

Getting Started with Query Understanding

Berlin Buzzwords
June 11, 2018

Hello

Hello

STANDARD
& POOR'S

Hello

STANDARD
& POOR'S

Etsy

Hello

STANDARD
& POOR'S

Etsy



RELATED
WORKS

Hello

Agenda

Agenda

Why QU?

Agenda

Why QU?

What is QU?

Agenda

Why QU?

What is QU?

Problems

Agenda

Why QU?

What is QU?

Problems

The Stakes

Why Query Understanding



Our goal is relevance.

IR 101

User

Information

IR 101

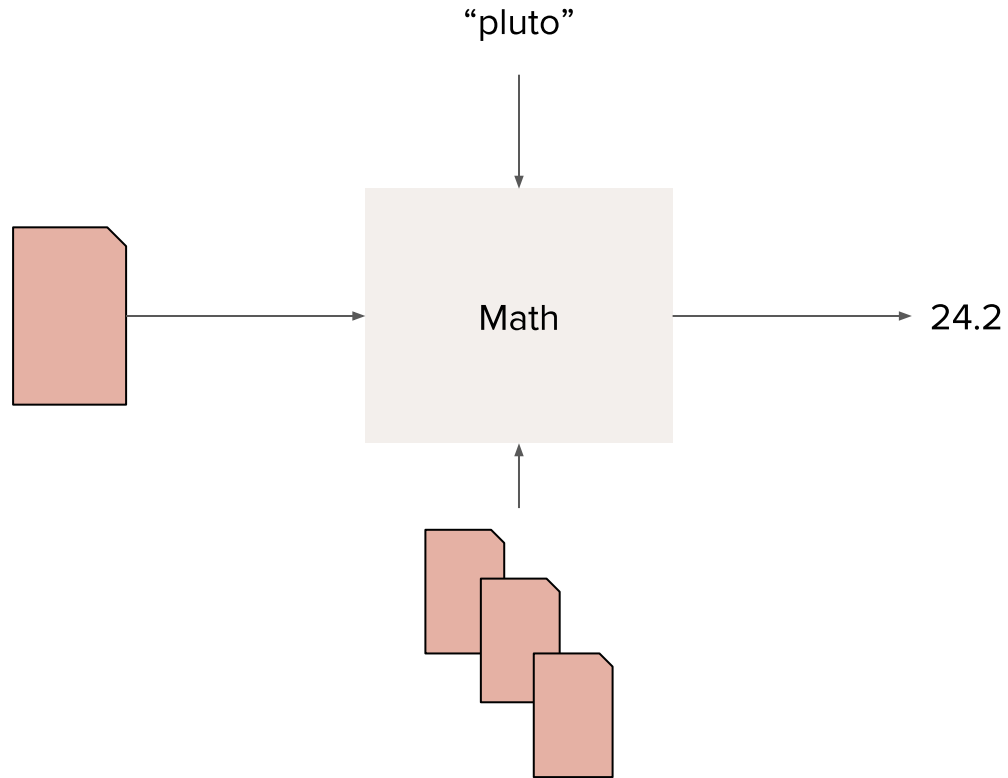


How else can we achieve relevance?

Why

Statistical Relevance

Statistical Relevance



Statistical Relevance

$$\Sigma \frac{[\text{document}] \text{ term frequency}}{[\text{corpus}] \text{ frequency}}$$

Statistical Relevance

$$\sum \frac{[\text{document}] \text{ term frequency}}{[\text{corpus}] \text{ frequency}}$$



Where's the **user** in this equation?

“fanny pack”

Browser: fanny pack - Buy Products Onl x | URL: https://www.flipkart.com/search?q=fanny%20pack&otracker=start&as-show=on&as=off

Navigation: Sell on Flipkart | Advertise | Gift Card | 24x7 Customer Care | Track Order | Signup | Log In

Search: fanny pack | CART 0

Categories: ELECTRONICS | APPLIANCES | MEN | WOMEN | BABY & KIDS | HOME & FURNITURE | BOOKS & MORE | OFFER ZONE

Filters: PICK A CATEGORY | Bags, Wallets & Belts | Travel Bags - Waist | Home Improvement | Books | Mobiles & Accessories | Tools & Hardware

Showing 1 - 8 of 8 results for "fanny pack"

Sort By: Relevance | Popularity | Price - Low to High | Price - High to Low

Product Name	Price	Discount
Spectrum Group Fanny Pack Waist Bag	₹695	₹700
Leatherman Micra Red Multi Utility Plier	₹2,390	₹2,550 6% off
Leatherman Micra Grey Multi Utility Plier	₹2,315	₹2,550 9% off
Leatherman Micra Black Multi Utility Plier	₹2,390	₹2,550 6% off

“bum bag”

bum bag - Buy Products Online x

Secure https://www.flipkart.com/search?q=bum%20bag&otracker=start&as-show=on&as=off

Sell on Flipkart Advertise Gift Card 24x7 Customer Care Track Order Signup Log In

Flipkart

ELECTRONICS ▾ APPLIANCES ▾ MEN ▾ WOMEN ▾ BABY & KIDS ▾ HOME & FURNITURE ▾ BOOKS & MORE ▾ OFFER ZONE

Home > Bags, Wallets ...

Showing 1 – 10 of 10 results for "bum bag"

Sort By Relevance Popularity Price – Low to High Price – High to Low Newest First

Filters

CATEGORIES

- ▾ Bags, Wallets & Belts
 - Bags & Backpacks
 - Handbags & Clutches
 - Luggage & Travel

PRICE

Min to ₹1250+

Assured

BRAND

Search Brand

- S2M
- Parfois
- McParkar

McParkar Rio Waist Bag
4★ (5)
₹399 ₹599 33% off

S2M Travel Money
3.6★ (43)
₹419 ₹740 43% off

S2M Travel Money
3★ (5)
₹419 ₹540 22% off

S2M Travel Money
3.7★ (15)
₹419 ₹640 34% off

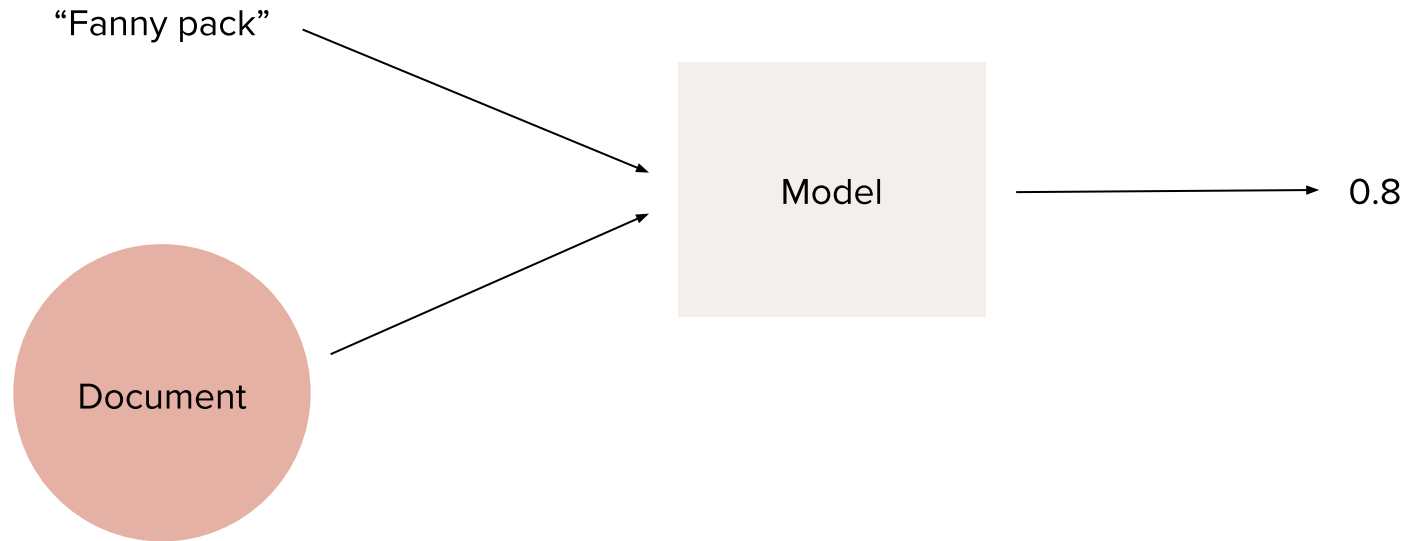


**Users and documents
speak different languages.**

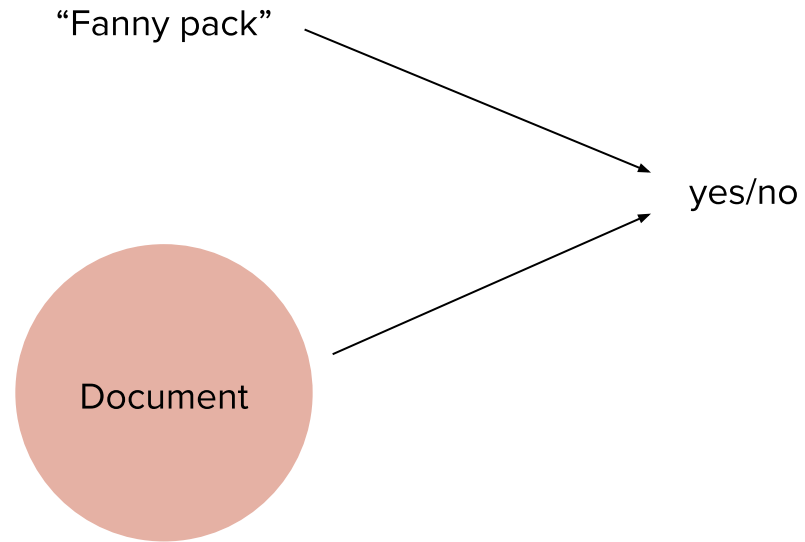
Why

Machine-Learned Relevance

Machine-Learned Relevance



Machine-Learned Relevance



Machine-Learned Relevance









Usual caveats apply:

