Quantifying Engagement with Citations on Wikipedia

Tiziano Piccardi, Miriam Redi, Giovanni Colavizza, Robert West

EPFL

WIKIMEDIA
FOUNDATION

University of Amsterdam

Content integrity

"Citations have several important purposes: [...] **to allow the reader to determine independently whether the referenced material supports the author's argument in the claimed way**, and to help the reader gauge the strength and validity of the material the author has used."

Wikipedia's verifiability policy requires **inline citations** for **any material** challenged or **likely to be challenged**, and for all quotations, anywhere in article space [1].

[1] https://en.wikipedia.org/wiki/Wikipedia:Citing_sources

Citing the source

The Web Conference

From Wikipedia, the free encyclopedia

The Web Conference (formerly known as **International World Wide Web Conference**, abbreviated as **WWW**) is a yearly international academic conference on the topic of the future direction of the World Wide Web. The first conference of many was held and organized by Robert Cailliau in 1994 at CERN in Geneva, Switzerland. The conference has been organized by the International World Wide Web Conference Committee (IW3C2), also founded by Robert Cailliau and colleague Joseph Hardin, every year since.[1] The conference's location rotates among North America, Europe, and Asia and its events usually span a period of five days. The conference aims to provide [___] in which "key influencers, decision makers, technologists, businesses and standards bodies" can both present their ongoing work, research, and opinions as [___] feedback from some of the most knowledgeable people in the field.[1]

The conference series is aimed at providing a global forum for discussion and debate in regard to the standardization of its associated techno[___] the impact of said technologies on society and culture. Developers, researchers, internet users as well as commercial ventures and organizations come toge[___] [___]ference to discuss the latest advancements of the Web and its evolving uses and trends, such as the development and popularization of the eTV and eBusiness.[2] The conferences usually include a variety of events, such as tutorials and workshops, as well as the main conference and special dedications of space in memory of the history of the Web and specific notable events.[3] The conferences are organized by the IW3C2 in collaboration with the World Wide Web Consortium (W3C), Local Organizing Committees, and Technical Program Committees.[4]

References   [edit source]

1. ^ a b "Past and Future Conferences" .
2. ^ Business/Technology Editors. "Ninth International World Wide Web Conference Opens Today: Latest Developments in Trend-Setting Technologies Revealed" . Business Wire. Retrieved 19 March 2014.
3. ^ Business & Hi-Tech Editors. "Web Inventor Tim Berners-Lee to Keynote; Premier International World Wide Web Conference". Business Wire. ProQuest 446691129 .
4. ^ "International World Wide Web Conference, 28th March - 1st April 2011, Hyderabad, India" . Www2011india.com. Retrieved 19 September 2011.

4

Understanding readers' interactions with references is crucial:

- *to understand the role of editors and policies in maintaining high quality information*

- *to study what can increase interest in the reference content*

- *to design visualizations and tools to support content referencing*

RQ1: To **what extent** do **users engage** with citations when reading Wikipedia?

RQ2: What **features of a page** predict whether a reader will interact with a citation on the page?

RQ3: What **features of a citation** predict whether a reader will interact with it?

Wikipedia

From Wikipedia, the free encyclopedia

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Wikipedia was launched on January 15, 2001, by Jimmy Wales and Larry Sanger.[13] Sanger coined its name,[14][15] as a portmanteau of "wiki" (the Hawai'ian word for "quick"[16]) and "encyclopedia". Initially an English-language encyclopedia, versions in other languages were quickly developed. With at least 5,951,036 articles,[note 3] the English Wikipedia is the largest of the more than 290 Wikipedia encyclopedias. Overall, Wikipedia comprises more than 40 million articles in 301 different languages[17] and by February 2014 it had reached 18 billion page views and nearly 500 million unique visitors per month.[18]

The logo of Wikipedia, a globe featuring glyphs from several writing systems

Type of site	Online encyclopedia
Available in	303 languages
Owner	Wikimedia Foundation
Created by	Jimmy Wales Larry Sanger[1]
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Screenshot [show]

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pageLoad

Wikipedia

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fnHover

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Data Collection

- English Wikipedia
- Client-side instrumentation
- 2 main rounds 4 weeks (33% sampling):
  - *October '18*
  - *April '19*
- Privacy constraints:
  - *All data comes from non logged-in users only.*
  - *We stored only anonymised summaries.*
  - *Sensitive data purged after 90 days.*

