



The role of Linked Data in Search and Online Media

Peter Mika

Researcher and Data Architect

Yahoo! Inc.



Search

For Yahoo!, search is much more than 10 blue links

Hi, serendipity588 | Sign Out | Help

Bucket: VIP038 | Quickkapps YAP - ... bad results / ads or bugs? tell us! [hide]

Make Yahoo! your homepage

YAH!C YAHOO!

Web Images Video Local Shopping News More

blu ray player

Search

Options

Also try: [blu ray player reviews](#), [best blu ray player](#), [more...](#)

Samsung blu-ray player

A Samsung Blu-Ray Player Is A Great Gift To Give. Shop Best Buy® Now!
www.BestBuy.com




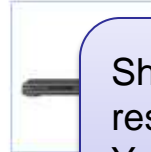





Sponsored Results

blu ray player

Exclusive Deals On 3D-Ready Blu-ray Players. Official Sony Site
www.SonyStyle.com/Blu-Ray

More Sponsors: [blu ray player](#), [blu ray dvd](#), [blu ray](#), [blu ray disc player](#)

Top Blu Ray Players

| | | | | |
|---|---|--|---|---|
|  Samsung BD-C6900 Blu-ray ... ★★★★★ \$197.77 - \$349.99 |  LG BX580 Blu-ray Disc ... ★★★★★ \$169 - \$287 |  Panasonic DMP-BD65 ... ★★★★★ \$99 - \$179.95 |  Panasonic DMP-BD65 ... ★★★★★ \$179.99 | |
|  Samsung BD-P3600 Blu-ray ... ★★★★★ (5) \$169.96 - \$299.99 |  Samsung BD-C7500 Blu-ray ... ★★★★★ \$179.99 - \$349.98 |  Sony BDP-S500 Blu-ray ... ★★★★★ (8) \$605.09 |  Sharp BD-HP20U Blu-ray ... ★★★★★ (12) \$89.99 |  LG BD530 Blu-ray Player ★★★★★ \$79.99 |

Shopping results from Yahoo! Shopping

Since Aug, 2010, 'regular' search results are 'Powered by Bing'

More Blu Ray Players from Yahoo! Shopping »

Blu ray Players and Blu ray Player Reviews

Search Pad

SearchScan - On

17,400,000 results for vienna, austria

Related Points of Interest



Maria am Ge



Kunsthistoris



Hundertwass



Hawelka



Spanish Ridi



Alsergrund



Kahlenberg



Schatzkammr

Search Pad

SearchScan - On

839,000 results for blu ray player:

Show All

Best Buy

Wikipedia

CNET Reviews

Shopping Sites

Sponsored Results

Related Searches

blu ray software

best buy

playstation 3

Sponsored Results

Blu-Ray Player at Amazon

Big Savings on Blu-Ray Player. Shipping on Qualified Orders
www.Amazon.com/electronics

Shop Target.com

Find Great Deals Online. Free Shipping on 100,000 Items!
Target.com/FreeShipping

Buy.com @ Blu Ray Player

This Week Only - Holiday Savings on Blu Ray Players! Most Ship Free.
www.Buy.com/Electronics

Sears@ Electronics Sale

Get More this Holiday Season with Your Way Rewards. Save Now!
www.Sears.com/Shop-Your-Way

Netflix Official Site

Blu-ray Movies \$0.32 Each

...ance: The latest DVD and Blu-ray

Not just search: advertizing

Hi, **Guest** | Sign In | Help | Bucket: VIP004 | highconf model ... bad results / ads or bugs? tell us! [hide] | Make Yahoo! your homepage | Mail

YAHOO! | Web | Images | Video | Local | Shopping | News | More

Search: **roi blanco** [Search] [Options]

Also try: [rio blanco county](#), [rio blanco herald times](#), [more...](#)

Rio Blanco | Visiting Card | [TripAdvisor](#)

Cheap Sinks | Great Deals | [Sinks-Taps](#)

Roi Blanco | Phone contact | [www.dc...](#)

Roi Blanco - Spain | LinkedIn
Experience: Researcher, Yahoo! Research; Visitor, University of G...
[www.linkedin.com/pub/roi-blanco/8/58/2b0](#) - [Cached](#)

Roi Blanco | Facebook
Roi Blanco is on Facebook. ...
[www.facebook.com/roicho](#) - ...

