



NORTH AMERICA | San Francisco 2024



**You've deployed user behavior insights to understand
your users.**

Now what?



**Eric
Pugh**

OpenSource Connections
Maintainer in OpenSearch
Search Quality Expert

Loves wood working and Danish modern furniture!



**Stavros
Macrakis**

OpenSearch @ Amazon
Maintainer in OpenSearch
Search Quality Expert

Loves to cook and eat!



**Aruna
Govindaraju**

Amazon
OpenSearch Specialist
Search Quality Expert

Loves to Hike !

Search is strategic

Search is strategic



**And yet it never seems
to work right**



wantdo Women's Hooded Winter
Coat Waterproof Warm Long Puffer..

And yet it never seems to work right

All jacket for warm weather

**And yet it never seems
to work right**

Search is strategic

Why is it hard?

- Embedded search within a document
- Company search within email
- Person search within email
- Applications
- Document search and recommendations (heavy on text)
- Academic documents for PhD researchers
- News for general public, for journalist
- Intranet, highly heterogeneous, inconsistent formats
- Knowledge management for researchers, for sales people, for application engineers
- Legal and regulatory, both high precision (relevant regulation) and high-recall (discovery)
- FAQs, call centers, troubleshooting (heavy on structured data)
- Looking for items, not documents (heavy on structured data)
- E-commerce search and recommendations. Looking for a thing to buy
- Anonymized from plumbing parts to real estate to yoga lessons
- Medical records, for hedge fund managers
- Job search, for time availability
- Expert search, for time availability
- Restaurant reviews, for similarity, from

VARIED USE CASES

VARIED DATASETS

VARIED USERS

One size Doesn't fit all

How can you fix it?

What search needs

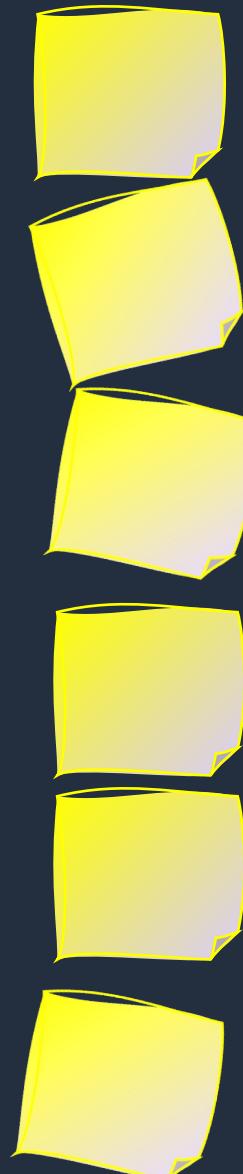
Conference survey

- Understand application data
- Talk to users and sponsors
- Regression testing
- Performance testing
- Log search actions
- Multilingual coverage
- Evaluate quality of results
- Privacy

What search needs

Conference survey

- Talk to users and sponsors
- Privacy
- Understand application data
- Evaluate quality of results
- Log search actions
- Performance testing
- Regression testing
- Multilingual coverage



Sort by gaps

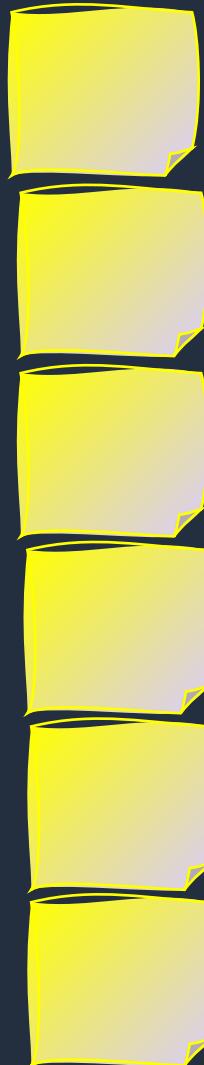
Conference survey

- Performance testing
 - Understand application data
- Multilingual coverage
- Regression testing
- Evaluate quality of results
- Talk to users and sponsors
 - Log search actions
- Privacy

What most needs improvement

Conference survey

- Log search actions
- Understand application data
- Evaluate quality of results
- Talk to users and sponsors
- Regression testing
- Performance testing
- Multilingual coverage
- Privacy



What are AWS users missing?

Conference survey

- Log search actions
- Understand application data
- Evaluate quality of results
- Talk to users and sponsors
- Regression testing
- Performance testing
- Multilingual coverage
- Privacy

AWS customer gaps

- Search specialist engineers
 - Search is a discipline
- Logging
- Quality evaluation
- Incorporating multiple signals
- Tuning

The virtuous circle of search improvement

Search processing

- Lexical search
- ML: Semantic search
- ML: Query understanding
- ML: Sparse neural
- ML: Relevance reranking
- ML: Multimodal

Measurement and analysis

- Search behavior
- Online evaluation tools
- A/B testing
- Creation of judgement sets
- Offline evaluation tools
- Metrics

Search tuning

- Hybridizing
- Regression evaluation
- Manual tuning of signals
- ML: Bayesian optimization (LTB)
- ML: Semantic model fine-tuning
- ML: Learning to Rank (LTR)

Start with generating results

Search processing

- Lexical search
- ML: Semantic search
- ML: Query understanding
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Multiple techniques

- Query understanding
- Query rewriting
- Lexical search
- Neural sparse retrieval
- Semantic vector search
- Multimodal search
- LLM reranking
- LLM summarization

How do you choose the best technique(s)?

- Query understanding
- Query rewriting
- Lexical search
- Neural sparse retrieval
- Semantic vector search
- Multimodal search
- LLM reranking
- LLM summarization

Tune

Search processing

- Lexical search
- ML: Semantic search
- ML: Query understanding
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Search tuning

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Measurement and analysis

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- Metrics

Combined strengths

Semantic search

1 text: There are people at the train **station** waiting for their trains and other trains are whizzing by them . id: 270366851.jpg



↑ Up 1

2 text: A train approaches a stop at an indoor **station** as several people walk and sit inside the building . id: 8065688234.jpg



↑ Up 1

3 text: People rushing and boarding buses at the depot **station** . id: 4817681157.jpg



↑ Up 1

4 text: People walk up steps from a large subway **station** while others stare from the ledge . id: 154653766.jpg



↑ Up 2

Lexical search

1 text: The several people standing on the **Washington Wells** platform , waiting for a train . id: 4582489690.jpg



No change

2 text: Three men are using Washington Mutual ATMs outside near a parking lot . id: 76873869.jpg



No change

3 text: A group of teenage boys is standing in front of a Wells Fargo Bank . id: 154653766.jpg



Hybrid search

1 text: The several people standing on the Washington Wells platform , waiting for a train . id: 4582489690.jpg



Not applicable

2 text: There are people at the train **station** waiting for their trains and other trains are whizzing by them . id: 270366851.jpg



↓ Down 1

3 text: A train approaches a stop at an indoor **station** as several people walk and sit inside the building . id: 8065688234.jpg



↓ Down 1

4 text: People rushing and boarding buses at the depot **station** . id: 4817681157.jpg



↓ Down 2

So how do you tune and combine them?

- Query understanding +
 - Query rewriting +
 - Lexical search +
 - Neural sparse retrieval +
- 
- Semantic vector search +
 - Multimodal search +
 - LLM reranking +
 - LLM summarization

Hybrids

Tuning (field boosts, ...)

Retrieval Augmented Generation (RAG)

You need to collect and analyze data

Search processing

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Search tuning

- Hybridizing
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- Manual tuning of signals
- ML: Bayesian optimization (LTB)
- ML: Semantic model fine-tuning
- ML: Learning to Rank (LTR)

