



Lessons and Challenges from Product Search

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A9.com

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About A9

- Subsidiary of Amazon.com
- Founded in 2003
- Three Areas of Focus:
 - Product Search
 - Search Advertising
 - Visual Search (SnapTell)
- Provides search for Amazon and other major retailers worldwide



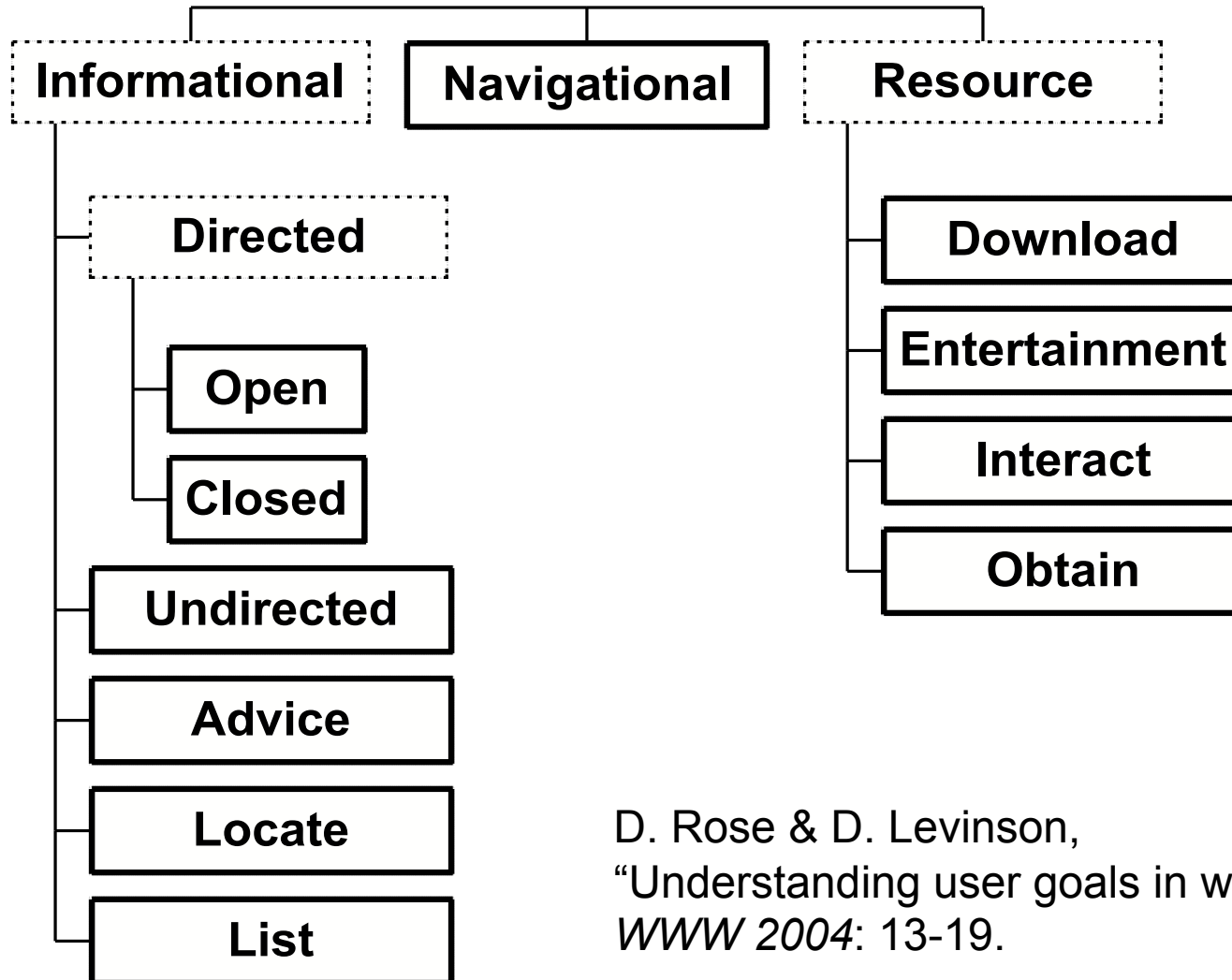
Different Domains, Different Solutions

- Traditional IR
- Enterprise Search
- Web Search
- Product Search

How are the issues different?

Let's go back to user goals...