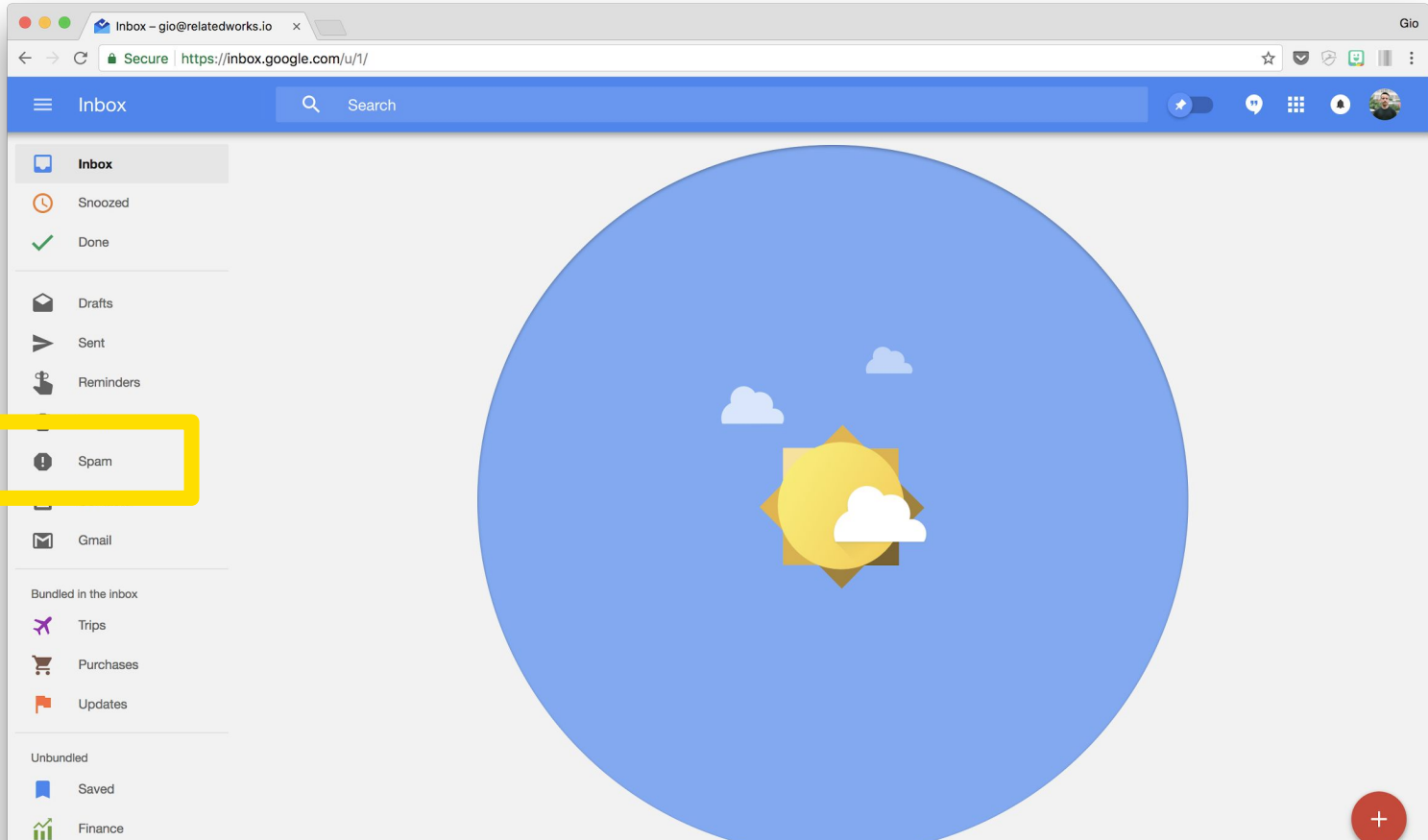
- Data is hard.
- Training is hard.
- Productionizing is hard.

“dress shirt”

Amazon.com: dress shirt: Clot x Gio

Secure https://www.amazon.com/s/ref=nb_sb_noss?url=search-alias%3Daps&field-keywords=dress+shirt

 <p>French Toast</p> <p>French Toast Boys' Long Sleeve Oxford Dress... from \$7¹⁰ Prime</p>	 <p>VAN HEUSEN</p> <p>Van Heusen Men's Long Sleeve Oxford Dress... from \$9⁰⁰ Prime</p>	 <p>Gioberti</p> <p>Gioberti Men's Long Sleeve Solid Dress Shirt from \$9⁹⁹ Prime</p>	 <p>VAN HEUSEN</p> <p>Van Heusen Men's Pinpoint Regular Fit Solid... from \$24⁹⁹ Prime</p>
 <p>Whatlees</p> <p>Whatlees Mens Geek Psychedelic Splash-ink... from \$19⁹⁶ Prime</p>	 <p>AUSELILY</p> <p>AUSELILY Women's Sleeveless Pockets Casu... from \$12⁹⁹ Prime</p>	 <p>French Toast</p> <p>French Toast Boys' Long Sleeve Poplin Dress... from \$5⁵⁹ Prime</p>	 <p>Tom's Ware</p> <p>Tom's Ware Mens Classic Slim Fit Contrast In... from \$17⁹⁹ Prime</p>





**Nobody uses ranking
models to filter spam.**

Neither should you.

What is Query Understanding

A vertical decorative bar on the left side of the slide, colored in a light beige or tan hue.

**Query Understanding is
focusing on queries.**



Query Understanding is
focusing on **intent**.

What

Material

“blue canvas tote”

Color

Category

What

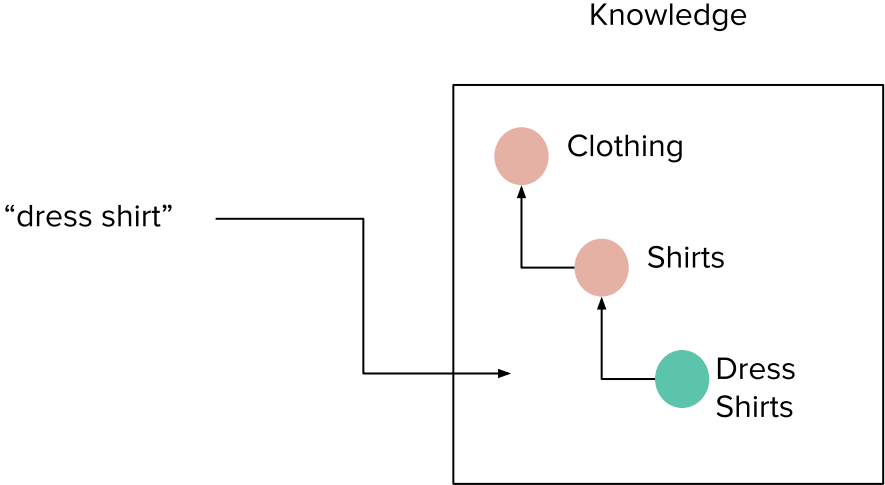
material_id:2

“blue canvas tote”