96M events collected
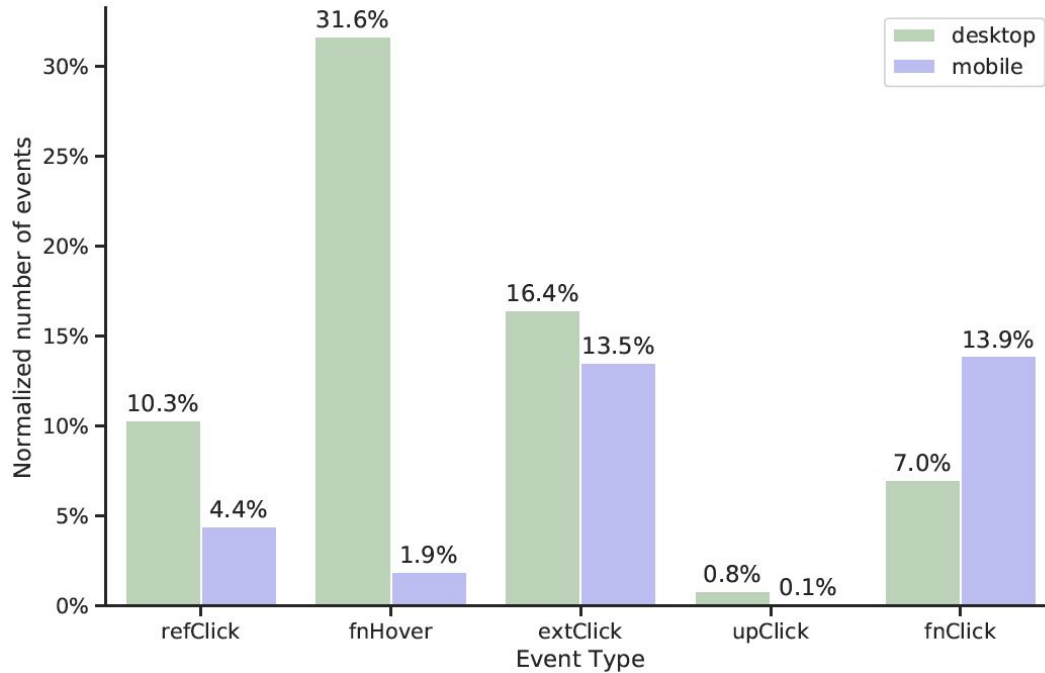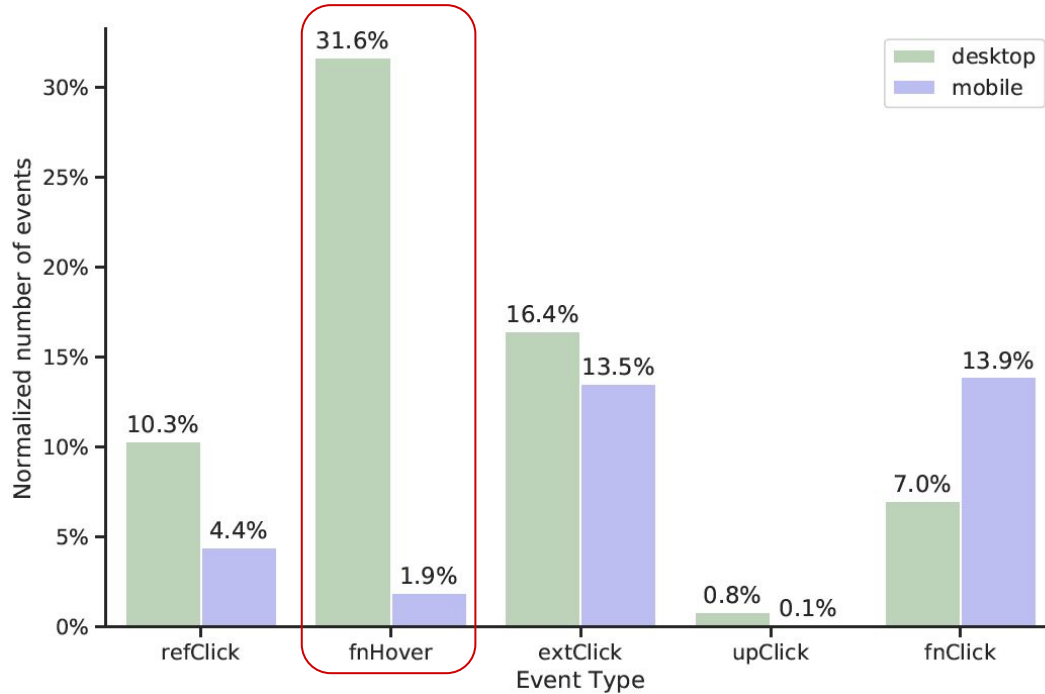
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96M events collected