Measurement and analysis

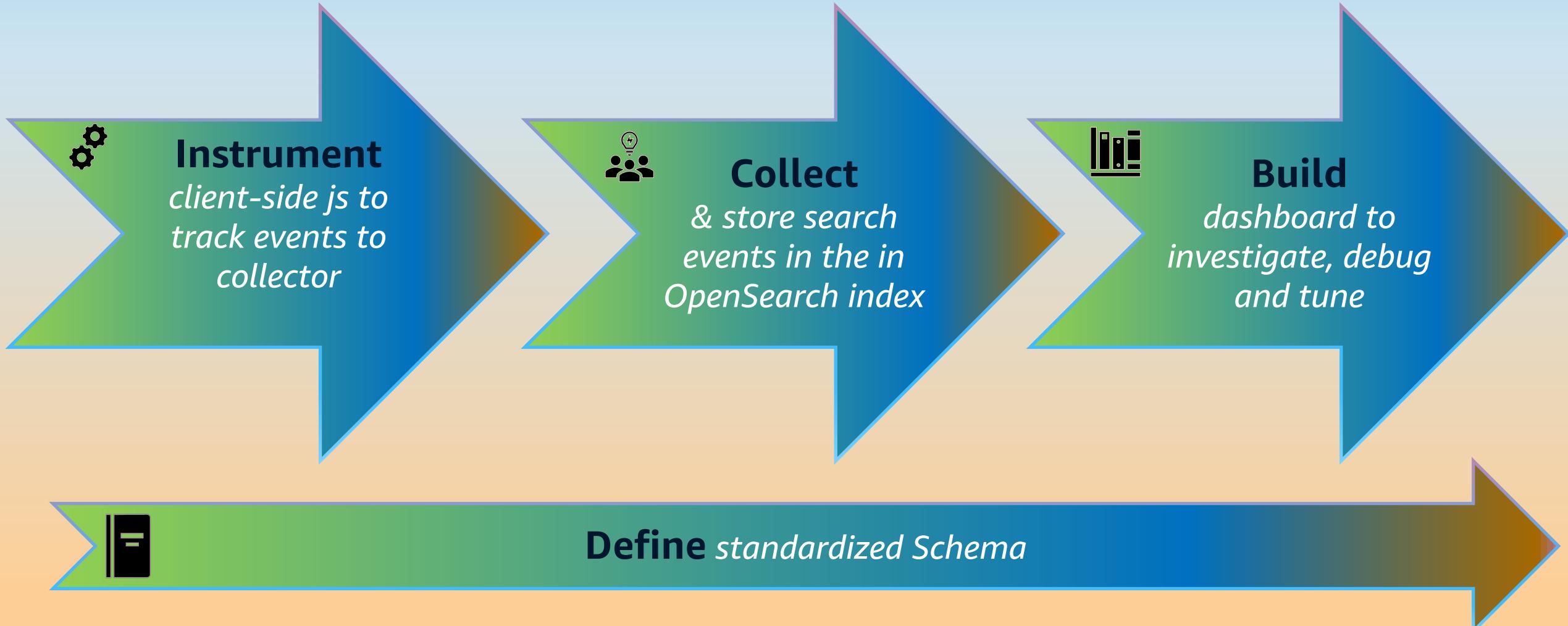
- Search behavior
- Online evaluation tools
- A/B testing
- Creation of judgement sets
- Offline evaluation tools
- Metrics

User Behavior Insights

- Collect fine-grained behavioral data
- Standard schema for search, search results, actions on search results
- Trace actions on search results *causally*
- Feed both manual and ML tuning

UBI in action
DEMO TIME

User Behavior Insights – the goal!





Your User ID: USER-eeed-43de-959d-90e6040e84f9

Your Session ID: SESSION-4e641735-f6d0-4bdf-8f2b-3f2fd811a571

Your Items: 0

Product Sort

Default

Filter by Brands

Xerox

HP

Lexmark

Epson

OKI

Canon

Brother

Filter by Product Types

Printer cleaning cartridge

xerox cartridge

2747 results found in 18ms



Xerox Phaser 3450 Std Print C...

159.94 \$ | Xerox

Result quality?



Add to

Xerox Phaser 7300 Magenta H...

379.95 \$ | Xerox

Result quality?



Add to

Xerox Phaser 7300 Cyan High ...

367.95 \$ | Xerox

Result quality?



Add to

Xerox Phaser 7300 Black High...

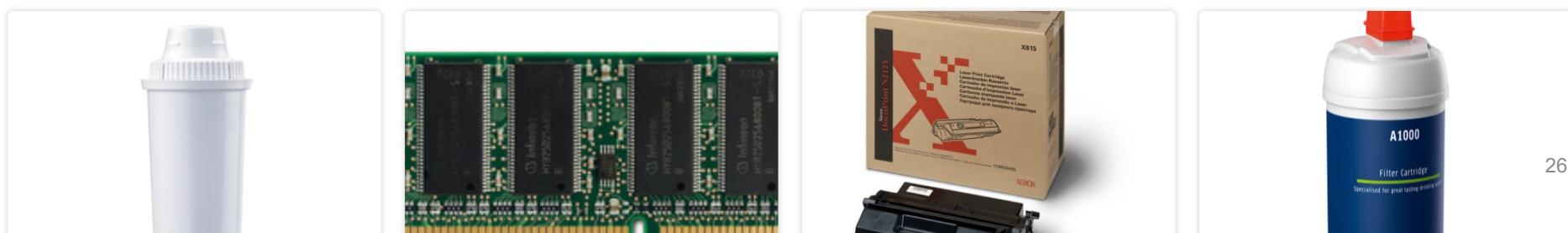
200.95 \$ | Xerox

Result quality?



Add to

1



26

UBI Search Query log

Not Secure chorus-opensearch-edition.dev.o19s.com:4000

Your User ID: USER-eeed-43de-959d-90e6040e84f9
Your Session ID: SESSION-4e641735-f6d0-4bdf-8f2b-3f2fd811a571
Your Items: 0

Chorus

Instrument

Product Sort Default

Filter by Brands

- Lexmark 520
- Xerox 429
- OKI 323
- Epson 272
- HERMA 265
- Canon 224
- Brother 163

Filter by Product Types

Elements Console Sources Network Performance Memory Application Lighthouse Recorder Performance insights △

Default levels ▾ 501 Issues: 497 3 1

Filter

3590 results found in 20ms

Xerox Phaser 7300 Magenta High Capacity Toner Cartridge 379.95 \$ | Xerox Result quality?

Xerox Phaser 7300 Cyan High Capacity Toner Cartridge 367.95 \$ | Xerox Result quality?

Xerox Phaser 7300 Black High Capacity Toner Cartridge 200.95 \$ | Xerox Result quality?

Xerox Phaser 3450 Standard Capacity Print Cartridge 159.94 \$ | Xerox Result quality?

Search bar: printer cartridge

onValueSelected current value: printer cartridge App.js:328

onValueChanged search value: printer cartridge App.js:312

tried to generate a genGuid in insecure context App.js:81

POSTing event: [{"action_name": "on_search", "client_id": "USER-eeed-43de-959d-90e6040e84f9", "query_id": "Q-143acc96-d4ca-4935-a384-fa1f54ca6323", "page_id": "/", "message_type": "QUERY", "message": "printer cartridge", "timestamp": 1719306196008, "event_attributes": {"object": null, "position": null, "browser": null, "session_id": null, "page_id": null, "dwell_time": null}}] UbiClient.ts:67

Access to XMLHttpRequest at 'http://chorus-opensearch-edition.dev.o19s.com:2022/log/ingest' from origin 'http://chorus-opensearch-edition.dev.o19s.com:4000' has been blocked by CORS policy: No 'Access-Control-Allow-Origin' header is present on the requested resource. chorus-opensearch-edition.dev.o19s.com:1 UbiClient.ts:109

AxiosError {message: 'Network Error', name: 'AxiosError', code: 'ERR_NETWORK', config: {...}, request: XMLHttpRequest, ...} UbiClient.ts:109

POST http://chorus-opensearch-edition.dev.o19s.com:2022/log/ingest net::ERR_FAILED 200 (OK) UbiClient.ts:106

17 messages 11 user messages 9 errors 0 warnings 8 info 0 verbose



Dev Tools



Console

History Settings Help Export Import

200 - OK

300 ms

1 GET ubi_queries/_search

Collect!

```
13      "relation": "eq"
14    },
15    "max_score": 1,
16    "hits": [
17      {
18        "_index": "ubi_queries",
19        "_id": "16052",
20        "_score": 1,
21        "_source": {
22          "query_response_id": "2ee0983c-329a-4994-ba7a-201986ba97b7",
23          "user_query": "redefine ancho de banda sin fricciones", ←
24          "query_id": "2c46b0c0-b06a-435f-9847-9da3b2ef8427", ←
25          "query": """{"size":25,"query": {"query_string": {"query": "(title:\\"redefine ancho de
26            banda sin fricciones\\") OR attr_t_device_type:\\"redefine ancho de banda sin
27            fricciones\\") OR name:\\"redefine ancho de banda sin fricciones\\\"),"fields":[],"type"
28            :"best_fields","default_operator":"or","max_determinized_states":10000
29            , "enable_position_increments":true,"fuzziness":"AUTO","fuzzy_prefix_length":0
30            , "fuzzy_max_expansions":50,"phrase_slop":0,"analyze_wildcard":false,"escape":false
31            , "auto_generate_synonyms_phrase_query":true,"fuzzy_transpositions":true,"boost":1.0}}
32            , "ext": {"query_id": "2c46b0c0-b06a-435f-9847-9da3b2ef8427", "user_query": "redefine
            ancho de banda sin fricciones", "client_id": "0603515a-c96c-4d88-ba22-6d54e8fba49d"
            , "object_id_field": "primary_ean", "query_attributes": {"application": "ubi-demo"}}}""",
33          "query_attributes": {
34            "application": "ubi-demo"
35          },
36          "client_id": "0603515a-c96c-4d88-ba22-6d54e8fba49d", ←
37          "timestamp": 1717527845739, ←
38          "query_response_hit_ids": []
39        }
40      }
41    ]
42  }
43 }
```

