A Deeper Investigation of the Importance of Wikipedia Links to the Success of Search Engines

https://wikiworkshop.org/2020/

Nicholas Vincent and Brent Hecht.

Contact: www.nickmvincent.com | nickvincent@u.northwestern.edu | @nickmvincent

PSA Research Group
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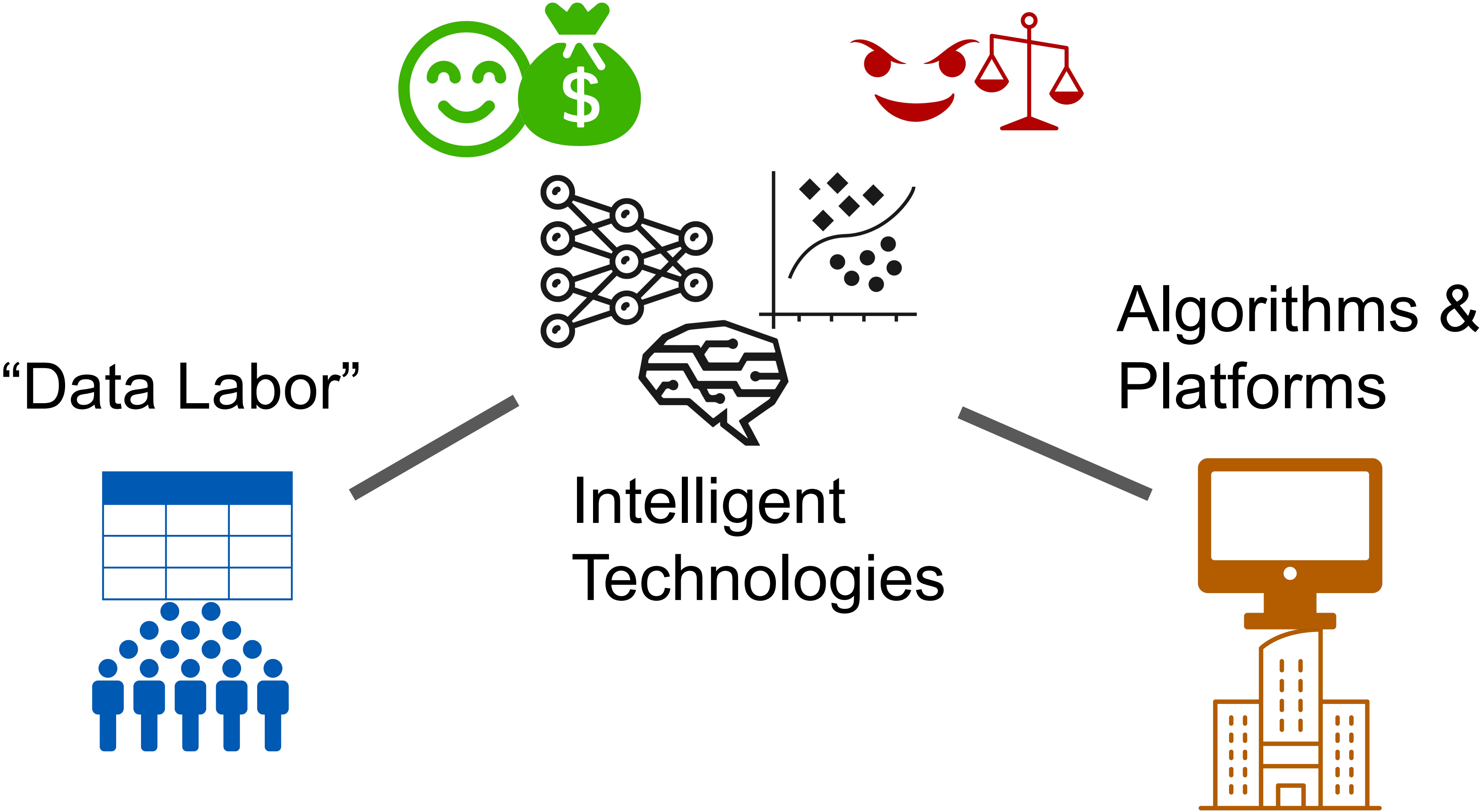


“Data Labor”

Intelligent Technologies

Algorithms & Platforms

Why Study Data Labor?

- Economic concerns
    - Intelligent technologies linked with serious societal harms from inequality
- Recognize and dignify data labor
- Sustainability of peer production

Make people aware of value, to make it possible for them to leverage the value and create change

Why Study Data Labor?

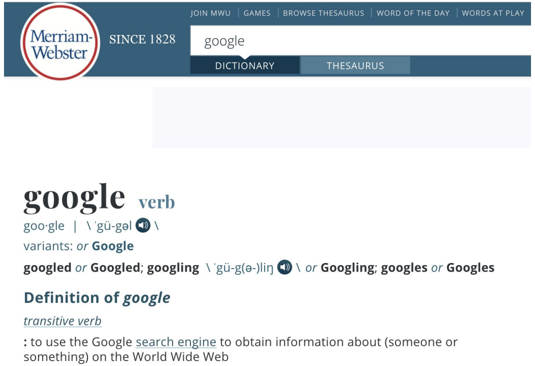
Leverage value of data labor to create a computing paradigm where economic benefits and power are shared much more broadly

Could range from: paycheck for your data to more recognition/agency for Wikipedia

So how exactly do Wikipedia and search engines fit into “data labor” research?