Roi Blanco - ACM author
[www.acm.org](#) - The premier ...
[portal.acm.org/author_page](#)





DBLP: Roi Blanco
2010; 21 : **Roi Blanco**, Hugo ...
2010; 339-346: 20 : Gianluca ...
Hugo Zaragoza ...
[www.informatik.uni-trier.de/.../a-tree/b/Blanco:Roi.html](#) - [Cached](#)

Rio Blanco Hotel | Great **Rio blanco** hotel Deals | [Expedia.co.uk](#)

Taps & Showers | and fast delivery, UK & ...
20 8506 9725
[irect2u.co.uk/mayfair](#)

Amazon.co.uk | Delivery on **Blanco**. Free UK ...
Delivery on Amazon Orders
[Amazon.co.uk](#)

Blanco - UK Sale
Save on all top **Blanco** products & ...
more. Compare prices & order now.

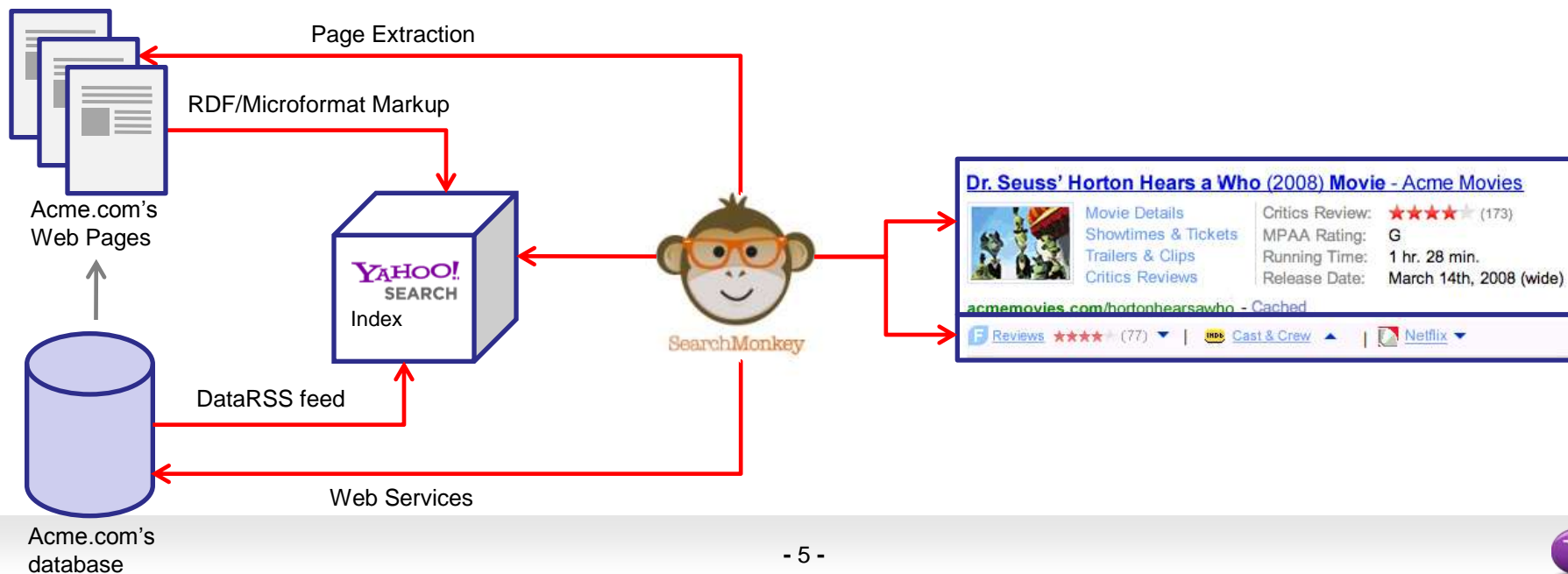


How could we get publishers to tell us: which pages are about a person or this particular person?



Yahoo! SearchMonkey

- Creating an ecosystem of publishers, developers and end-users
 - Publishers provide structured data embedded in HTML
 - Yahoo crawls this data and makes it available to developers
 - Developers help to transform data into rich results displays
 - End users benefit from richer and more relevant search results





- Yahoo has been a first adopter of Semantic Web technology
 - First search engine to support RDFa
 - Promoting the use of standard ontologies
 - Helping publishers to get on the Semantic Web
- Working with the community on developing and maintaining ontologies
 - VoCamp series of events
 - Working with the W3C
- Making the data available
 - Yahoo! BOSS: API for developers
 - Yahoo! Webscope datasets for research



Facets and Enhanced Results in Yahoo! Search

Hi, serendipity588 | Sign Out | Help

Bucket: CS01 | Smart Summary T... bad results / ads or bugs? tell us! [hide]

Make Yahoo! your homepage | M

Web Images Video Local Shopping News More

YAHOO!

ipod

Search

Options

Restrict search results to pages with product data.