UBI Event log – Product hover

Not Secure chorus-opensearch-edition.dev.o19s.com:4000

Your User ID: USER-eeed-43de-959d-90e6040e84f9
Your Session ID: SESSION-4e641735-f6d0-4bdf-8f2b-3f2fd811a571
Your Items: 0

Chorus

Instrument

Product Sort Default

Filter by Brands

- Lexmark 520
- Xerox 429
- OKI 323
- Epson 272
- HERMA 265
- Canon 224
- Brother 163

Filter by Product Types

Elements Console Sources Network Performance Memory Application Lighthouse Recorder Performance insights

Default levels ▾ 501 Issues: 497 3 1

top Filter

onValueSelected current value: printer cartridge

onValueChanged search value: printer cartridge

tried to generate a genGuid in insecure context

POSTing event: [{"action_name": "on_search", "client_id": "USER-eeed-43de-959d-90e6040e84f9", "query_id": "Q-143acc96-d4ca-4935-a384-fa1f54ca6323", "page_id": "", "message_type": "QUERY", "message": "printer cartridge", "timestamp": 1719306196008, "event_attributes": {"object": null, "position": null, "browser": null, "session_id": null, "page_id": null, "dwell_time": null}}]

Access to XMLHttpRequest at 'http://chorus-opensearch-edition.dev.o19s.com:2022/log/ingest' from origin 'http://chorus-opensearch-edition.dev.o19s.com:4000' has been blocked by CORS policy. No 'Access-Control-Allow-Origin' header is present on the requested resource.

AxiosError {message: 'Network Error', name: 'AxiosError', code: 'ERR_NETWORK', config: {...}, request: XMLHttpRequest, ...}

POST http://chorus-opensearch-edition.dev.o19s.com:2022/log/ingest net::ERR_FAILED 200 (OK)

chorus-opensearch-edition.dev.o19s.com:1 UbiClient.ts:67

App.js:328

App.js:312

App.js:81

UbiClient.ts:109

UbiClient.ts:106

UbiClient.ts:106

3590 results found in 20ms

The screenshot shows a Chorus product search interface. A large orange oval highlights the word 'Instrument' in the top navigation bar. On the left, there's a sidebar for 'Product Sort' and 'Filter by Brands'. The main area displays a grid of four printer cartridges: Xerox Phaser 7300 Magenta, Cyan, and Black, along with a Xerox Phaser 3450 Std Print cartridge. Each item has a price of \$379.95, a brand of Xerox, and a 'Result quality?' button. Below the grid is a developer tools console showing logs related to the search, including CORS errors for XMLHttpRequests to the log/ingest endpoint. The bottom status bar indicates 3590 results found in 20ms.



Console

History Settings Help Export Import

200 - OK

687 ms

```
1 GET ubi_events/_search ▶ 🔎
2 {
3   "size": 200
4 }
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
24
25
26
27
```

Collect!

```
431 {
432   "_index": "ubi_events",
433   "_id": "18",
434   "_score": 1,
435   "_source": {
436     "action_name": "product_hover", ←
437     "client_id": "ca6e48ea-3f23-466a-9360-2096a1d36bd9",
438     "query_id": "816c6f03-bb7e-4b96-a014-e41961c8b563",
439     "message_type": "INFO",
440     "message": "innovate world-class technologies",
441     "timestamp": 1717527762153,
442     "event_attributes": {
443       "session_id": "7761ebe6-6515-4065-9893-72ea67264386",
444       "page_id": "/assumenda/nesciunt.webm",
445       "ip": "175.29.166.4",
446       "dwell_time": 24.448537132662686,
447       "browser": "Mozilla/5.0 (iPhone; CPU iPhone OS 10_3_3 like Mac OS X) AppleWebKit/535.1 (KHTML, like Gecko) CriOS/21.0.879.0 Mobile/70N546 Safari/535.1",
448       "position": {
449         "x": 380,
450         "y": 356,
451         "page_depth": 2,
452         "scroll_depth": 69,
453         "trail": [
454           "/recognize/organization.json",
455           "/central/later.wav"
456         ]
457       }
458     }
459   }
460 }
```

UBI Event log – Add to Cart

Not Secure chorus-opensearch-edition.dev.o19s.com:4000

Your User ID: USER-eeed-43de-959d-90e6040e84f9
Your Session ID: SESSION-4e641735-f6d0-4bdf-8f2b-3f2fd811a571
Your Items: 1

Chorus

Instrument

Product Sort Default

Filter by Brands

- HP 1009
- Lexmark 520
- Xerox 429
- OKI 323
- Epson 272
- HERMA 265
- Canon 224

429 results found in 14ms



Xerox Phaser 7300 Magenta H...
379.95 \$ | Xerox
Result quality?



Xerox Phaser 7300 Cyan High ...
367.95 \$ | Xerox
Result quality?



Xerox Phaser 7300 Black High...
200.95 \$ | Xerox
Result quality?



Xerox Phaser 3450 Std Print C...
159.94 \$ | Xerox
Result quality?

Elements Console Sources Network Performance Memory Application Lighthouse Recorder Performance insights △

top ▾ Filter Default levels ▾ No Issues 445 131 1

No messa...
No user m...
No errors
No warnin...
No info
No verbose

Console

History Settings Help Export Import

200 - OK

687 ms

```
1 GET ubi_events/_search ▶ ⚭  
2 {  
3   "size": 200  
4 }
```

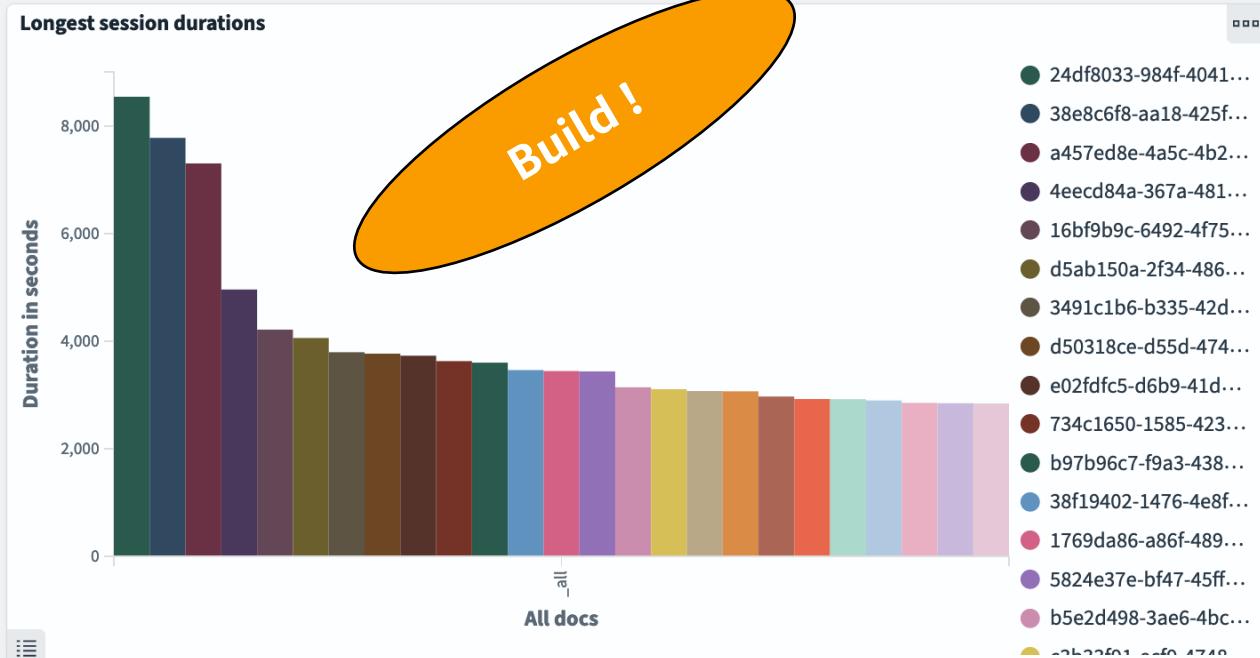
Collect!

```
513 -      },
514 -      {
515 -         "_index": "ubi_events",
516 -         "_id": "20",
517 -         "_score": 1,
518 -         "_source": {
519 -             "action_name": "add_to_cart", ←
520 -             "client_id": "ca6e48ea-3f23-466a-9360-2096a1d36bd9", ←
521 -             "query_id": "816c6f03-bb7e-4b96-a014-e41961c8b563", ←
522 -             "message_type": "CONVERSION",
523 -             "message": "disintermediate clicks-and-mortar e-commerce",| ←
524 -             "timestamp": 1717527762209,
525 -             "event_attributes": {
526 -                 "session_id": "7761ebe6-6515-4065-9893-72ea67264386",
527 -                 "page_id": "/fish/spring.wav",
528 -                 "ip": "160.168.56.27",
529 -                 "dwell_time": 2.8094781835391944,
530 -                 "browser": "Mozilla/5.0 (iPod; U; CPU iPhone OS 3_3 like Mac OS X; am-ET) AppleWebKit/535.28.6 (KHTML, like Gecko) Version/3.0.5 Mobile/8B119 Safari/6535.28.6",
531 -                 "position": { ←
532 -                     "ordinal": 1,
533 -                     "x": 108,
534 -                     "y": 34,
535 -                     "page_depth": 8,
536 -                     "trail": [
537 -                         "/nostrum/omnis.webm",
```