Search engines

- ubiquitous
- hugely influential



google verb

goo·gle | \ˈgü-gəl\

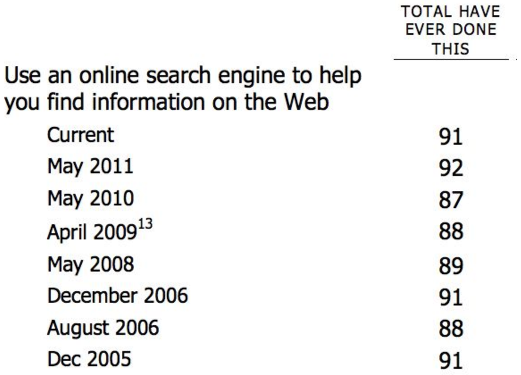
variants: *or* **Google**

googled *or* **Googled**; **googling** \ˈgü-g(ə-)liŋ\ *or* **Googling**; **googles** *or* **Googles**

Definition of *google*

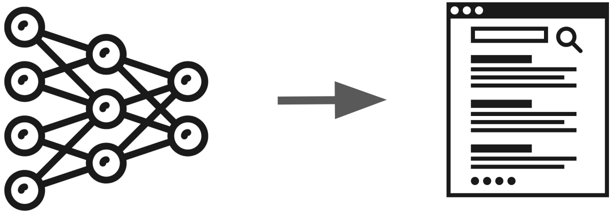
transitive verb

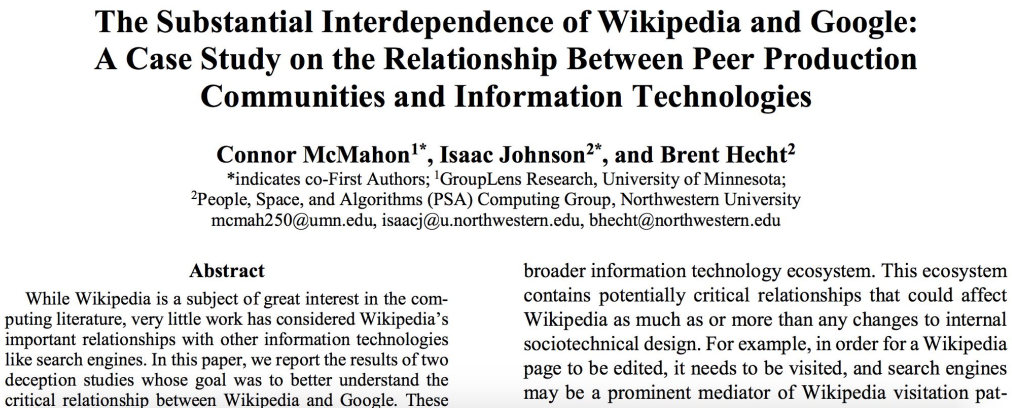
: to use the Google search engine to obtain information about (someone or something) on the World Wide Web



	TOTAL HAVE EVER DONE THIS
Use an online search engine to help you find information on the Web	
Current	91
May 2011	92
May 2010	87
April 2009[13]	88
May 2008	89
December 2006	91
August 2006	88
Dec 2005	91

Image from: Purcell, Kristen, Lee Rainie, and Joanna Brenner. "Search engine use 2012." (2012).





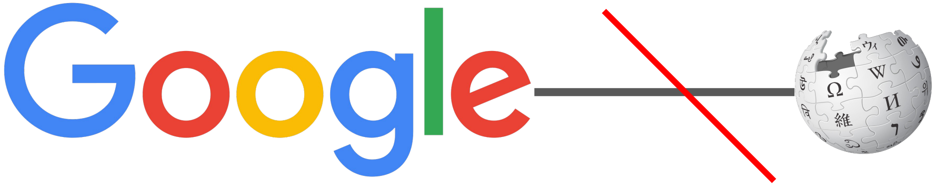
The Substantial Interdependence of Wikipedia and Google: A Case Study on the Relationship Between Peer Production Communities and Information Technologies

Connor McMahon[1*], Isaac Johnson[2*], and Brent Hecht[2]
*indicates co-First Authors; [1]GroupLens Research, University of Minnesota;
[2]People, Space, and Algorithms (PSA) Computing Group, Northwestern University
mcmah250@umn.edu, isaacj@u.northwestern.edu, bhecht@northwestern.edu

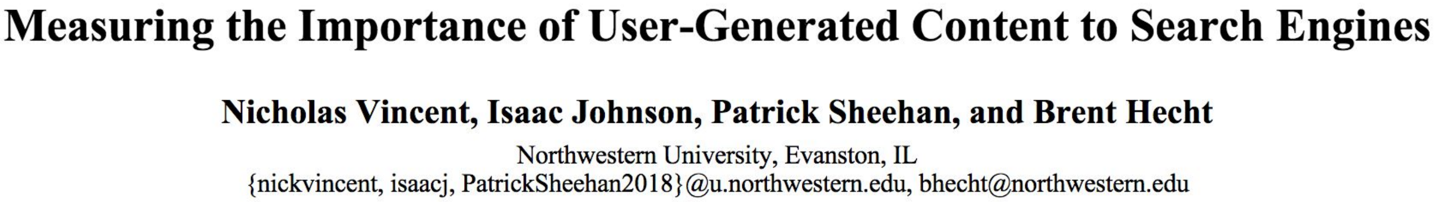
Abstract

While Wikipedia is a subject of great interest in the computing literature, very little work has considered Wikipedia's important relationships with other information technologies like search engines. In this paper, we report the results of two deception studies whose goal was to better understand the critical relationship between Wikipedia and Google. These

broader information technology ecosystem. This ecosystem contains potentially critical relationships that could affect Wikipedia as much as or more than any changes to internal sociotechnical design. For example, in order for a Wikipedia page to be edited, it needs to be visited, and search engines may be a prominent mediator of Wikipedia visitation pat-



26% click through rate → 14% click through rate



Measuring the Importance of User-Generated Content to Search Engines

Nicholas Vincent, Isaac Johnson, Patrick Sheehan, and Brent Hecht
Northwestern University, Evanston, IL
{nickvincent, isaacj, PatrickSheehan2018}@u.northwestern.edu, bhecht@northwestern.edu

Wikipedia was a top source of content and appeared in 80-90% of results pages for some cateogires.