Sites - Search ipod on Yahoo! Shopping

39,500,027 results for ipod:

Show All

Shopping Sites

Sponsor Results

Related Searches

- itunes
- best buy
- apple
- iphone
- zune

Find iPods In Your Favorite Size & Color At Best Buy®. Shop Now.
www.BestBuy.com

Apple iPod

Save up to 90% on the latest 5th generation iPod nano, apple ipod, ipod touch, ipod shuffle, more...
www.bidfun.com/nano-5g-16gb

More Sponsors: [ipod](#), [ipod nano](#), [ipod touch](#)

MP3 Speakers : Electronics : iPod + MP3 Players : iPod ...

★★★★★ Shop for MP3 Speakers Electronics iPod + MP3 Players iPod + MP3 Accessories Products and Promotions at Target. Find Speakers + Docks Electronics iPod + MP3 ...
target.com/MP3-Speakers-iPod-Accessories/b?ie=UTF8&... - 341k - [Cached](#)

Structured Data Display Full

Speakers + Docks : Electronics iPod + MP3 Players : iPod ...

★★★★★ Shop for Speakers + Docks Electronics iPod + MP3 Players iPod + MP3 Accessories Products and Promotions at Target. Find Speakers + Docks Electronics iPod + MP3 ...
target.com/Speakers-Docks-iPod-MP3-Accessories/b?ie=UTF8&... - 313k - [Cached](#)

Structured Data Display Full

ipod - CNET Reviews

Star rating, price, image (where available) displayed as part of the abstract.

Sponsored Results

Sponsored Results

Your iPod is Sad?

Repair your iPod, undelete your songs with CopyTrans Doctor.
www.copytrans.net

Copy iPod to iTunes

Copy your entire iPod back to your computer. Free PC and OSX downloads
www.TouchCopy.com