The Goals of Web Search



D. Rose & D. Levinson,
"Understanding user goals in web search,"
WWW 2004: 13-19.

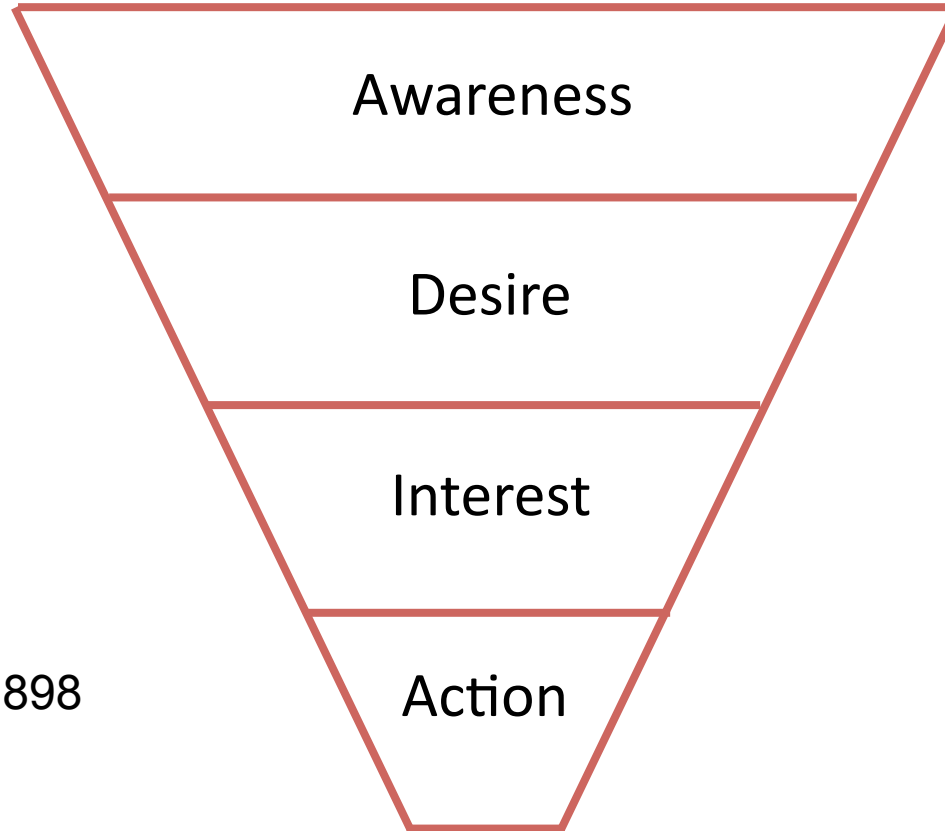
Why do people search on Amazon?

“When they want to buy something” (?)

- Even ignoring the non-buying uses (research, etc.), user goals are varied...

The Goals of Product Search

Depends on where you are in the *buying funnel*.



St. Elmo Lewis, 1898

Shop All Departments

Search Toys & Games

GO

Cart

Wish List

Toys & Games

Categories & Characters

Bestsellers

New Releases

Boys Toys

Girls Toys

Games & Puzzles

Hobby, Models & Trains

Toys Outlet



Get the best things under the sun in our Summer Catalog



See more

Shop Toys

Deals & Savings

- Weekly Toy Savings
- Toys Outlet Deals
- Toy Values Under \$25
- Toy Values Under \$50
- Toy Values Under \$75

Age Ranges

- Birth to 24 Months
- 2 to 4 Years
- 5 to 7 Years
- 8 to 11 Years
- 12 to 15 Years
- Grownups

Outdoor Fun

- Summer Catalog
- Waterslides
- NERF & Soft Blasters
- Water Fun

Featured

- Toy Story 3 Store
- Disney Store
- Backyard Safari
- Frustration-Free Packaging
- Green Toys
- The Official Twilight Store

Categories

- Arts & Crafts
- Action Figures

Toys & Games

Shop for [dolls](#), [action figures](#), [games](#), and [gifts](#) for [boys](#) and [girls](#).

