

Machine Learning for Advertiser Engagement

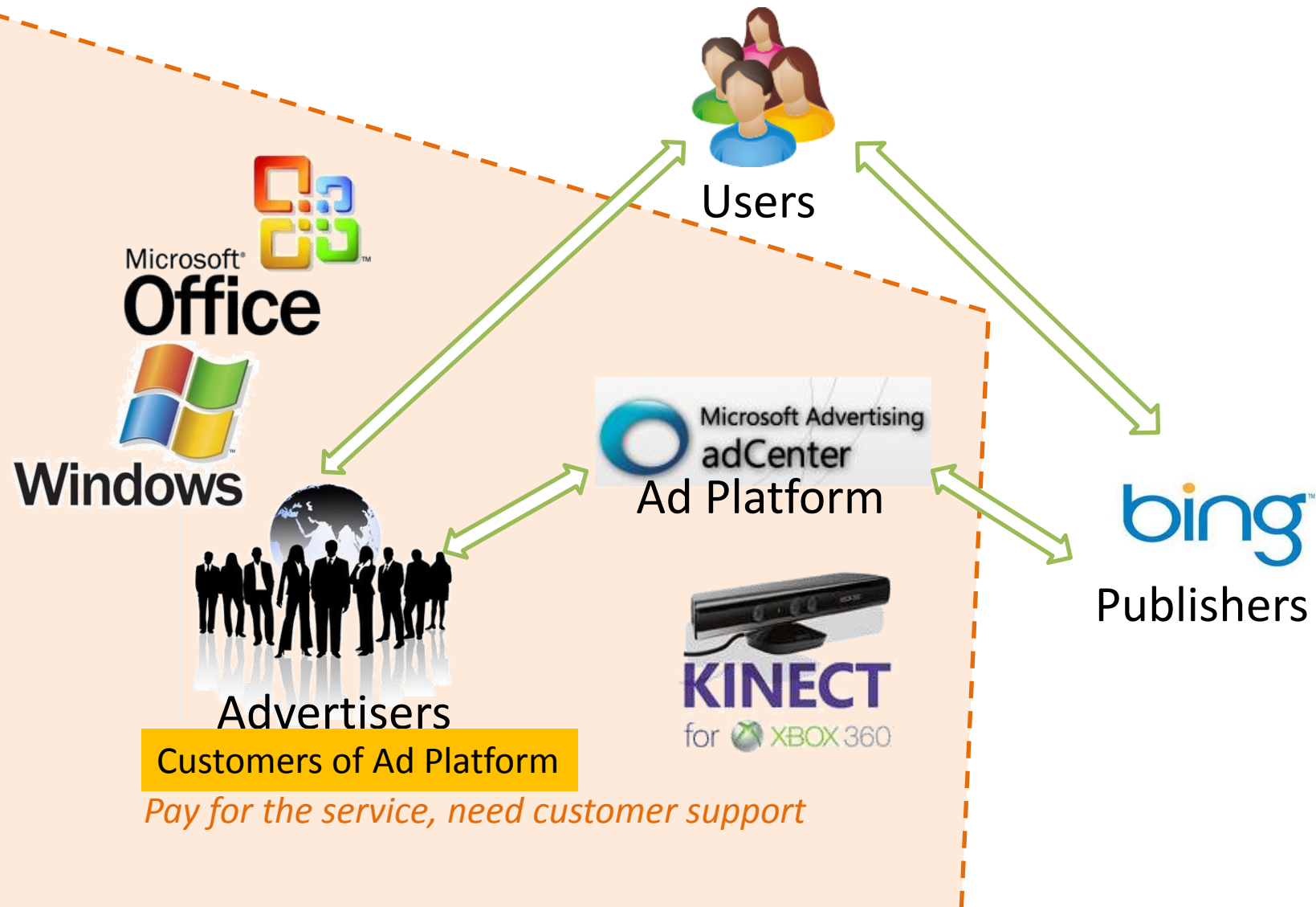
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Eco-system in Online Advertising



Pain Points: Don't Know Why

<input type="checkbox"/>	Keywords	Status	Match type	Current bid (max. CPC)	Clicks	Impressions	CTR (%)	Conversions
<input checked="" type="checkbox"/>	MLOAD	Active	Exact	0.05	0	0	0.00	0
<input type="checkbox"/>	MLOAD	Active	Content	0.05	0	0	0.00	0
<input checked="" type="checkbox"/>	MLOAD 2010	Active	Exact	0.15	0	0	0.00	0
<input type="checkbox"/>	MLOAD 2010	Active	Content	0.05	0	0	0.00	0
<input checked="" type="checkbox"/>	online advertising	Active	Exact	0.05	0	0	0.00	0
<input type="checkbox"/>	online advertising	Active	Content	0.05	0	0	0.00	0