- not true for every category
- not always in the top 3 results

takeaway: Wikipedia is **one of the most important sources of results for search engines**

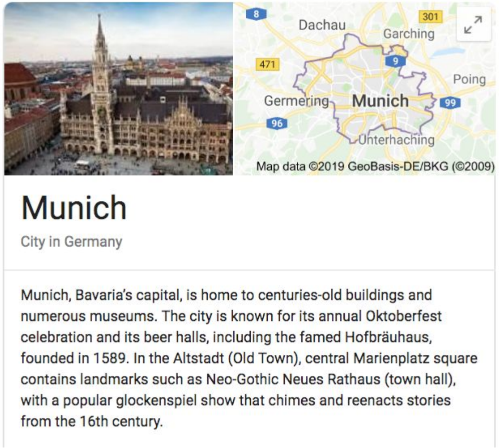
We had several generalization questions:

- What about search engines other than Google?
- What about mobile results?

Technical challenge:

- How do we handle the ever-changing Search Engine Results Pages (“**SERPs”**) for multiple search engines?
    - SERPs are no longer just “10 blue links”

SERPs are not just 10 blue links

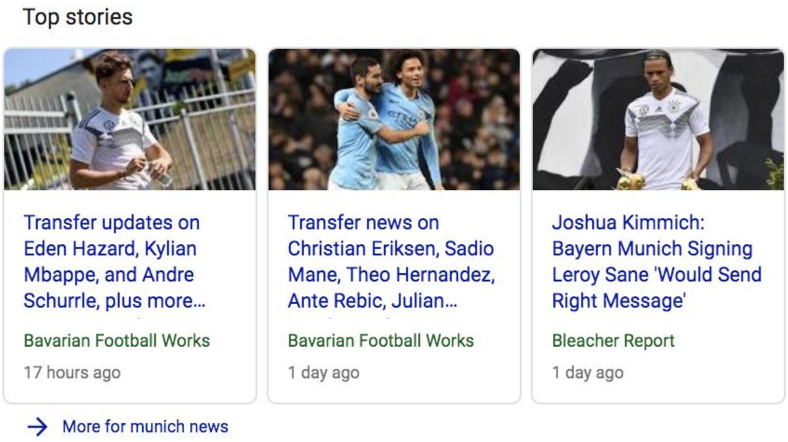


Map data ©2019 GeoBasis-DE/BKG (©2009)

Munich

City in Germany

Munich, Bavaria's capital, is home to centuries-old buildings and numerous museums. The city is known for its annual Oktoberfest celebration and its beer halls, including the famed Hofbräuhaus, founded in 1589. In the Altstadt (Old Town), central Marienplatz square contains landmarks such as Neo-Gothic Neues Rathaus (town hall), with a popular glockenspiel show that chimes and reenacts stories from the 16th century.



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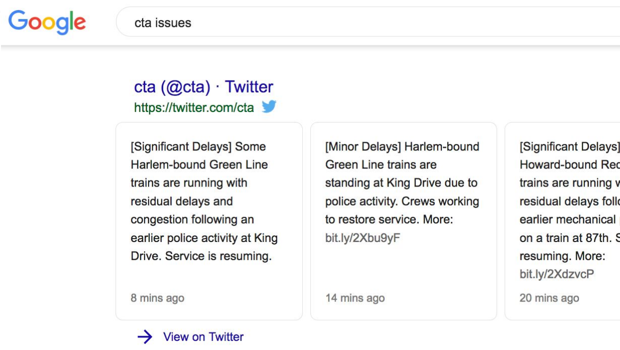

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8 mins ago

[Minor Delays] Harlem-bound Green Line trains are standing at King Drive due to police activity. Crews working to restore service. More: bit.ly/2Xbu9yF

14 mins ago

[Significant Delays] Howard-bound Red trains are running v residual delays follo earlier mechanical on a train at 87th. S resuming. More: bit.ly/2XdzvcP

20 mins ago

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Knowledge Box, News Carousel, Twitter Carousel, etc.
Presumably very important to search

Methods

Search Engines, Devices, and Queries

a. What search engines?
   i. Google, Bing, and DuckDuckGo
b. What devices to emulate?
   i. Desktop and Mobile (we also considered the effect of different screen sizes)
c. What queries to make?
   i. **Critical and challenging**
   ii. Our approach: multiple important categories, drawing on past work

Query selection

“common” queries (100 from search engine optimization company ahrefs.com)

e.g. `“facebook”, “youtube”, “amazon”, “gmail”`

“trending” queries (282 from Google trends)

e.g. `“World Cup”, “thank u, next”, “What is fortnite”`

“medical” queries (50 from prior research that shared Bing data)

e.g. `“how to lose weight”, “indigestion”`

See:

- Top Google searches (as of October 2019): 2019. https://ahrefs.com/blog/top-google-searches.
- https://trends.google.com/trends/?geo=US
- Soldaini, L. et al. 2016. Enhancing web search in the medical domain via query clarification. *Information Retrieval Journal*. 19, 1–2 (2016), 149–173.

