

Exposing Inconsistent Search Results with Bobble

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UCSD

Motivation

- Search engines deliver inconsistent search results
- These inconsistent results may sway searchers' opinions or judgment to products or political events etc.

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Rex Agreement Testimonial - YouTube



www.youtube.com/watch?v=GdY3nowCg3g
Dec 16, 2011 - 1 min - Uploaded by REXAgreement
Homeowners need cash? The **Rex Agreement**. <http://1rex.com> allows you to get cash from your home. **Rex ...**

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REX Agreement Definition | Investopedia

www.investopedia.com/terms/r/rexagreement.asp
Aug 6, 2008 - **REX Agreement** - Definition of **REX Agreement** on Investopedia - An alternative to a home equity line of credit (HELOC) and refinancing that ...

The Nuts and Bolts of a REX Agreement

www.americanbar.org/newsletter/.../law.../rexagreement.html
A **REX Agreement**, which is slightly modified for each state's specific laws, is in the form of a coordinated group of four operative legal documents: an option ...

REX Agreement - NuWire Investor

www.nuwireinvestor.com/articles/rex-agreement-58162.aspx
May 23, 2008 - A **REX Agreement** is an equity-financing tool developed by Real Estate Equity Exchange and Company (REX & Co.) that enables homeowners ...

FirstREX â€ the REX Agreement

<https://www.rexagreement.com/>
With the **REX Agreement**, we've eliminated both. In fact, the **REX Agreement** is not debt of any kind. Convert a portion of your home equity to cash today, with no ...

Disclosures - FirstREX - The REX Agreement

www.rexagreement.com/index.php/rexdisclosures/

REX Agreement Definition | Investopedia

www.investopedia.com/terms/r/rexagreement.asp
The **agreement** is offered by **REX & Company**, and it gives homeowners a cash payment of 12 to 17% of their home's market value under the stipulation that ...
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The Nuts and Bolts of a REX Agreement

<https://www.americanbar.org/newsletter/.../law.../rexagreement.html>
A **REX Agreement**, which is slightly modified for each state's specific laws, is in the form of a coordinated group of four operative legal documents: an option ...

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Articles and Reports - the REX Agreement

<https://www.rexagreement.com/about-us/articles-and-reports/>
In this article, we'll analyze **REX & Company's agreement**, the after-tax financial impacts, and take a look at a few examples that will help potential users to ...

Rex Agreement Testimonial - YouTube



www.youtube.com/watch?v=GdY3nowCg3g
Dec 16, 2011 - 1 min - Uploaded by REXAgreement
Homeowners need cash? The **Rex Agreement**. <http://1rex.com> allows you to get cash from your home. **Rex ...**

The REX Agreement - RethinkingHomeEquity - YouTube



www.youtube.com/watch?v=qF08...
Feb 10, 2012 - 2 min - Uploaded by RexAgreement
The **REX Agreement** allows you to get cash from your home without monthly payments or interest. If you want ...

Rex Agreement: Avoid This Like The Plague « Penguin Homes Blog
realestateblog.wordpress.com/.../rex-agreement-avoid-this-like-the-pl...

Mar 17, 2008 - The **Rex Agreement** has to be one of the most abusive instruments I can imagine. It's just like taking your home equity to the pawn shop.

REX123 - Find out if the REX Agreement is right for you

www.rex-inc.com/
FirstREX enables homeowners to convert the equity in their home into cash, with no debt, no interest, and no monthly payments - ever. A **REX Agreement** is an ...

REX Agreement

www.1rex.com/
FirstREX enables homeowners to convert the equity in their home into cash, with no debt, no interest, and no monthly payments - ever.

Rex Agreement: Avoid This Like The Plague

realestateblog.wordpress.com/.../rex-agreement-avoid-this-like-the-pl...
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with Testimonial - YouTube

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May 23, 2008 - A **REX Agreement** is an equity-financing tool developed by Real Estate Equity Exchange and Company (REX & Co.) that enables homeowners ...

Rex Agreement - A Great New Way to Reduce Debt

www.rexagreement.net/a-great-new-way-to-reduce-debt-the-r...
The **REX Agreement** is not debt of any kind. It is a real estate investment agreement that enables you to convert a portion of your home equity into immediate ...

Rex Agreement

www.rexagreement.net/
The **Rex Agreement** is a way for homeowners to get cash from their home without monthly payments or interest.

Searches related to rex agreement

rex agreement reviews n1urk

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Ads related to proposition 39

Yes on **Prop 39** - Close the Corporate Loophole

www.yesonprop39.com/
Bring Dollars and Jobs Back to CA

Prop 37 is Wrong - Prop 37 hurts Californians | NoProp37.com

www.noprop37.com/
Vote NO on 37!

Prop 39 LivingVotersGuide | Cali.LivingVotersGuide.org

cali.livingvotersguide.org/
Pro/cons of **Prop 39** MultiState Tax powered by voters like you!

Times endorsements: Yes on **Proposition 39** - latimes.com

www.latimes.com/news/.../la-ed-prop39-20120927,0,7091721.story
Sep 27, 2012 – **Proposition 39** eliminates an indefensible tax break that encourages multistate companies to create jobs out of state.

Yes on **Proposition 39** - Close the Loophole

www.cleanenergyjobsact.com/
Close the Corporate Loophole - Bring dollars and jobs back to California. Vote yes on **Prop 39**

California **Proposition 39**, Income Tax Increase

ballotpedia.org/.../California_Proposition_39_Income_Tax_Increase...
3 days ago – Supporters of **Proposition 39** assert that it will currently rewards out-of-state companies for taking jobs out of ...

Who's Funding **Prop 39**, the Multistate Biz Tax &

www.kcet.org/.../propositions-whos-funding-prop-39-the-m...
by Zach Behrens - in 567 Google+ circles
Campaign finance for **Prop 39**, which would change how multistate businesses calculate their income tax liability and put revenues toward energy efficiency ...

News for **proposition 39**

ABC30.com **Prop. 39** would end break for out-of-state businesses
Visalia Times Delta – 7 hours ago
A ballot initiative funded by a billionaire hedge fund manager is asking voters to do what Gov.

Proposition 39 at a glance

Ventura County Star – 1 day ago

Endorsements: **Proposition 39** is a tax code fix worthy of your 'yes' vote

www.sacbee.com/2012/09/23/.../endorsements-prop39-is.htm...
Sep 24, 2012 – **Proposition 39** shows how direct democracy should work. The initiative on the Nov. 6 ballot would close a \$1 billion corporate tax loophole, one ...

Prop. 39: Voters must close tax loophole - SFGate

www.sfgate.com/.../Prop-39-Voters-must-close-tax-loophole-391420...