No impression

Low conversion rate

Low CTR

Pain Points: Don't Know How

Edit text ad

Ad title:

25 characters maximum

[Insert dynamic text](#)

Ad text:

70 characters maximum

[Insert dynamic text](#)

Display URL:

The URL shown in your ad.

35 characters maximum

[Insert dynamic text](#)

Destination URL:

The webpage that customers go to when they click your ad.

http:// https:// Keyword destination URL

1017 characters maximum

[Insert dynamic text](#)

Text ad preview:

MLOAD 2010
NIPS 2010 workshop: Machine Learning in Online Advertising
microsoft.com/~mload-2010

Line breaks and ad size will vary depending upon the ad's position on the webpage and the viewer's browser settings.

Learn how to [customize your ad using dynamic text.](#)

Save

Save and create another

Cancel

<input type="checkbox"/>	Keywords	Status	Match type	Current bid (max. CPC)
<input type="checkbox"/>	MLOAD	Active	Exact	0.05
<input type="checkbox"/>	MLOAD	Active	Content	0.05
<input checked="" type="checkbox"/>	MLOAD 2010	Active	Exact	0.15
<input type="checkbox"/>	MLOAD 2010	Active	Content	0.05
<input checked="" type="checkbox"/>	online advertising	Active	Exact	0.05
<input type="checkbox"/>	online advertising	Active	Content	0.05

Advertiser Engagement (AE)

- Provide a set of tools or functions to help advertisers address their pain points
- If we can do it
 - Improve advertiser satisfaction and campaign performance
 - Attract more advertisers
 - Raise ad platform revenue
- Otherwise
 - Damage campaign performance
 - Cause advertiser defection
 - Hurt ad platform revenue

Machine Learning for AE

- Machine learning techniques can help
 - Ad platform is very complicated
 - We have a huge volume of data