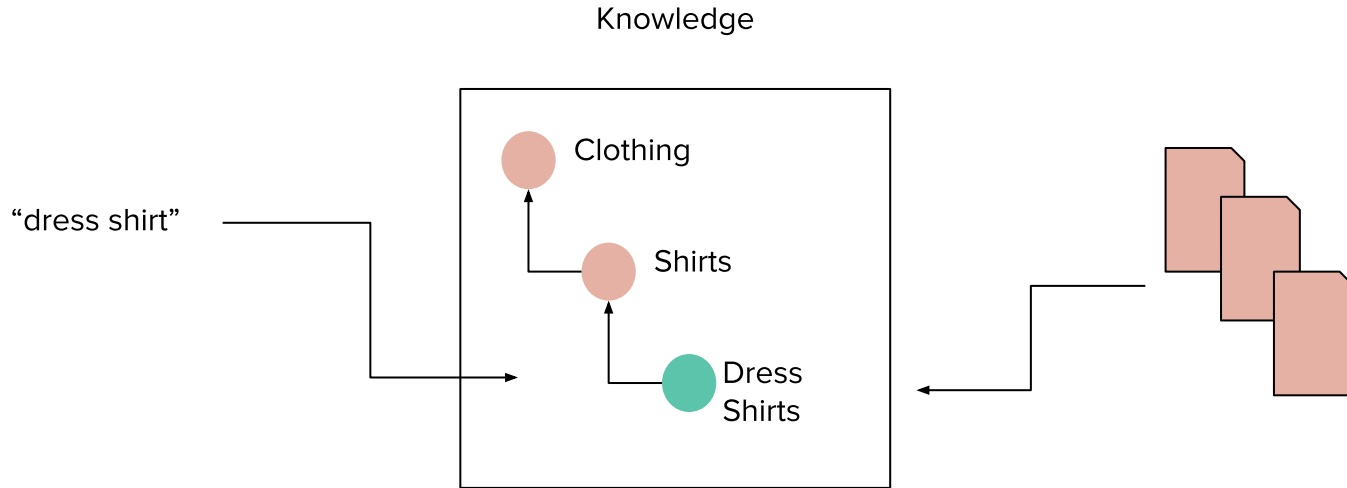
color_id:1

category_id:3

What



What



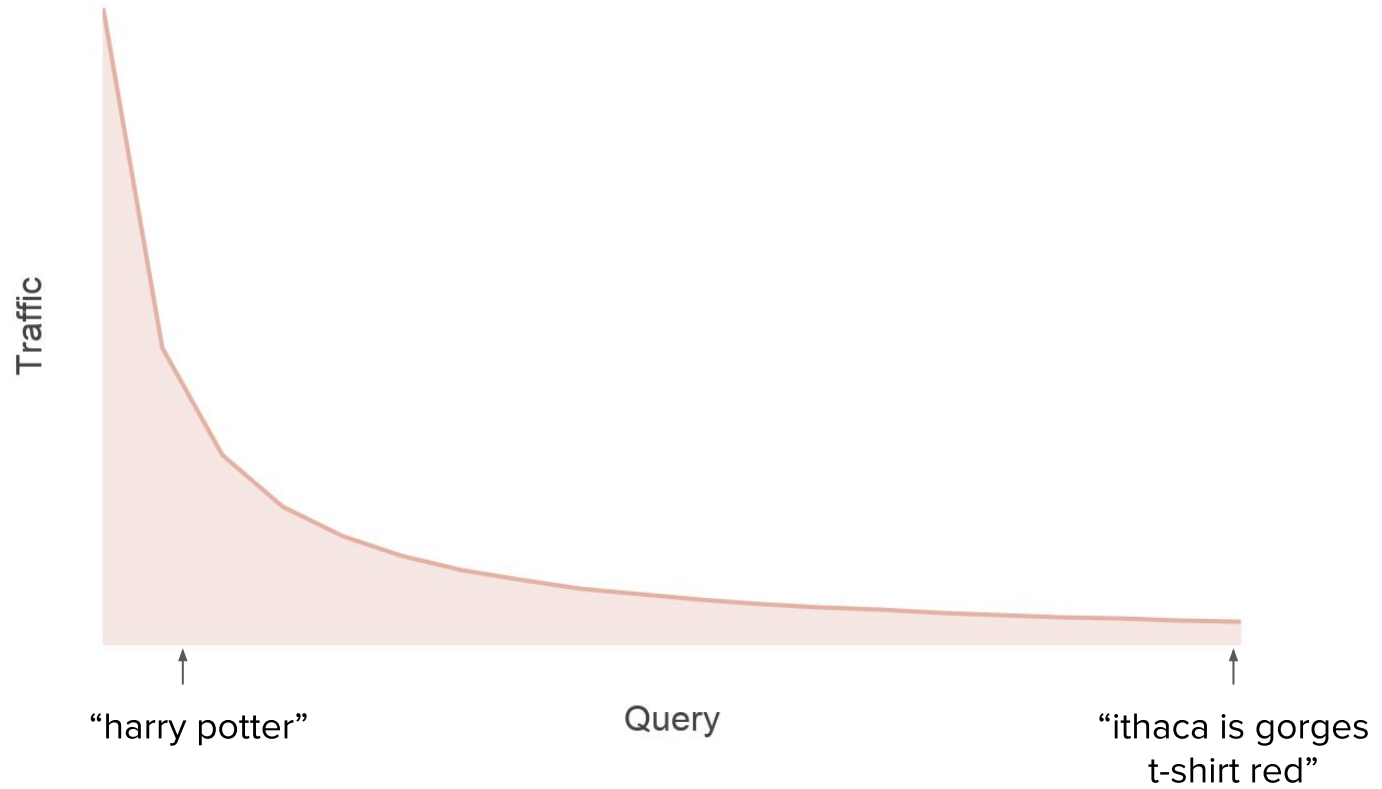


HOLD UP

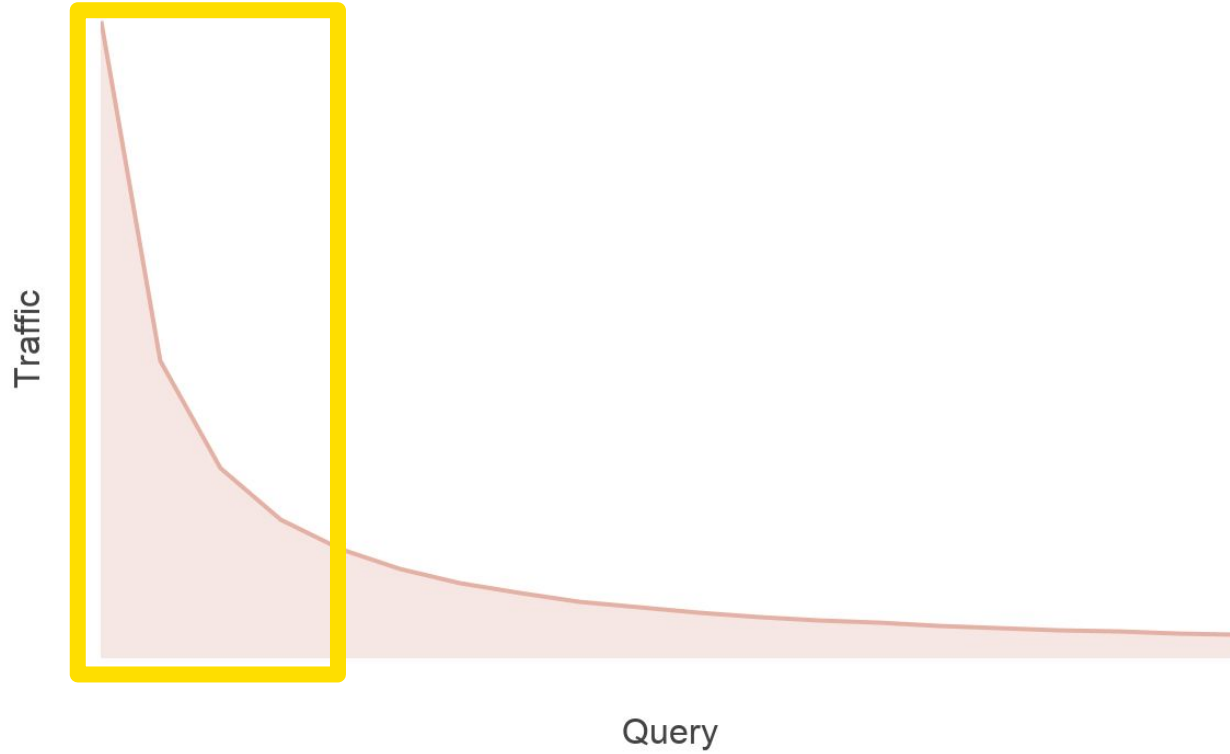


70 BILLION

What



What



“fanny pack”

Browser: fanny pack - Buy Products Onl x | URL: https://www.flipkart.com/search?q=fanny%20pack&otracker=start&as-show=on&as=off

Navigation: Sell on Flipkart | Advertise | Gift Card | 24x7 Customer Care | Track Order | Signup | Log In

Search: fanny pack | CART 0

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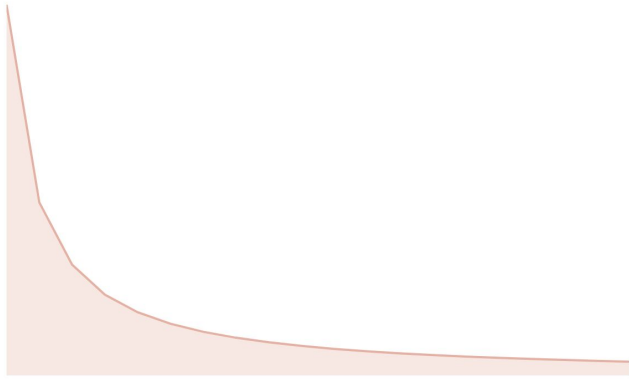
Filters: PICK A CATEGORY | Bags, Wallets & Belts | Travel Bags - Waist | Home Improvement | Books | Mobiles & Accessories | Tools & Hardware

Showing 1 - 8 of 8 results for "fanny pack"

Sort By: Relevance | Popularity | Price - Low to High | Price - High to Low

Product Name	Price	Discount	Rating
Spectrum Group Fanny Pack Waist Bag	₹695	₹700	
Leatherman Micra Red Multi Utility Plier	₹2,390	₹2,550 6% off	5★ (1)
Leatherman Micra Grey Multi Utility Plier	₹2,315	₹2,550 9% off	5★ (1)
Leatherman Micra Black Multi Utility Plier	₹2,390	₹2,550 6% off	4.3★ (6)

What



Knowledge



Problems

Precision Problems

Garbage results

Recall Problems

Not enough results

Problems

Precision Problems

“formation”

ShopSpring.com: formation x Gio

Secure https://www.shopspring.com/search?query=formation

Free shipping + free returns

SPRING

New Arrivals Women Men Kids Lifestyle Beauty Brands On Sale Sign In

formation

“formation” (44) Sort: Relevance

Category

- Women 7
- Men 20
- Kids 2
- Beauty 2
- Lifestyle 14

Price +

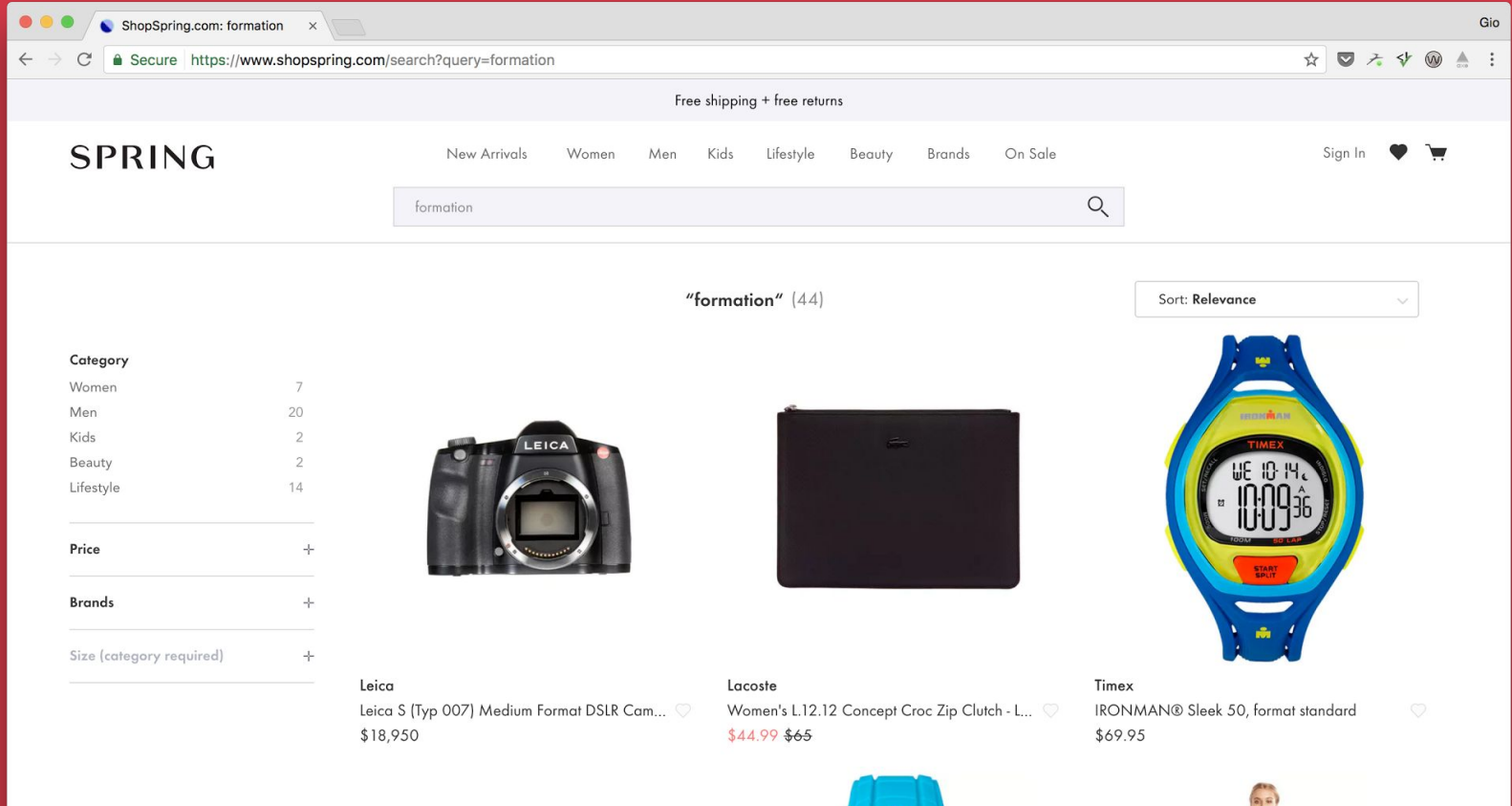
Brands +

Size (category required) +

Leica
Leica S (Typ 007) Medium Format DSLR Cam...
\$18,950

Lacoste
Women's L.12.12 Concept Croc Zip Clutch - L...
~~\$44.99~~ \$65

Timex
IRONMAN® Sleek 50, format standard
\$69.95

A screenshot of a web browser showing search results for "formation" on ShopSpring.com. The browser address bar shows "https://www.shopspring.com/search?query=formation". The page features a navigation bar with "SPRING" and various category links. A search bar contains the text "formation". Below the search bar, the results are displayed in a grid. On the left, there is a sidebar with filter options for Category, Price, Brands, and Size. The main content area shows three product listings: a Leica camera, a black Lacoste clutch bag, and a blue and yellow Timex Ironman watch. Each listing includes the brand name, product description, and price. The Leica camera is priced at \$18,950. The Lacoste clutch is priced at \$65, with a crossed-out price of \$44.99. The Timex watch is priced at \$69.95. The page also shows a "Sort: Relevance" dropdown menu and a "Free shipping + free returns" banner.

“beyonce”



ShopSpring.com: beyonce x Gio

Secure https://www.shopspring.com/search?query=beyonce

Free shipping + free returns.

SPRING

New Arrivals Women Men Kids Lifestyle Beauty Brands On Sale

Search Sign In

La Perla
BEYOND THE BEACH PLAYSUIT IN STRETCH...
\$1,080

La Perla
BEYOND THE BEACH VISCOSE KNIT TOP
\$600

La Perla
BEYOND THE BEACH SHORT VISCOSE KNI...
\$840

“solange”

ShopSpring.com: solange x Gio


Secure https://www.shopspring.com/search?query=solange

Free shipping + free returns.