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20

RQ1:
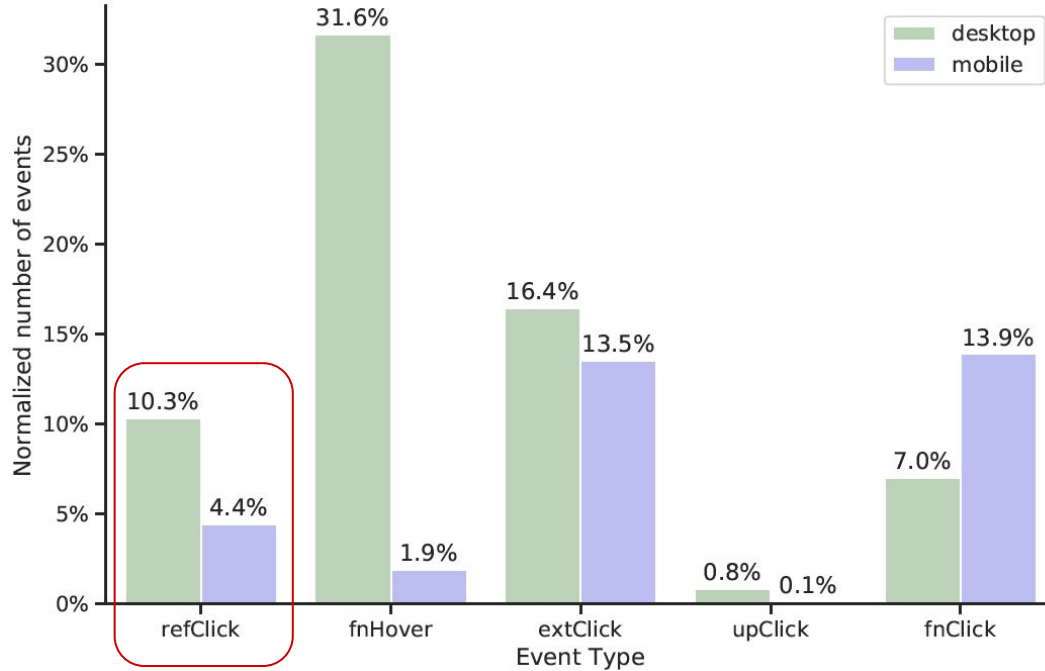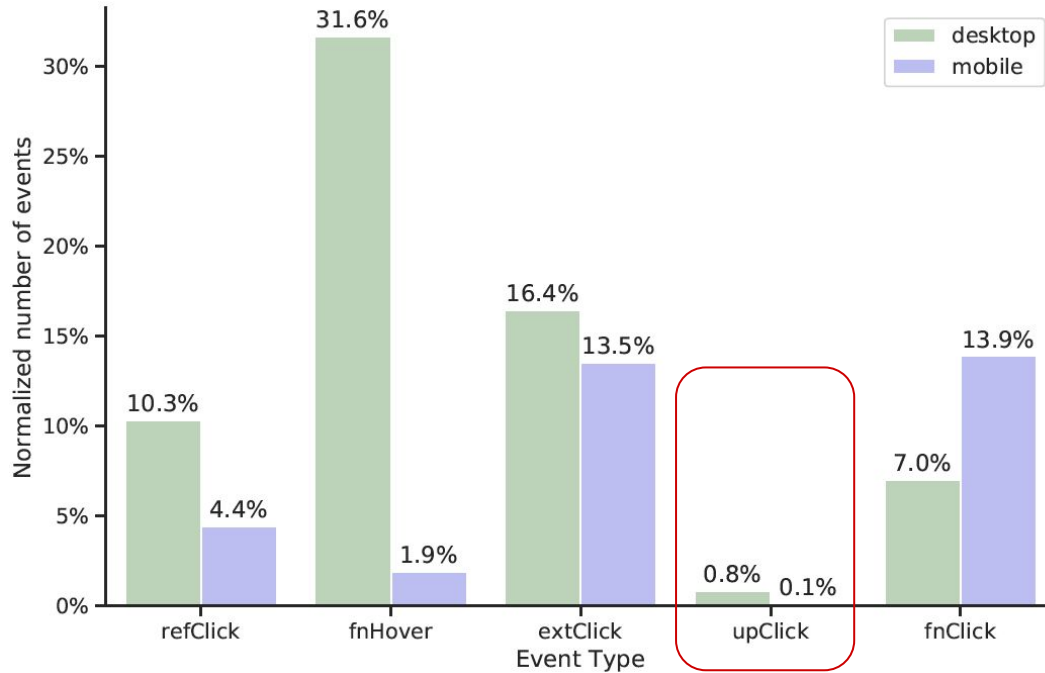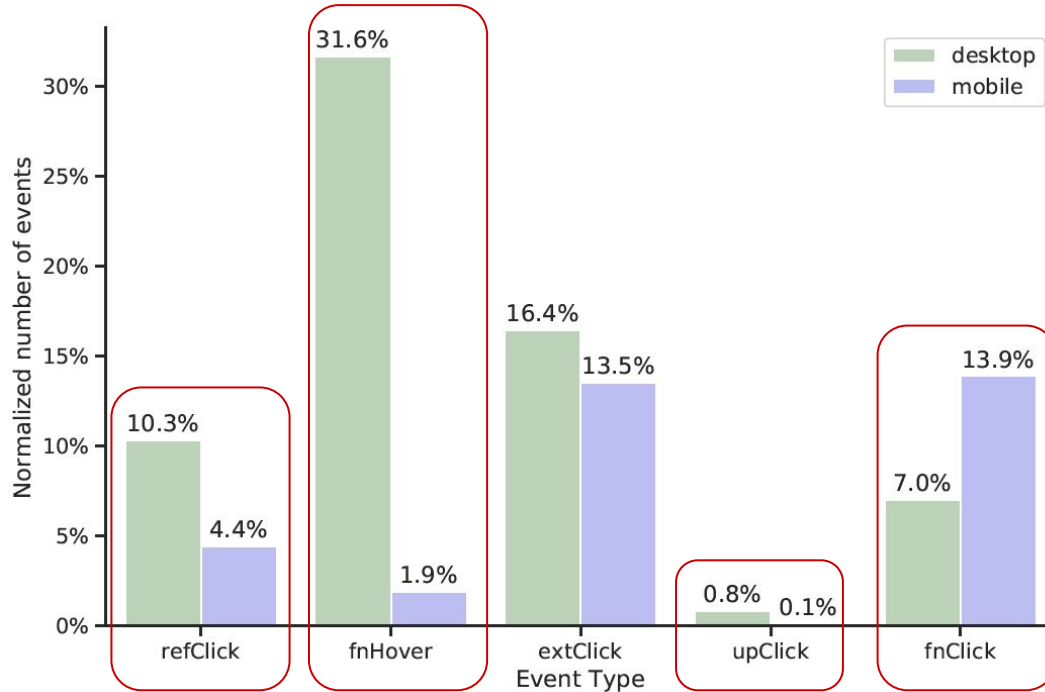
To what extent do users engage with citations when reading Wikipedia?