Data collection

Our approach: use `puppeteer` (Node.js) run “headless” Chrome

- We forked NikolaiT’s `se-scraper` library: https://github.com/NikolaiT/se-scraper
- Our version focuses on recording and analyzing link coordinates with the space of a single SERP
- I’ll repost code links on the final slide

One approach for SERP scraping:

Researcher looks at SERP HTML

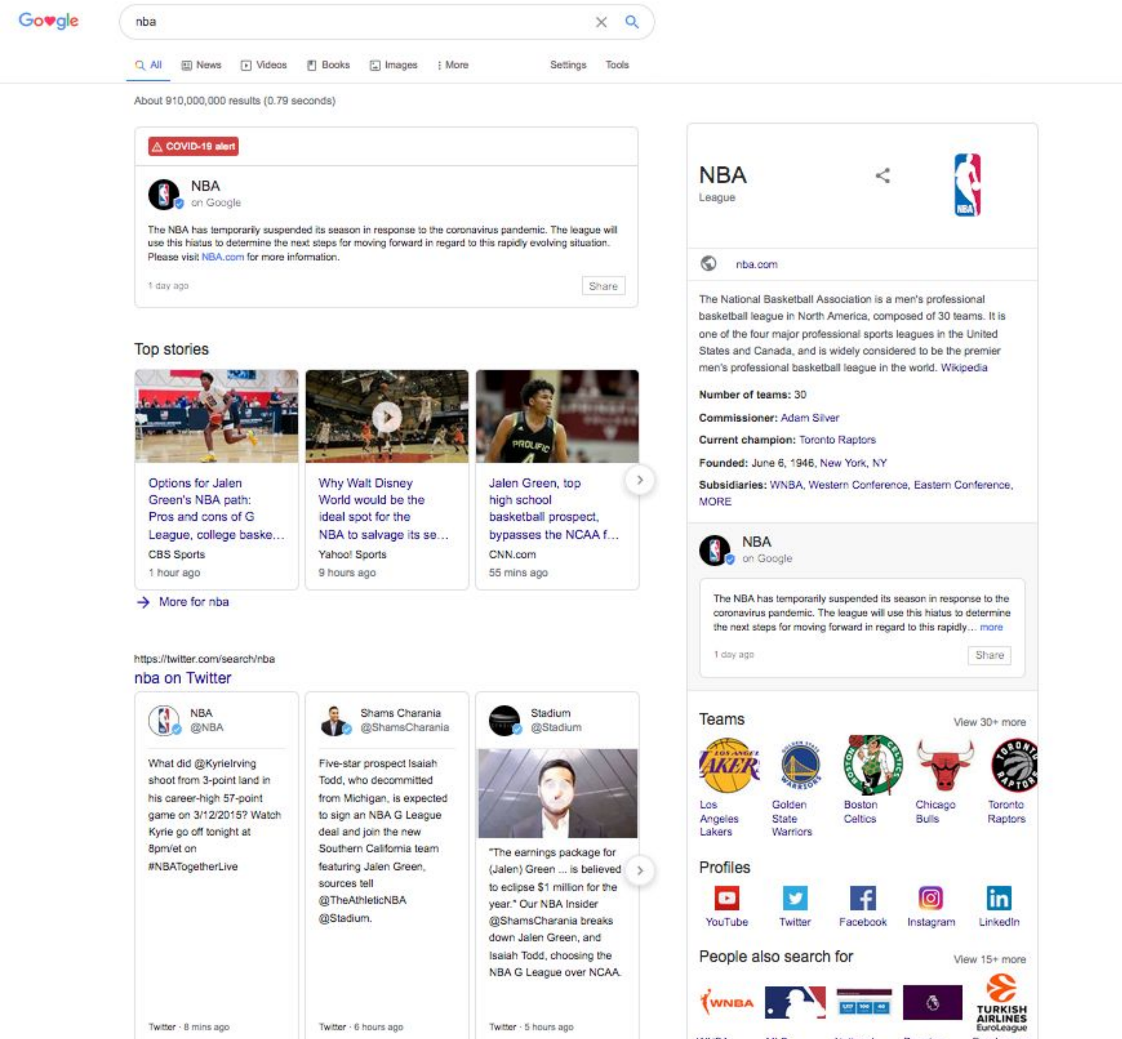
```
<div> … </div>
<div class=”searchResult_abc123”>
<a href=”wikiworkshop.org”> Wiki
Workshop 2020</a>
</div>
<div> … </div>
```

Write CSS rules to parse HTML page into a ranked list

“find all elements with class of searchResults_abc123”

```
1.   wikiworkshop.org
2.   twitter.com/wikiworkshop
```

How should we turn this into a ranked list?



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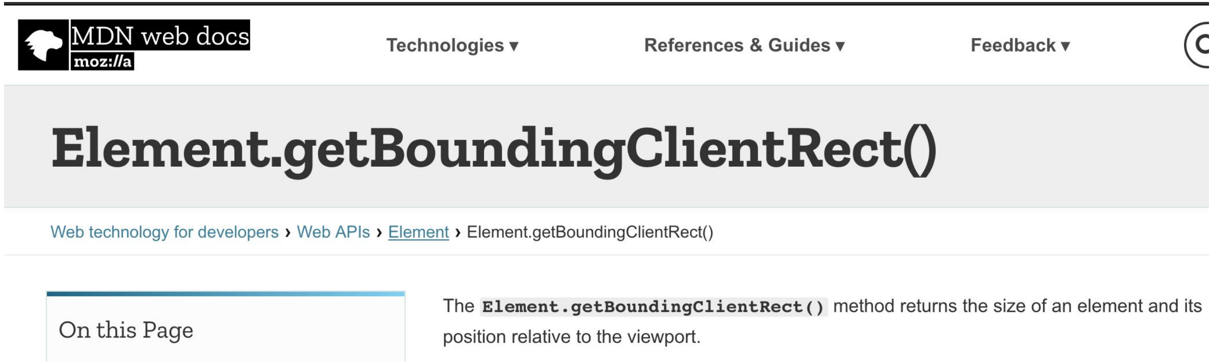
Spatial analysis: getting link coordinates