iPod Nano at Amazon

Low prices on iPod Nano. Qualified orders over \$25 ship free.
Amazon.com

ipod Mp3 Players

Buying Decisions Made Easy At Bing™ Shopping. Bing & Decide.
Bing.com/Shopping

\$50 Ipod Touch

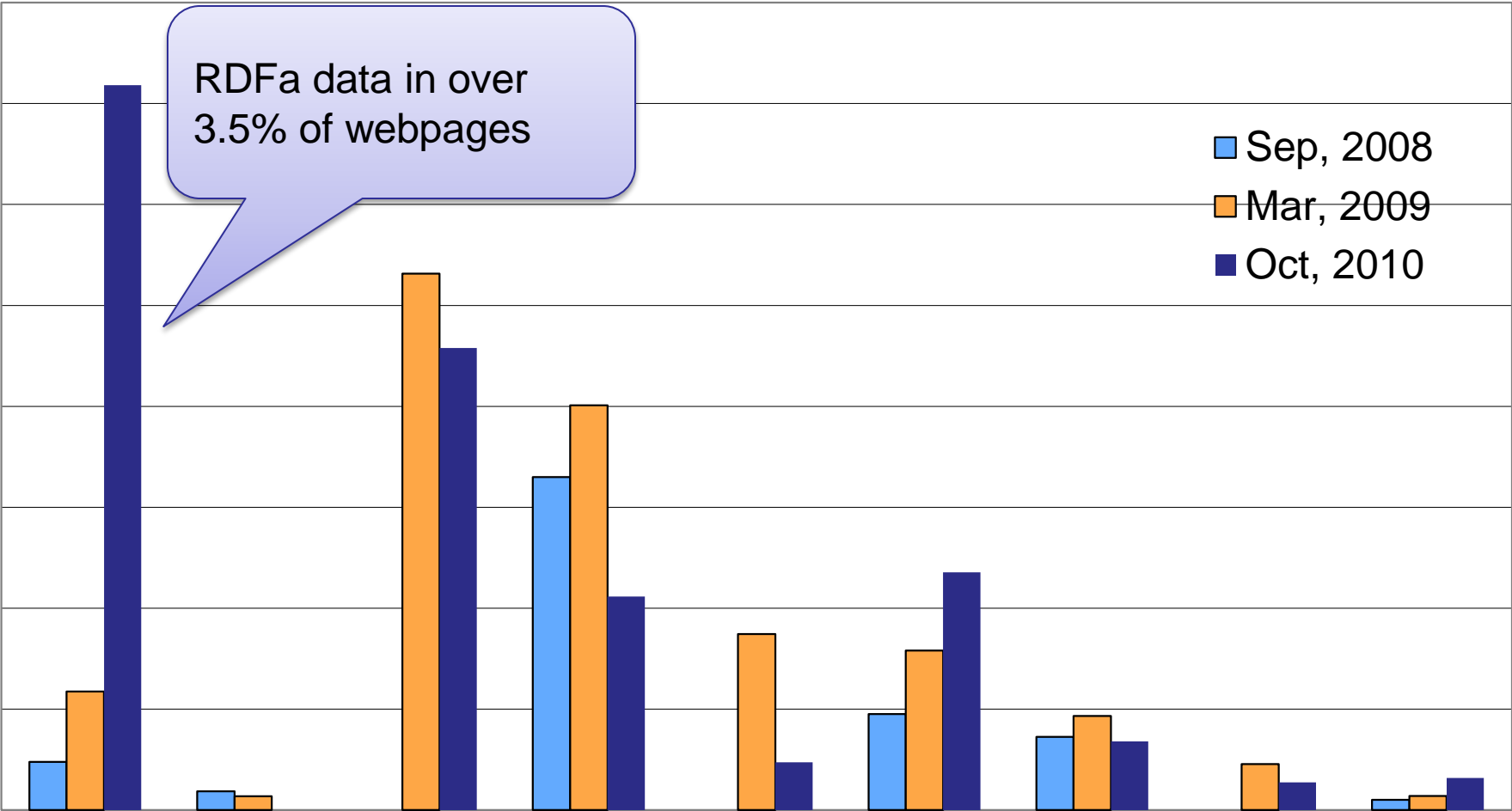
See All \$50 ipod touch. Great Deal



The success of SearchMonkey

- Launched in May, 2008, over time rolled out in >20 markets
- >400% increase in RDFa data
- >15% increase in click-through rates for some sites
- User studies confirm that users prefer enhanced results
- >15,000 developers, >400 applications in the gallery
- Welcomed by both the traditional search press and the SW community
- A year later, implemented by Google as “Rich Snippets”
 - No developer tool
 - Google opts to create their own ontology
- Embedded metadata is now a part of Search Engine Optimization (SEO)

Percentage of URLs with certain forms of embedded data



Future expected benefits

- Query formulation
 - “Snap to grid”
 - Showing related entities based on an initial query
 - Guiding the user in constructing the query
 - Making the user aware of the interpretation of the query
- Ranking
 - Semantic search engines exist as prototypes
 - Semantic Search workshop series and evaluations
 - ESWC 2008, WWW 2009, WWW 2010
- Result presentation
 - Snippet generation
 - Adaptive and interactive presentation
 - Aggregated search
 - Task completion



The Web of Objects

Yahoo! started by cataloguing the best of the Web...



[Yahoo! Deutschland](#)  [CLICK HERE TO VISIT THE STARS](#) [YAHOO! LOS ANGELES](#) [Weekly Picks](#)

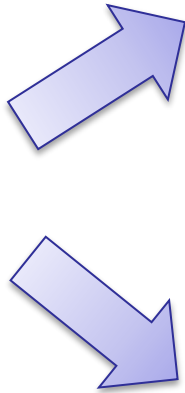
[Options](#)

[Yellow Pages](#) - [People Search](#) - [City Maps](#) -- [News Headlines](#) - [Stock Quotes](#) - [Sports Scores](#)