all searches with at least 1 result

workstation telephone handset wallet
microphone pen pc camera backpack headset laptops
box briefcase phones notebook pencil device
xer desk tablet laptop chair x lap seat video
imac ipad screen folder drawer
notebooks computer iphone phone pad
folders headphones smartphone ipod camcorder
papers scanner mobile computers keyboard receiver
typewriter cabinet projector

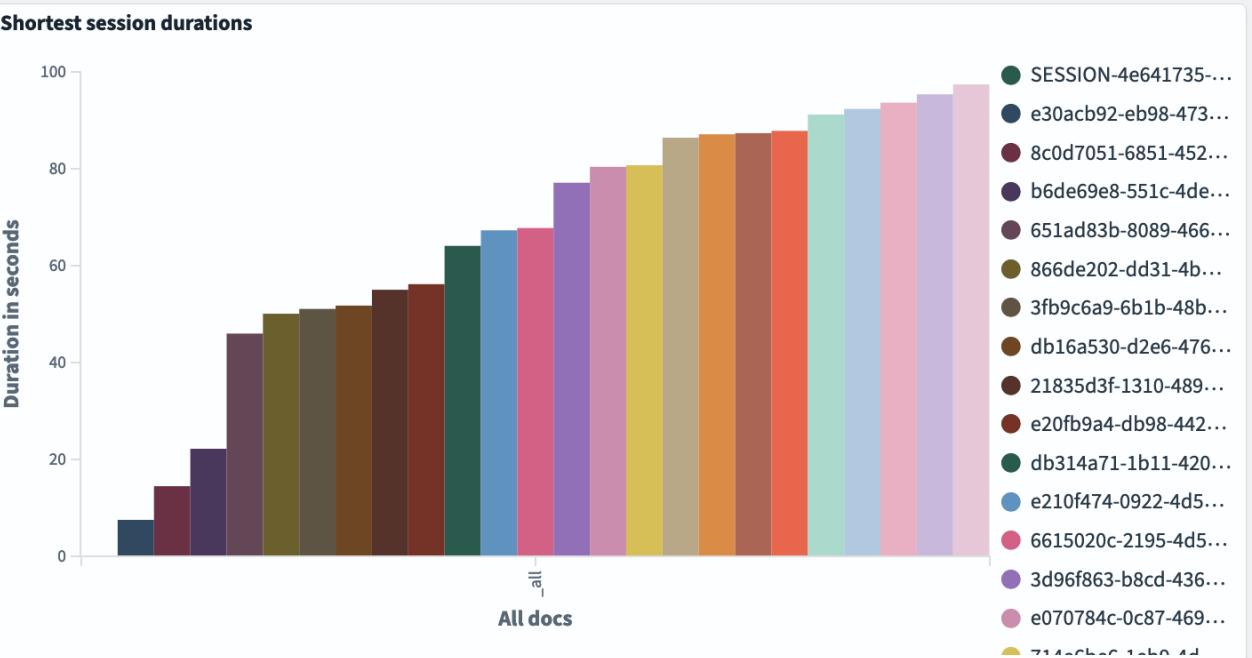
message: Descending - Count



All searches

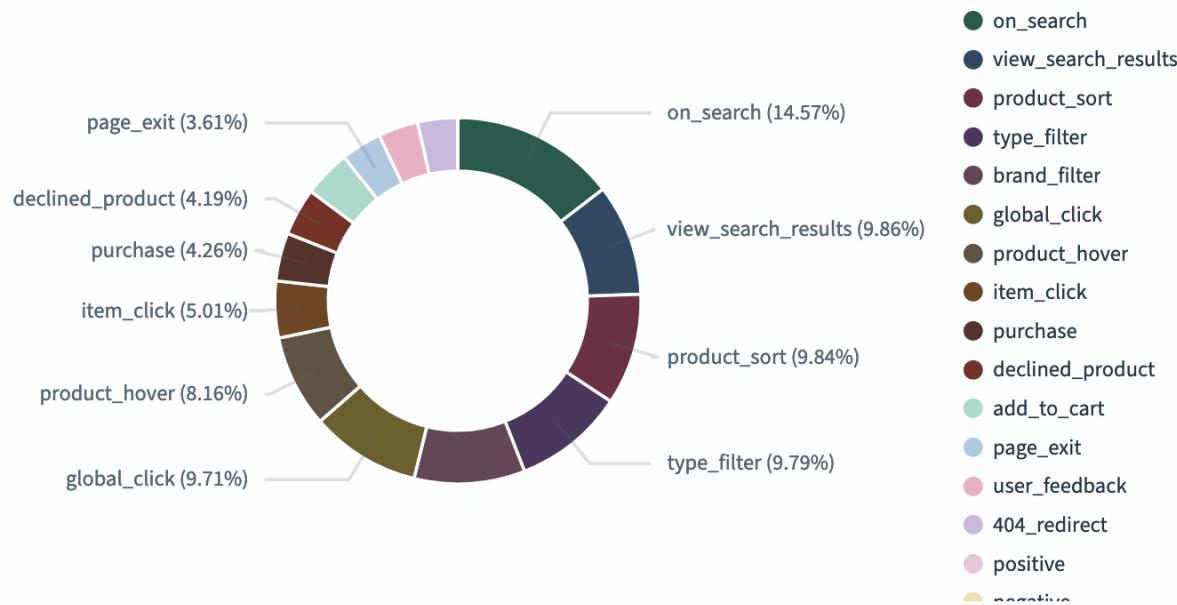
backpack cellphone ipad handset chair earpiece suitcase
notebook fastest laptop woot best Laptop pencil
ipod tablet seat pc phone lap screen
camera iphone what is ubi? dresser laptop pad
desk User Behavior Insights
mobile cheapest laptop with i9 folder computer
headphones smartphone notepad phones couch
briefcase scanner

message: Descending - Count

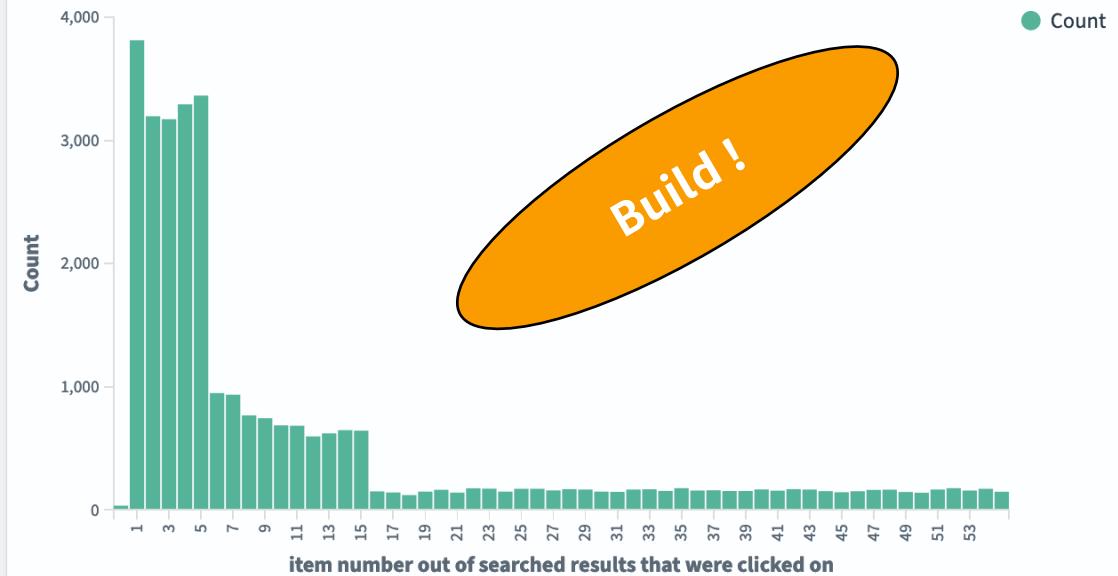


+ Add filter

basic pie



click position



all ubi messages

User Behavior Insights fastest laptop cheapest laptop with i9
Sorting on ratings, asc best Laptop woot