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Yes on **Proposition 39** - Close the Loophole

www.cleanenergyjobsact.com/
Close the Corporate Loophole - Bring dollars and jobs back to California. Vote yes on **Prop 39**.

California **Proposition 39**, Income Tax Increase for Multistate ...

ballotpedia.org/.../California_Proposition_39_Income_Tax_Increase...
3 days ago – Supporters of **Proposition 39** assert that it will close a tax "loophole" that currently rewards out-of-state companies for taking jobs out of ...

Times endorsements: Yes on **Proposition 39** - latimes.com

www.latimes.com/news/.../la-ed-prop39-20120927,0,7091721.story
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Editorial: No on Prop. 39 - SFGate

www.sfgate.com/opinion/.../Editorial-No-on-Prop-39-3884285.php

Sep 21, 2012 – the Legislature recently came within a whisker of eliminating the loophole and devoting the new revenue to scholarships for middle-class ...

Prop. 39: Voters must close tax loophole - SFGate

www.sfgate.com/.../Prop-39-Voters-must-close-tax-loophole-391420...
Oct 2, 2012 – **Proposition 39** will close a loophole that allows out-of-state corporations to pay less tax than California corporations, a loophole that creates an ...

Prop. 39: More burdens on state business - SFGate

www.sfgate.com/.../Prop-39-More-burdens-on-state-business-391420...
Oct 2, 2012 – **Prop. 39** would eliminate the three-factor apportionment formula that has been ... **Prop. 39** would repeal a long-standing method for income tax ...

Editorial: No on Prop. 39 - SFGate

www.sfgate.com/opinion/.../Editorial-No-on-Prop-39-3884285.php
Sep 21, 2012 – the Legislature recently came within a whisker of eliminating the loophole and devoting the new revenue to scholarships for middle-class ...

About **Proposition 39**

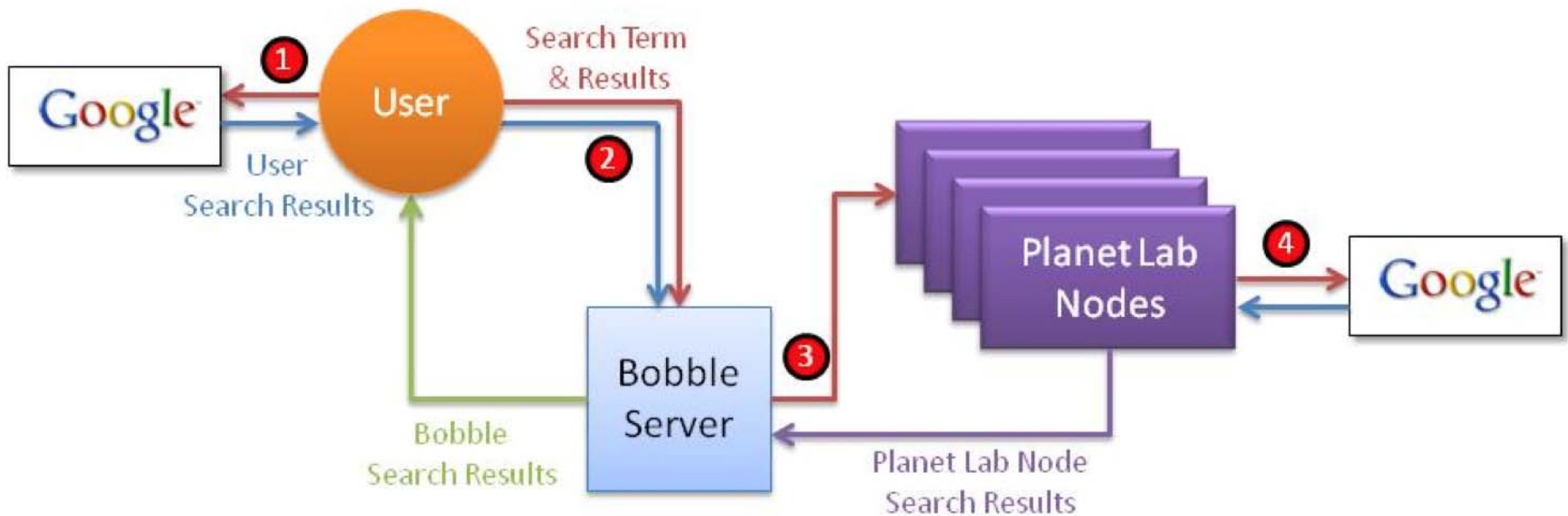
www.calcharters.org/2010/09/about-prop39.html
Proposition 39 was written to ensure that all public school students share equally in district facilities. The bargain made when **Prop. 39** was passed by California ...

Proposition 39 | Official Voter Information Guide | California ...

Goal: Understand the Nature of Inconsistencies

- Browser plugin, *Bobble* (<http://bobble.gtisc.gatech.edu/>)
 - allows users to see how the search results that Google returns to them differs from the results that would be returned to other users distributed around the world
 - record the user's search query and repeating it from a variety of different vantage points
- Study how users' Google search results vary based on their geographic locations and past search histories
 - 75,000 queries
 - 175 users
 - Nine months