SPRING

New Arrivals Women Men Kids Lifestyle Beauty Brands On Sale


Search Sign In





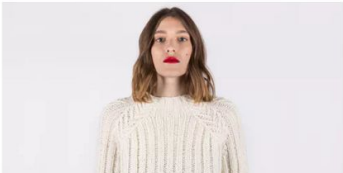
TOMS
TOMS Brown Multi Textile Women's Solana F...
\$39



Faherty
Solana Coverup Dress - Tidepool Stripe
\$148



TOMS
TOMS Cork Glitz Women's Solana Flip
\$39



Precision

“beyond” → “beyon”

“beyonce” → “beyon”

“format” → “format”

“formation” → “format”

“solana” → “solan”

“solange” → “solan”

Precision

Problem: Stemming proper nouns

Precision

Problem: Stemming proper nouns

1. **Easy** - Human-powered exceptions.

```
1  ENTITIES = [  
2      "beyonce",  
3      "solange",  
4      "cardi b"
```



**Your users don't care how
smart you are.**

Precision

Problem: Stemming proper nouns

1. **Easy** - Human-powered exceptions.
2. **Medium** - Harvest data.

Precision

List of R&B musicians

From Wikipedia, the free encyclopedia



This article **does not cite** sources. This article has been **challenged** and **removed** from Wikipedia. You can help Wikipedia by adding citations to reliable sources. To learn more, see the help page on citing sources.

This is a list of [rhythm and blues](#) (R&B) music artists. This list includes artists who have been on a major label). Bands are listed by the first

Precision

Problem: Stemming proper nouns

1. **Easy** - Human-powered exceptions.
2. **Medium** - Harvest data.
3. **Hard** - Part of Speech (POS) Tagger, Named Entity Recognition (NER).

Precision

beyonce formation t-shirt

ANALYZE

[See supported languages](#)

Entities

Sentiment

Syntax

Categories

beyonce formation₁ t-shirt₂

1. formation

LOCATION

Sentiment: Score 0 Magnitude 0

[Wikipedia Article](#)

Saliency: 0.65

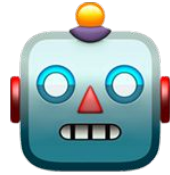
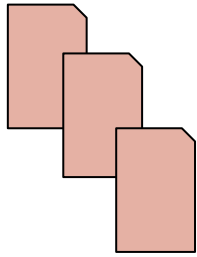
2. t-shirt

CONSUMER GOOD

Sentiment: Score 0 Magnitude 0

Saliency: 0.35

Precision



```
1 ENTITIES = [  
2     "beyonce",  
3     "solange",  
4     "cardi b"  
5     ...  
6 ]
```

“dress shirt”

The screenshot shows an Amazon search results page for 'dress shirt'. The browser address bar displays the URL: https://www.amazon.com/s/ref=nb_sb_noss?url=search-alias%3Daps&field-keywords=dress+shirt. The page features a grid of eight product listings, each with an image, brand name, title, and price.

Product Image	Brand	Title	Price
	French Toast	French Toast Boys' Long Sleeve Oxford Dres...	from \$7 ¹⁰ Prime
	VAN HEUSEN	Van Heusen Men's Long Sleeve Oxford Dress...	from \$9 ⁰⁰ Prime
	Gioberti	Gioberti Men's Long Sleeve Solid Dress Shirt	from \$9 ⁹⁹ Prime
	VAN HEUSEN	Van Heusen Men's Pinpoint Regular Fit Solid...	from \$24 ⁹⁹ Prime
	Whatlees	Whatlees Mens Geek Psychedelic Splash-ink...	from \$19 ⁹⁶ Prime
	AUSELILY	AUSELILY Women's Sleeveless Pockets Casu...	from \$12 ⁹⁹ Prime
	French Toast	French Toast Boys' Long Sleeve Poplin Dress...	from \$5 ⁵⁹ Prime
	Tom's Ware	Tom's Ware Mens Classic Slim Fit Contrast In...	from \$17 ⁹⁹ Prime

Precision

Problem: Not respecting phrases.

Precision

Problem: Not respecting phrases.

1. **Easy** - Human-powered phrase list.

Precision

Problem: Not respecting phrases.

1. **Easy** - Human-powered phrase list.
2. **Medium** - Heuristic-powered phrase list.

Precision

Pointwise Mutual Information (PMI)

$$\frac{P(\text{“dress shirt”})}{P(\text{“dress”}) * P(\text{“shirt”})}$$

Precision

W Dress shirt - Wikipedia x Gio

Secure | https://en.wikipedia.org/wiki/Dress_shirt ☆ 🛡️ 🔄 🗨️ ⋮

Not logged in | [Talk](#) | [Contributions](#) | [Create account](#) | [Log in](#)

Article [Talk](#) [Read](#) [Edit](#) [View history](#) 🔍

Dress shirt

From Wikipedia, the free encyclopedia

A **dress shirt**, **button shirt**, **button-front**, **button-front shirt**, or **button-up shirt** is a garment with a [collar](#) and a full-length opening at the front, which is fastened using [buttons](#) or [shirt studs](#). A **button-down** or **button-up shirt** is a dress shirt which has a button-down collar – a collar having the ends fastened to the shirt with buttons,^[1]


Dress shirts are normally made from woven [cloth](#), and are often accompanied by a [jacket](#), collar sleeve, and [tie](#), for example with a [suit](#) or [formalwear](#), but shirts are also worn more casually.

In [British English](#), "dress shirt" ("formal shirts," or "tuxedo shirts" in American English) means specifically the more formal evening garment worn with [black-](#) or [white-tie](#). Some of these formal shirts have stiff fronts and [detachable collars](#) attached with [collar studs](#).


Traditionally dress shirts were worn by men and boys, whereas women and girls often wore [blouses](#) or, sometimes, known as [chemises](#). However, in the mid-1800s, they also became an item of women's clothing and are worn by both sexes today.^[2]

Contents [\[hide\]](#)

- [Components](#)
 - [Collars](#)
 - [Cuffs](#)
 - [Other features](#)
- [Formal shirts](#)
- [Materials](#)
 - [Non-iron](#)
- [Shirt wearing](#)
- [Fit](#)
- [Industrial production](#)
- [See also](#)
- [Bibliography](#)
- [References](#)



In 17th century, men's shirts and cuffs were embellished with fine lace.

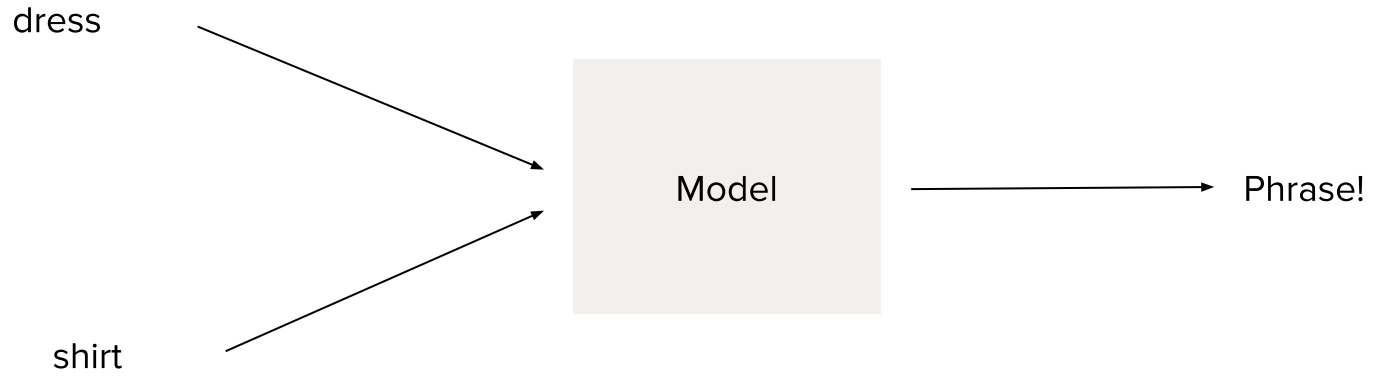


Precision

Problem: Not respecting phrases.

1. **Easy** - Human-powered phrase list.
2. **Medium** - Heuristic-powered phrase list.
3. **Hard** - Supervised-learning.

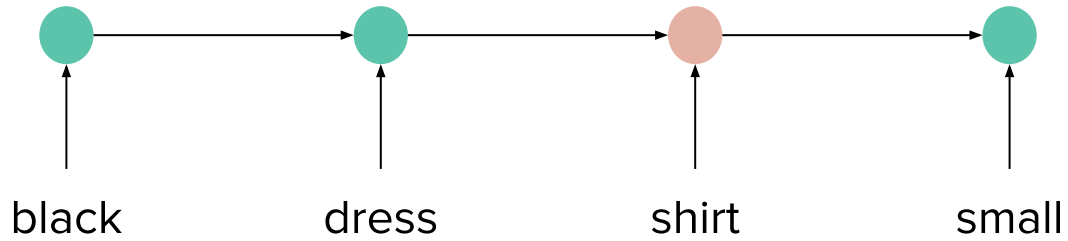
Precision



Precision

black | dress shirt | small

Precision



“dress”

Dress | Etsy

Secure | https://www.etsy.com/search?q=dress&order=most_relevant&view_type=gallery

Free ship Tweed suit for coat and dre...
DecorHomeArt
★★★★★ (64)
\$86.00 Free shipping

Dress and messes mom of both JPEG...
SewVinlylyMade
★★★★★ (72)
\$2.50

Pimpi dress
enchantedlittleone
\$35.00 Free shipping

Anne Wheeler: The Greatest Showma...
NchntdCostumes
\$200.00

1930s-40s Novelty Print Dress
TheGildedCave
\$140.00

100 Acts of Sewing: Dress No. 1 - Se...
100ActsofSewing
★★★★★ (1,738)
\$17.00

BEAUTIFUL Dress perfect for Prom/S...
PrincessAliDiscount
\$95.00

OUT of PRINT McCall's Pattern M669...
GGselections
★★★★★ (3,404)
\$5.95

Precision

Finished Goods



Craft Supplies



Precision

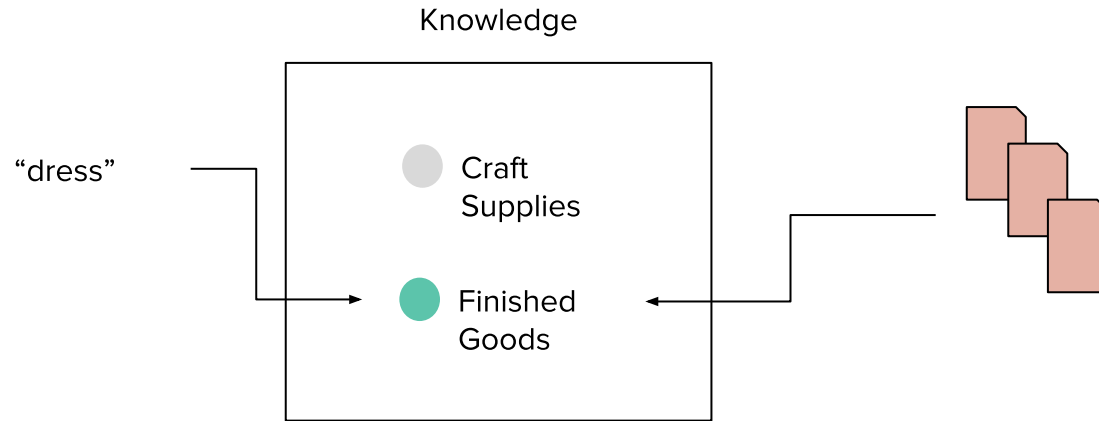
Problem: Ambiguous keywords.