Great Travel Toys Under \$20

1 2 3 4 5



[Bruder CAT Bulldozer](#)



[Hot Wheels 5 Car Gift Pack](#)



[Kid Galaxy Backyard Flyer Vector](#)

[See more](#)

Save up to 50% on Water Toys

Page 1 of 5



Banzai Wipeout Curve Water Park
~~\$599.00~~ \$399.98



Monsoon Force Power Stream Blaster...
Banzai
~~\$15.99~~ \$4.98



Swim School Baby And Me Combo Float
~~\$16.99~~ \$9.99



Toys Savings

Weekly deals on hot brands

[Shop now](#)



Toys Outlet

Save 25% to 70%

[Shop now](#)

Zombies, Zombies Everywhere



Get ready for spooky stories around the campfire with new [zombie games from Twilight](#). Play ghoulish games or just plain scare your friends. Make hot summer nights haunted summer nights and have a blast.

[See more zombies](#)



Check out our **Disney Store**

[Shop now](#)

Shop All Departments

Search Toys & Games roller coaster

GO

Cart

Wish List

Toys & Games

Categories & Characters | Bestsellers | New Releases | Boys Toys | Girls Toys | Games & Puzzles | Hobby, Models & Trains | Toys Outlet

Age Range

- Birth to 24 Months (6)
- 2 to 4 Years (13)
- 5 Years & Up (9)
- 8 Years & Up (10)
- Grownups (1)

Department

< Any Department

Toys & Games

- Preschool (18)
- Bikes, Skates & Ride-Ons (3)
- Construction, Blocks & Models (28)**
- Play Vehicles (3)
- Action Figures (7)
- Activities & Amusements (8)
- Games (3)
- Learning & Education (13)
- Dolls (3)
- Pretend Play & Dress-up (1)
- Hobbies (4)
- Sports & Outdoor Play (1)
- Toy Figures & Playsets (1)

Characters

Any Character

- Featured Characters (1)
- Book & Fairy Tale Characters (1)
- Doll Characters (4)
- Superheroes & Comic Book Characters (1)
- TV Characters (6)

Interest

Any Interest

- Animals & Nature (2)
- Fantasy & Sci-Fi (2)

Toys & Games > "roller coaster"

Related Searches: roller coaster toys.

Showing 1 - 24 of 82 Results

Sort by Relevance



Step 2 Up & Down Roller Coaster

Buy new: \$119.99

9 new from \$99.99

In stock but may require an extra 1-2 days to process.

Eligible for FREE Super Saver Shipping.

★★★★★ (187)

Manufacturer recommended age: 24 Months - 5 Years

> Show only Step 2 items



Quercetti Skyrail Rollercoaster, 150 Pieces

Buy new: \$36.99 \$24.17

13 new from \$23.95

Get it by Friday, July 9 if you order in the next 22 hours and choose one-day shipping.

Eligible for FREE Super Saver Shipping.

★★★★★ (28)

> Show only Quercetti items



Step2 Extreme Coaster

Buy new: \$289.99

6 new from \$259.97

Usually ships in 3 to 5 days

Eligible for FREE Super Saver Shipping.

★★★★★ (11)

Manufacturer recommended age: 36 Months - 8 Years

> Show only Step 2 items



Phoenix Roller Coaster Kit

Buy new: \$149.95 \$129.95

In Stock

★★★★★ (1)

> Show only Coaster Dynamix items



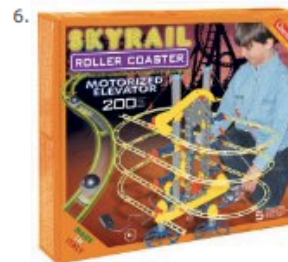
K'Nex Dragon's Drop Roller Coaster

Buy new: \$79.99 \$79.98

3 new from \$79.98

In Stock

★★★★★ (2)



Quercetti Skyrail Rollercoaster with Elevator, 200 Pieces

Buy new: \$49.99 \$34.32

16 new from \$32.49

Get it by Friday, July 9 if you order in the next

Shop All Departments

Search Construction Toys, Blocks & Models roller coaster

GO

Cart

Wish List

Toys & Games

Categories & Characters

Bestsellers

New Releases

Boys Toys

Girls Toys

Games & Puzzles

Hobby, Models & Trains

Toys Outlet

Age Range

- 2 to 4 Years (3)
- 5 Years & Up (5)
- 8 Years & Up (8)
- Grownups (1)

Department

- < Any Department
- < Toys & Games

Construction, Blocks & Models

- Building Sets (17)
- Construction & Models (1)

Gender

Any Gender

- Boys (16)
- Girls (13)

Shipping Option (What's this?)