Bobble Architecture



Requirements for Data Collection

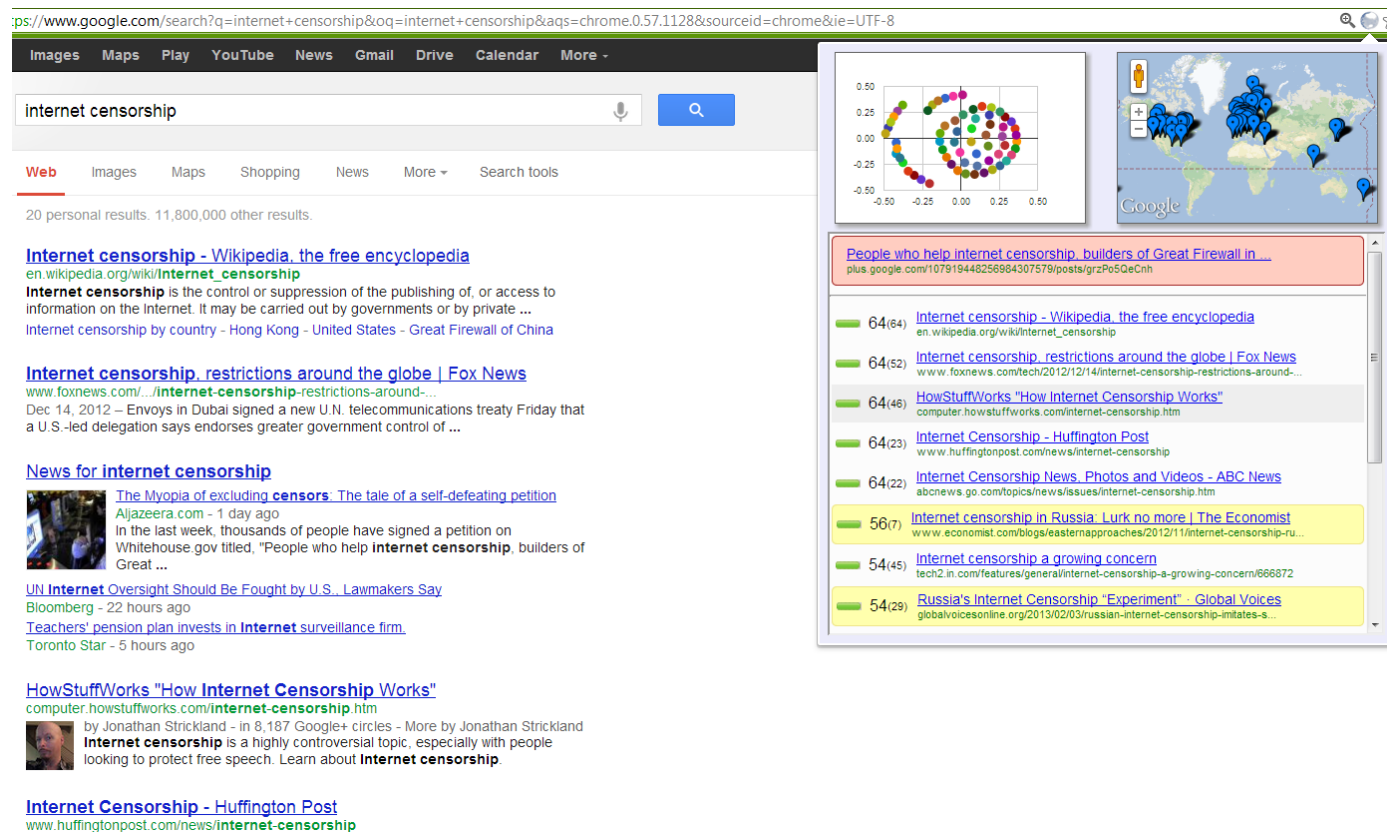
- Effects of **personalization**
 - personalized and non-personalized search results of Google users
- Effects of **geography**
 - non-personalized search results from different regions

Challenges for Data Collection

- Non-intrusive data collection
- Measurement benchmark

Data Collection Platform

- A Chrome browser agent
- Browser agents on 308 PlanetLab nodes



The screenshot shows a Google search for "internet censorship". The search results page includes a search bar, navigation tabs (Web, Images, Maps, Shopping, News, More), and search tools. The main results section displays several links, including Wikipedia, Fox News, and Huffington Post. A sidebar on the right features a circular data visualization (a scatter plot with colored dots) and a world map with blue location pins. The sidebar also contains a list of search results with green checkmarks and numerical indicators.

ps://www.google.com/search?q=internet+censorship&oq=internet+censorship&aqs=chrome.0.57.1128&sourceid=chrome&ie=UTF-8

Images Maps Play YouTube News Gmail Drive Calendar More -

internet censorship

Web Images Maps Shopping News More Search tools

20 personal results. 11,800,000 other results.

[Internet censorship - Wikipedia, the free encyclopedia](#)
en.wikipedia.org/wiki/Internet_censorship
Internet censorship is the control or suppression of the publishing of, or access to information on the Internet. It may be carried out by governments or by private ...
Internet censorship by country - Hong Kong - United States - Great Firewall of China

[Internet censorship, restrictions around the globe | Fox News](#)
www.foxnews.com/.../internet-censorship-restrictions-around-...
Dec 14, 2012 – Envoys in Dubai signed a new U.N. telecommunications treaty Friday that a U.S.-led delegation says endorses greater government control of ...

[News for internet censorship](#)

[The Myopia of excluding censors: The tale of a self-defeating petition](#)
Aljazeera.com - 1 day ago
In the last week, thousands of people have signed a petition on Whitehouse.gov titled, "People who help **internet censorship**, builders of Great ...

[UN Internet Oversight Should Be Fought by U.S., Lawmakers Say](#)
Bloomberg - 22 hours ago

[Teachers' pension plan invests in Internet surveillance firm.](#)
Toronto Star - 5 hours ago

[HowStuffWorks "How Internet Censorship Works"](#)
computer.howstuffworks.com/internet-censorship.htm
by Jonathan Strickland - in 8,187 Google+ circles - More by Jonathan Strickland
Internet censorship is a highly controversial topic, especially with people looking to protect free speech. Learn about **Internet censorship**.

[Internet Censorship - Huffington Post](#)
www.huffingtonpost.com/news/internet-censorship

People who help internet censorship, builders of Great Firewall in ...
plus.google.com/107919448256884307579/posts/grzPo5QeCnh

64(64) [Internet censorship - Wikipedia, the free encyclopedia](#)
en.wikipedia.org/wiki/Internet_censorship

64(52) [Internet censorship, restrictions around the globe | Fox News](#)
www.foxnews.com/tech/2012/12/14/internet-censorship-restrictions-around-...

64(46) [HowStuffWorks "How Internet Censorship Works"](#)
computer.howstuffworks.com/internet-censorship.htm

64(23) [Internet Censorship - Huffington Post](#)
www.huffingtonpost.com/news/internet-censorship

64(22) [Internet Censorship News, Photos and Videos - ABC News](#)
abcnews.go.com/topics/news/issues/internet-censorship.htm