Citation
Click-through rate

$$\frac{\textit{Page loads with at least 1 click}}{\textit{Total page loads}}$$

Given random page-load, what is the probability of observing an interaction with the references?

Probability of at least 1 citation click

Probability of at least 1 citation click

Probability of at least 1 footnote hover

Probability of hovers

Transition probability

Example:
pageLoad → pageLoad → fnHover → refClick → END

pageLoad

Wikipedia

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extClick

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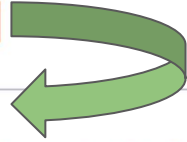The logo of Wikipedia, a globe featuring glyphs from several writing systems

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Owner	Wikimedia Foundation	
Created by		
Website	www.wikipedia.org⧉ ✏	

`extClick`

References

`refClick`

1. ^ Sidener, Jonathan (December 6, 2004). "Everyone's Encyclopedia"⧉. *U-T San Diego*. Archived from the original⧉ on January 14, 2016. Retrieved October 15, 2006.

2. ^ Chapman, Roger (September 6, 2011). "Top 40 Website Programming Languages"⧉. *roadchap.com*. Archived from the original⧉ on September 22, 2013. Retrieved September 6, 2011.

183 ^ ...anuary 30, 2006). "Politicians notice Wikipedia"⧉. CNET. Retrieved Ja...

`upClick`

184. ^ Bergstein, Brian (January 23, 2007). "Microsoft offers cash for Wikipedia edit"⧉. MSNBC. Retrieved February 1, 2007.

185. ^ Hafner, Katie (August 19, 2007). "Lifting Corporate Fingerprints From the Editing of

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Wikipedia
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46.9%

Wikipedia (/ˌwɪkɪˈpiːdiə/ ◄) listen) *wik-ih-PEE-dee-ə* or /ˌwɪkiˈpiːdiə/ ◄) listen) *wik-ee-PEE-dee-ə*) is a multilingual online encyclopedia created and maintained as an open collaboration project[3] using a wiki-based editing system.[4] It is the largest and most popular general work on the World Wide Web,[5][6][7] and is one of the most popular websites ran by free content and no commercial ads, and is owned and supported by the Wikime through donations.[9][10][11][12]

fnHover

Shin, Annys (January 5, 2017). "Wikipedia was born in 2001. And the world got a bit truthier"⧉. *The Washington Post*. Retrieved March 22, 2019.

Wikipedia was launched on January 15, 2001, by Jimmy Wales and Larry Sanger.[13] Sanger coined its name,[14][15] as a portmanteau of "wiki" (the Hawai'ian word for "quick" [16] ia". Initially an English-language encyclopedia, versions in other languages were quickly developed. With at least 5,951,036 articles,[non the English Wikipedia is the largest of the more than 290 Wikipedia encyclopedias. Overall, Wikipedia comprises more than 40 million articles in 301 different languages[17] and by February 2014 it had reached 18 billion page views and nearly 500 million unique visitors per month.[18]

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References

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1. ^ Sidener, Jonathan (December 6, 2004). "Everyone's Encyclopedia"⧉. *U-T San Diego*. Archived from the original⧉ on January 14, 2016. Retrieved October 15, 2006.

2. ^ Chapman, Roger (September 6, 2011). "Top 40 Website Programming Languages"⧉. *roadchap.com*. Archived from the original⧉ on September 22, 2013. Retrieved September 6, 2011.

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185. ^ Hafner, Katie (August 19, 2007). "Lifting Corporate Fingerprints From the Editing of

Wikipedia

WIKIPEDIA

The logo of Wikipedia, a globe featuring glyphs from several writing systems

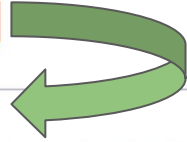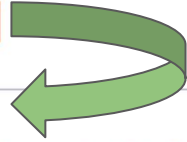| Screenshot	[show]
Type of site	Online encyclopedia
Available in	303 languages
Owner	Wikimedia Foundation
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Website	www.wikipedia.org⧉ ✎

30

46.9% pageLoad

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fnHover — Shin, Annys (January 5, 2017). "Wikipedia was born in 2001. And the world got a bit truthier". *The Washington Post*. Retrieved March 22, 2019.