Get all the links (“a” elements) in a page:

```
await this.page.$$eval('a', getPos);
```

Calculate their position (x, y) with JavaScript:



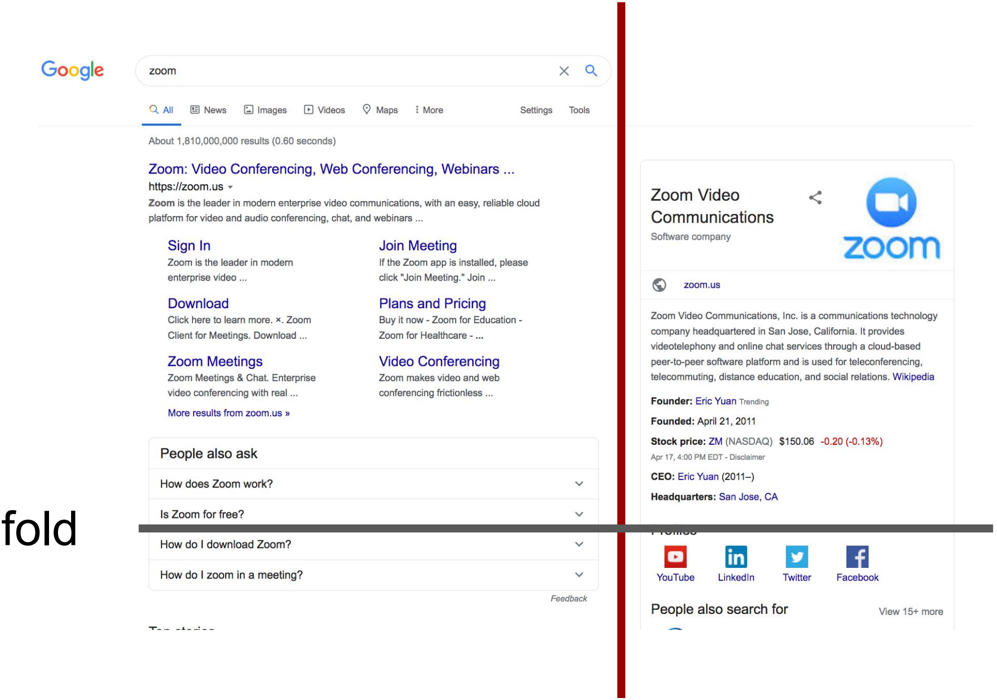
Element.getBoundingClientRect()

Web technology for developers › Web APIs › Element › Element.getBoundingClientRect()

The `Element.getBoundingClientRect()` method returns the size of an element and its position relative to the viewport.

Spatial incidence rate definition

full page



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Zoom Video Communications, Inc. is a communications technology company headquartered in San Jose, California. It provides videotelephony and online chat services through a cloud-based peer-to-peer software platform and is used for teleconferencing, telecommuting, distance education, and social relations. Wikipedia

Founder: Eric Yuan Trending

Founded: April 21, 2011

Stock price: ZM (NASDAQ) $150.06 -0.20 (-0.13%)
Apr 17, 4:00 PM EDT - Disclaimer

CEO: Eric Yuan (2011–)

Headquarters: San Jose, CA

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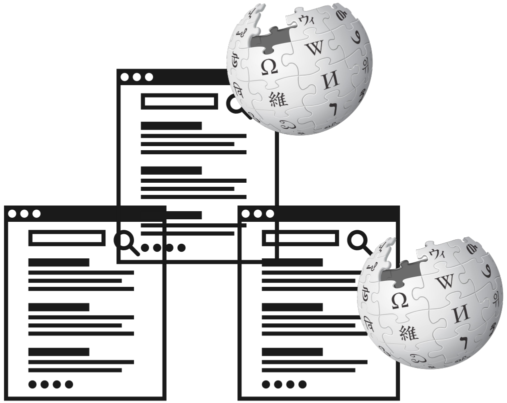
above-the-fold