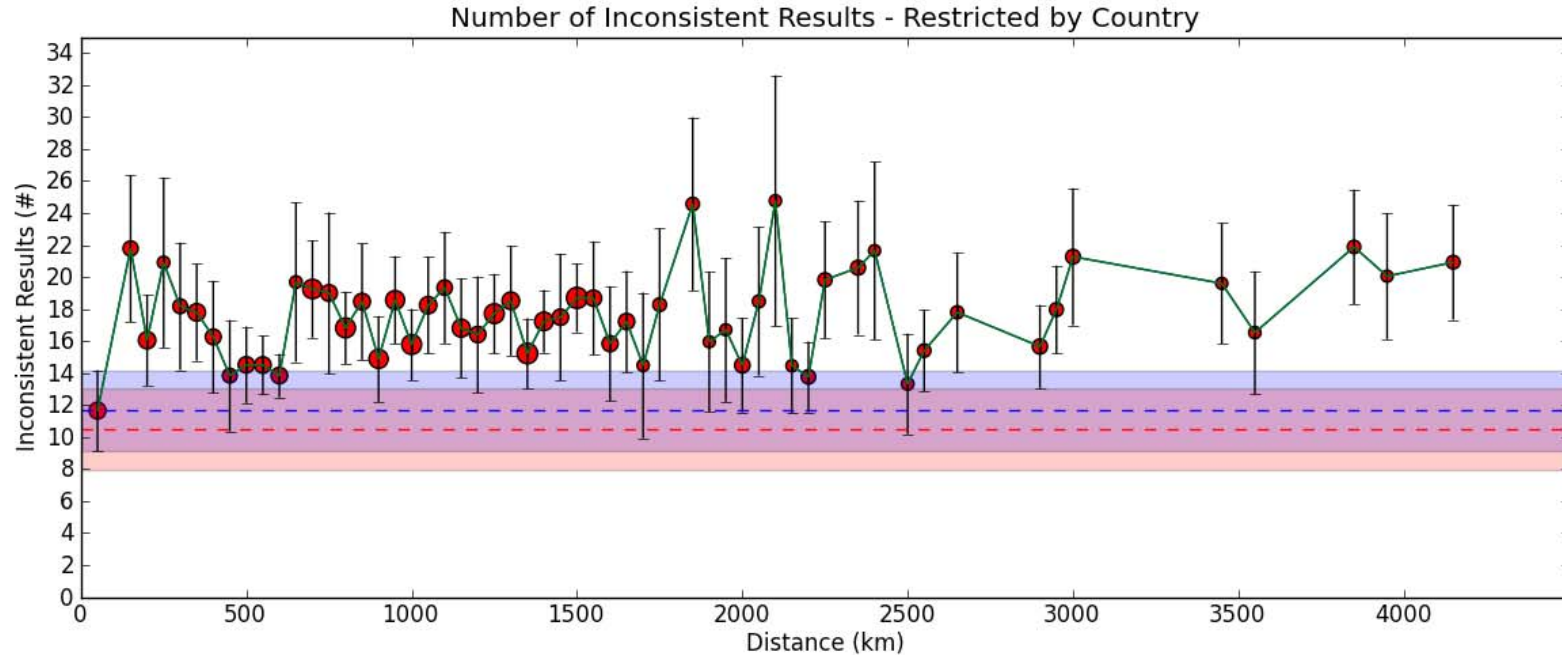
56(7) [Internet censorship in Russia: Lurk no more | The Economist](#)
www.economist.com/blogs/easternapproaches/2012/11/internet-censorship-ru...

54(45) [Internet censorship a growing concern](#)
tech2.in.com/features/general/internet-censorship-a-growing-concern/666872

54(29) [Russia's Internet Censorship "Experiment" - Global Voices](#)
globalvoicesonline.org/2013/02/03/russian-internet-censorship-imitates-s...

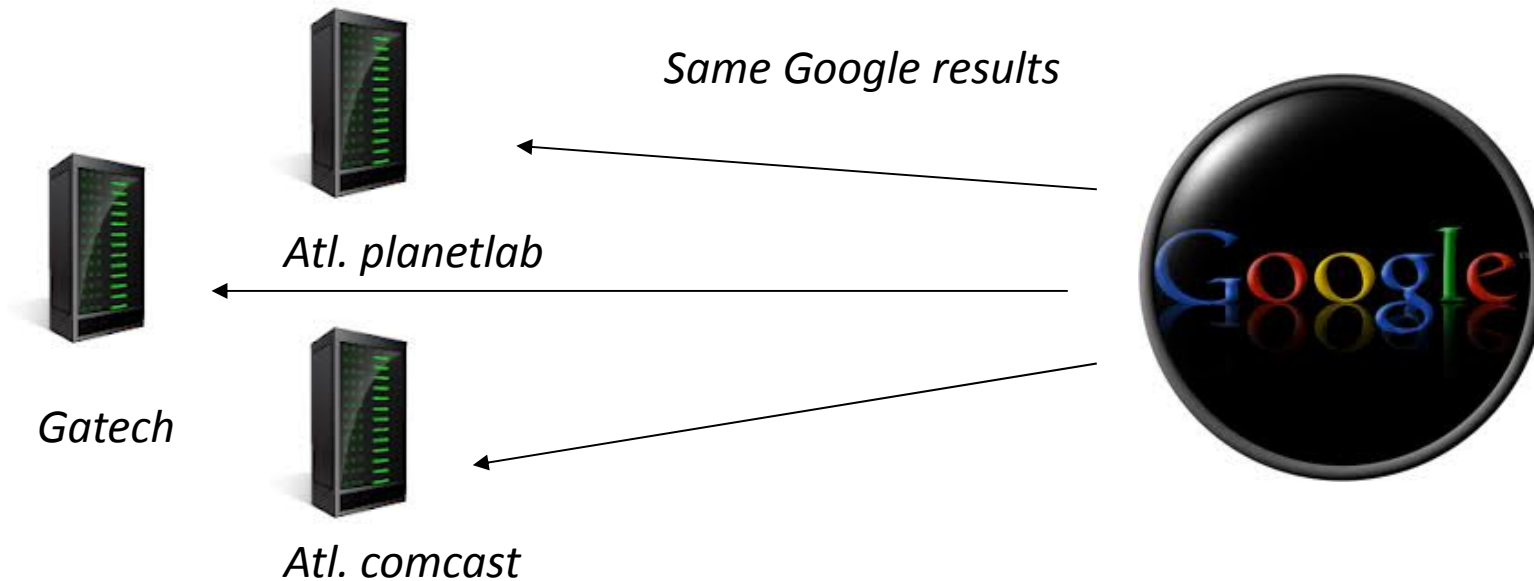
Benchmark

- Use a 50Km-planetlab-node search result as a Google user's non-personalized result