Any Shipping Option

- Prime Eligible
- Free Super Saver Shipping

Brand

- Quercetti (5)
- K'Nex (16)
- Knex (1)
- Mega Brands (1)
- Intelligent Toys (1)
- Megabloks (2)
- Magnext (1)

Avg. Customer Review

Any Avg. Customer Review

- ★★★★☆ & Up (12)
- ★★★★☆ & Up (16)
- ★★★★☆ & Up (17)
- ★★★★☆ & Up (17)

Toys & Games > "roller coaster" > Construction, Blocks & Models

Related Searches: roller coaster toys.

Showing 1 - 24 of 28 Results

Sort by Relevance

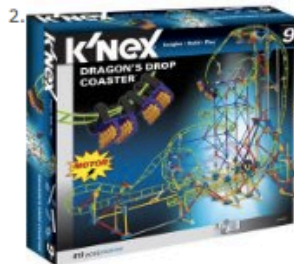


1. Quercetti Skyrail Rollercoaster, 150 Pieces

Buy new: ~~\$36.99~~ \$24.17
13 new from \$23.95

Get it by **Friday, July 9** if you order in the next **23 hours** and choose one-day shipping.
Eligible for **FREE** Super Saver Shipping.

★★★★☆ (28)
> Show only Quercetti items



2. K'Nex Dragon's Drop Roller Coaster

Buy new: ~~\$79.99~~ \$79.98
3 new from \$79.98

In Stock
★★★★☆ (2)
> Show only K'Nex items



3. Quercetti Skyrail Rollercoaster with Elevator, 200 Pieces

Buy new: ~~\$49.99~~ \$34.32
16 new from \$32.49

Get it by **Friday, July 9** if you order in the next **20 hours** and choose one-day shipping.
Eligible for **FREE** Super Saver Shipping.

★★★★☆ (6)
Manufacturer recommended age: 8 Years and up
> Show only Quercetti items



4. K'Nex Education Roller Coaster Physics - 2039 Pieces

Buy new: ~~\$250.00~~ \$225.00

Get it by **Friday, July 9** if you order in the next **19 hours** and choose one-day shipping.



5. Knex Hornet Swarm Dueling Coaster

Buy new: ~~\$99.99~~ \$74.98
2 new from \$49.99

In Stock
★★★★☆ (6)



6. K'Nex Rippin' Rocket Roller Coaster

4 new from \$149.37

★★★★☆ (32)
Manufacturer recommended age: 10 - 16 Years
> Show only K'Nex items

Shop All Departments

Search Construction Toys, Blocks & Models roller coaster GO

Cart

Wish List

Toys & Games

Categories & Characters | Bestsellers | New Releases | Boys Toys | Girls Toys | Games & Puzzles | Hobby, Models & Trains | Toys Outlet

Age Range

- 2 to 4 Years (3)
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- 8 Years & Up (8)
- Grownups (1)

Department

- < Any Department
- < Toys & Games

Construction, Blocks & Models

- Building Sets (17)
- Construction & Models (1)

Gender

Any Gender

- Boys (16)
- Girls (13)

Shipping Option [\(What's this?\)](#)

Any Shipping Option

- Prime Eligible
- Free Super Saver Shipping

Brand

- Quercetti (5)
- K'Nex (16)
- Knex (1)
- Mega Brands (1)
- Intelligent Toys (1)
- Megabloks (2)
- Magnext (1)

Avg. Customer Review

Any Avg. Customer Review

- ★★★★☆ & Up (12)
- ★★★★☆ & Up (16)
- ★★★★☆ & Up (17)
- ★★★★☆ & Up (17)

Toys & Games > "roller coaster" > Construction, Blocks & Models

Related Searches: [roller coaster toys](#).

Showing 1 - 24 of 28 Results

Sort by Avg. Customer Review



1. **K'Nex Rippin' Rocket Roller Coaster**

4 new from \$149.37

★★★★★ (32)

Manufacturer recommended age: 10 - 16 Years

> Show only K'Nex items



2. **Mega Brands Magnext iCoaster**

Buy new: ~~\$99.99~~ \$39.99

40 new from \$39.99

In Stock

★★★★☆ (68)

Manufacturer recommended age: 6 - 12 Years

> Show only Mega Brands items



3. **Quercetti Super Marble Run Vortis, 224 Pieces**

Buy new: ~~\$54.99~~ \$41.58

13 new from \$34.28

Get It by **Friday, July 9** if you order in the next **21 hours** and choose one-day shipping.