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Wikipedia

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Wikipedia (/ˌwɪkɪˈpiːdiə/ (◄) listen) *wik-ih-PEE-dee-ə* or /ˌwɪkiˈpiːdiə/ (◄) listen) *wik-ee-PEE-dee-ə*) is a multilingual online encyclopedia created and maintained as an open collaboration project[3] using a wiki-based editing system. It is the largest and most popular general reference work on the World Wide Web,[5][6][7] and is one of the most popular websites ranked by Alexa as of March 2020. It features exclusively free content and no commercial ads, and is owned and supported by the Wikimedia Foundation, a non-profit organization funded primarily through donations.[9][10][11][12]

fnHover

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33.8% **refClick** **1.1%**

References

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2. ^ Chapman, Roger (September 6, 2011). "Top 40 Website Programming Languages". *roadchap.com*. Archived from the original on September 22, 2013. Retrieved September 6, 2011.

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The logo of Wikipedia, a globe featuring glyphs from several writing systems

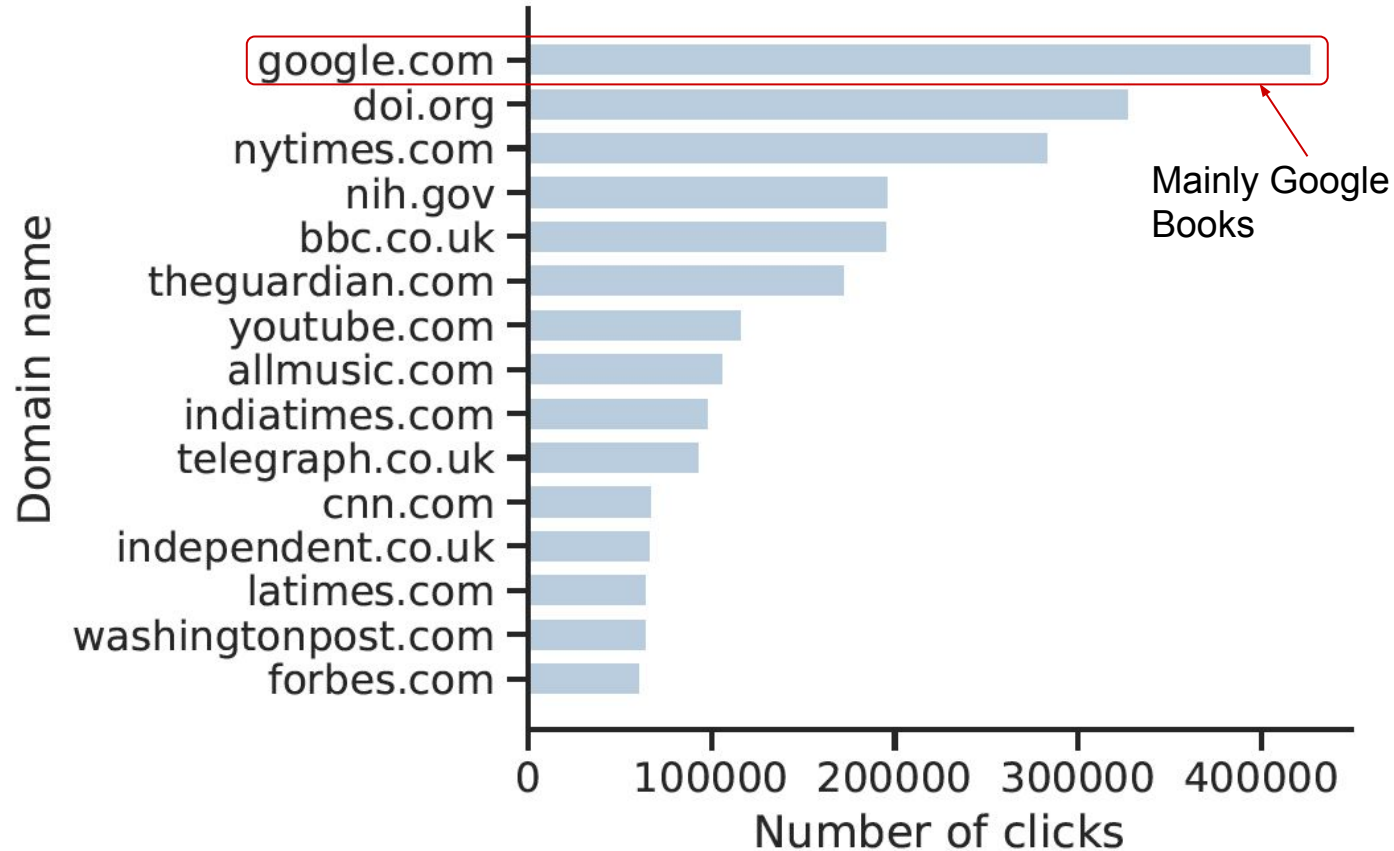| Screenshot	[show]
Type of site	Online encyclopedia
Available in	303 languages
Owner	Wikimedia Foundation
Created by	Jimmy Wales
Website	www.wikipedia.org

extClick

Top destination of readers leaving through the references

Mainly Google Books

RQ1: Take away

- 1 in 340 page loads has clicks on the references

- 1 in 70 page loads has hover events

- The most frequent destination of the outgoing traffic from Wikipedia are Google subdomains, scientific articles, and news websites.