- [Arts](#) - - [Humanities](#), [Photography](#), [Architecture](#), ...
- [Business and Economy \[Xtra!\]](#) - - [Directory](#), [Investments](#), [Classifieds](#), ...
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- [Education](#) - - [Universities](#), [K-12](#), [Courses](#), ...
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- [Government](#) - - [Politics \[Xtra!\]](#), [Agencies](#), [Law](#), [Military](#), ...
- [Health \[Xtra!\]](#) - - [Medicine](#), [Drugs](#), [Diseases](#), [Fitness](#), ...
- [News \[Xtra!\]](#) - - [World \[Xtra!\]](#), [Daily](#), [Current Events](#), ...
- [Recreation and Sports \[Xtra!\]](#) - - [Sports](#), [Games](#), [Travel](#), [Autos](#), [Outdoors](#), ...
- [Reference](#) - - [Libraries](#), [Dictionaries](#), [Phone Numbers](#), ...
- [Regional](#) - - [Countries](#), [Regions](#), [U.S. States](#), ...
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Traditionally, traffic flows from the homepage and search to static content services



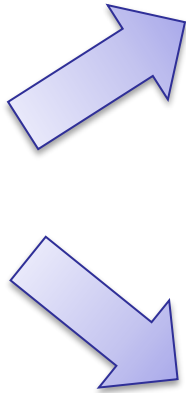
Homepage



Web search



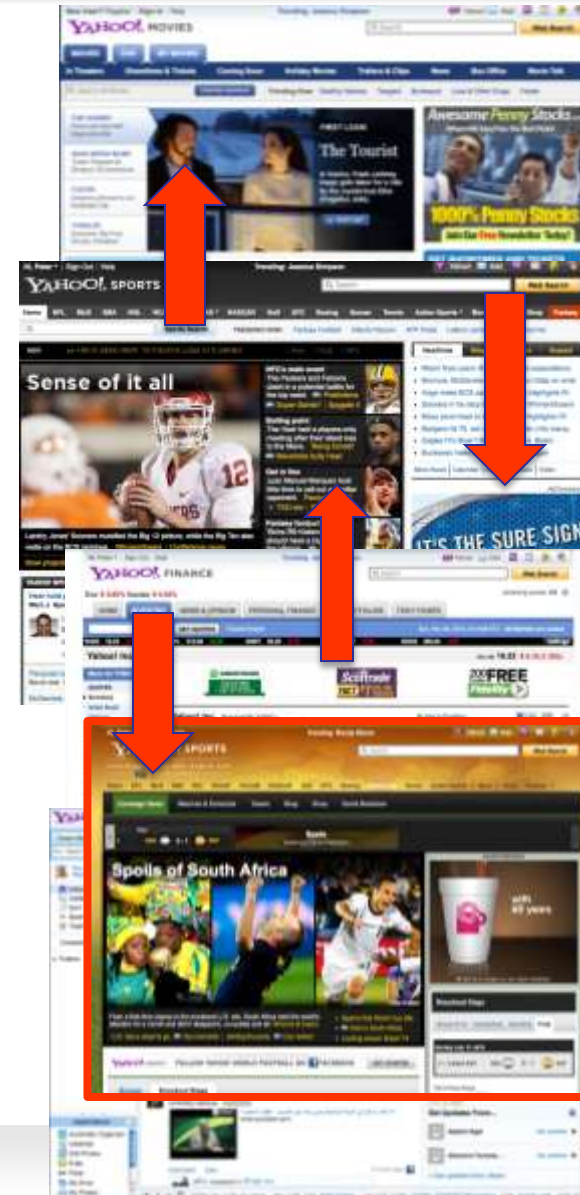
Today, we have a network where new user experiences are created on-demand



Homepage



Web search



Implicit search: Contextual Shortcuts in Yahoo! News

Hi, Peter | Sign Out | Help

Yahoo! Mail

YAHOO! NEWS

Search

Web Search

HOME U.S. BUSINESS WORLD ENTERTAINMENT SPORTS TECH POLITICS SCIENCE HEALTH OPINION MOST POPULAR

World Video Middle East Europe Latin America Africa Asia Canada Australia/Antarctica Kevin Sites

Search All News News Search

TRENDING NOW: wikileaks college football manny pacquiao black friday lebron james

US, SKorea launch war games in tense Yellow Sea

Associated Press

Buzz up! 1178 votes | Share 1030 | retweet 169 | Email | Print

By DAVID GUTTENFELDER and JEAN H. LEE, Associated Press – 1 hr 39 mins ago



AFP – US and S.Korea plan naval show of force off tense peninsula

YEONPYEONG ISLAND, South Korea – A U.S. supercarrier and South Korean destroyer took up position in the tense Yellow Sea on Sunday for joint military exercises that were a united show of force just days after a deadly North Korean artillery attack.