left-hand and right-hand

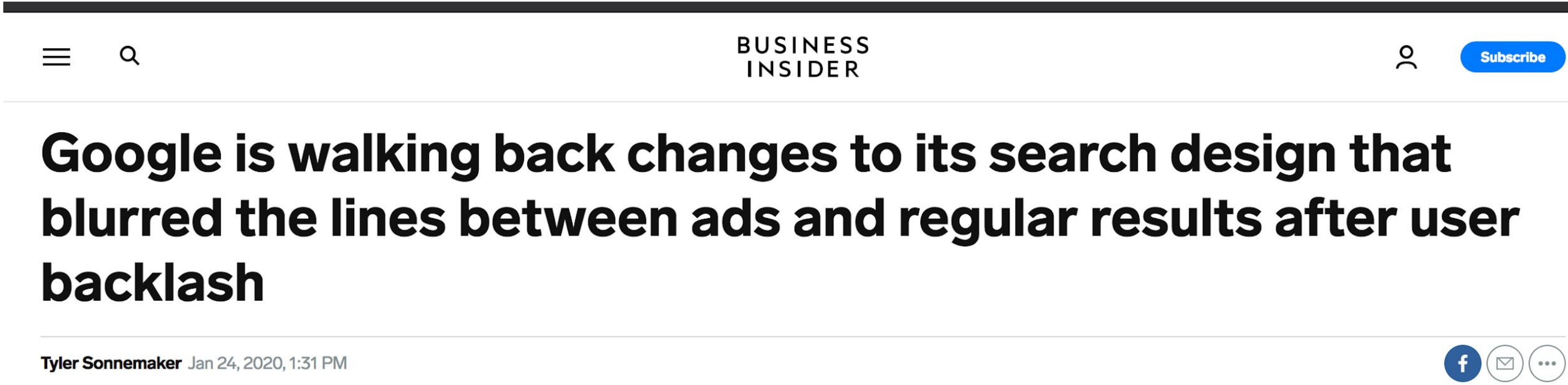
Incidence rates

- how often is Wikipedia showing up in SERPs?
  - If we collect 3 SERPs, and Wikipedia appears twice, incidence rate = 2 / 3
- how often is Wikipedia showing up in prominent parts of SERPs?
  - if Wikipedia appear “above-the-fold” in only one of our 3 SERPs, above-the-fold incidence rate = 1 / 3



Data validation - a tough task

SERP data changes constantly - remember this?



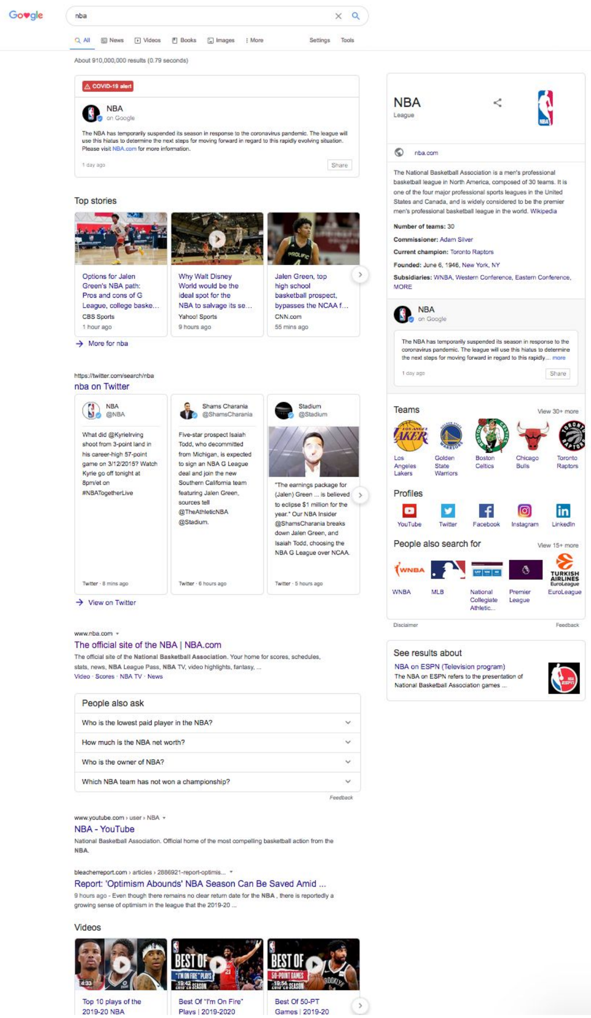
Google is walking back changes to its search design that blurred the lines between ads and regular results after user backlash

Tyler Sonnemaker Jan 24, 2020, 1:31 PM

Data validation - visual inspection

Basic approach:

- save screenshots of SERPs
- visualize the analysis-ready data (i.e. the JSON files for quantitative analysis)
- make sure they seem to match up!



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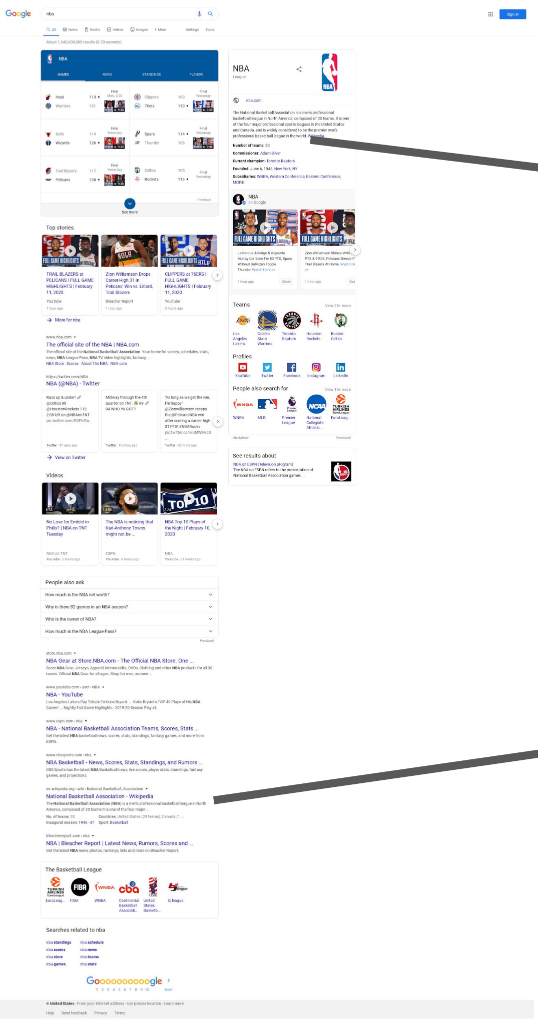

