



Bidding Strategy in Google Product Listing Ads

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The Data Science Conference 2017

Google Product Listing Ads (PLA)

SEM

GOOGLE


razor e300 electric 24v motorized scooter

All Shopping Videos Images News More Settings Tools


About 82,100 results (0.54 seconds)

Shop for razor e300 electric 24v m... on Google Sponsored ⓘ


PLA




Razor™ E300
Electric Scooter
\$192.85
Kmart
Free shipping




Razor E300
Electric ...
\$207.99
Office Depot
★★★★★ (1k+)



Razor E300S
Electric-...
\$199.00
Walmart
Special offer



Razor E300S
Electric ...
\$239.99
Toys R Us
★★★★★ (99)



Razor E300
Electric 24v ...
\$159.95
eBay
Free shipping

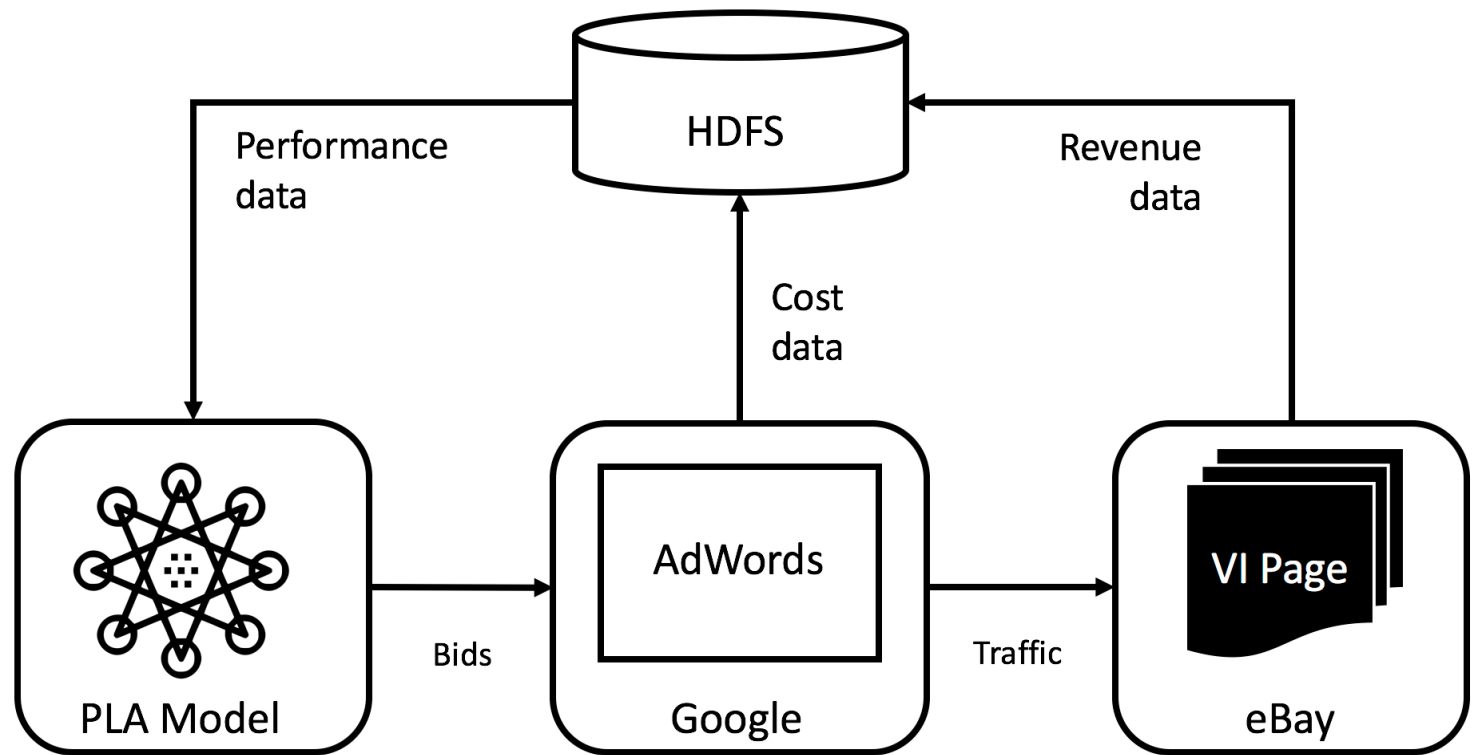
Text Ads

Razor E300 Electric Scooters
Ad www.target.com/Toys ▼
Find Razor E300 Electric Scooters Today. Shop Online & Save at Target.com.
5% Off W/ REDcard · Free Shipping \$35+ · Same Day Store Pick-Up
Top Toys · Pedal Riding Toys · Characters & Brands · Free In-Store Pick-Up · Electric Riding Toys
📍 Bellevue, WA - (425) 562-0830 - Open today · 7:00 AM – 11:00 PM ▼