As tensions escalated across the region, with North Korea threatening another "merciless" attack, China belatedly jumped into the fray. Beijing's top nuclear envoy, Wu Dawei, called for an emergency meeting in early December among regional powers involved in nuclear disarmament talks, including North Korea.



Slideshow: North Korea fires on South Korean island



North Korea Video: U.S.-Korea military drills start Reuters



North Korea Video: Tension in Korea peninsula Australia 7 News



nuclear disarmament talks

Search

[China calls for emergency talks on N.Korea](#)
China called Sunday for an emergency meeting in early December of envoys to the six-nation talks on North Korean nuclear...
<http://news.yahoo.com/>

[China calls for urgent talks on North Korea](#)
China quickened its diplomatic efforts to ease tensions between North and South Korea, calling Sunday for an emergency meeting...
<http://news.yahoo.com/>

More >>

YAHOO! NEWS

1 stock to buy tomorrow!
We have tomorrow's big winner - Join our Free New sletter today!
www.AwesomePennyStocks.com

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Top Stories

US, SKorea launch war games in tense Yellow Sea

Hovering over an underlined phrase triggers a search for related news items.

Insin routes NU 70-23 for B10 title

5 rare Sumatran elephants found dead in Indonesia

More Top Stories >

AdChoices

> Learn more

* Roll over for important details.



Creating personalized experiences: Content Optimizing Knowledge Engine (COKE)

The image shows a screenshot of the Yahoo! homepage. The main content area features a large article titled "Acrobatic leap leads to stunning play" with a photo of a football player. Below it are several smaller featured stories. On the right side, there is a search bar and a "Web Search" button. A callout bubble points to the main article, and another callout bubble points to an advertisement for "giffgaff" on the right side of the page.

Machine Learning based 'search' algorithm selects the main story and the three alternate stories based on the users demographics (age, gender etc.) and previous behavior. Results in 30-60% increase in CTR compared to editorial.

Display advertising is a similar top-1 search problem on the collection of advertisements. Users can opt-out of the behavioral targeting of ads through AdChoices.

YAHOO!

Web Images Vid

UK only

Y! UK & IE My Yahoo! Get Yahoo! on your phone

something to share? Sign Out Page Options

YAHOO! SITES Edit

- Mail
- Finance (Dow Jones)
- Flickr
- Games
- Messenger
- Movies
- Music
- TV
- Weather (4°C)

TODAY - November 28, 2011



Acrobatic leap leads to stunning play

Oklahoma State's Broderick Brown vaults far out of bounds to reach a ball, and then surprises everyone. [Watch >>](#)

- Hogs make BCS case
- Conference races
- College scoreboard

- Catch may be play of the year
- Who's that with Kim Kardashian?
- Moves that make you look cheap
- Rare bears brought to light

1 - 4 of 24

NEWS WORLD LOCAL FINANCE

- U.S., S. Korea take up position in tense Yellow Sea | Photos
- Haiti presidential election begins amid cholera, confusion
- U.S. asks whistleblower WikiLeaks to halt document release
- Rio de Janeiro police claim victory after invading gang haven

Display advertising is a similar top-1 search problem on the collection of advertisements. Users can opt-out of the behavioral targeting of ads through AdChoices.

As a reward, we're giving you a gift of even more minutes.

£10

For £10 get...

giffgaff
thumbs up
goodybag

Latest video picks



Hyperlocal experiences at Yahoo!

Web Images Video Local Shopping More ▾

YAHOO!

Web Search

Yahoo.com Mail My Yahoo!

Hi, serendipity588 Sign Out

BROOKLYN HEIGHTS Including Downtown change ▾

Top Picks News Things to Do Deals

The best news, deals and things to do around you

38°F
Fair



Brooklyn Heights Blog

Love Lane Mews: Gordon Gekko Meets Mary Poppins

4 hrs ago
The Wall Street Journal recently caught up with Love Lane Mews architect Stephen... new condos there will be "supercalafragalisticexpialadoshus" meets "greed is good" preservation, the...

Share Comment Like

Hyperlocal: showing content from across Yahoo that is relevant to a particular neighbourhood.

Write to Brooklyn Heights ▾

EVENT GET INVOLVED
SUBMIT A LOCAL SOURCE **WRITE**

Dumbo NYC

Dumbo Links Week of 21Nov2010



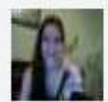
18 hrs ago
The following are selected links from this past week on blogs and websites with discussion about Dumbo (and its neighboring areas): More Apple Talk in Dumbo?, 24Nov10, Brownstoner 30 Washington St Two Fl Extension?, 22Nov10, Brownstoner Toll Bros...