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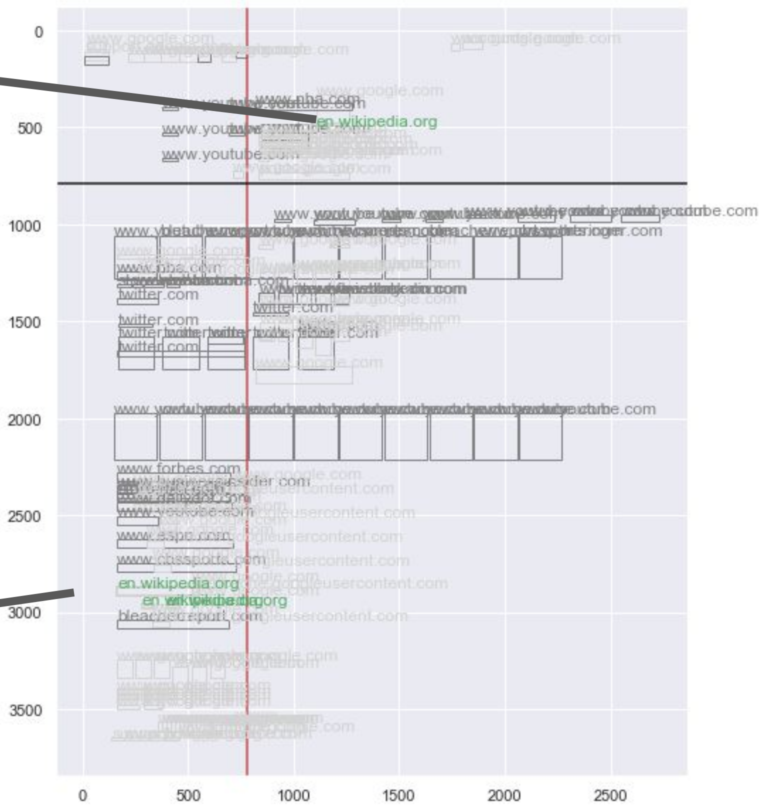

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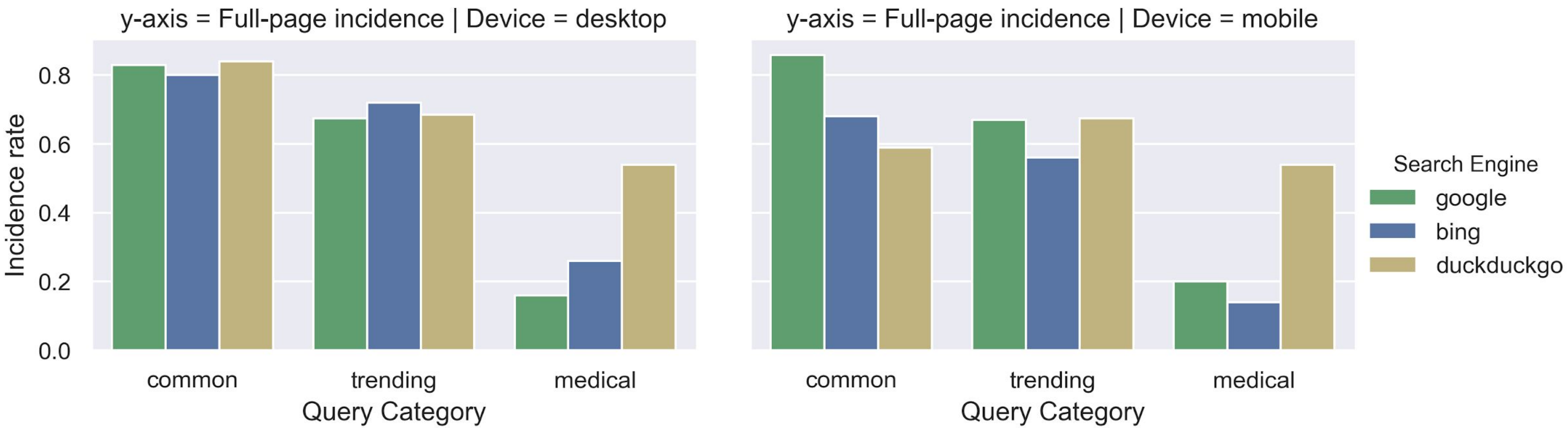
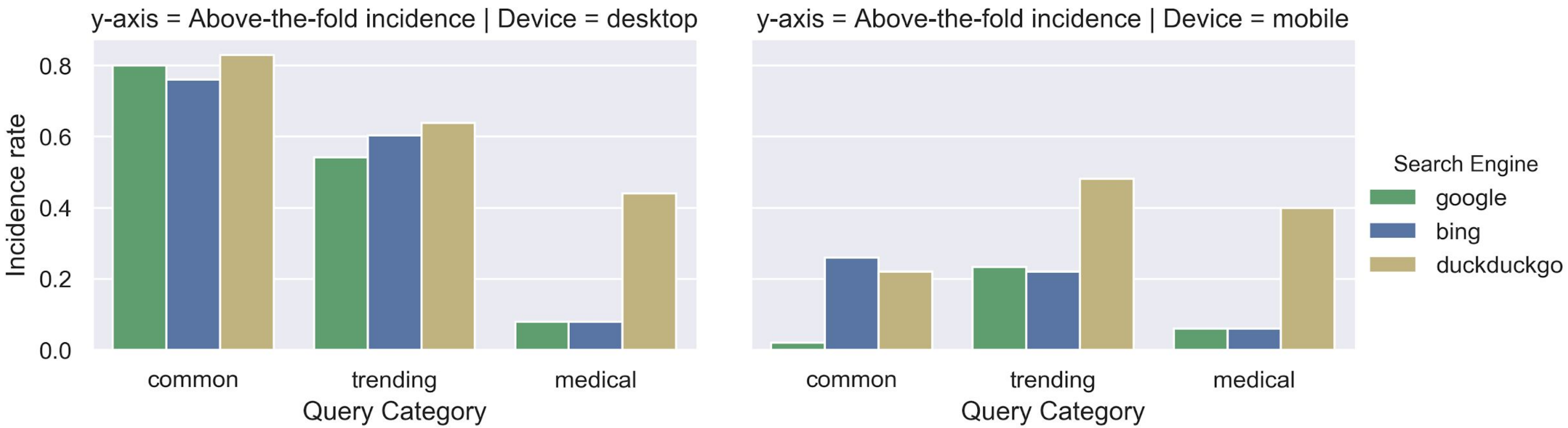
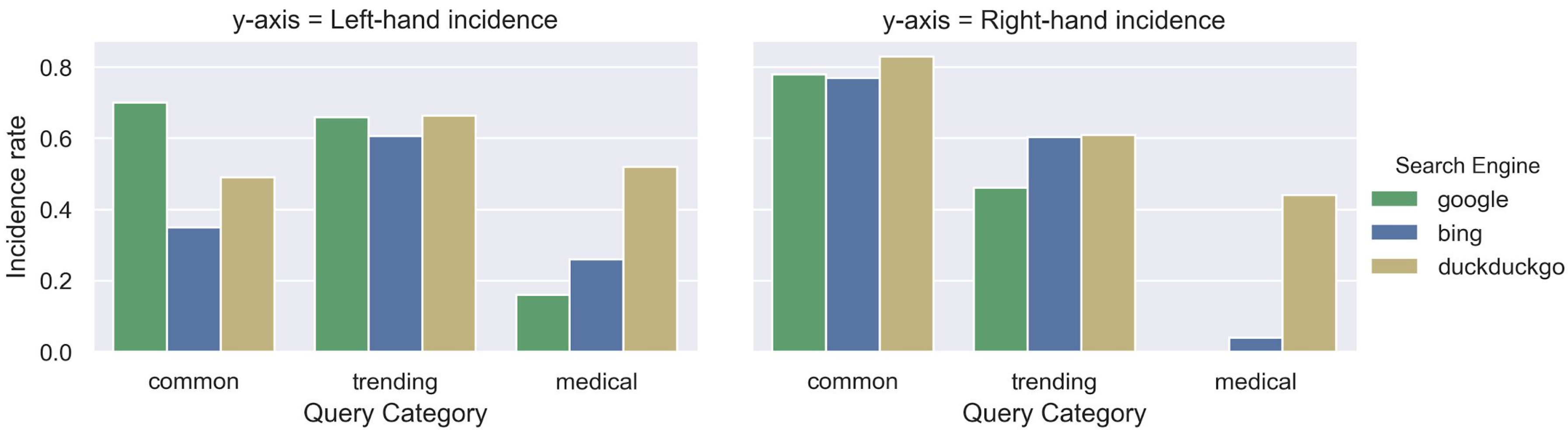