Benchmark Results

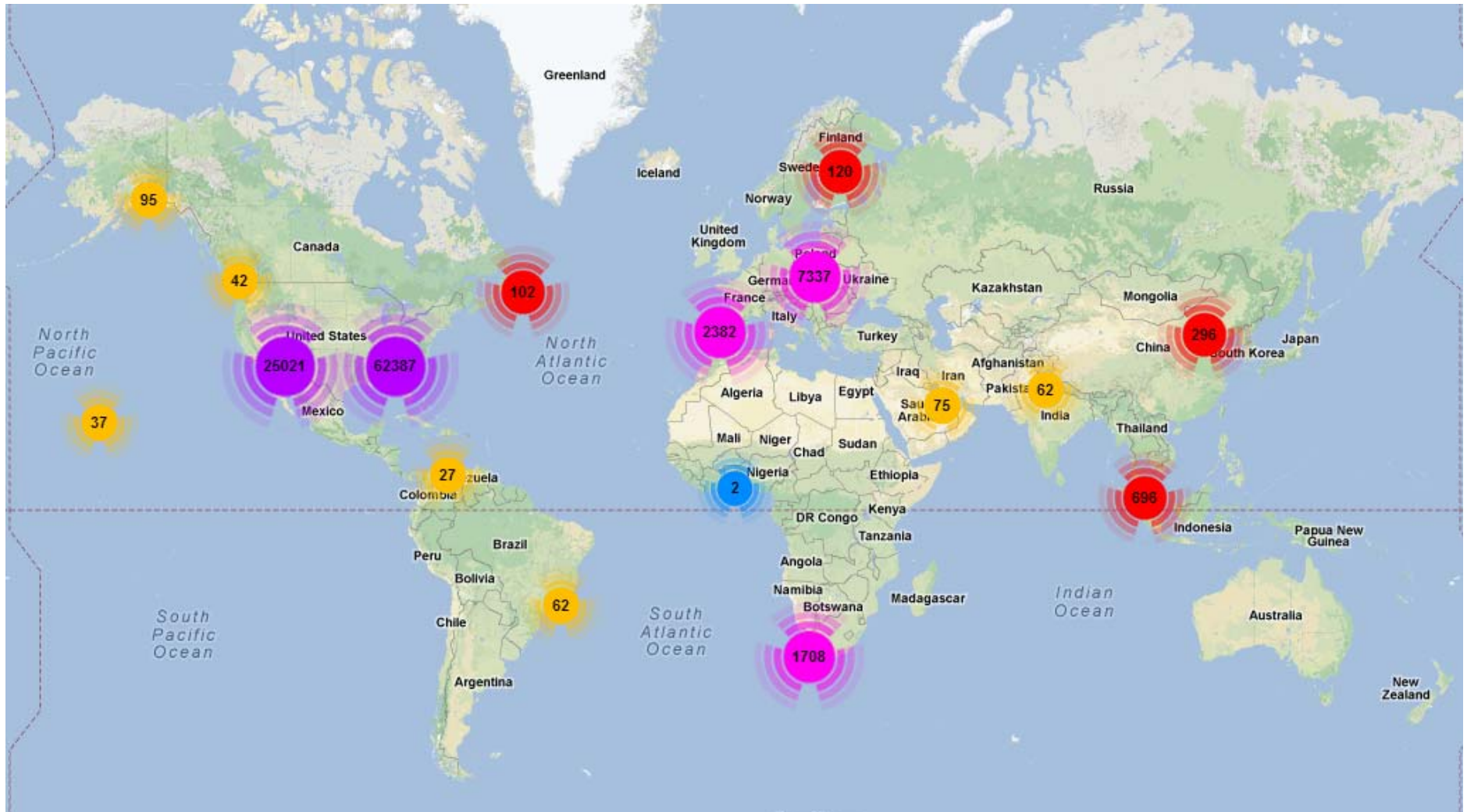
- Search results from planetlab node == search results from regular user's machines
 - A proportion test shows no significant difference at $p\text{-value} < .05$



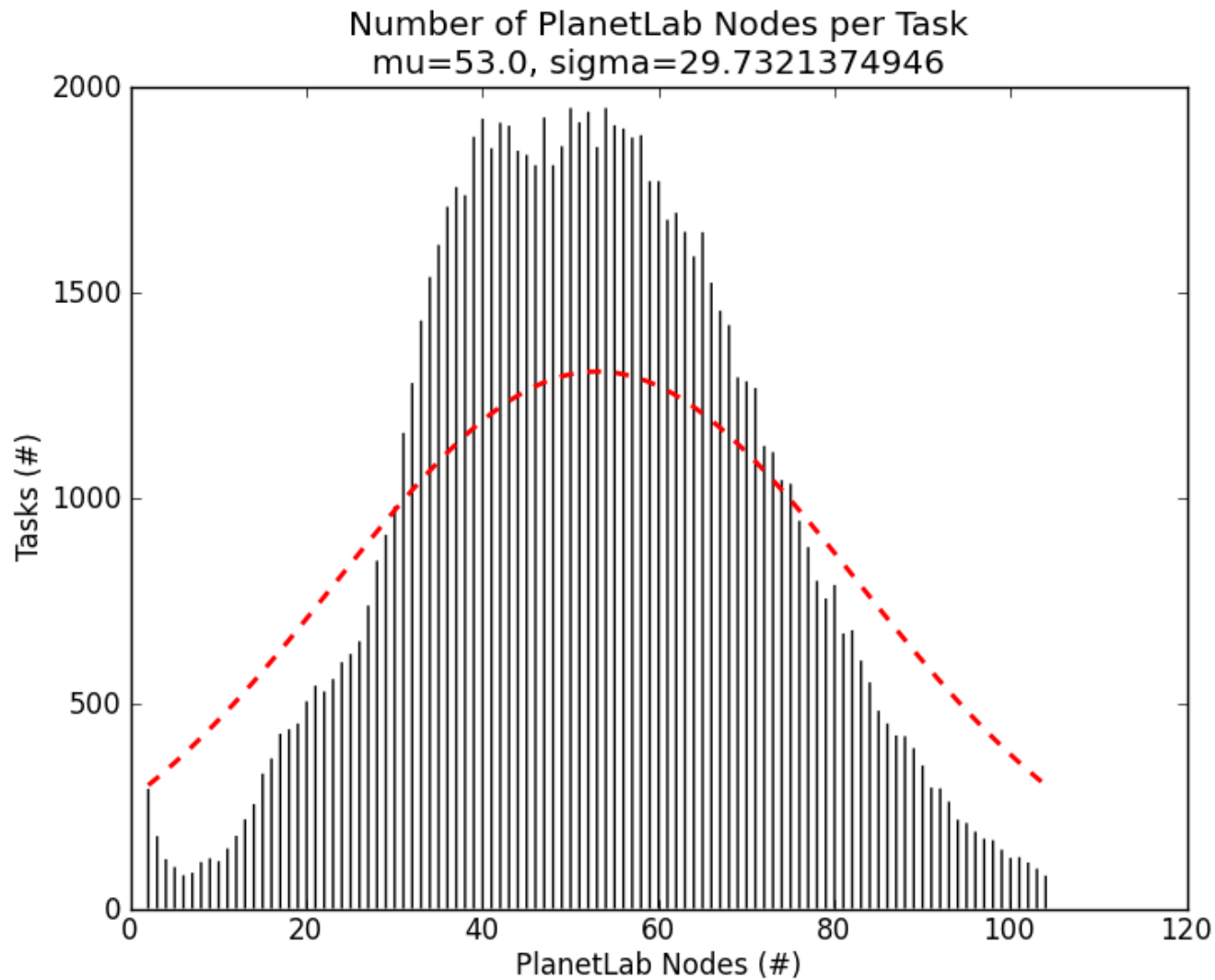
Statistics

- From 2012/1/17 – 2012/10/25 (9 months)
- 174 unique Google-user installation
- 100,451 queries
 - 13,974 queries issued by non-signed-in users
 - 86,477 queries issued by signed-in users
- 80,897 unique search terms