Share Comment Like

Posts From Community Writers



Charles Manley wrote an article:
Aeropostale Opens on Newly Paved Fulton Street in Downtown Brooklyn



Lucrezia Wise wrote an article:
Sing Along at the Jingle Bell Jamboree!

About this experience ▸

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Brooklyn Heights Blog

News »

From topic pages to creating entire sites: Yahoo's World Cup site

The screenshot shows the Yahoo! Sports website during the 2010 World Cup. The top navigation bar includes the user name 'Hi, Peter', 'Sign Out', 'Help', and 'Trending: Mandy Moore'. The main header features the 'YAHOO! SPORTS' logo, a search bar, and a 'Web Search' button. Below this is a secondary navigation bar with links for 'Home', 'NFL', 'MLB', 'NBA', 'NHL', 'NCAA', 'NASCAR', 'Golf', 'UFC', 'Boxing', 'World Cup', 'Tennis', 'Action Sports', 'More', 'Shop', and 'Fantasy'. A third navigation bar highlights 'Coverage Home', 'Matches & Schedule', 'Teams', 'Blog', 'Shop', and 'David Beckham'. The main content area is dedicated to the 'Final' match between 'NED' (Netherlands) and 'ESP' (Spain), with a score of '0-1'. A large image shows a player celebrating, with the headline 'Spoils of South Africa'. A text box below the image reads: 'From a first-time champ to the emotional U.S. win, South Africa held the world's attention for a month and didn't disappoint, vuvuzelas and all. **Winners & losers** U.S. has a ways to go | Top moments | Joining the party | Cup rewind'. A list of links includes 'Spain's first World Cup title', 'Ode to South Africa', and 'Looking ahead: Brazil '14'. On the right, there's a section for 'Knockout Stage' with tabs for 'Round of 16', 'Quarterfinal', 'Semifinal', and 'Final'. Below that, it shows the date 'Sunday July 11, 2010' and the match details '(64) 2:30pm EDT NED 0-1 ESP'. The footer includes 'YAHOO! SPORTS', 'FOLLOW YAHOO! WORLD FOOTBALL ON FACEBOOK', and a 'GET STARTED' button.

Hi, Peter | Sign Out | Help

Trending: Mandy Moore

YAHOO! SPORTS

COVERAGE OF THE 2010 WORLD CUP SOUTH AFRICA

Home NFL MLB NBA NHL NCAA NCAAB NASCAR Golf UFC Boxing World Cup Tennis Action Sports More Shop Fantasy

Coverage Home Matches & Schedule Teams Blog Shop David Beckham

Final

NED 0-1 ESP

Spain

World Cup 2010

Spoils of South Africa

From a first-time champ to the emotional U.S. win, South Africa held the world's attention for a month and didn't disappoint, vuvuzelas and all. **Winners & losers**

U.S. has a ways to go | Top moments | Joining the party | Cup rewind

- Spain's first World Cup title
- Ode to South Africa
- Looking ahead: Brazil '14

Knockout Stage

Round of 16 Quarterfinal Semifinal Final

Sunday July 11, 2010

(64) 2:30pm EDT NED 0-1 ESP

Third Place Game

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with 60 years

Y!