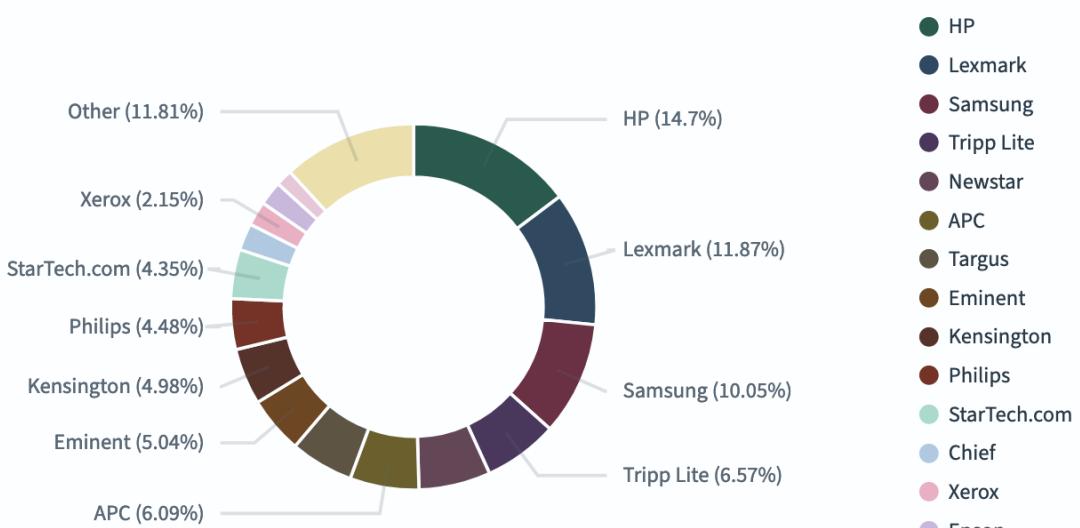
iphone Failed navigation laptop

Sorting on price, asc what is ubi?

Sorting on ratings, desc

Sorting on relevance

Margin by Vendor (pie chart)

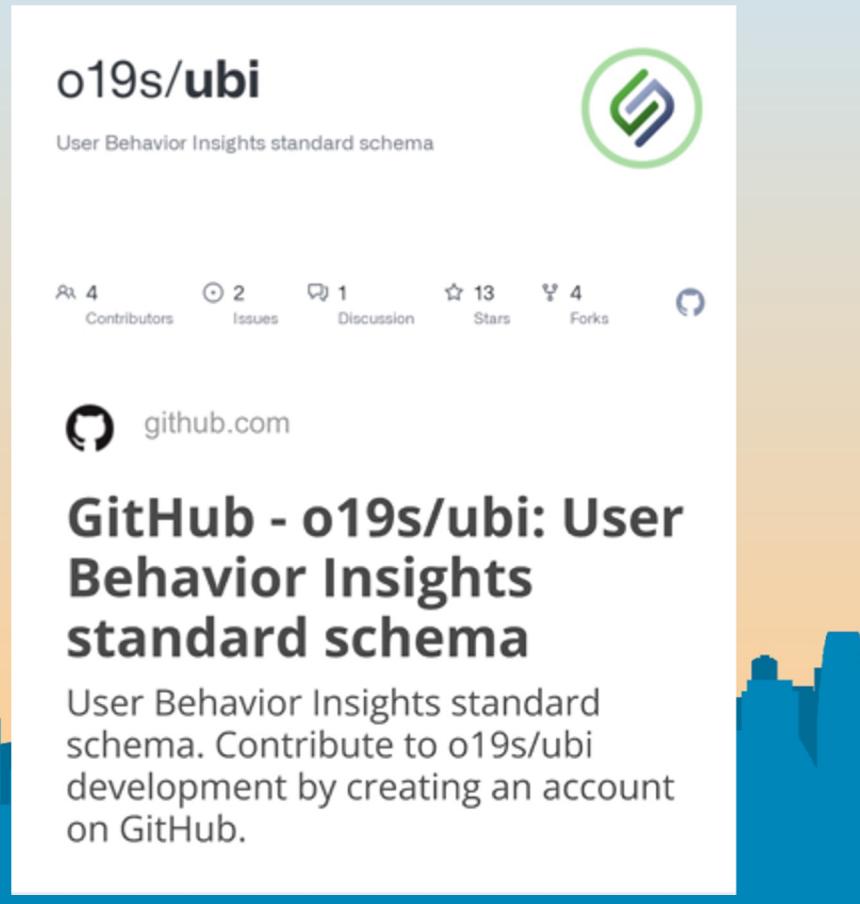


You've Deployed User Behavior Insights to understand your users !

Now WHAT?

What's Changed since OpenSearchCon Berlin

❑ UBI Specification 1.1 Released



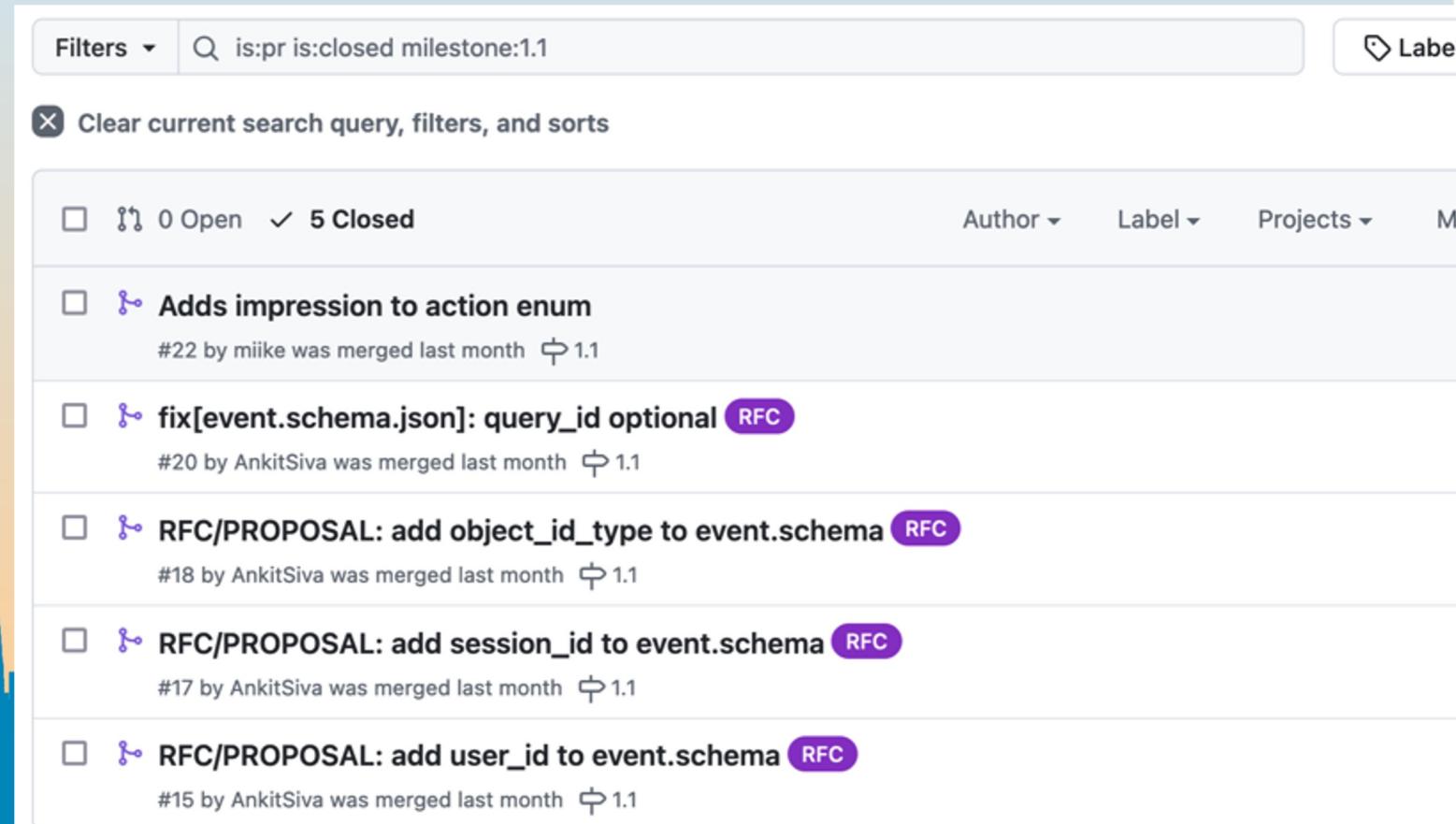
o19s/ubi
User Behavior Insights standard schema

4 Contributors 2 Issues 1 Discussion 13 Stars 4 Forks

github.com

GitHub - o19s/ubi: User Behavior Insights standard schema

User Behavior Insights standard schema. Contribute to o19s/ubi development by creating an account on GitHub.