Geographic Distribution of Queries



Bobble Response Time



Query Categorization

 open directory project

Search: president obama

Open Directory Categories (1-5 of 100)

1. [Society: History: By Region: North America: United States: Presidents: Obama, Barack: News and Media](#) (40)
2. [Society: History: By Region: North America: United States: Presidents: Obama, Barack](#) (31)
3. [Regional: North America: United States: Government: Elections: President: 2008: Candidates: Obama, Barack](#) (16)
4. [Regional: North America: United States: Government: Elections: President: 2008: Candidates: Obama, Barack: News and Media](#) (14)
5. [Reference: Libraries: Presidential](#) (16)

[more...](#)

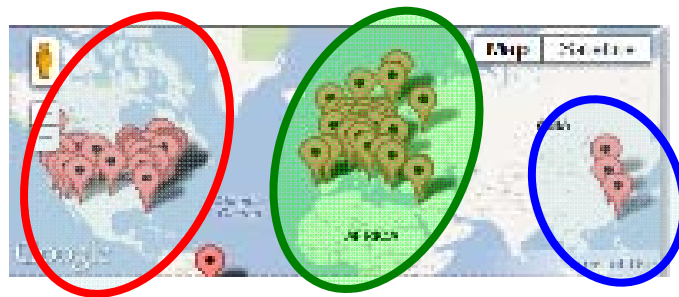
Open Directory Sites (1-20 of 5611)

1. [WhiteHouse.gov - President Barack Obama](#)★ - Official biography of President Barack Obama.
-- <http://www.whitehouse.gov/administration/president-obama/> [Kids and Teens: School Time: Social Studies: History: By Region: North America: United States: Presidents: Obama, Barack](#) ()
2. [WhiteHouse.gov - President Barack Obama](#)★ - Official biography of President Barack Obama.
-- <http://www.whitehouse.gov/administration/president-obama/> [Society: History: By Region: North America: United States: Presidents: Obama, Barack](#) (31)
3. [Snopes.com - Barack Obama](#) - Rumor control information on urban legends about President Barack Obama.
-- <http://www.snopes.com/politics/obama/obama.asp> [Society: History: By Region: North America: United States: Presidents: Obama, Barack: News and Media](#) (40)
4. [History.com - Barack Obama](#) - Profile of the 44th President includes video and audio galleries along with his biography, a timeline and transcripts of major speeches.
-- <http://www.history.com/presidents/obama> [Society: History: By Region: North America: United States: Presidents: Obama, Barack](#) (31)
5. [PBS Video - Obama Presidency](#) - Collected coverage of President Barack Obama's ascent to power and the issues he faces in office.
-- <http://video.pbs.org/feature/59/> [Society: History: By Region: North America: United States: Presidents: Obama, Barack](#) (31)
6. [Wikipedia - Michelle Obama](#) - Hyperlinked encyclopedia article about First Lady Michelle Obama, wife of President Barack Obama.
-- http://en.wikipedia.org/wiki/Michelle_Obama [Society: History: By Region: North America: United States: First Ladies: Obama, Michelle](#) (11)
7. [The Obama Dog Blog](#) - News, photographs and video of the Obama's First Dog.
-- http://dreamdogstart.typepad.com/the_obamas_dog/ [Recreation: Pets: Dogs: Breeds: Working Group: Portuguese Water Dog: President Obama's First Dog](#) ()
8. [Chicago Reader - Obama-rama](#) - Collection of articles from the Reader, starting in 1995, about the politics and political career of Barack Obama.
-- <http://www1.chicagoreader.com/obama/> [Society: History: By Region: North America: United States: Presidents: Obama, Barack: News and Media](#) (40)
9. [Twitter - Barack Obama](#) - Brief reports from the President on what he's doing and thinking.
-- <http://twitter.com/BarackObama> [Kids and Teens: School Time: Social Studies: History: By Region: North America: United States: Presidents: Obama, Barack](#) ()
10. [Twitter - Barack Obama](#) - Brief reports from the President on what he's doing and thinking.
-- <http://twitter.com/BarackObama> [Society: History: By Region: North America: United States: Presidents: Obama, Barack](#) (31)

Using dmoz.org query categorization

(How) Does Location Affect Search Results?

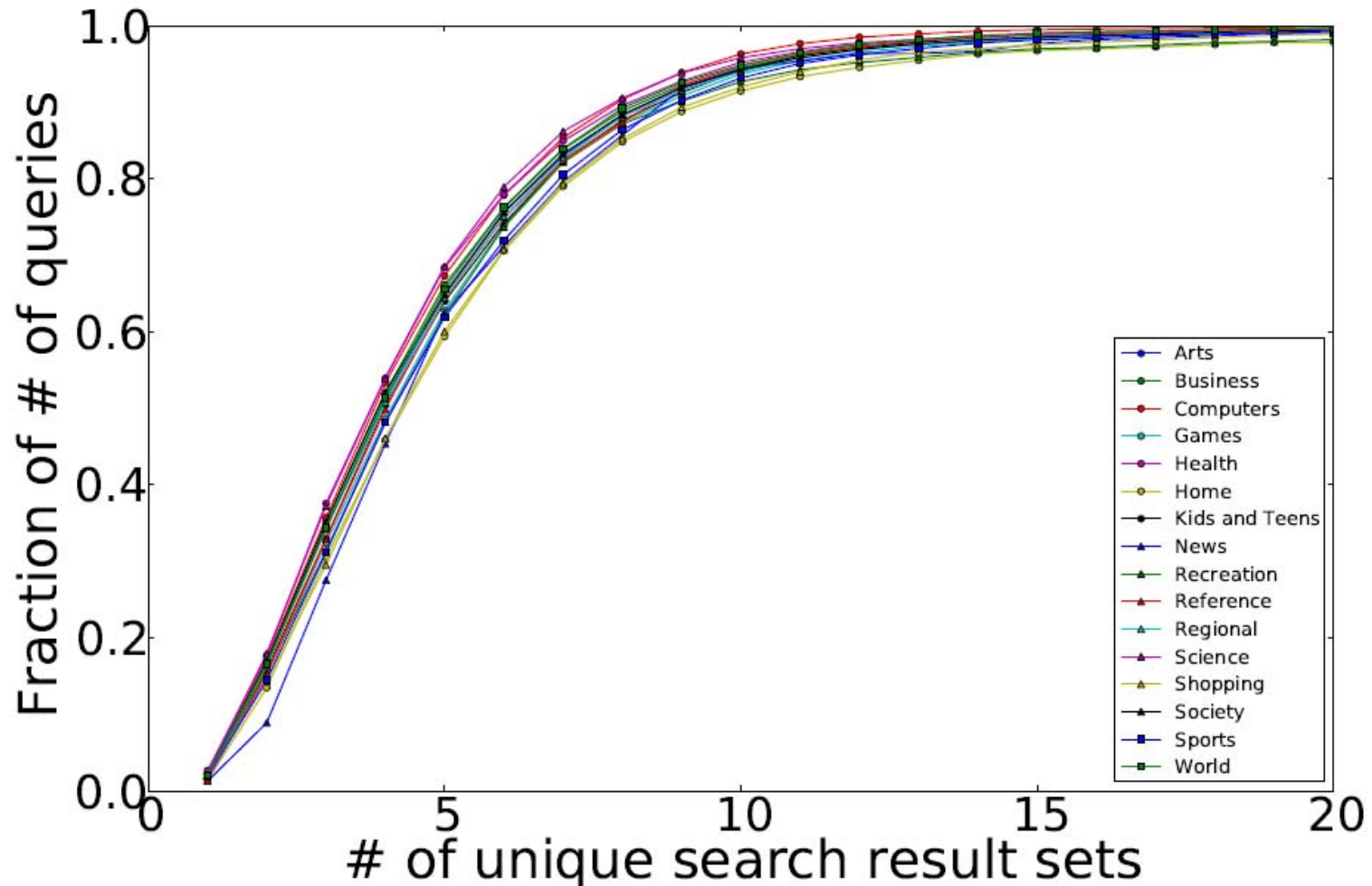
- Use dbscan algorithm to cluster PlanetLab nodes based on locations (cluster 1)
- Cluster Google search results based on the unique search result sets (cluster 2)
- Chi-square test:
 - ~95% of queries show high correlation in p-value (< 0.05)