RQ2:

What **features of a page** predict whether a reader will interact with a citation on the page?

From the page source code

- *Page length*
- *Number of references*

From page-load data

- *Popularity*
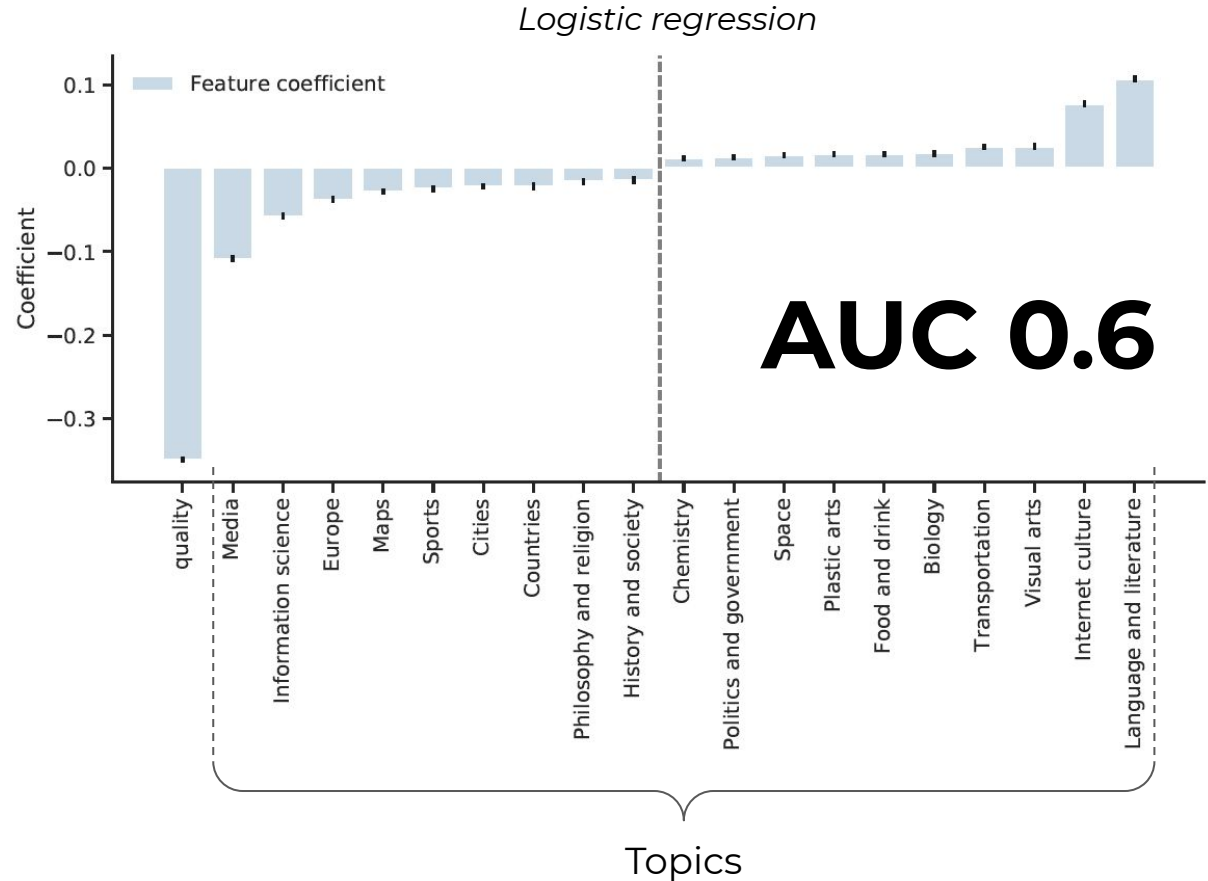
From Wikimedia ORES (Scoring Platform)