Diagnosis

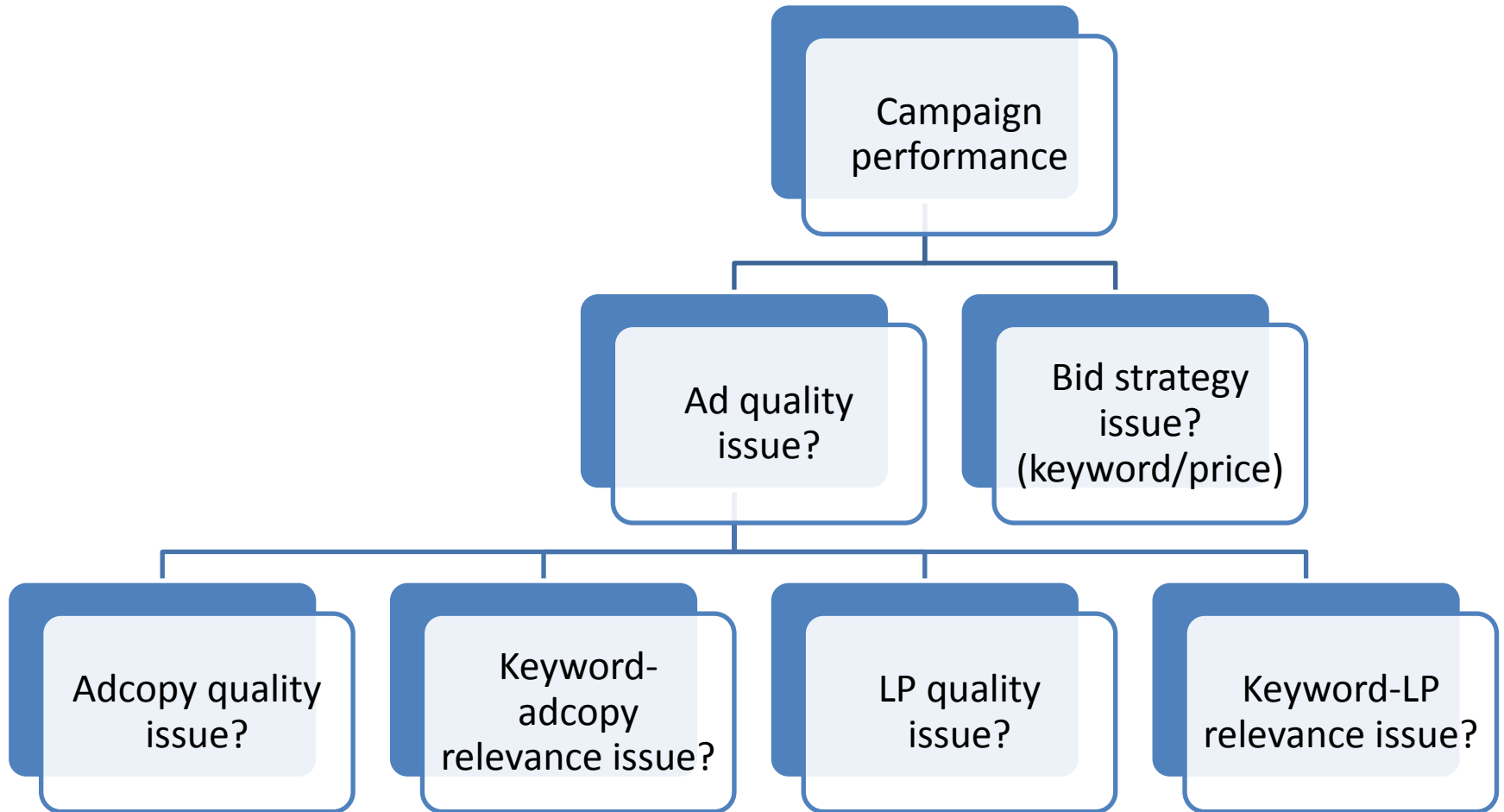
- Help advertisers know why

Improvement

- Help advertisers know how

HOW TO DIAGNOSE

Stagewise Diagnosis



Diagnose Ad Quality Issues: Formulation (1)

- Multi-class classification
- Data: $\{(X,Y)\}$
 - X: features to represent a keyword-ad pair
 - Y: 1, adcopy quality issue;
 - 2, keyword-adcopy relevance issue;
 - 3, LP quality issue;
 - 4, keyword-LP relevance issue

Diagnose Ad Quality Issues: Formulation (2)

- Causality inference
- Basic idea
 - Build a causality graph to represent the dependence
 - Learn the parameters of the causality graph using training data
 - Inference the hidden sub quality issues for new ads

Improve ad quality

Improve bid strategy

HOW TO IMPROVE

Optimize Ads Quality

- Example: how to optimize ad copy
- Formulate as a machine learning problem

$$x \Rightarrow x'$$

Similarity between original ad and new ad

$$\max_{x'} U(x') + S(x, x') + N(x')$$

Quality of new ad

Likelihood of new ad

Improve Bid Strategy

- Bid strategy
 - Determine the set of keywords to bid
 - Determine the bid prices for those keywords
- Find optimal bid strategies to fulfill a certain campaign goal
 - Given budget, maximize click number
 - Given expected click number, minimize cost

Improve Bid Strategy: Goal 1

Maximize
click number

$$\max_b \sum_j v_j \alpha_{1,j} c_{1,j}$$

...

$$\max_b \sum_j v_j \alpha_{n,j} c_{n,j}$$

$$S. t. \sum_j v_j \alpha_{i,j} c_{i,j} \beta_{i,j} \leq B_i, \forall i$$
$$(\alpha, \beta) = A(b)$$

Budget
constraint

Improve Bid Strategy: Goal 2

Minimize
cost

$$\min_b \sum_j v_j \alpha_{1,j} c_{1,j} \beta_{1,j}$$

...

$$\min_b \sum_j v_j \alpha_{n,j} c_{n,j} \beta_{n,j}$$

S. t. $\sum_j v_j \alpha_{i,j} c_{i,j} = C_i, \forall i$ Campaign goal

$$(\alpha, \beta) = A(b)$$

Summary

- Advertiser engagement (AE) is very important for online advertising
- Many AE tasks can be solved by machine learning techniques
- Machine learning for AE: a very promising direction
 - Auction mechanism design for AE (David Parkes' talk)
 - Optimizing landing page
 - Campaign/account level bid strategy optimization
 - ...

Acknowledgement

- Thanks to my colleagues
 - Tie-Yan Liu
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Thanks

We are hiring!

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