Eligible for **FREE** Super Saver Shipping.

★★★★★ (29)

Manufacturer recommended age: 8 Years and up

> Show only Quercetti items



4. **Quercetti Skyrail Rollercoaster, 150 Pieces**

Buy new: ~~\$36.99~~ \$24.17

13 new from \$23.95

Get it by **Friday, July 9** if you order in the next



5. **K'nex Serpent's Spiral Coaster - 1118 pcs**

Buy new: ~~\$99.99~~

7 new from \$95.00

Get it by **Friday, July 9** if you order in the next



6. **Knex Sawblade Thrill Ride**

6 new from \$89.99

★★★★★ (18)

> Show only K'Nex items

Different Tools for Different Stages

- Product search shows more fluid movement between searching and browsing behavior
 - Because of the nature of the task?
 - Because of the interfaces?



What Amazon Queries Look Like

All US	Books	Electronics	Apparel
fitflops	clive cussler	ipod nano 5 th generation	gucci
silent spring	survival skills	sd	gown
caetano veloso	koben	sennheiser ie8	coach bag
k michelle fallin	call of courage	headphones sennheiser	bass pro shops caps
mickey mouse black and white	piaget's theory of intellectual development: an introduction	shipping rates for amazon	music t-shirts
catholic bible study workbook	cd	camera sony. memory	soda shoes women
envogue ev3	skill sharpeners	1:2 vga cable	red bull t shirt
childrens and household tales	which old testament book best represent the chronological structure	stereo with cd player and ipod dock	long black underbust corset
mark morrison	captain bogg and salty	netboo acer	dooney & bourke leather
xd600/5	0230610943	inversorde 12 voltio a 110 voltio	angelsounds ₂

Context is King

Some facets for
Dresses (left)

VS.

Digital Cameras (right)

Not “one size fits all”

Fabric

Any Material Type

- 100% Cotton (97)
- Blends (74)
- Linen (28)
- Polyester (495)
- Silk (254)

Shipping Option [\(What's this?\)](#)

Any Shipping Option

- Prime Eligible
- Free Super Saver Shipping

Brand

- bebe (14)
- PacificPlex (57)
- Eva Franco (7)
- Jessica Howard (12)
- Merona (108)
- Mango (1)
- GUESS (38)

[> See more...](#)

Size

00	0	2	4	6
8	10	12	14	16
18	20	22	24	26
28				

Color

Special Sizes

- Misses (211)
- Petite (81)
- Plus Size (108)

Department

- < Any Department
- < Electronics
- < Camera & Photo
- < Digital Cameras
- Point & Shoot Digital Cameras**

Brand

- Nikon (10)
- Panasonic (6)
- Polaroid (1)
- Sony (32)
- Fuji (3)
- Kodak (3)
- Vivitar (6)

[> See more...](#)

Megapixels

- 5.9 MP & Under (3)
- 6 to 7.9 MP (1)
- 8 to 9.9 MP (3)
- 10 to 11.9 MP (38)
- 12 MP & Up (23)

Price

Any Price

- Under \$25 (1)
- \$25 to \$50 (1)
- \$50 to \$100 (6)
- \$100 to \$200 (19)
- \$200 & Above (41)

\$ to \$ [GO](#)

Optical Zoom

- 3x to 3.9x (5)
- 4x to 5.9x (42)
- 6x to 9.9x (4)

Condition

Any Condition

- New (67)
- Used (26)
- Refurbished (7)

Context is King, cont'd

The image displays two screenshots of an Amazon search interface, illustrating how context affects search results. Red circles highlight key elements in both screenshots.

Top Screenshot (Shoes):

- Search bar: **Shoes** | | GO
- Navigation: Women's | men's | Juniors' | Girls' | Boys' | Athletic & Outdoor | Designer | Handbags | Accessor
- Page Title: **Shoes > "timberland"**
- Related Searches: [adidas](#), [clarks](#), [nike](#).
- Results: Showing 1 - 24 of 1,094 results

Bottom Screenshot (Music):

- Search bar: **Music** | | GO
- Navigation: Advanced Search | Browse Genres | New Releases | Bestsellers | Music Deals | Music You Should Hear
- Page Title: **Music > "timberland"**
- Suggestion: **Did you mean: [timbaland](#)**
- Product Listings:

