



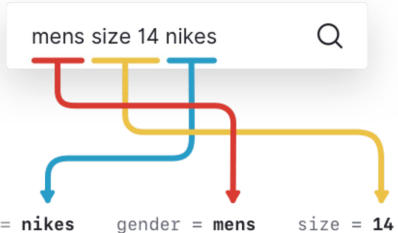
**Highly efficient dense retrieval
using neural hashes**

hello@sajari.com

Core components of great search

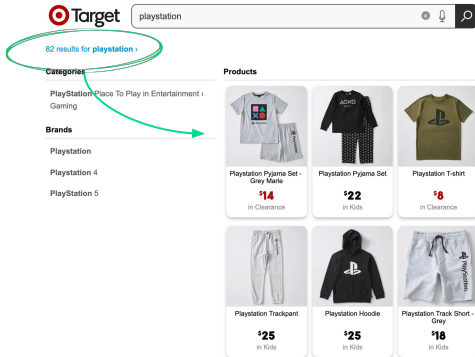
Query understanding

Modify the query to help improve the relevance process



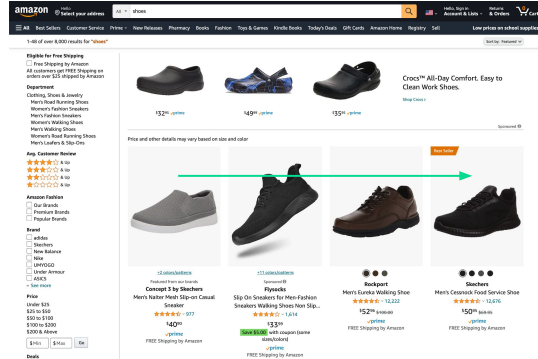
Relevance

Filter results to best match the query intent (user satisfaction)



Ranking

Order results to maximise a goal (e.g. units sold, profit, etc)



What is AI relevance?

Represent words (and images) mathematically

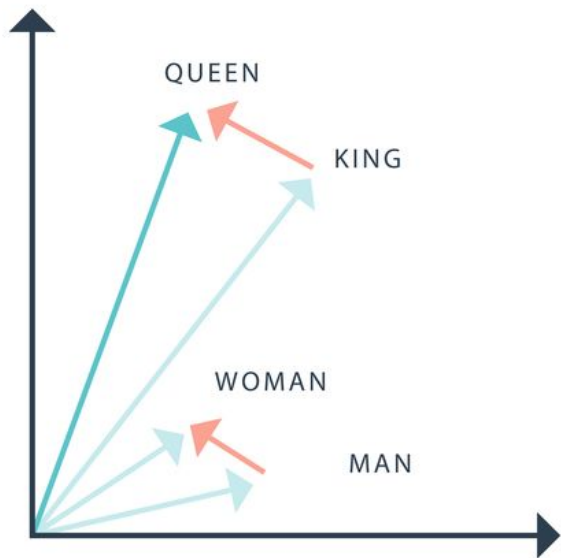
Keyword search is binary, terms either match or they don't. Synonyms and rules help to make this work ok.

AI relevance instead uses similarity. Close concepts are represented very similarly mathematically.

Learn and improve with data

Data such as purchases can be used to amplify relationships and thus continuously improve relevance.

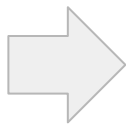
$$\text{KING} - \text{MAN} + \text{WOMAN} = \text{QUEEN}$$



The next evolution of search indexes

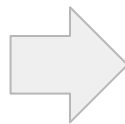
Keywords

2000 - present



Vectors

2013 - present



Neural hashes

2021



First generation AI. Better quality results, but very expensive and/or very slow at scale



Next generation AI.

Extremely fast and efficient at scale, with the same result quality as vectors!

Why hashes over vectors?