Above-the-fold incidence rates



Left-hand and right-hand



Summary of findings

- Using the easy-to-understand (but limited) measure of incidence rates, **Wikipedia's importance to the success of search engines extends beyond Google and desktop-formatted search results**
- Queries and devices matter:
  - Wikipedia appears above the fold more often on desktop devices than mobile devices
  - Knowledge panel elements are a key source of Wikipedia content, but not the only sources

Data from the Public Fuels Intelligent Technologies

- Are Wikipedia editors some of the most important employees of search engines?

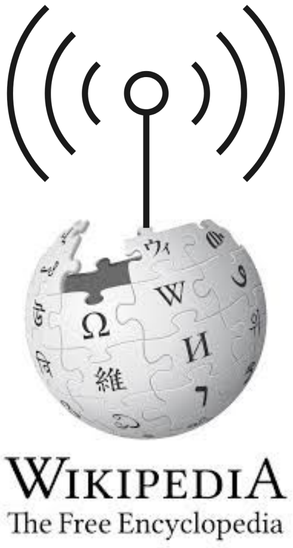
You **cannot** pay people to edit Wikipedia.

More prominently credit Wikipedia? Credit individual contributors? Solicit contributions? Donate to Wikipedia?

Wikipedia Matters Outside Wikipedia

Positive: effective peer production = effective search results?

Negative biases in coverage / quality = impact on search results?



Raises the stakes of Wikipedia-focused research and Wikipedia findings

Limitations

- Audit study!
  - Small scale relative to actual query datasets
- Still US / en.wikipedia only
  - Wikipedia has geographic / language differences
- Queries matter immensely.
  - Incidence rate can lose meaning very quickly, e.g. if we append “wikipedia” to each query
  - Interpret accordingly

Many thanks to:

co-author Brent Hecht, thoughtful reviewers and colleagues
Open Software

- se-scraper / puppeteer
- numpy / pandas / seaborn / scipy ecosystem

Community Data Science Collective’s COVID-19 Digital Observatory

-wiki page: https://wiki.communitydata.science/COVID-19_Digital_Observatory
-has SERP data for COVID-related keywords, using a newer version of this software developed after this study
-other data of interest to this group (Wikipedia editing, reddit)

Questions?

@nickmvincent on Twitter or nickvincent@u.northwestern.edu

Links:

paper: https://www.nickmvincent.com - under “Pre-prints”
se-scraper: https://github.com/NikolaiT/se-scraper
our se-scraper fork: https://github.com/nickmvincent/se-scraper
updated scraping repo: https://github.com/nickmvincent/LinkCoordMin
COVID-19 Digital Observatory:
https://wiki.communitydata.science/COVID-19_Digital_Observatory