- *Topics*
  - *Vector of 42 topics: Sports, Art, Medicine, Science, Space...*
- *Quality class*
  - *Stub, Start, C-Class, B-Class, Good Article, Featured Article*
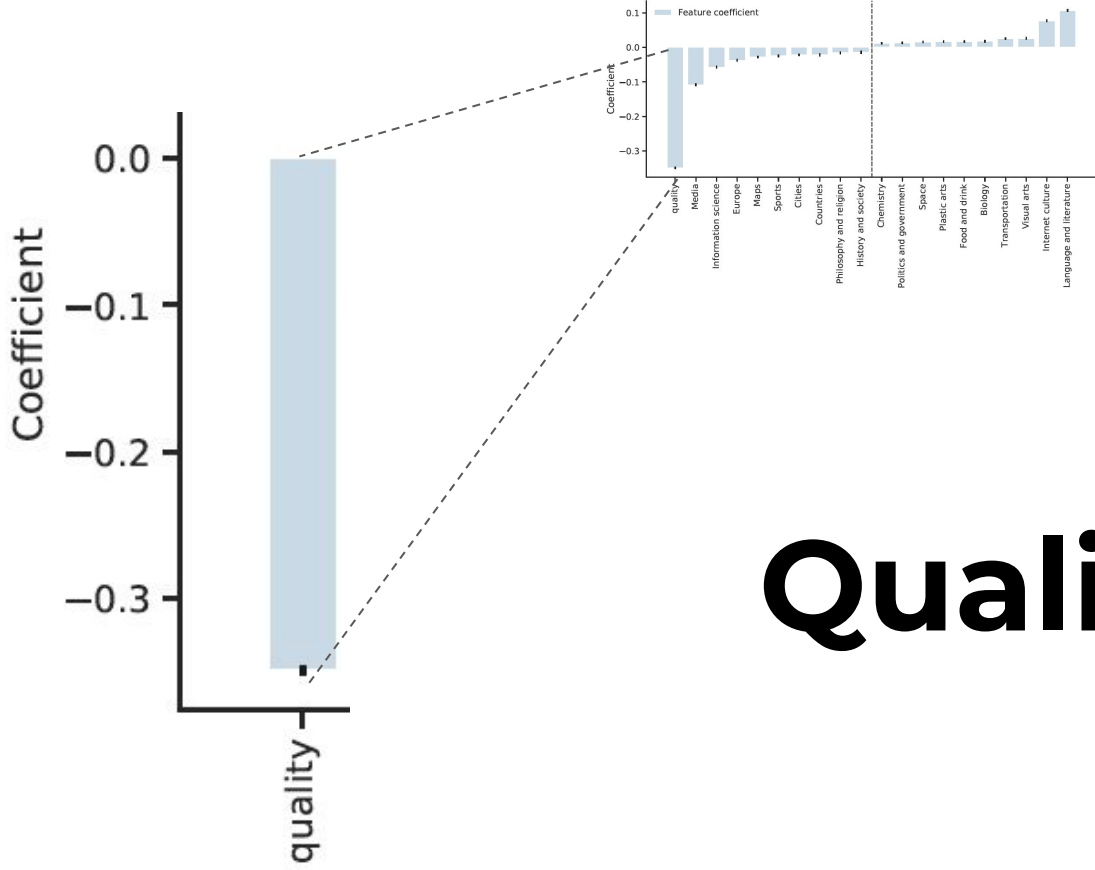
52 page features

Dataset:

From the same session we extracted one page load with click (*positive*) on references and one without (*negative*).

938K sample

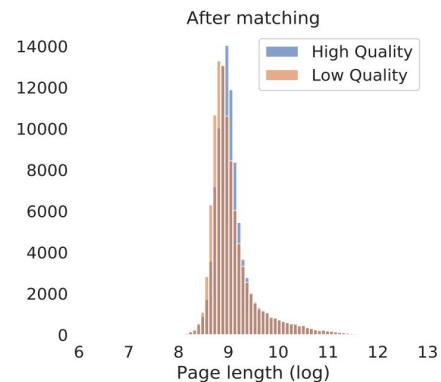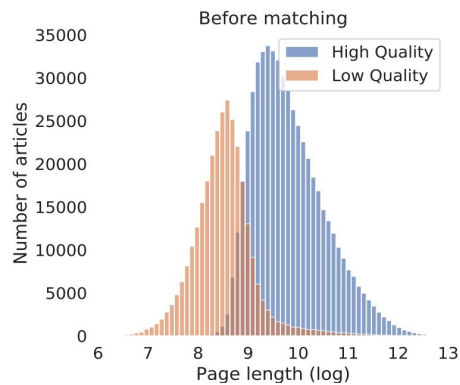*Logistic regression*

AUC 0.6

Topics

Quality?