Precision

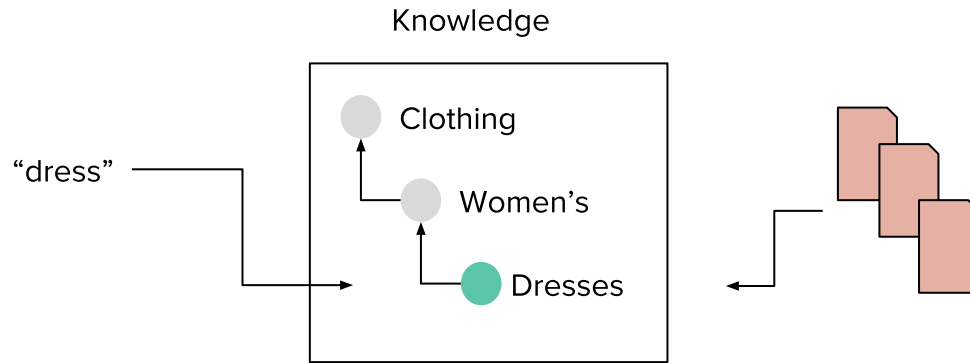
Problem: Ambiguous keywords.

Solution: Query Classification.

Precision



Precision



Precision

Problem: Ambiguous keywords.

1. **Easy** - Human-powered mappings.

Precision

Problem: Ambiguous keywords.

1. **Easy** - Human-powered mappings.
2. **Medium** - Data-powered mappings.

Precision

$P(\text{Finished Goods} \mid \text{"dress"}) =$

$$\frac{\# \text{ of Finished Goods clicks for "dress"}}{\# \text{ of clicks for "dress"}}$$

Precision

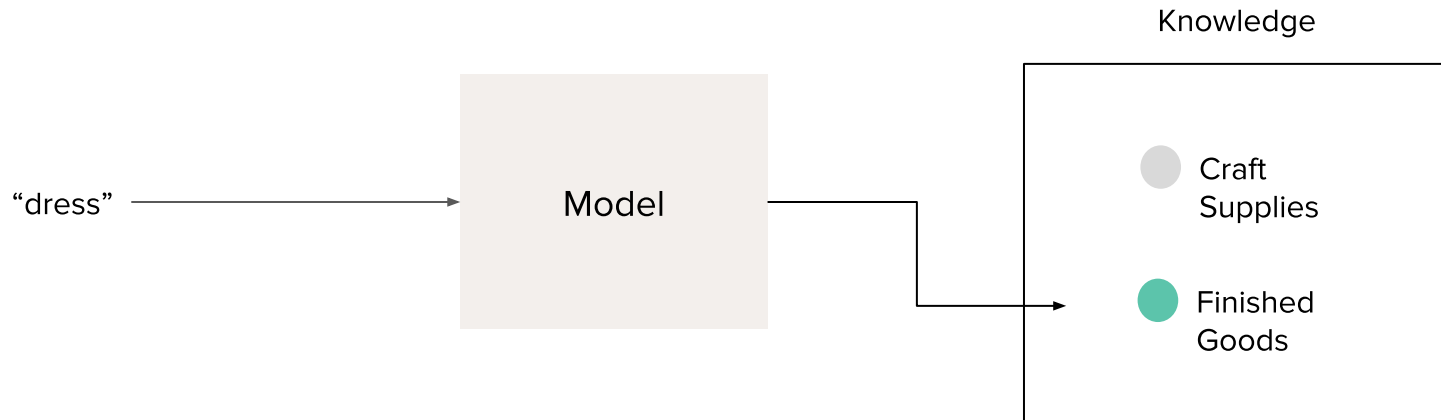
```
stem(dress) == stem([clothing.womens.]dresses)
```

Precision

Problem: Ambiguous keywords.

1. **Easy** - Human-powered mappings.
2. **Medium** - Data-powered mappings.
3. **Hard** - Supervised-learning.

Precision



Precision

The screenshot shows a web browser window displaying the scikit-learn documentation page for Naive Bayes. The page title is "1.9. Naive Bayes" and the URL is "scikit-learn.org/stable/modules/naive_bayes.html". The page features a navigation bar with links for Home, Installation, Documentation, and Examples, along with a Google Custom Search box. A sidebar on the left contains navigation links for previous and next sections, version information (scikit-learn v0.19.1), and a list of sub-sections under "1.9. Naive Bayes". The main content area includes a description of Naive Bayes methods, a mathematical formula for the joint probability, and a classification rule. A "Fork me on GitHub" banner is visible in the top right corner.

1.9. Naive Bayes — scikit-learn x

scikit-learn

Home Installation Documentation Examples

Google Custom Search

1.9. Naive Bayes

Naive Bayes methods are a set of supervised learning algorithms based on applying Bayes' theorem with the "naive" assumption of independence between every pair of features. Given a class variable y and a dependent feature vector x_1 through x_n , Bayes' theorem states the following relationship:

$$P(y | x_1, \dots, x_n) = \frac{P(y)P(x_1, \dots, x_n | y)}{P(x_1, \dots, x_n)}$$

Using the naive independence assumption that

$$P(x_i | y, x_1, \dots, x_{i-1}, x_{i+1}, \dots, x_n) = P(x_i | y),$$

for all i , this relationship is simplified to

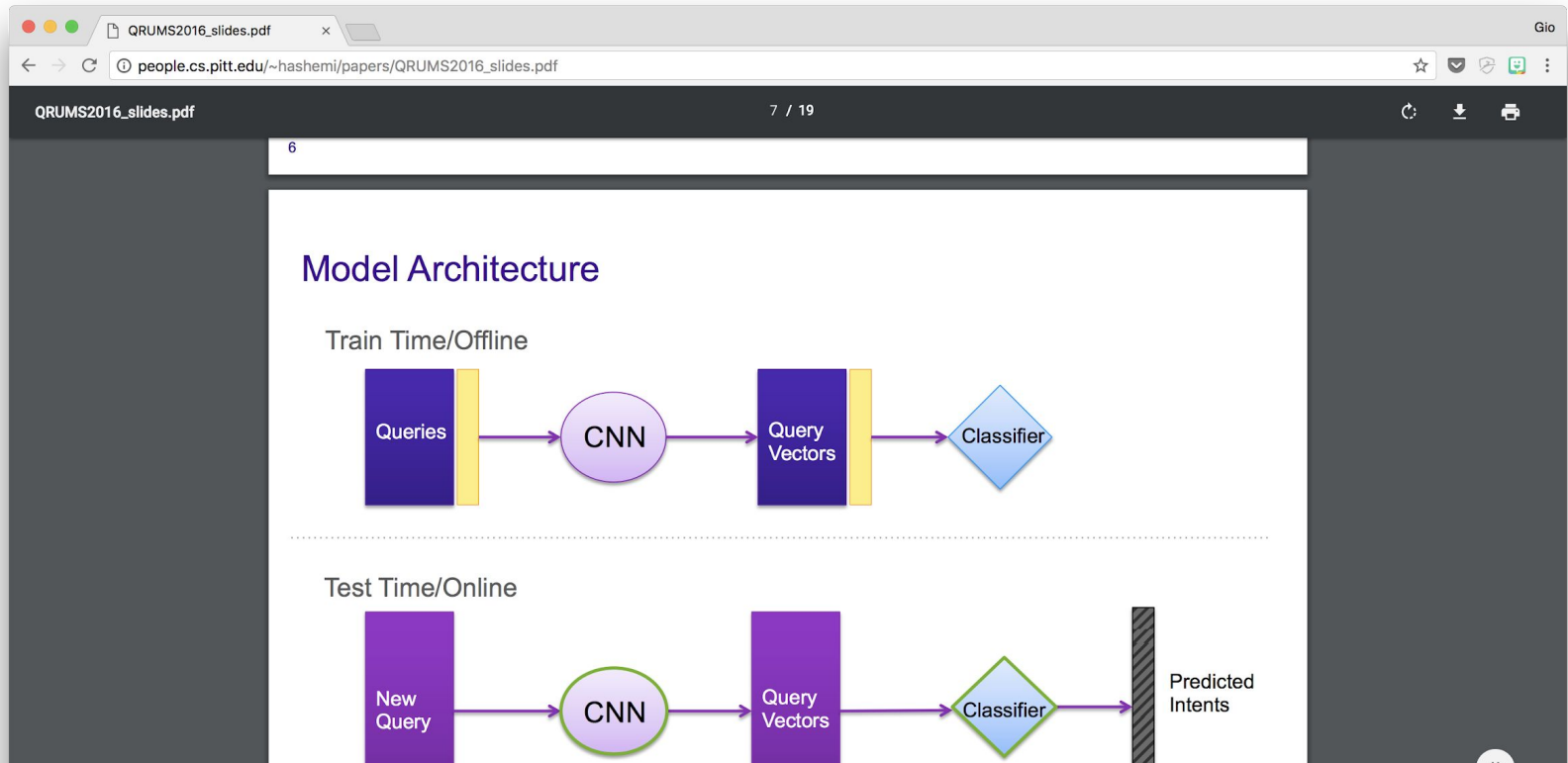
$$P(y | x_1, \dots, x_n) = \frac{P(y) \prod_{i=1}^n P(x_i | y)}{P(x_1, \dots, x_n)}$$

Since $P(x_1, \dots, x_n)$ is constant given the input, we can use the following classification rule:

$$P(y | x_1, \dots, x_n) \propto P(y) \prod_{i=1}^n P(x_i | y)$$
$$\hat{y} = \arg \max_y P(y) \prod_{i=1}^n P(x_i | y),$$

and we can use Maximum A Posteriori (MAP) estimation to estimate $P(y)$ and $P(x_i | y)$; the former is then the relative

Precision



Problems

Recall Problems

“fanny pack”

Browser: fanny pack - Buy Products Onl x | URL: https://www.flipkart.com/search?q=fanny%20pack&otracker=start&as-show=on&as=off

Navigation: Sell on Flipkart | Advertise | Gift Card | 24x7 Customer Care | Track Order | Signup | Log In

Search: fanny pack | CART 0

Categories: ELECTRONICS | APPLIANCES | MEN | WOMEN | BABY & KIDS | HOME & FURNITURE | BOOKS & MORE | OFFER ZONE

Showing 1 – 8 of 8 results for “fanny pack”

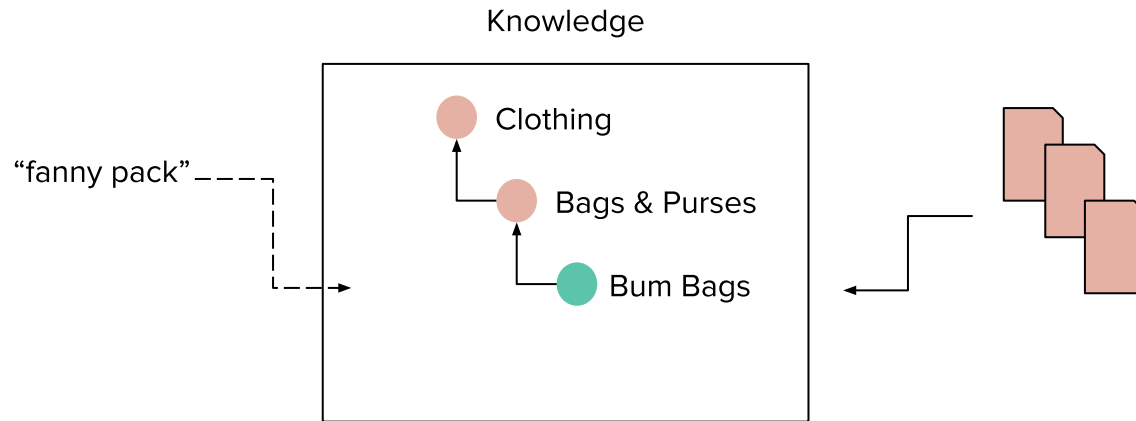
Sort By: Relevance | Popularity | Price – Low to High | Price – High to Low