Filters ▾ is:pr is:closed milestone:1.1

Clear current search query, filters, and sorts

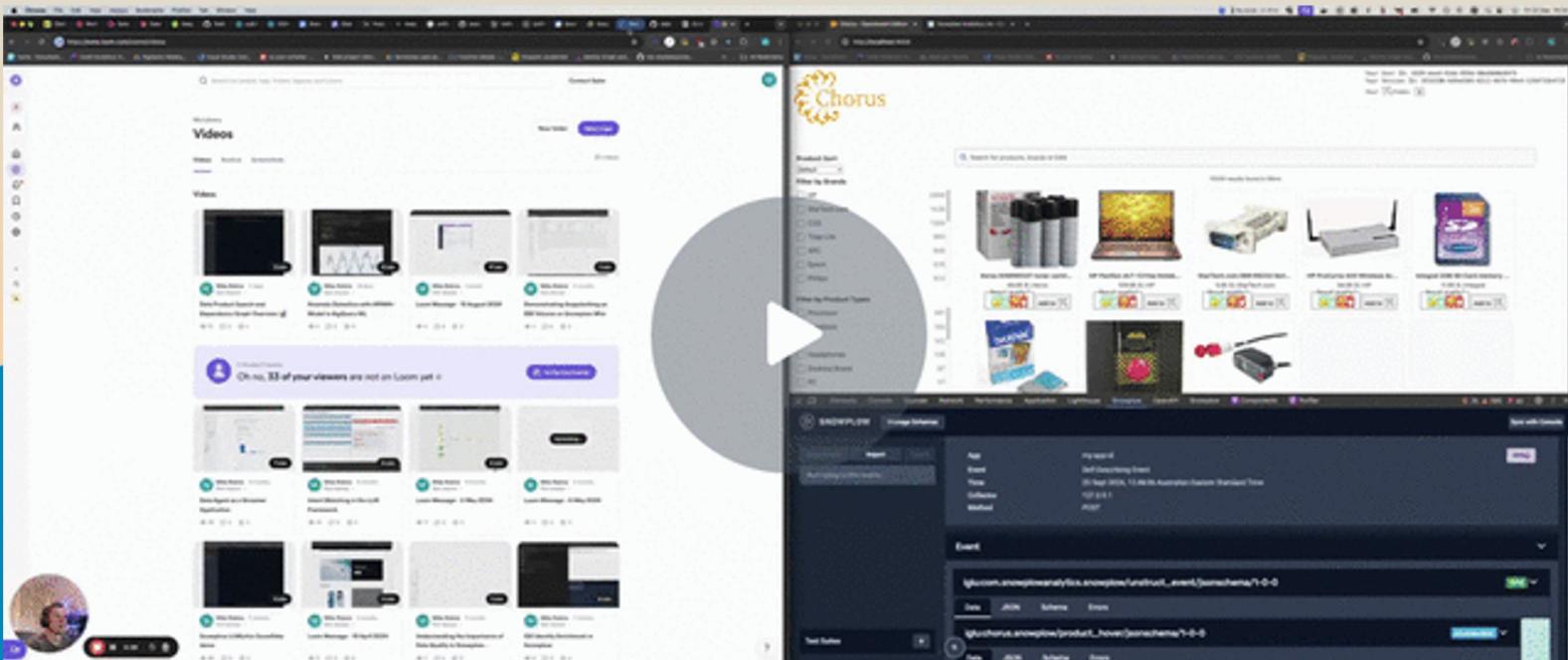
0 Open ✓ 5 Closed

Author ▾ Label ▾ Projects ▾ M

- Adds impression to action enum
#22 by miike was merged last month → 1.1
- fix[event.schema.json]: query_id optional RFC
#20 by AnkitSiva was merged last month → 1.1
- RFC/PROPOSAL: add object_id_type to event.schema RFC
#18 by AnkitSiva was merged last month → 1.1
- RFC/PROPOSAL: add session_id to event.schema RFC
#17 by AnkitSiva was merged last month → 1.1
- RFC/PROPOSAL: add user_id to event.schema RFC
#15 by AnkitSiva was merged last month → 1.1

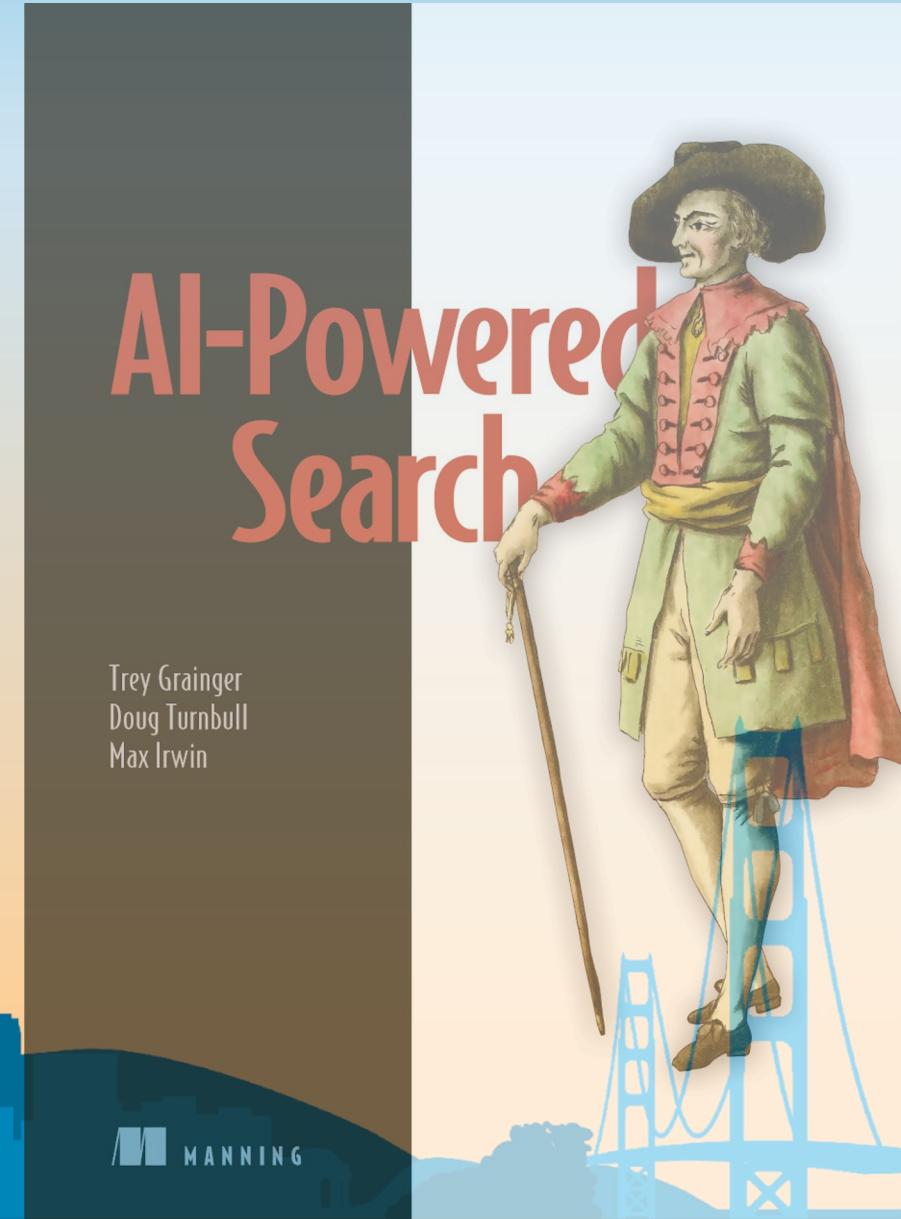
What's Changed since OpenSearchCon Berlin

- ❑ UBI Specification 1.1 Released
- ❑ Snowplow, a vendor in User Analytics space leverages UBI with OpenSearch