SEO

Razor E300S Sit or Stand Electric Scooter for EcoSmart Teens & Adults
<https://www.razor.com/products/electric-scooters/e300/> ▼
Built with a larger deck, frame and tires for teens and adult riders, the E300S is as ... and adult riders, the E300 is one of Razor's fastest electric scooter – traveling up to ... 24V (two 12V) sealed lead acid rechargeable battery system; Battery charger ... and frame; High torque, chain driven motor; Twist-grip acceleration control ...

PLA Workflow



Problem Statement

Razor E300 Electric 24V Motorized Scooter - Grey

Shop for Razor E300 Electric 24V... on Google

Product	Price	Store
Razor E300 Electric 24V ...	\$269.00	Walmart
Razor E300 Electric ...	\$209.99	Toys R Us
Razor E300S Seated ...	\$208.70	Walmart
Razor™ Razor E300 Electric ...	\$261.00	Sears
Razor E300S Electric ...	\$302.99	Walmart
Razor E300S Seated ...	\$195.95	eBay

eBay

Razor E300S Seated Electric 24V Motorized Scooter

\$195.95

Buy It Now

Thank you! Your order has been placed.

You will receive an email confirmation shortly.

Estimated delivery: Between Tuesday, Nov. 13 and Thursday, Nov. 15

Your order is covered by eBay Buyer Protection. Learn more.

What do you want to do next?

- View your order details
- Go to My eBay
- Go to eBay's homepage

eBay pays Google when a user clicks an ad

eBay makes money **ONLY** when a user buys the item

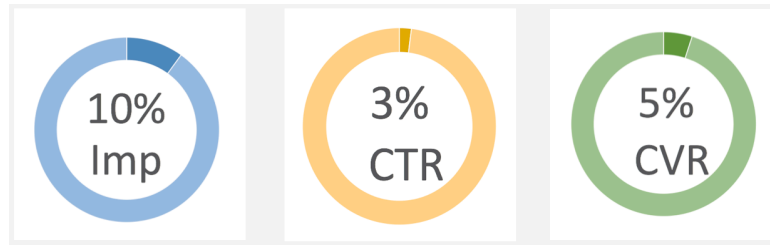
Given a fixed budget, what bid value should be placed on each item so that the total incremental GMB is maximized?

- Over-bidding leads to higher advertising costs => loss of profit
- Under-bidding leads to poor or no ad position => loss of revenue

* iGMB: incremental GMB = direct GMB + CAV (Customer Acquisition Value)

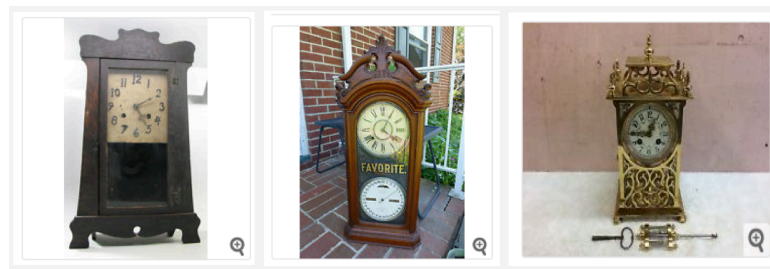
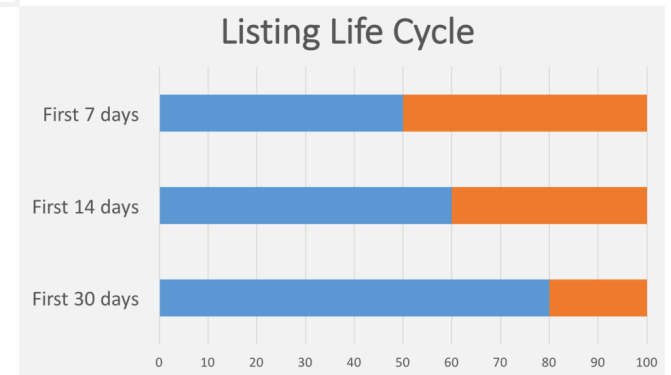
* NoRBs: New or Reactivated Buyers