Summary of Inconsistencies

- Not in user's result set, but in Google top 3 elsewhere: 30.66%
- Not in user's result set, but in Google top 10 elsewhere: 86.41%
- At least one result appears in Google's result set but does not appear at other PlanetLab nodes: 1.88%

How Many Unique Sets of Results?



How Does Personalization Affect Results?

- For signed-in users
 - 33% of queries have at least one search result added as a result of personalization
 - 11% of queries have at least one search result removed
- For anonymous users:
 - 31% of queries have at least one search result added
 - 15% have at least one search result removed

Hoeffding Distance

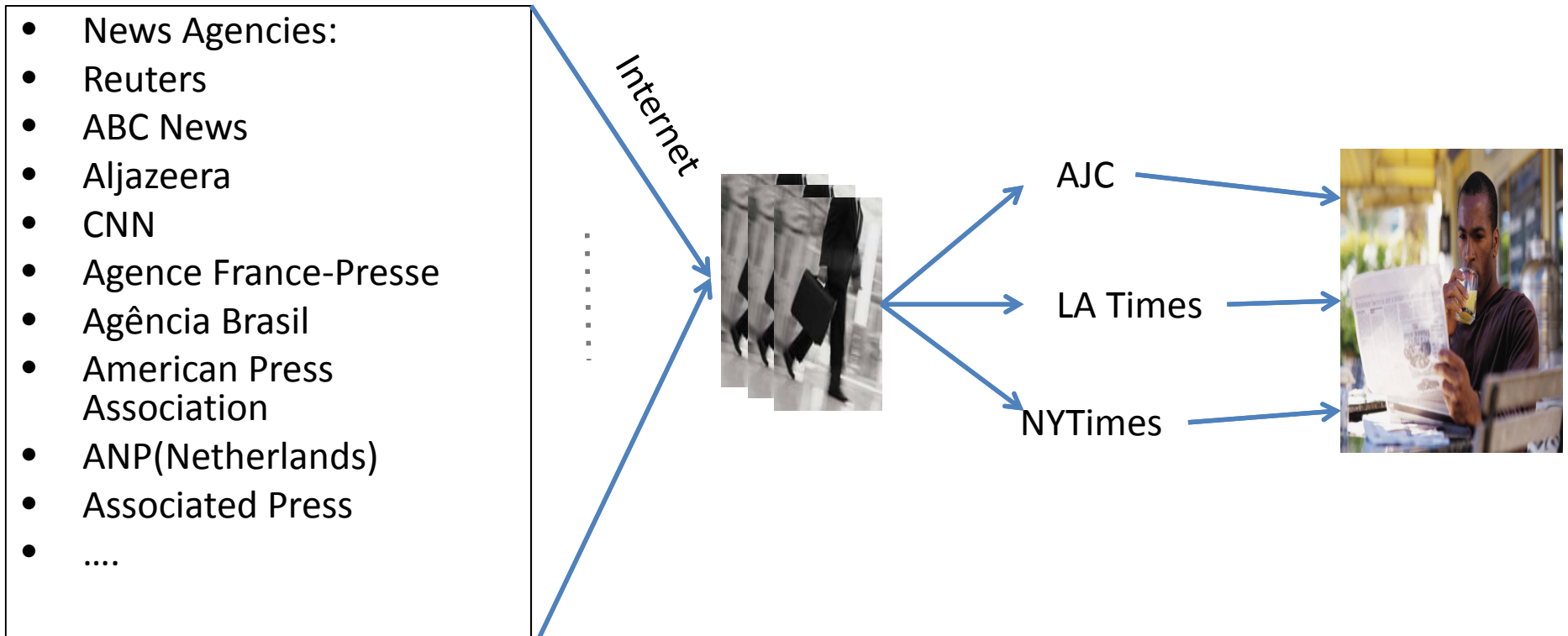
- Way of characterizing inconsistencies across searches
 - Interpretable with respect to search algorithms retrieving ranked lists of different lengths
 - Models the increased attention users pay to top ranks over bottom ranks
- Zero: No difference between sets
One: Completely different