Timberland Waterproof Boot \$68.71 - \$157.00 16 new from \$111.99 ★★★★★ (2) > Show only Timberland items	Timberland Classic 3 Eye Lug Handsewn \$82.99 - \$110.00 5 new from \$89.64 Eligible for FREE Super Saver Shipping. ★★★★★ (3) > Show only Timberland items	Timberla \$62.97 - \$ 3 new from Eligible for ★★★★★ > Show only
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Amazon is a Marketplace...

amazon.com Hello, Dan Rose. We have [recommendations](#) for you. (Not Dan?) Kindle: Now Just \$189

[Dan's Amazon.com](#) | [Today's Deals](#) | [Gifts & Wish Lists](#) | [Gift Cards](#) [Your Account](#) | [Help](#)

Shop All Departments

[MP3 Players & Accessories](#) | [All Electronics](#) | [Brands](#) | [Bestsellers](#) | [MP3 Players](#) | [MP3 Accessories](#) | [Speaker Systems](#) | [Headphones](#) | [Cases](#) | [MP3 Downloads](#) | [Deals](#)

Altec Lansing inMotion COMPACT iM310 Portable Speakers for iPod and MP3 Players
 by [Altec Lansing](#)
 ★★★★★ (134 customer reviews)

List Price: ~~\$79.99~~
 Price: **\$42.42**
 You Save: **\$37.57 (47%)**

In Stock.
 Ships from and sold by [Electronics Expo](#).

35 new from \$41.99 | **3 used** from \$37.99

What Do Customers Ultimately Buy After Viewing This Item?

- 46% buy the item featured on this page:
 Altec Lansing inMotion COMPACT iM310 Portable Speakers for iPod and MP3 Players
 ★★★★★ (134) \$42.42
- 24% buy
 Cyber Acoustics Portable Digital Docking Speaker for iPod (Black) ★★★★★ (278)
 \$37.71
- 13% buy
 Altec Lansing IMT320 inMotion Compact iPod Speaker System ★★★★★ (31)
 \$69.99
- 11% buy
 Altec Lansing IMT620 inMotion Classic Portable iPod Dock with Rechargeable Battery and FM Tuner ★★★★★ (128)
 \$104.93

[Explore similar items](#)

[See all 9 customer images](#)
[Share your own customer images](#)

\$42.42 + \$6.99 shipping
 In Stock. Sold by **Electronics Expo**
 Quantity:

 or
[Sign in](#) to turn on 1-Click ordering.

Express Checkout with PayPhrase

[What's this?](#) | [Create PayPhrase](#)

More Buying Choices

- Big VALUE Inc
 \$45.27 + \$8.29 shipping
- Buy.com
 \$65.18 + Free Shipping
- J&R Music and Computer World
 \$59.00 + \$8.42 shipping

38 used & new from \$37.99
 Have one to sell?

...So Search Must Be Realtime

- New products added to the catalog all the time
- New merchants adding offers for products all the time
- Prices being changed all the time
- Items going in and out of stock all the time

Structured Data: “It’s a gift...”

- Unlike web search, we already know the semantics of different bits of text
- We don’t need to crawl our own site!
- We know how important different fields are for customers
- We have a large degree of quality control
- We don’t have to do sentiment analysis to know if a review was positive or negative.


Structured Data: “...and a curse”

- Search engine needs to have both DBMS-like (“right answer”) and IR-like (“best answer”) behavior.
- Traditional IR mechanisms don’t always work well for structured data
 - e.g. $tf \times idf$ with weighted fields

S. Robertson, H. Zaragoza, and M. Taylor,
“Simple BM25 Extension to Multiple Weighted Fields,” *CIKM* 2004

Structured Data: “...and a curse”


- What happens when one of the fields is orders of magnitude bigger than others?
 - Search-Inside-the-Book vs. Brand
- What happens when you don't have all the fields all the time?



Pirates of the Caribbean - The Curse of the Black Pearl (Two-Disc Collector's Edition) (2003)
[Johnny Depp](#) (Actor), [Geoffrey Rush](#) (Actor), [Gore Verbinski](#) (Director) | Rated: PG-13 | Format: DVD
 ★★★★★ (2,064 customer reviews)

List Price: ~~\$19.99~~
 Price: **\$13.49** & eligible for **FREE Super Saver Shipping** on orders over \$25. [Details](#)
 You Save: **\$6.50 (33%)**
[Special Offers Available](#)

In Stock.
 Ships from and sold by **Amazon.com**. Gift-wrap available.