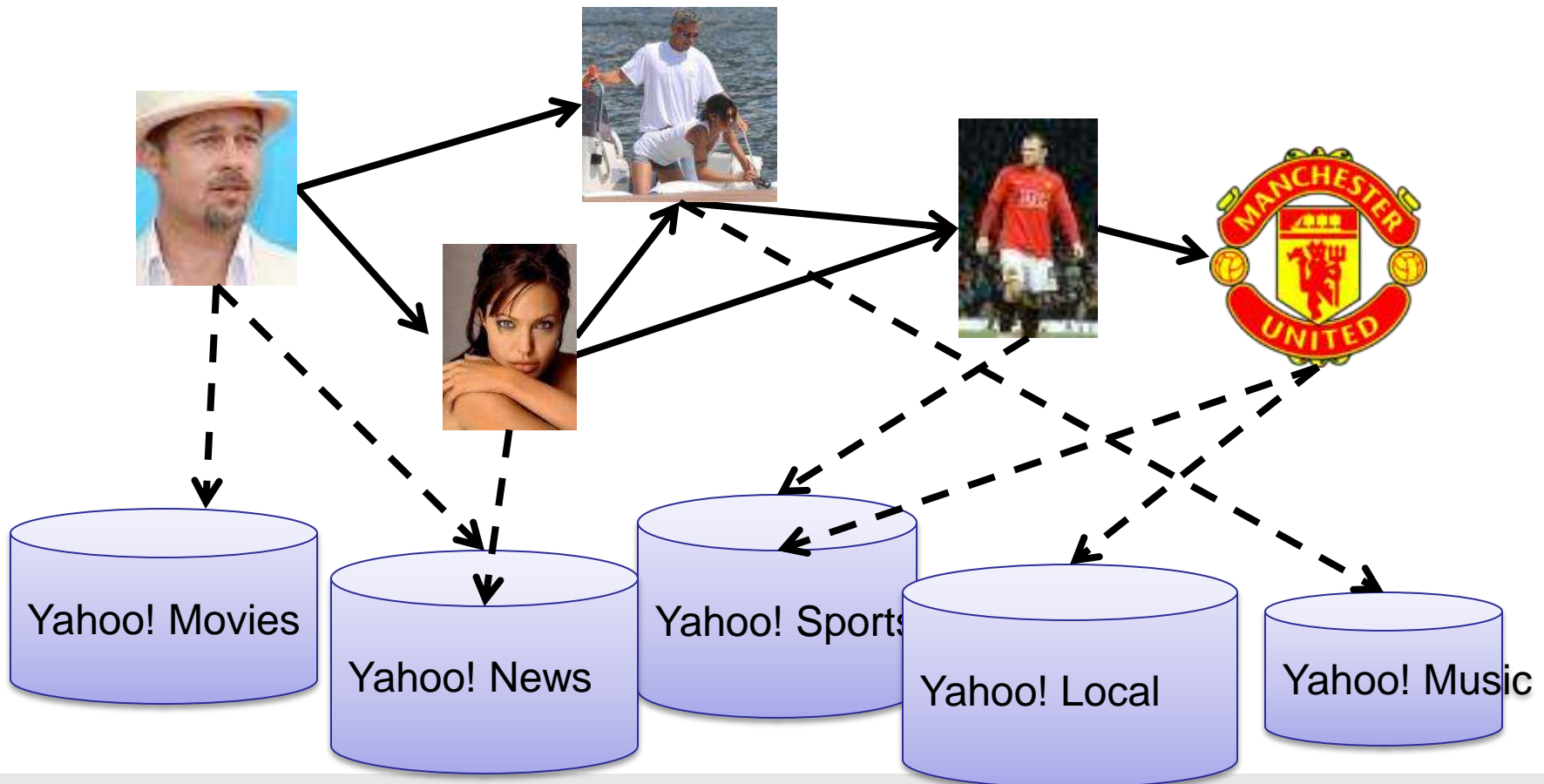
Yahoo's World Cup website has been almost three times as popular as the second most visited site. ([Hitwise, US, June 2010](#))

Semantic technologies for content

- As most media companies, Yahoo has a fragmented content landscape
 - Content is acquired from hundreds of data providers each using their own proprietary formats
 - Large amounts of structured data extracted from webpages
- The role of semantic technology is to unify content
 - Unique identifier for each object
 - RDF-like representation with rich metadata about each attribute value and relationship
 - E.g. licensing, serving restrictions, provider
 - OWL 2 as an ontology language

The Web of Objects

- A growing graph that will eventually cover the attributes and relationships of all entities known to Yahoo!



Benefits

- Increased coverage for existing products that require entity graphs for navigation
- Dynamic interlinking of content
 - E.g. direct links from Yahoo! News to background information in Yahoo! Music about an artist
- Dynamic composition of web pages
 - Topic-entity pages
- Better understanding of user intent
 - Semantic analysis of query logs
 - Semantic analysis of navigation paths



Summary

Linked Data for Search and Online Media

- Enriching Search
 - Answering specific information needs in vertical domains
 - Helping users to discover related queries/content and to understand search results
- Linking owned content assets and the best of the Web
 - Content optimization and display advertizing
 - Recommendations (for example, related articles)
 - Entire new sites generated on demand
- There is a need for both standards and industry agreements in establishing the data layer of the Web

The End

- Credits to Yahoos around the world
- Contact me at
 - pmika@yahoo-inc.com
 - Internships, faculty and student grants available!