Personalized Queries, Signed-in users

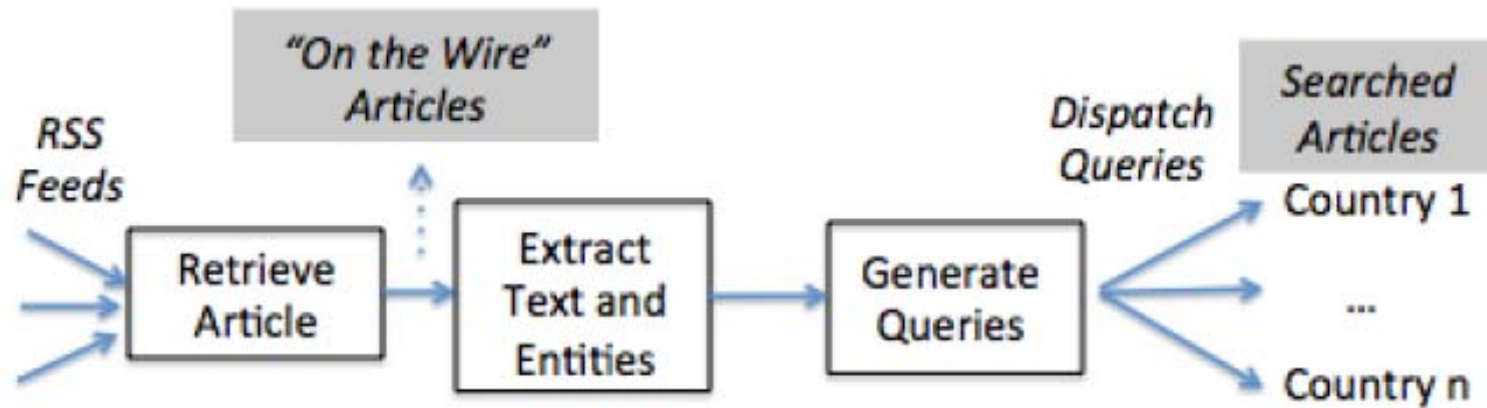
(a) Signed-in data set

Category	# of queries	# of customized queries	Mean	Std. Dev.
Arts	12,302	7,859	0.0829	0.0902
Business	7,284	4,602	0.0834	0.0902
Computers	13,159	8,642	0.0859	0.0905
Games	3,318	2,132	0.0847	0.0907
Health	2,000	1,243	0.0859	0.0930
Home	1,470	933	0.0842	0.0888
Kids and Teens	5,588	3,583	0.0821	0.0896
News	348	211	0.0795	0.0820
Recreation	3,055	1,946	0.0890	0.0959
Reference	2,127	1,402	0.0896	0.0957
Regional	9,361	5,840	0.0825	0.0882
Science	4,170	2,621	0.0838	0.0923
Shopping	3,239	2,052	0.0868	0.0937
Society	5,758	3,619	0.0836	0.0904
Sports	2,761	1,759	0.0817	0.0895
World	12,041	7,850	0.0869	0.0922

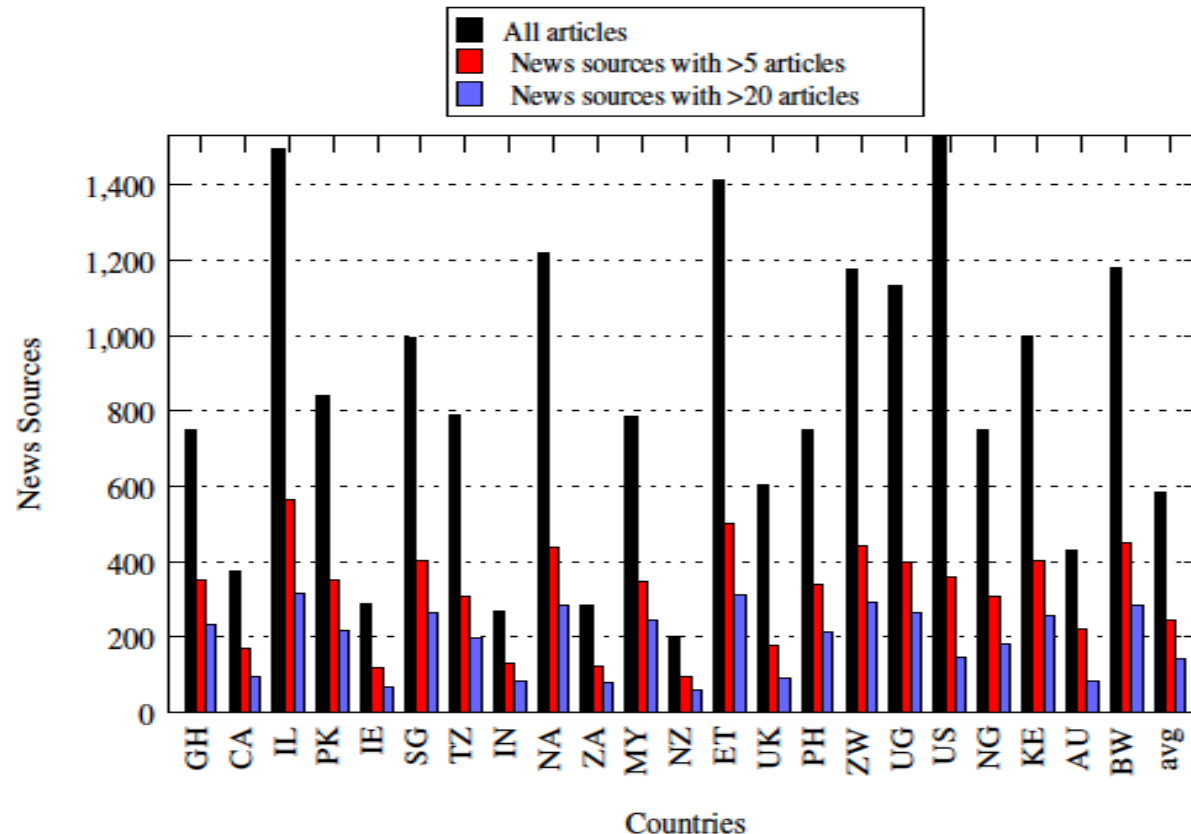
Other Applications: News



Data Collection



Lack of Sources in RSS Feeds



- 80-20 principle for English language edition countries.
- For many countries its 90% of articles from 10% of news sources.
- Same holds for Spanish, French and Arabic.

Local BIAS (RSS Feeds)

Country	Sources	Articles	Top Two Sources
US	1,529	54,943	washingtonpost.com reuters.com
UK	604	35,848	telegraph.co.uk bbc.co.uk
Singapore	993	63,134	straitstimes.com washingtonpost.com
Brazil	560	37,549	terra.com.br dgabc.com.br
Israel	1,495	103,157	jpost.com washingtonpost.com
Australia	429	36,308	abc.net.au smh.com.au
France	423	40,934	20minutes.fr nouvelobs.com
Ireland	287	29,055	google.com irishtimes.com
Canada	373	38,504	vancouver.sun.com montrealgazette.com
Germany	325	39,522	focus.de welt.de
New Zealand	202	26,008	stuff.co.nz tvnz.co.nz
Switzerland	226	30,676	romandie.com nouvelobs.com
India	266	39,278	indiatimes.com hindustantimes.com

RSS Feeds

Conclusion

- Search inconsistency (and information manipulation) is pervasive
 - Geographic location introduces inconsistency in about 98% of queries
 - Personalization results in addition or removal of results more than 30% of the time
- We have also done this analysis for news stories (similar geographic conclusions)
- Next steps
 - More detailed study of how personas affect results
 - Countermeasures