What's Changed since OpenSearchCon Berlin

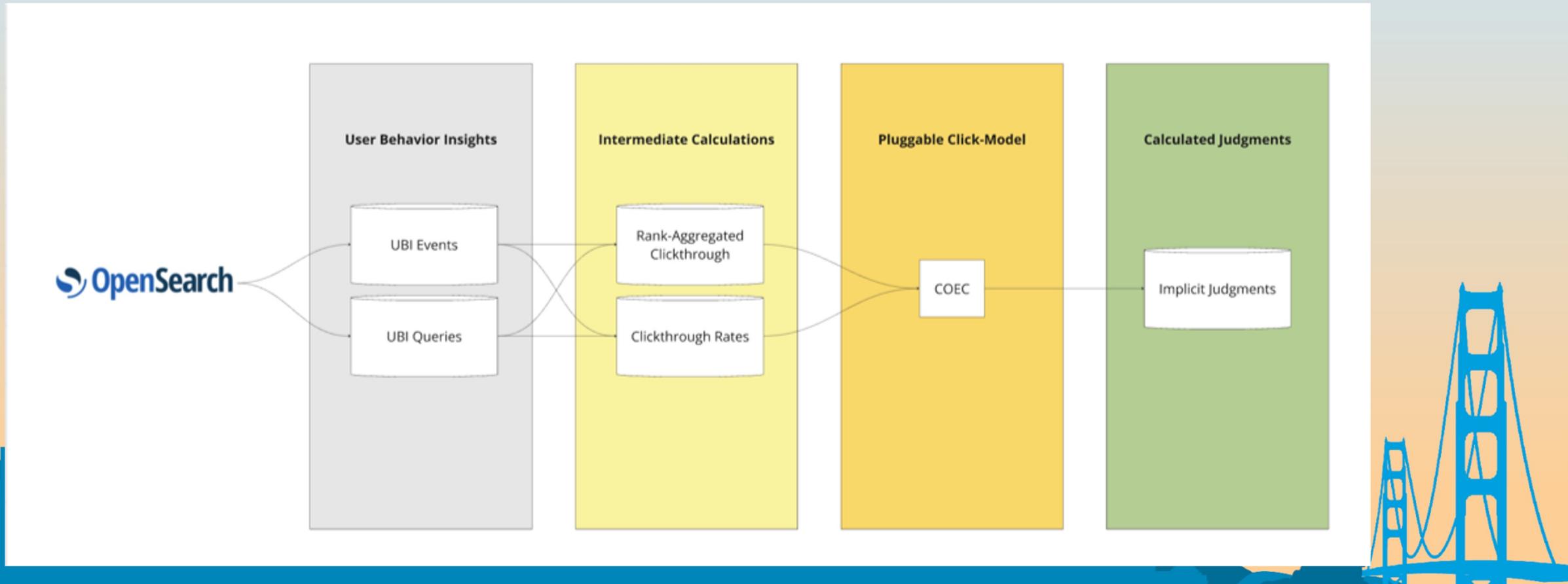
- ❑ UBI Specification 1.1 Released
- ❑ Snowplow, a vendor in User Analytics space leverages UBI with OpenSearch
- ❑ See Trey Grainger's talk at 1PM!



Look! IMPLICIT JUDGEMENTS!

IMPLICIT JUDGEMENTS!

Evaluating a pure Java approach with 150 million events and 10 million queries.



CLICKS OVER EXPECTED CLICKS (COEC)

$$\frac{ctr_{qd_r}}{\overline{ctr}_r}$$

$$\frac{\sum_{r=1}^N c_{qd_r}}{\sum_{r=1}^N \overline{ctr}_r \cdot v_{qd_r}}$$

CTR normalized with expected CTR at rank r

... aggregated across all ranks

Doc	Rank	v - number d shown as result of query q at rank r	Number of clicks	CTR	Mean CTR@Rank	COEC
1	1	250	110	0.440	0.450	0.98
2	2	124	31	0.250	0.175	1.43
3	3	240	30	0.125	0.075	1.67
1	2	900	87	0.075	0.175	0.55

IMPLICIT JUDGEMENTS!

RFC for Implicit Judgements and the related Evaluation Framework is published!



opensearch-project/OpenSearch
[#15354 \[RFC\]](#)
OpenSearch Search Quality Evaluation...

1 comment

 [jzonthein](#) opened on August 22, 2024

 [github.com](#)

[RFC] OpenSearch Search Quality Evaluation Framework
· Issue #15354 · [opensearch-project/OpenSearch](#)

RFC] OpenSearch Search Quality Evaluation Framework Introduction User Behavior Insights (UBI) provides OpenSearch users with the ability to capture user behavior data to be used for improving sear...



SEARCH QUALITY METRICS

Metrics Data structure designed for ease of: aggregation, filtering and grouping

Covers multiple use cases:

Quick summaries of performance using different metrics

Investigate performance regressions over time

Compare search configurations

Evaluate performance under different query sets (main sample, top queries, etc)

Deep dive into best and worst performing queries



datetime	search_config	query_set_id	query	metric	value
2024-07-01	research_1	sampled_queries	urban books series paperback	ndcg	0.35
2024-06-25	baseline	sampled_queries	ballet protectors	jaccard	1.00
2024-06-28	research_2	sampled_queries	razer wireless mouse	ndcg	0.35
2024-06-25	research_1	sampled_queries	princess revlon	prec@5	0.10

OpenSearch Dashboards

Dashboards Editing Single Search Configuration (unsaved) Options Share Add Cancel Save Reporting Create new

search_config.keyword: baseline × metric.keyword: dcg × + Add filter

Search Configuration

Search Configuration: baseline Evaluation Metric: dcg

Apply changes Cancel changes Clear form

Recent Evaluations

dcg: metric.keyword: Descending

datetime per day Average value

datetime per day	Average value
2024-07-01	2.504
2024-06-30	2.514
2024-06-29	2.504
2024-06-28	2.533
2024-06-27	2.533
2024-06-26	2.514
2024-06-25	2.467

Evaluation per Date

Average value vs. datetime per 3 hours

dcg

Search

DQL

Calendar

Jun 24, 2024 @ 14:19:50.681 → Jul 1, 2024 @ 17:14:38.851

Refresh

metric.keyword: dcg ×

search_config.keyword: baseline ×

+ Add filter

Search Configuration Input

search_config.keyword

baseline

metric.keyword

dcg

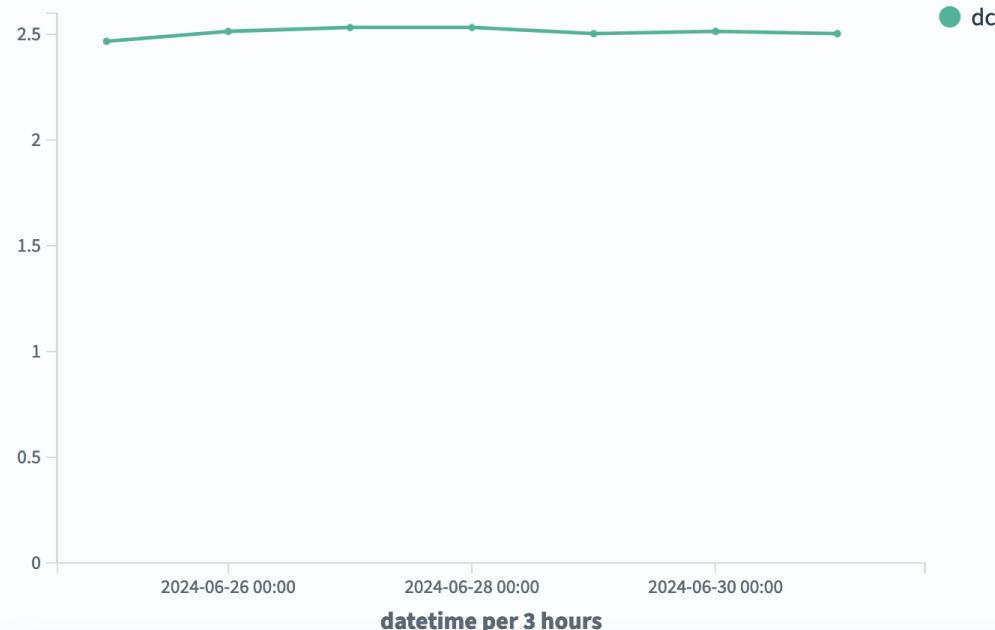
Query

Select...