Pirates of Penzance: Rogue Opera 1995
 Format: VHS Tape
 No customer reviews yet. [Be the first.](#)

Available from these sellers.

1 used from **\$39.95**

Using Behavioral Data

- Powerful source of information for any search engine
- When is using behavioral data an invasion of privacy (or just plain creepy), and when is it better for users?
- Customers of a business seem more comfortable with that business learning from past behavior.

Interpreting Behavioral Signals

- Example: Are search result clicks good or bad?
- How many clicks are best?
 - 1: the customer found what she's looking for right away
 - many: the customer found many items worthy of consideration, and is comparing / learning about / being entertained by / buying them.
 - zero: the search result contained all the information needed
- Also, some items are “click-attractive”

D. Rose, “Why Is Web Search So Hard... to Evaluate?”
J. Web Eng. (3-4): 171-181 (2004)

Evaluating Product Search Relevance

Common argument:

- Customers go to a shopping site to buy stuff.
- If a search change leads to customers buying more stuff, they must have had their search needs met more effectively.
- Therefore, relevance can be measured by how much customers buy.

What's wrong with this argument?

(Besides ignoring the rest of the buying funnel...)

The A/B Test Mystery

- We want to compare two ranking algorithms, A and B
- Half the users randomly assigned to get results from algorithm A, half from algorithm B.
- At the end of a certain period, the average revenue is higher in group A than group B.

Does this mean algorithm A is producing more relevant results than algorithm B?

The A/B Test Mystery, Solved

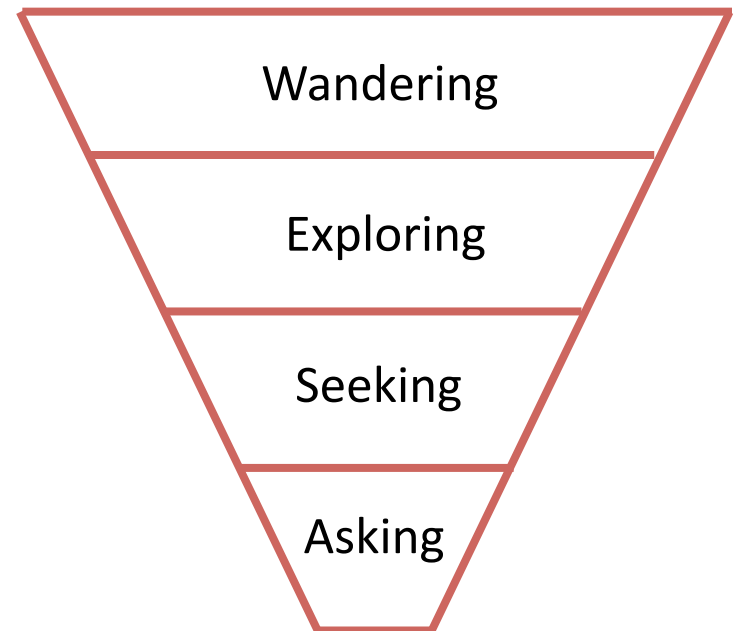
- Algorithm A could be better than B, or...
- Algorithm A could be recommending higher-priced items than B, or...
- Algorithm A could be recommending completely unrelated but very popular items.
 - You search for python programming, I show you “Harry Potter”
- (If we were judging by clicks, Algorithm A might be showing more click-attractive items)

Lessons for IR

- One idea: Generalizing the buying funnel

The Information-Seeking Funnel

- **Wandering.** No information seeking-goal in mind. However, may have a meta-goal (e.g. “find a topic for my final paper.”)
- **Exploring.** Have general goal (e.g. “learn about the history of communication technology”) but not a plan for achieving.
- **Seeking.** Have started to identify info needs that must be satisfied (e.g. “find out about the role of the telegraph in communication.”), but needs are open-ended.
- **Asking.** Have very specific information need corresponding to a closed-class question (“when was the telegraph invented?”).



D. Rose, “The Information-Seeking Funnel,”
Information-Seeking Support Systems Workshop, 2008

Summary

- Start thinking about how to meet user needs before user knows she has a need
- Offer different interaction mechanisms for different parts of the information-seeking process
- Let type of content influence the way search works
- Design for realtime
- Interpret behavioral data carefully
- Exploit structure when you have it
- Exploit context when you have it

Questions?

contact: danrose @ a9.com