Challenge:
Data
Sparsity



Limited Historical Data

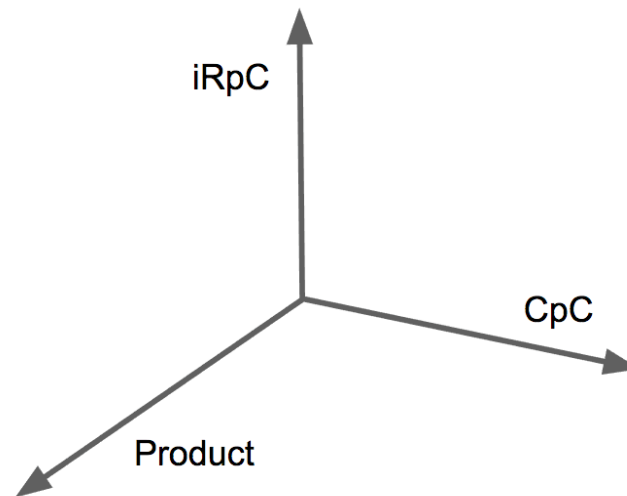
Short Life Cycle



Semi-Structured Data

Grouping
Model:
Item Segmentation

Cluster similar items into Item Group (IG)

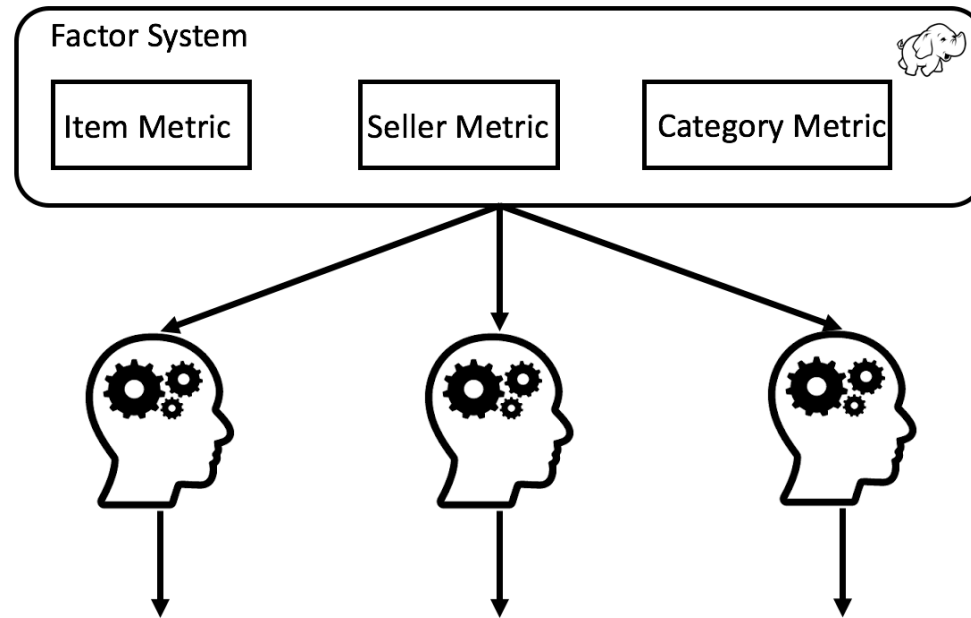


Fisher-Jenks Algorithm:

- Reduce the variance within classes
- Maximize the variance between classes

Grouping
Model:
iRpC Estimation

Estimate Incremental Revenue per Click (iRpC)



$$iRpC = (CVR * Price + CVR_{New} * iCAV_{New} + CVR_{React} * iCAV_{React}) * Take Rate$$

