

# More Ads, Happier Shoppers: Unified-Valuation Ad Allocation at Scale

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# Introduction and Contributions

- **Business context:** Wayfair is an e-commerce website, sell furniture
- **Goal:** Optimize ad footprint (# of ad product shown per search page)
  - Key tension: a retailer wants more footprint & ad revenue, shoppers want more relevance
  - Well know problem: Google's ad fatigue (2015), LinkedIn's common currency feed (2020)
- **Contributions**
  - ① Unified sponsored & organic valuation joins ad revenue, CVR, and VCD (product profit)
  - ② E-commerce guardrails (max ad block, required organic spacing, and pCVR floor)
  - ③ Production-ready in weeks: near-optimal greedy merge + keyword cache
  - ④ Large-scale evidence that larger footprint can raise profit *and* CVR

# Methodology: Ranking & Guardrails

## Common currency values

$$u^a = \text{AdRev} + \text{pCVR}^a(\lambda + \text{VCD}^a),$$

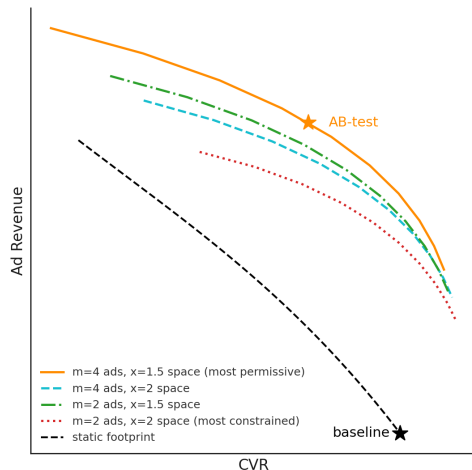
$$u^o = \text{pCVR}^o(\lambda + \text{VCD}^o)$$

## Objective with guardrails

$$\max \sum_{i=1}^N u_i \quad \text{s.t.} \quad \begin{cases} \sum \text{pCVR} \geq C & [\lambda] \\ \max \text{ ad run} \leq m \\ \text{organic spacing} \geq x \end{cases}$$

## Simplifications for implementation

- Greedy merge gives  $\geq 99\%$  of optimality
- Keyword cache recovers  $\approx 98\%$  of real time ad revenue with  $< 1\%$  CVR loss



AdRev-CVR trade-off; orange dot = deployed  $\lambda, m, x$

# Six Week A/B on Wayfair US Search

- 1/3 Control (static 6 ads), 1/3 Batch-VCD, 1/3 Batch-NoVCD
- Lifts vs. static baseline (bold =  $p < 0.05$ )
  - Version without VCD term performed better
  - Happier shoppers: CVR and gross revenue improved
  - Long-term gains in CVR and gross revenue (projected based on Athey 2024)

	Batch-VCD	Batch-NoVCD
<i>Panel A: Advertising Metrics</i>		
Ad revenue	<b>28.3</b>	<b>35.0</b>
Avg. footprint lift	<b>78.3</b>	<b>81.7</b>
<i>Panel B: Advertising + Organic Metrics</i>		
CVR	- 0.7	<b>1.0</b>
VCD	1.2	<b>2.7</b>
Gross revenue	0.4	<b>2.6</b>

- Low latency real time footprints to improve coverage for new keywords
- Make VCD term work by improving inputs' accuracy
- Extend from grids (current work) to carousels

**Thank you!**