Product Name	Price	Discount
Spectrum Group Fanny Pack Waist Bag Black	₹695	₹700
Leatherman Micra Red Multi Utility Plier 10 Tools, Red	₹2,390	₹2,550 6% off
Leatherman Micra Grey Multi Utility Plier 10 Tools, Grey	₹2,315	₹2,550 9% off
Leatherman Micra Black Multi Utility Plier 10 Tools, Black	₹2,390	₹2,550 6% off

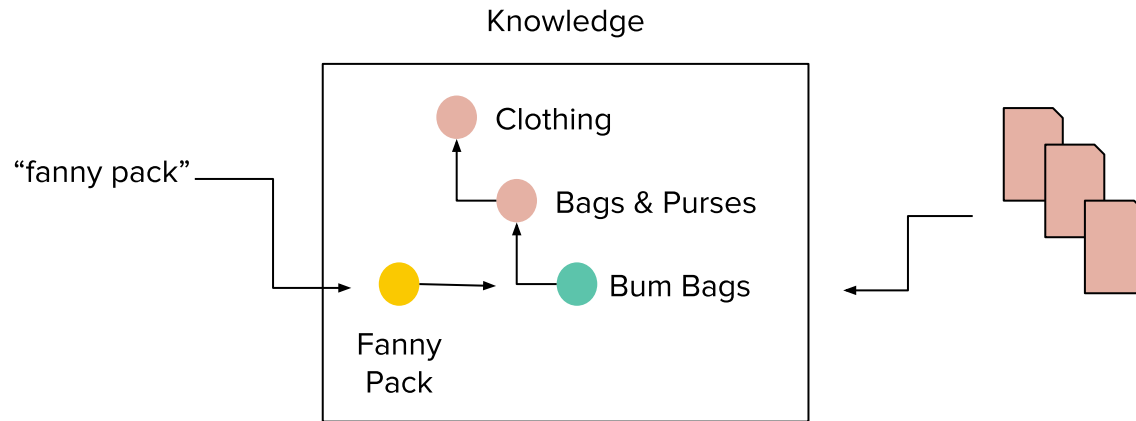
Filters: PICK A CATEGORY | Bags, Wallets & Belts | Travel Bags - Waist | Home Improvement | Books | Mobiles & Accessories | Tools & Hardware

Additional products visible: The Magical Fanny Pack

Recall



Recall



Recall

Problem: Nomenclature mismatch.

- 1. Easy** - Human-powered synonyms.

Recall

Problem: Nomenclature mismatch.

1. **Easy** - Human-powered synonyms.
2. **Medium** - Existing data sources, i.e. Wordnet, Wikipedia.

Recall

```
>>> from nltk.corpus import wordnet as wn
>>> wn.synsets("fanny")
[Synset('buttocks.n.01'),
```

Fanny pack

From Wikipedia, the free encyclopedia

For the hip-hop group, see [FannyPack](#).



This article **needs additional c**
material may be challenged and

A **fanny pack** (American English) or **bum bag** (British English) is

Recall

Problem: Nomenclature mismatch.

1. **Easy** - Human-powered synonyms.
2. **Medium** - Existing data sources, i.e. Wordnet, Wikipedia.
3. **Hard** - Automatically detect synonyms.

Recall

Embedding projector - visualiz x

Secure https://projector.tensorflow.org

Embedding Projector

Points: 71291 | Dimension: 200 | Selected 53 points

5 tensors found
Word2Vec All

Label by
word

Color by
No color map

Spherrize data

Load data Publish

Checkpoint: Demo datasets
Metadata: oss_data/word2vec_full_200d_labels.tsv

T-SNE **PCA** CUSTOM

X Component #1 Y Component #2

probable

word probable
count 196

Search by
probable word

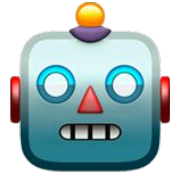
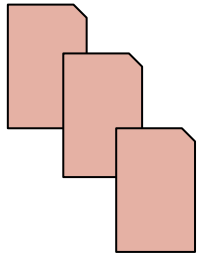
neighbors 52

distance COSINE EUCLIDEAN

Nearest points in the original space:

likely	0.913
possible	0.980
unlikely	0.986
probably	0.994
suggests	1.018
believed	1.032
interesting	1.036
perhaps	1.037
clear	1.038
seems	1.044
thus	1.045
therefore	1.051

Precision



```
1  SYNONYMS = {  
2    "fanny pack": "bu  
3    .....  
4  }  
5
```

“red nascar”

red nascar | Search Results | D x

https://dp.la/search?q=red+nascar

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red nascar Search

24 results for red nascar


Sort by Relevance Items per page 20

Refine your search


Type	
image	19
text	1

Subject


NASCAR (Association)	19
Winston Cup	16
Robinson, Red	13
Charlotte Motor Speedway (Concord, N.C.)	12
Stock car drivers	8
National 500 (Automobile race)	8
Automobile racing fans	8
Pearson, David, 1934-	6
World 600 (Automobile race)	4
Models (Persons)	3
Jeanes, Laura	3



Button, NASCAR Dads for George W. Bush, 2004
2004
Button promoting George W. Bush's Presidential Campaign in 2004. Red Background and white text that reads: "Nascar Dads / For / President / George W. / Bush / 2004" Democratic pundit coined the term,....
[View Full Item](#) in University of North Carolina at Chapel Hill



Red Vogt and Red Byron
Photograph of Atlanta, Georgia garage owner and mechanic Red Vogt (left) sitting on the outside of a racing car. Red Byron, a stock car driver, sits inside the car. Cars prepared by Vogt dominated NAS...
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Red Vogt
Photograph of Atlanta, Georgia garage owner and mechanic Red Vogt seated on the hood of a car outside his garage. A neon sign advertising his garage hangs above. Vogt provided many of the early stock...
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“nascar”

nasar | Search Results | DPLA x

https://dp.la/search?q=nascar

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nascar Search


5,288 results for **nascar**

Sort by Relevance Items per page 20


Refine your search

Type	
image	5,172
text	63
sound	22
moving image	18


Subject	
NASCAR (Association)	4,871
Winston Cup	3,419
Charlotte Motor Speedway (Concord, N.C.)	2,987
Stock cars (Automobiles)	1,941
National 500 (Automobile race)	1,905
Stock car racing	1,469
Stock car drivers	1,346
World 600 (Automobile race)	1,006
Daytona International Speedway	813
Models (Persons)	645
Automobile racing drivers	544



NASCAR
Photograph of Bill Elliott's race car leading Tony Stewart's car through the opening lap of the Winston Cup race at the Atlanta Motor Speedway in Henry County, Georgia. A line of cars drives behind th...
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NASCAR
ence, Dan
encyclopedia article about NASCAR in Georgia. Georgia drivers, car owners, mechanics, and speedways have long played an important role the establishment, development, and growing popularity of the...
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NASCAR at the Brickyard
1993
[View Full Item](#) in Indianapolis Special Collections Room, Indianapolis Public Library

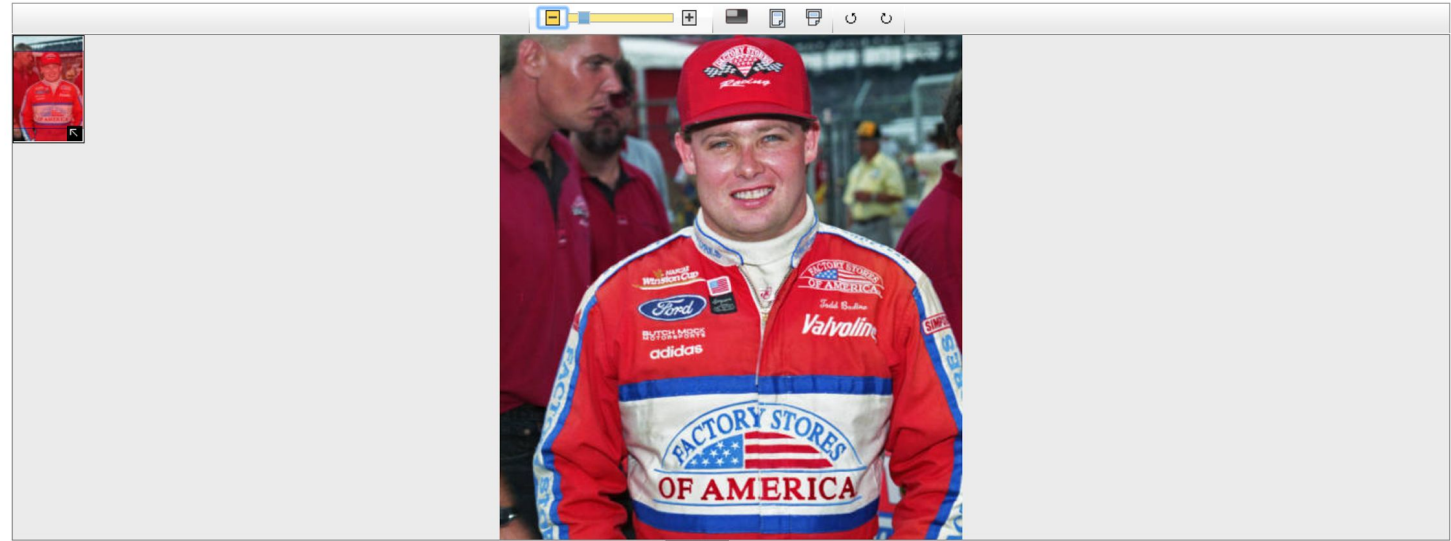
Search Search Advanced Search

Home >> Indianapolis Motor Speedway Collection >> Todd Bodine Posing, 1994

Reference URL Share Add tags Comment

Todd Bodine Posing, 1994

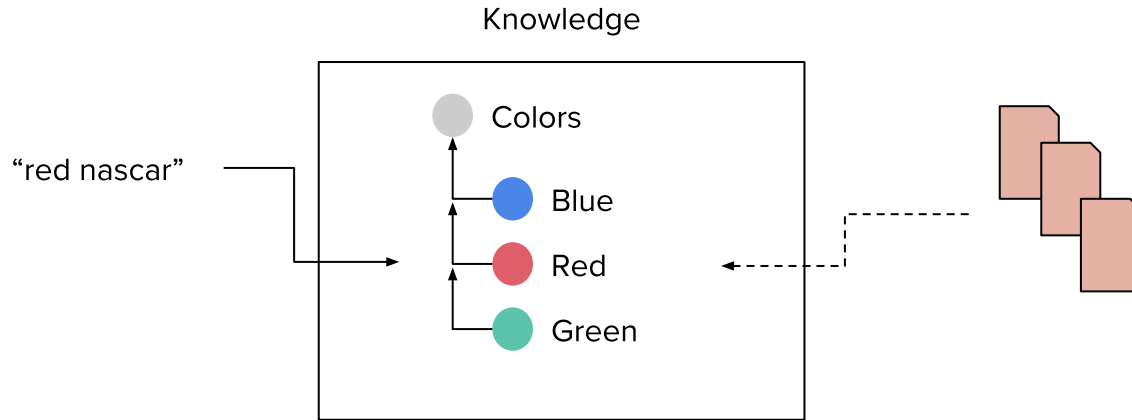
[View Description](#)



Description

Recall

Problem: Missing data.