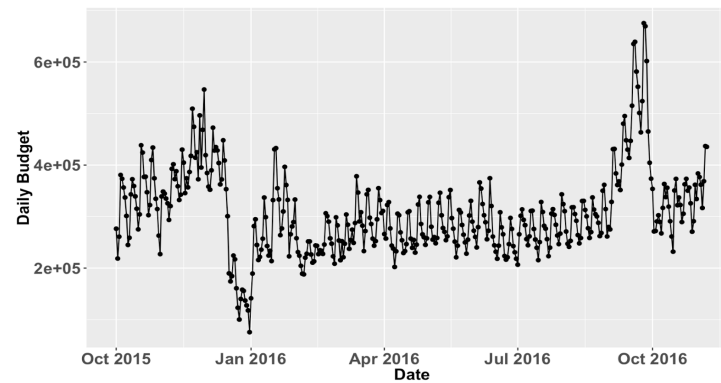
* We train Gradient Boosted Trees (XGBoost) on 100M clicks and use Platt scaling to calibrate the predicted item conversion rate, segmented by vertical and price bucket.

Challenge:
Dynamic
Environment



Competition

Change in Demand



Budget Management



Generalized Second Price (GSP) Auction

Search Engine runs GSP to sell ad slots to advertisers

- Advertisers submit bids for their ads.
- Search Engine scores and ranks all the ads based on item score.
- Top K ads win the corresponding K slots in SRP.
- Each winning ad pays the minimum amount to secure its slot.

Advertiser		Quality (CTR X Rel)	Bid		Item Score (Quality X Bid)	Rank		Pay
Target		0.05	\$1.0		0.05	3		\$0.0
Walmart		1.0	\$2.0		2.0	1		\$1.6
eBay		0.1	\$1.5		0.15	2		\$1.1
Kmart		0.1	\$0.3		0.03	4		\$0.0

Truthful Bidding

Truthful bidding: bid one's true valuation per click.

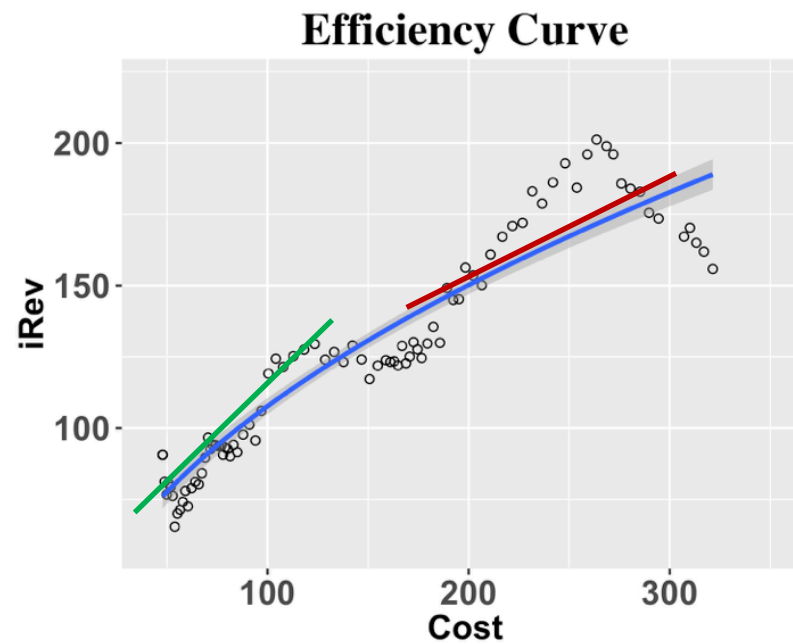
Truthful bidding is suboptimal in repeated GSP auctions.

	eBay	Walmart	Target	Ad Slot	CTR	Pay	Profit	Utility
True Valuation	¢70	¢60	¢10					
Strategy A (Truthful)	¢70	¢60	¢10	1st	0.05	¢61	¢9	0.45
Strategy B (Non-Truthful)	¢50	¢60	¢10	2nd	0.02	¢11	¢59	1.18

Efficiency Curve

Efficiency Curve (EC):

A graph plotting the iRev (R) as a function of the Cost (C).



Marginal ROI (mROI): the gradient of a given point on the EC, indicating the amount of revenue per extra dollar spent.

Bidding Model

Idea: Invest the additional dollar on the Item Group where the marginal ROI is the highest.

Estimate the efficiency curve for each Item Group.

$$R_i = f_i(C_i)$$

Allocate budget to each item groups with the following optimization.

$$\max_{C_i} \sum_i^M R_i \quad S.T. \quad \left| \sum_i^M C_i - Budget \right| \leq \epsilon$$