	Vectors	Neural hashes
Storage size	Large. Must store the vector and some kind of graph or tree based structure	Tiny. Hashes for 99% nDCG use ~10% of the vector size and there is no structure needed for storage. Can also go smaller!
Query speed	Moderate to fast. Various, but commonly need at least some float arithmetic.	Ridiculous. Simple binary bit comparison such as XOR. GPUs are not needed at all.
Data velocity	Moderate. Varies, but typically immutable, thus deletion and/or editing not supported	Great. Fits in a modified posting list. Can be inserted, modified or deleted easily. No graph or tree based structures to maintain.

Inevitable that hashes will replace vectors for dense search

Demo time!

1 *cpu*, 25k products → hash index = 15MB

What this does do

Old Best Buy catalog (~25k products)

AI based queries (universal sentence encoder vectors → neural hashes)

Nearest neighbor lookup (ANN)

Applies historical and/or real-time learnings to improve results

What this does not do

No keywords or tokenization

No language processing

No boosting

No rules

No hacks

No ranking aside from the AI driven nearest neighbor



Thank you

Keep in touch: @hamishogilvy

Relevance is a hard problem

Today relevance is largely still determined by keywords, synonyms, stemming, stop words, rules tokenization, ...

Without **enormous human assistance** this approach works poorly...

The screenshot shows the Kettlebell website's search results for the query "kettlebell". The search bar at the top right contains the text "kettlebell". Below the navigation bar, a banner displays "Here's what we found for 'kettlebell'" with "kettlebell" circled in green. Below this, it states "28 products found" and shows a search bar with "kettlebell" and a magnifying glass icon. The results are filtered by 28 products. On the left, there is a "Colour" filter with options: Beige, Black, Blue, Grey, Multi, Red, Silver, and White. The first product, a "1.7L Stainless Steel Kettle - Black", is circled in green and priced at \$39.00. The second product is a "1.7L Glass Kettle with Variable Temperature" priced at \$60.00, with a "BACK ONLINE SOON" label. The third product is a "1.7L Ombre Kettle" priced at \$39.00. The "Sort by:" options are Popular, New, and \$\$\$.

Kettlebell

Search: kettlebell

Here's what we found for "kettlebell"

28 products found

Search: kettlebell

Filter 28 products

Sort by: Popular New \$\$\$

Colour

- Beige
- Black
- Blue
- Grey
- Multi
- Red
- Silver
- White

Price

1.7L Stainless Steel Kettle - Black
\$39.00

1.7L Glass Kettle with Variable Temperature
\$60.00
BACK ONLINE SOON

1.7L Ombre Kettle
\$39.00

Even for very large companies

THE HOME DEPOT You're shopping **Daly City** **94015** **OPEN** until 9 pm

Store Finder Truck & Tool Rental For the Pro Gift Cards Credit Services Track Order Help

My Account **Lists** **Cart** | 0 items

All Departments Home Decor, Furniture & Kitchenware **DIY Projects & Ideas** Project Calculators Installation & Services Specials & Offers Local Ad

Home / Text Search / fix a hole in the wall

Fix A Hole In The Wall

Search Instead for "fix a hole in the wall"

1 Results Sort by: Best Match

Get It Fast

☐ In Stock at Store Today

Daly City & nearby stores

Availability

☐ Hide Unavailable Products


Department

Paint (1)

Patching & Repair (1)

Want more filters?

First, select a department.



Epoxy Saint-Gobain ADFORS Fix it Fast Wall Hole Filler, White

★★★★★ (18) Model #FW9058-U

\$3.85

Pickup
Unavailable at Daly City

Delivery
Unavailable

☐ Compare

Related Searches

THE HOME DEPOT

You're shopping **Daly City** **94015**


CLOSED until 6 am

Cool My House

Filter & Sort Brand Price Review Rating

20 Results


PET LIFE Small Navy Hush Puppy Electronic Heating and Cooling Smart Collapsible Pet House

 **\$56.99**

Pickup
Free ship to store

Delivery
Free

PET LIFE Beige Hush Puppy Electronic Heating and Cooling Smart Collapsible Pet House - Small

 **\$54.42**

★★★★★ (1)