Recall

Problem: Missing data.

1. Easy - Ask humans.

Recall

Problem: Missing data.

1. **Easy** - Ask humans.
2. **Medium** - Heuristics.

Recall

```
from colorthief import ColorThief

color_thief = ColorThief('/path/to/imagefile')
# get the dominant color
dominant_color = color_thief.get_color(quality=1)
# build a color palette
palette = color_thief.get_palette(color_count=6)
```

Recall

Shoes

Women's Shoes

Slip Ons

Loafers

Morgan Quinn Shoes

suede kiltie shoes

rust suede loafers

70's hippie shoes

kiltie fringe shoes

suede leather shoes

70's suede wedges

rust brown boat shoe

USA union made

women's size 8 shoes

gum sole platforms

minimalist shoes

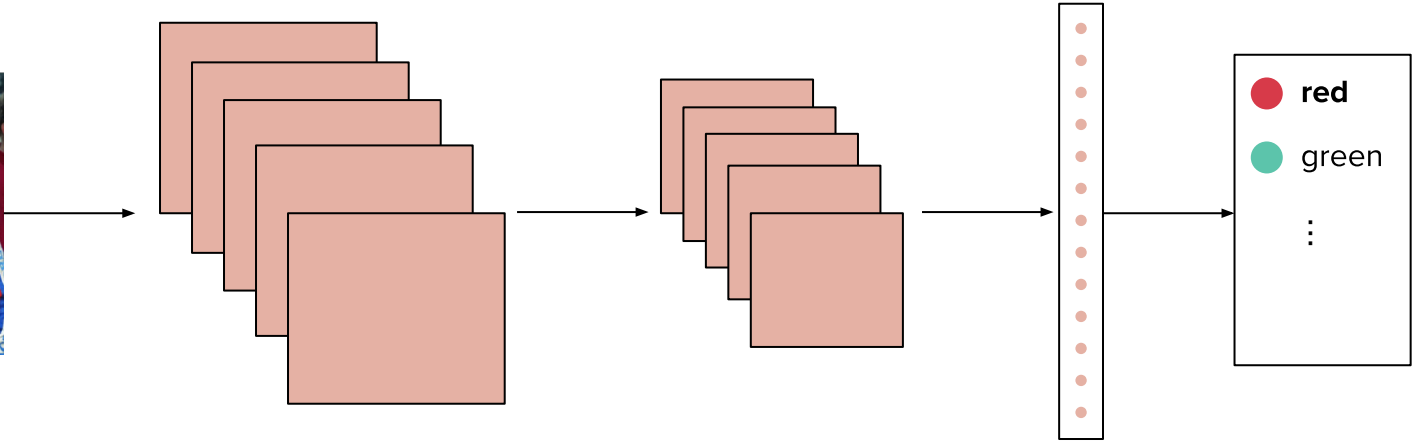
slip on moccasins

Recall

Problem: Missing structured data.

1. **Easy** - Ask content creators.
2. **Medium** - Heuristics.
3. **Hard** - ML/AI.

Recall



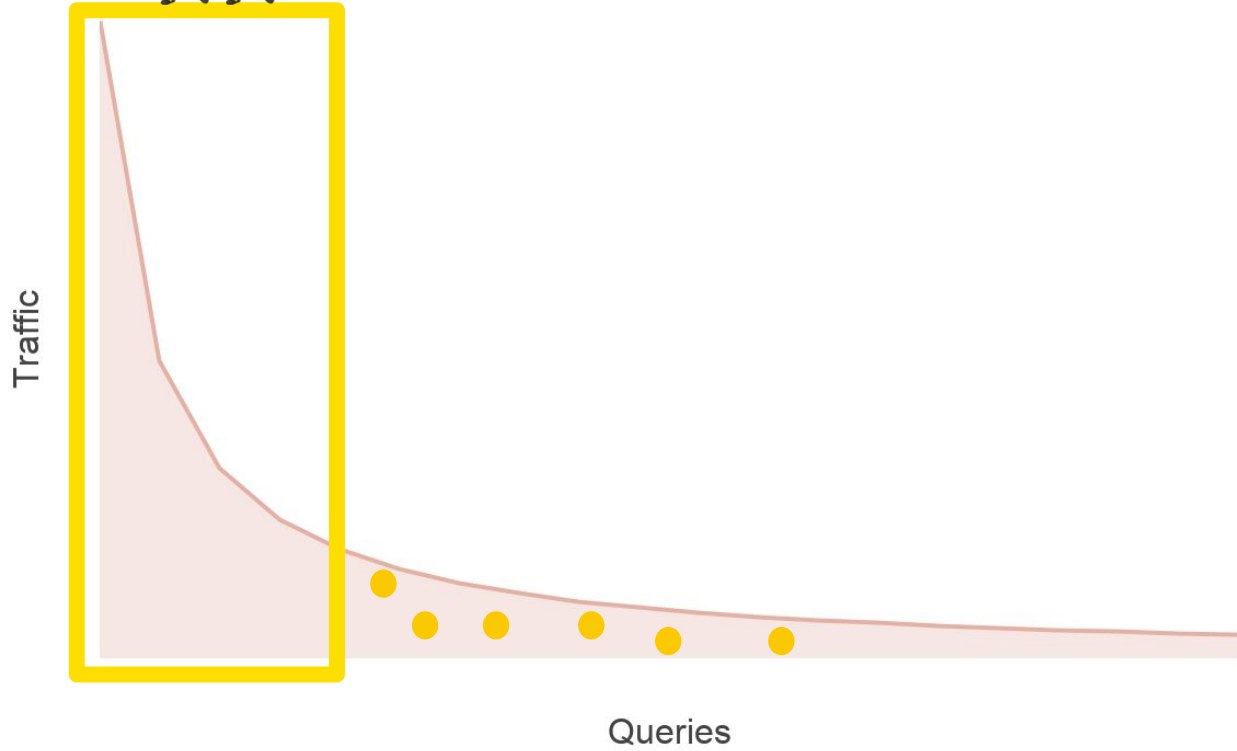
Problems

Patterns

Patterns

1. **Easy** - Humans.

Patterns



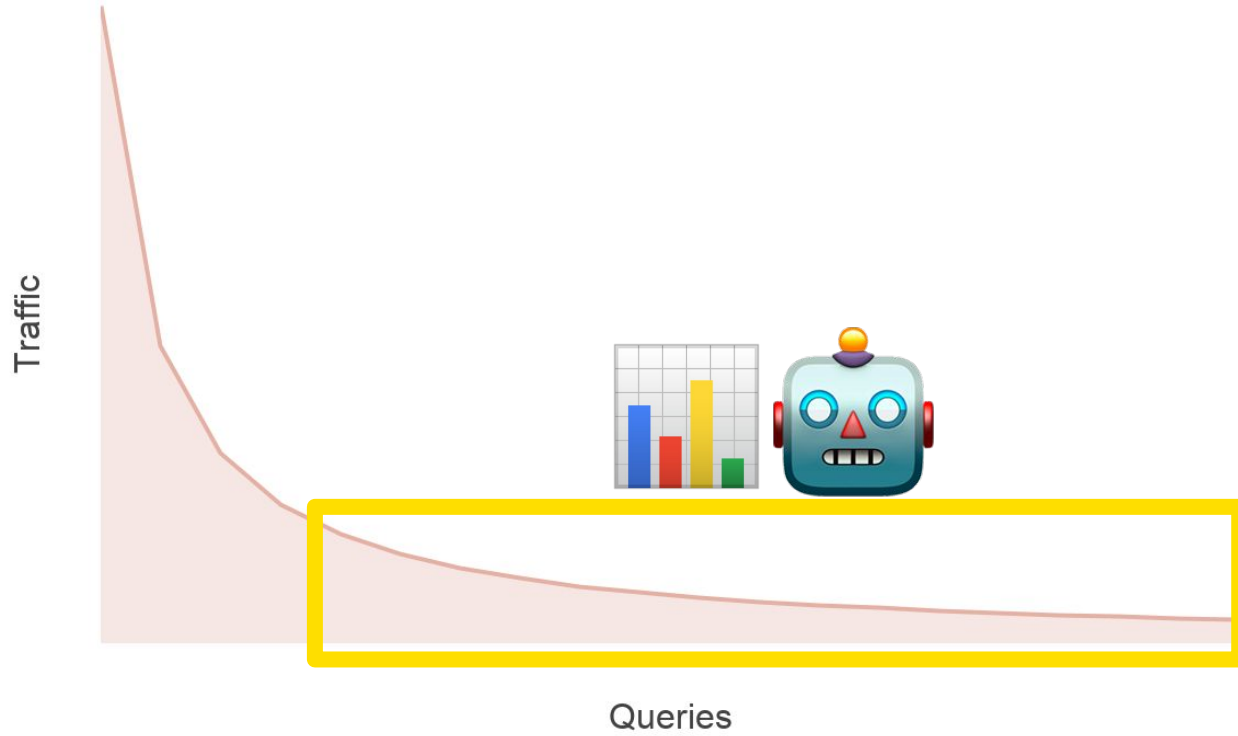
Patterns

1. **Easy** - Humans.
2. **Medium** - Data/Heuristics.

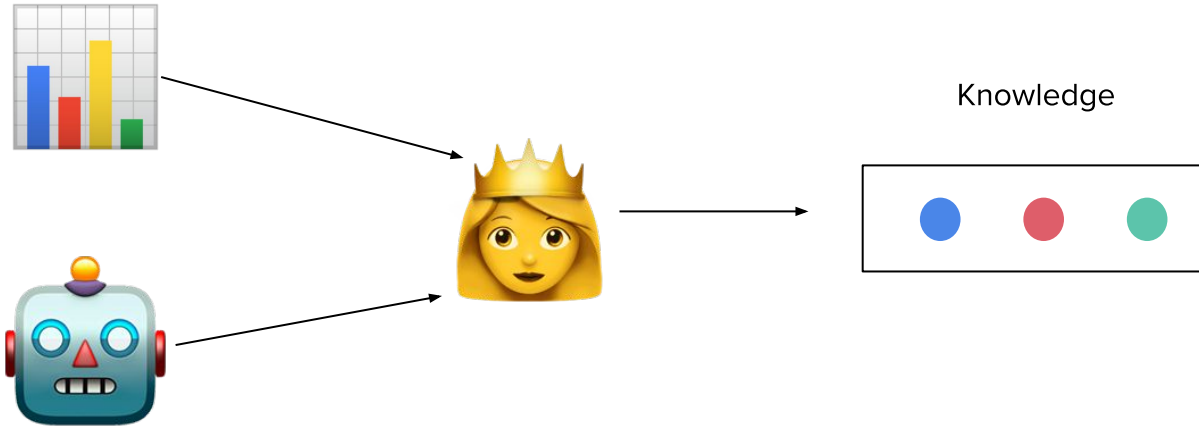
Patterns

1. **Easy** - Humans.
2. **Medium** - Data/Heuristics.
3. **Hard** - AI/ML.

