</tbody>
</table>
Demand side: Advertisers

• Integration
• Set a bid (CPC, CPA) and/or a budget
• Set an objective (views, clicks, conversions, … )

Supply side: Ad exchanges

• Criteo Integrates with SSPs
• We participate in real time on a CPM basis
Demand side: Advertisers

- “Second price” property: higher CPA $\rightarrow$ higher payment $\rightarrow$ higher volume

Supply side: Ad exchanges

- Second price auctions (with/without reserve prices, dynamic floors, etc.)
- First price auctions
- Header bidding (multiple sub-auctions resolved by a single “meta-auction”)
- ...
• bid $\propto$ CPA * $P(A|\text{Display, User, Context info})$

• We show and track ads
Budget management

Budget allocation
Align marginal ROIs

How many Actions?
What is the revenue of the Ad campaign?
What should we predict?
Advertiser’s dashboard

- # users
- # visits
- # conversions
- # actions

Organic

Marketing channel X: Budget X$

Marketing channel Y: Budget Y$
The attribution problem

# users
# visits
# conversions
# actions

Attribution algorithm

Organic

Marketing channel X: Budget X$

Marketing channel Y: Budget Y$

users
visits
conversions
actions
users
visits
conversions
actions
users
visits
conversions
actions
Advertisers’ attribution models – rule based

Other rules, based on

- Position (i.e. first and last clicks get 40% each, the rest is uniform)
- Matching to other events (e.g. add to cart)
Advertisers’ attribution models – algorithmic

- Incremental value effect
  - Probability of conversion as a function of ad exposure
  - Use the model to compute incremental value of each ad.

- Game theory
  - Shapley values (assign credit to individual channels who cooperate to generate a conversion)
  - Multiple payment schemes proposed

What are the models for an attribution-aware bidder?

Advertiser's dashboard

# users

# visits

# conversions

# actions

Organic

Marketing channel X: Budget X$

Marketing channel Y: Budget Y$
Use a control population!

- # users
- # visits
- # conversions
- # actions

Control population for:

- Organic
- Marketing channel X: Budget X$
- Marketing channel Y: Budget Y$

Control 20% ignore first days
Incrementality testing for a DSP

- It is client-wise
- Test users get the normal treatment
- For a Control user, every time we would show an ad for the client under iABT
  - We log all information
  - We participate with another client
Exposed Users who had seen an ad vs users who would have seen an ad (for a specific client)

It is a counterfactual measurement.

\[
\text{Uplift} = \frac{\text{Sales}_{\text{Test}} - \text{Sales}_{\text{Control}}}{\text{Sales}_{\text{Control}}}
\]

Computed on exposed population (!?!)
**Uplift measurement – Intent to treat**

**Intent to treat** We consider all users which could have been treated (e.g. all retargetable users)

\[
\text{Uplift} = \frac{\text{Sales}_{\text{Test}} - \text{Sales}_{\text{Control}}}{\text{Sales}_{\text{Control}}}
\]

*Computed on retargetable users*
**Uplift measurement – Ghost population**

**Ghost population** subset of users that we see on ad exchanges, for which we participate (or would participate) for that client

\[
\text{Uplift} = \frac{\text{Sales}_{\text{Test}} - \text{Sales}_{\text{Control}}}{\text{Sales}_{\text{Control}}}
\]

Computed on ghost population
Approximating control-exposed

**Predicted “Ghost” Ads:** use simulated auctions on the ad exchange.

Use it both on test and control to predict exposed users.

“**Ghost**” exposed: assume sales in Ghost not exposed are the same in Test and Control.
Beware of filters!

The bidder changes the status of users

The probability that we participate for a client in iABT is not the same between test and control
Work with clients

Transparency
• Share raw data
• All experiences and measurement must be reproducible by both

Interpretability
• Who are the incremental buyers?
• Where do I generate a new sale?
• How effective is web inventory wrt app inventory?
Budget management - bis

- iABT are expensive
- iROI very noisy
  - Measure average iROI is ok
  - Measuring marginal iROI much more challenging
- Measurement is challenging for small advertisers
How does an incremental attribution system look like?


Thank you