Apply changes

Cancel changes

Clear form

Evaluation per Date**Performance per Query**

Query

Average value

eve of chaos sylvia day

0.53

2人 ソファー 肘なし 本体

0.515

cheetah print jeans

0.512

grey pocket book

0.431

auto mirror 6x7

0.392

thomas media 365

0.346

360 ground blind

0.29

パナックスジンセン

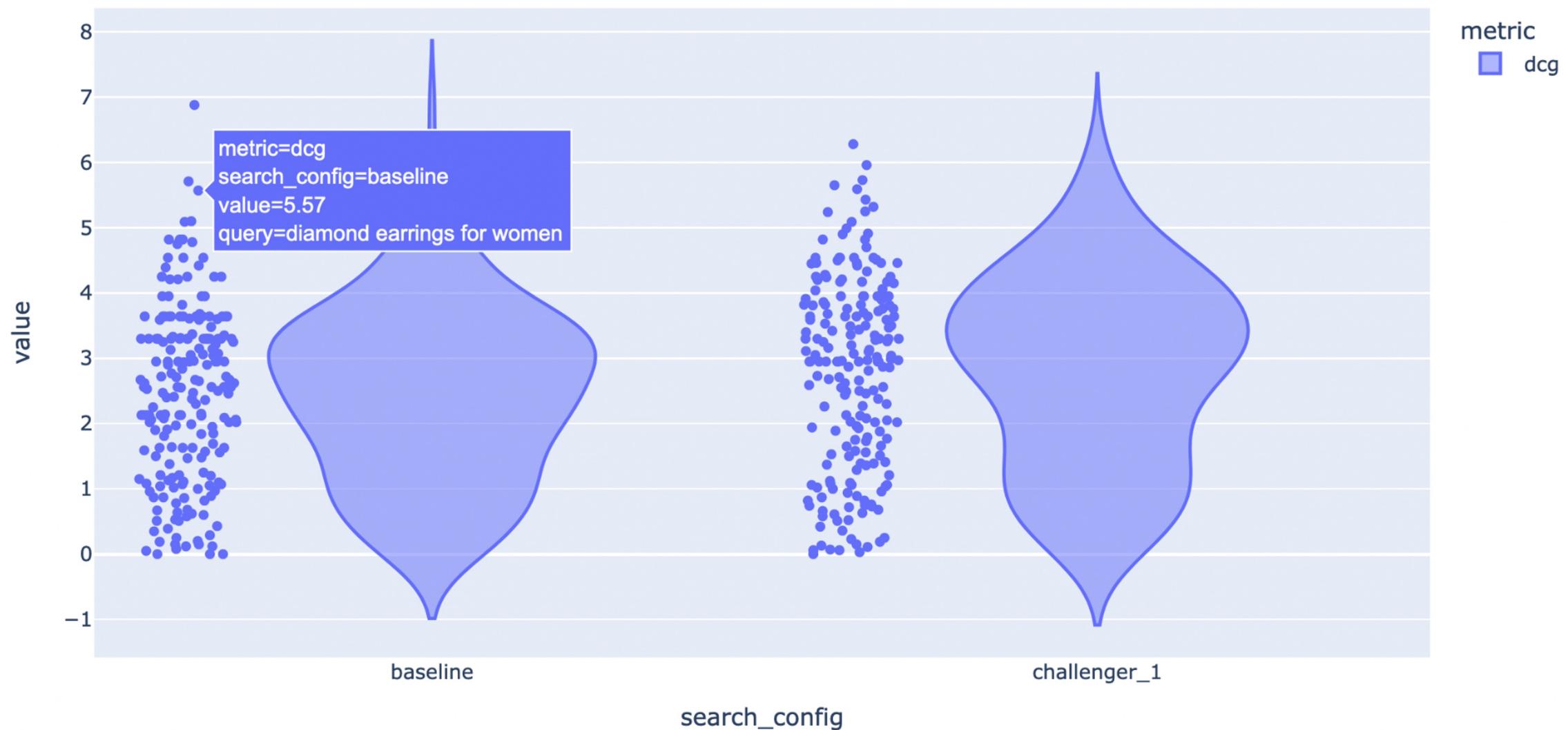
0.251

attote for men

0.201

white claw

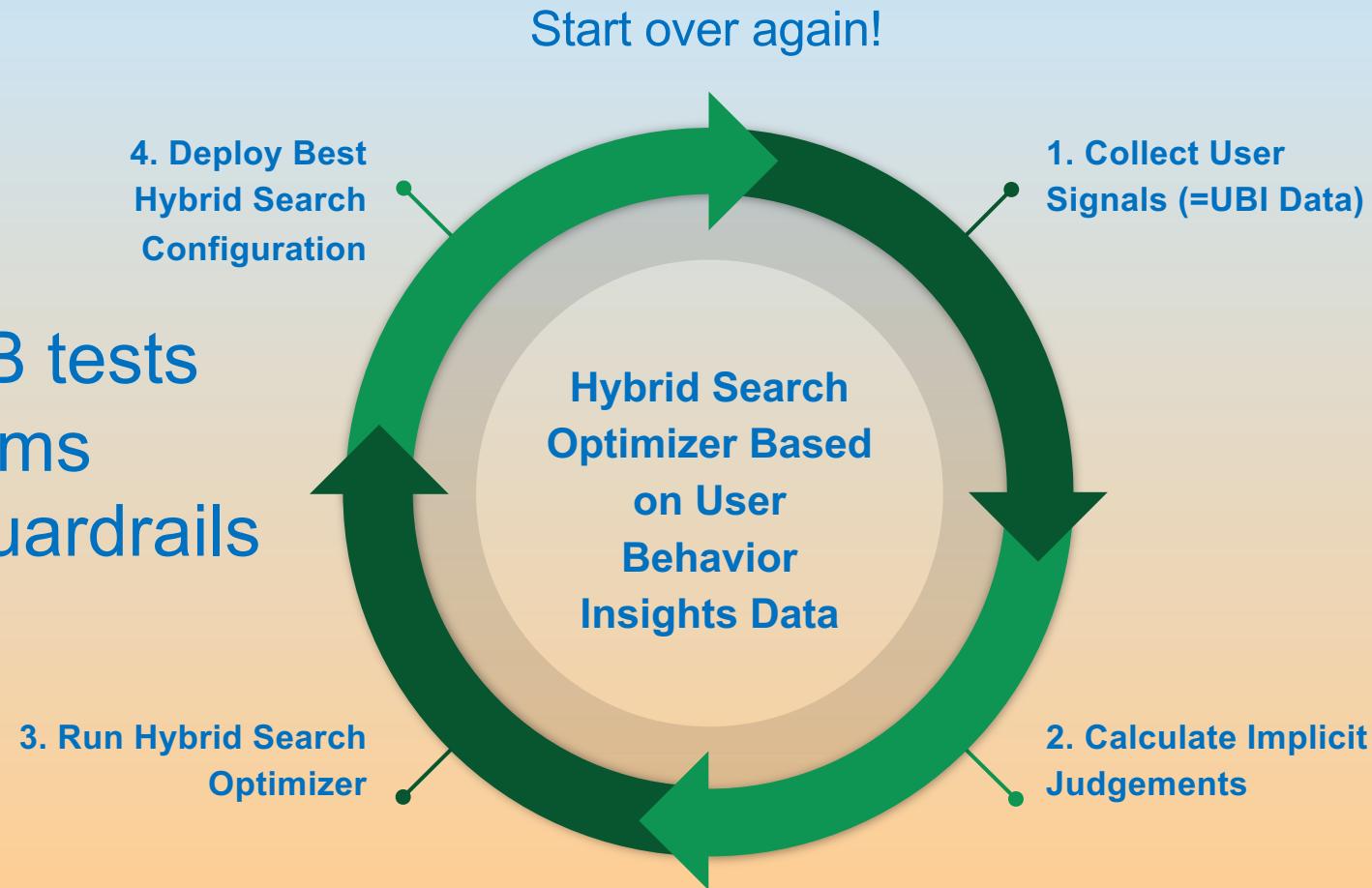
0.186



WHERE ARE WE GOING?

HYBRID SEARCH OPTIMIZER...

- Interleaved A/B tests
- Bandit algorithms
- Establishing guardrails





NORTH AMERICA | San Francisco 2024



USEFUL RESOURCES FOR SEARCH DEVELOPERS

Readings

- [“Search Relevance Organizational Maturity Model”](#) (ppt + video)
- Nielsen Norman Group – nngroup.com/search/?q=search

Conferences

(see [Charlie Hull’s blog on search conferences](#))

- **Haystack** – small, 2 day, focused on search relevance – haystackconf.com (Charlottesville, VA, annually in April)
- **Berlin Buzzwords** – large, 2½ day, everything about open source search and big data – berlinbuzzwords.de (Berlin, Germany, annually in June)

- **MICES** – small, informal, 1 day, e-commerce search – mices.co (Berlin, Germany, just after Buzzwords)
- **SIGIR** – huge, very academic – sigir-2024.github.io (2024: DC, July)
- **OpenSearchCon** – everything OpenSearch, both search and analytics -- <https://opensearch.org/events/opensearchcon/> (Berlin, May; US, October)

Training organizations

- **OpenSource Connections (TLRE)** – opensourceconnections.com/training/opensearch-training-think-like-a-relevance-engineer-tlre
- **SEASE (London)** – sease.io/training/opensearch-training-list
- **Sematext** – sematext.com/training/opensearch/