Patterns



Patterns





HIGH STAKES

“clutch”

clutch in Clutches & Parts | eBay

Secure | https://www.ebay.com/sch/Clutches-Parts/33730/fi.html?_from=R40&_nkw=clutch&_vxp=mr

Hi! Sign in or register | Daily Deals | Gift Cards | Help & Contact | **List. Sell. Get Paid.** | Sell | My eBay |

Shop by category Clutches & Parts Advanced Include description

Refine your search for clutch

All Listings Auction Buy It Now Sort: Best Match View: Group Similar Listings

375,943 results for clutch Save this search **Guaranteed 3 day delivery**

Find parts for your automobile [Go to My Garage](#)

Select a vehicle:

EXEDY SC646 CLUTCH SLAVE CYLINDER CIVIC /INTEGRA /DEL SOL B18 D16 B16
OHHC SOHC
Brand New
★★★★★ 22 product ratings
14.51
Buy It Now
Free Shipping
14 Sold
 FAST 'N FREE
Estimated Delivery Fri, May. 4

EM NEW Clutch Pedal w/ Bracket 5 Speed Manual Black 99-07 Silverado Sierra
Genuine GM Parts & Accessories 100% Satisfaction
Brand New
★★★★★ 6 product ratings
63.03
Buy It Now
Free Shipping
 FAST 'N FREE
Estimated Delivery Thu, May. 3

Yield Pledge® Money Market
1.50% 1-YEAR INTRO APY
First year Annual Percentage Yield (APY) on balances up to \$250K for first-time clients!
 EverBank
It's your money. Make the most of it.*

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Industrial Hydraulic Clutches & Pneumatic Clutches

Categories

All

- ↳ eBay Motors
- ↳ Parts & Accessories
- ↳ Car & Truck Parts
- ↳ Transmission & Drivetrain
- Clutches & Parts**
 - Flywheels, Flexplates, & Parts
 - Automatic Transmission & Parts
 - Pressure Plates
 - More ▾
- ↳ Clothing, Shoes & Accessories
- ↳ Cell Phones & Accessories

Show more ▾

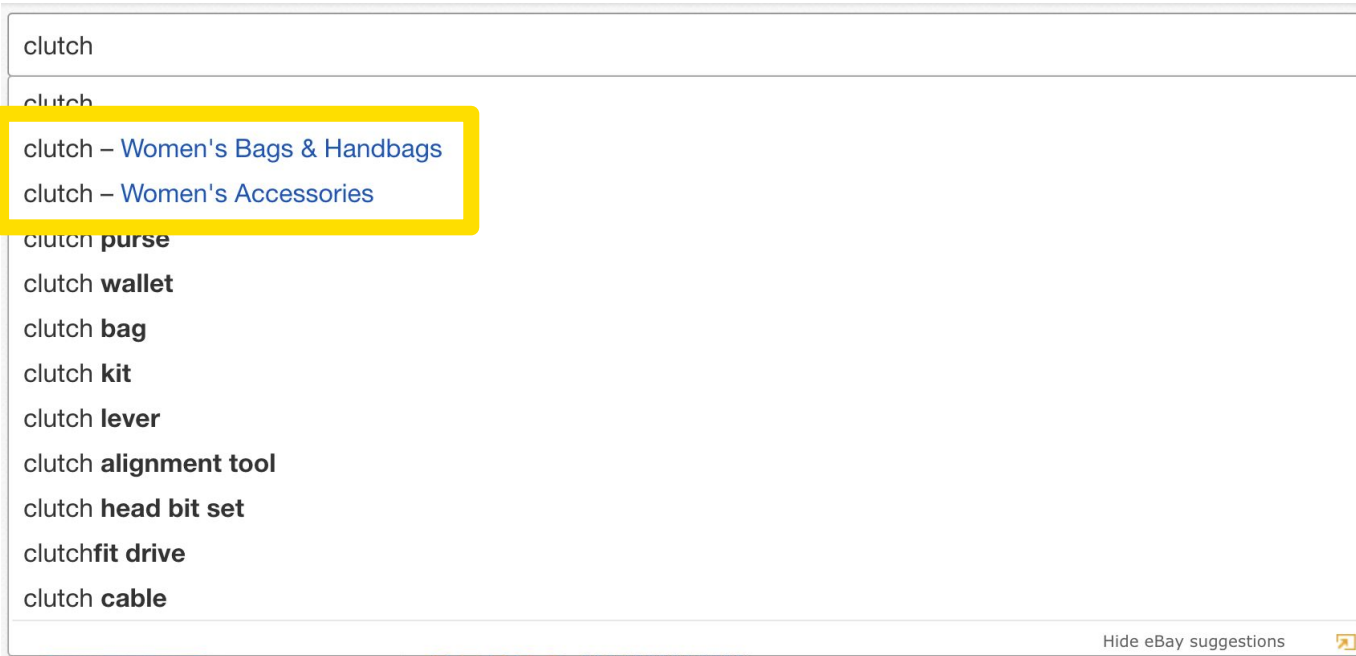
Brand see all

- Advanced Clutch Technology (4,579)
- Centric Parts (28,645)
- Competition Clutch (3,858)
- Exedy (28,722)
- Ford (1,408)
- LuK (29,346)
- Sachs (13,095)
- Valeo (13,112)

Warranty see all


- No Warranty (91,721)
- Unspecified Length (83,550)

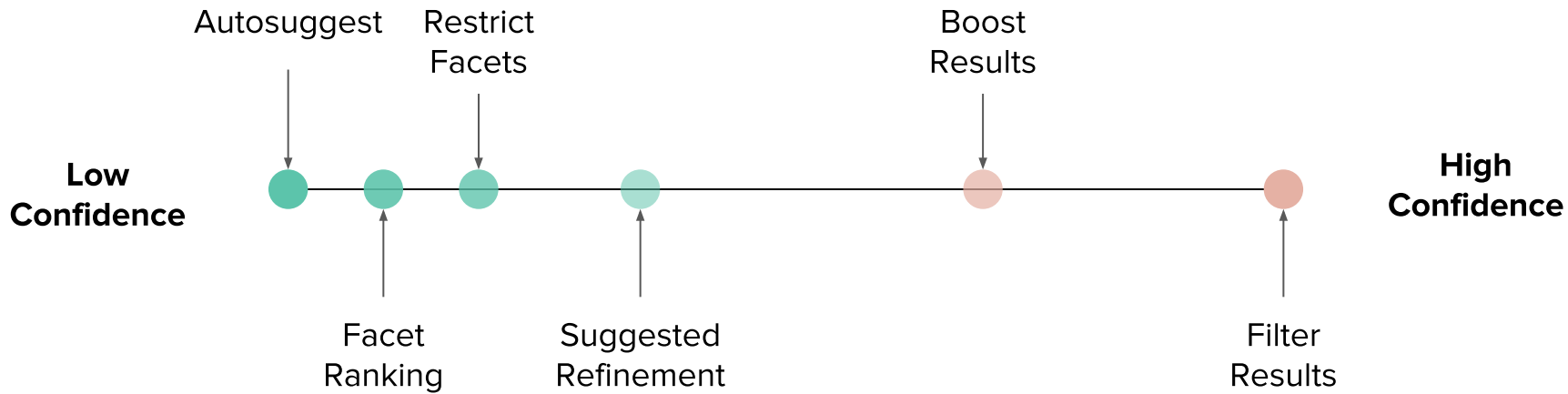
Query Understanding + UX



A screenshot of an eBay search dropdown menu. The search input field contains the text "clutch". Below the input, a list of suggestions is displayed. The first two suggestions, "clutch – Women's Bags & Handbags" and "clutch – Women's Accessories", are highlighted with a yellow rectangular box. The remaining suggestions are "clutch **purse**", "clutch **wallet**", "clutch **bag**", "clutch **kit**", "clutch **lever**", "clutch **alignment tool**", "clutch **head bit set**", "clutch**fit drive**", and "clutch **cable**". At the bottom right of the dropdown, there is a link that says "Hide eBay suggestions" next to a small icon.

- clutch
- clutch
- clutch – [Women's Bags & Handbags](#)
- clutch – [Women's Accessories](#)
- clutch **purse**
- clutch **wallet**
- clutch **bag**
- clutch **kit**
- clutch **lever**
- clutch **alignment tool**
- clutch **head bit set**
- clutch**fit drive**
- clutch **cable**

Hide eBay suggestions 



Denouement

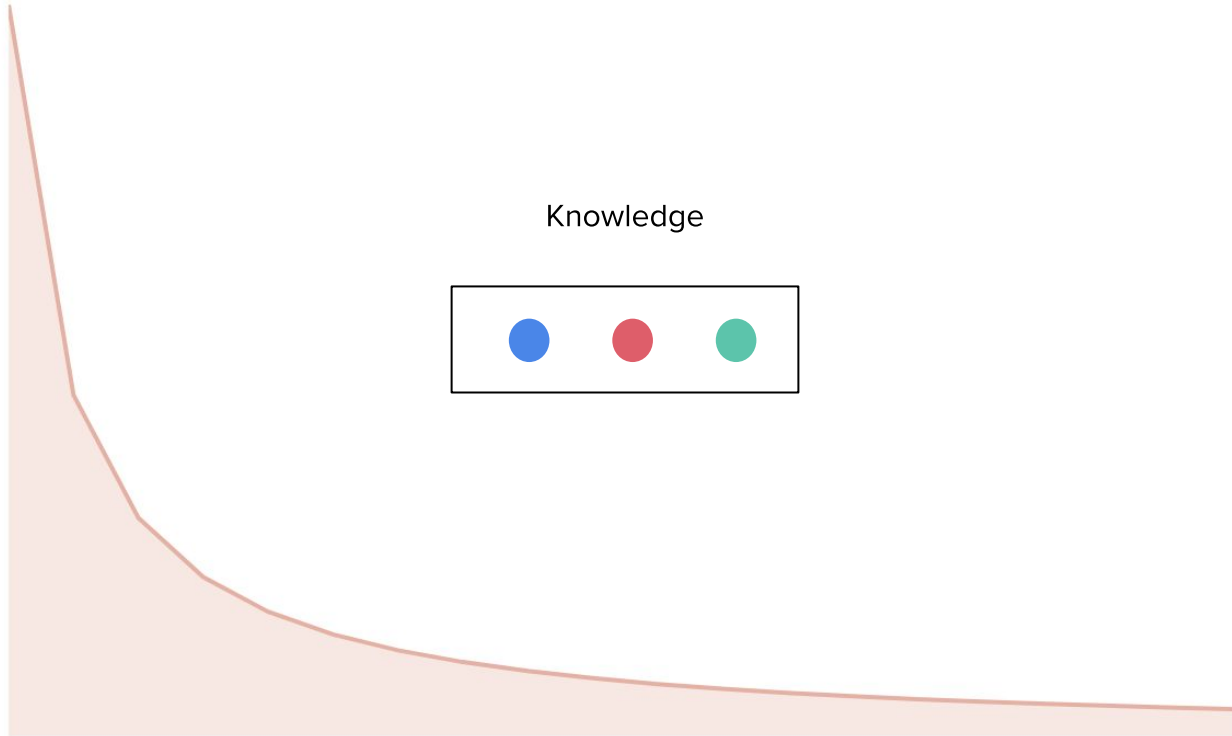


**Query Understanding
helps us achieve a
baseline of relevance.**



Query Understanding is
focusing on **intent**.

What





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