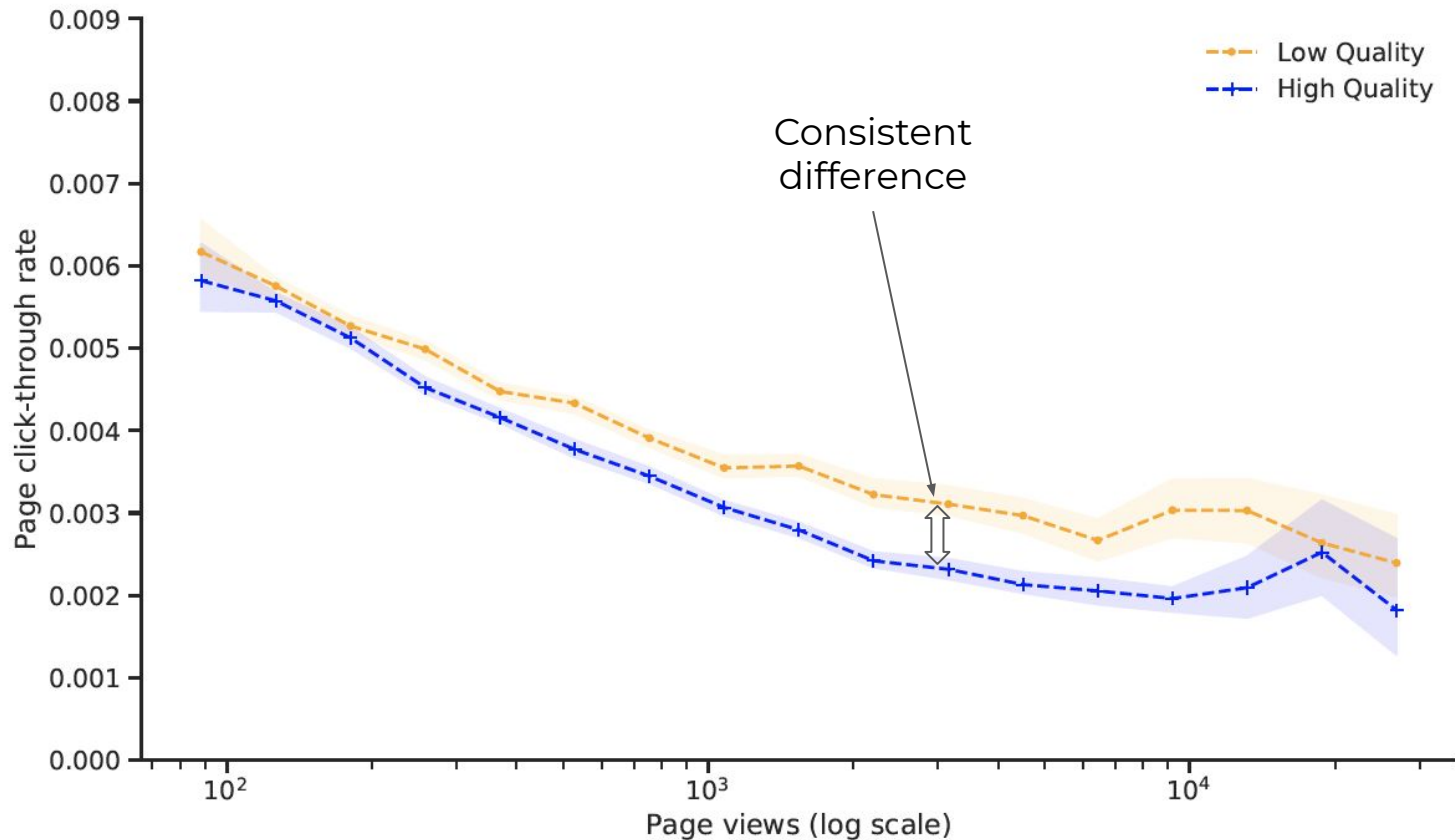# Matched dataset using propensity score

Forced conditions: at least 100 page-loads in 4 weeks, difference in length no more than 10%

854K samples

Effect of Quality (Blue, Orange) and Popularity (X) on Click-through rate

Even **stronger result** by investigating

page length

(one of the feature contributing to quality)

Controlling for type of article and readers community

RQ2: Take away

- Readers tend to **interact more** (1) on the references of pages with limited content: short articles and with **poor quality**.

- Popular articles have lower CT rate.

RQ3:

What **features of a citation** predict whether a reader will interact with it?

Matched dataset

One references with interaction and one without, taken from the same page-load.

1.8M pairs

Constraints:

- Negative: the closest reference
- One pair per reader

Features analysis

The words with higher positive contribution in the prediction are

Case 1: about recent events
2019

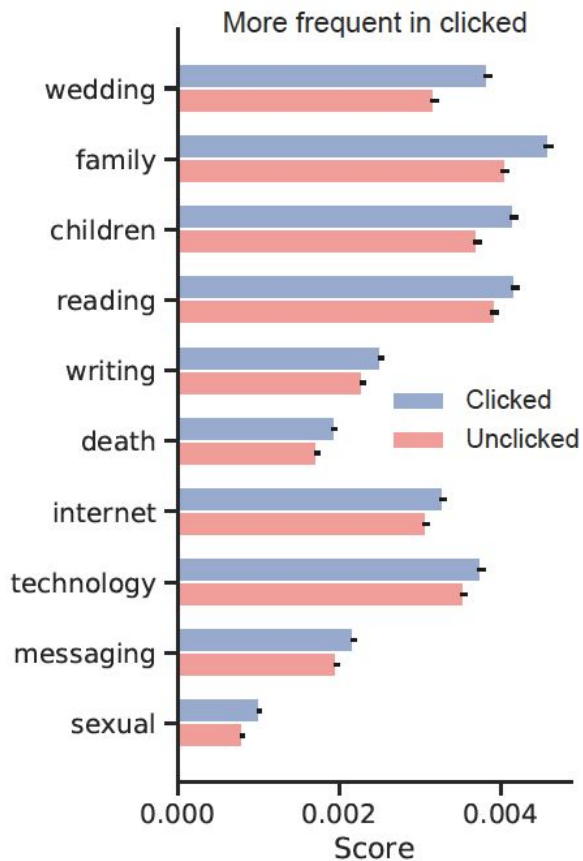**Case 2:** about open access resources
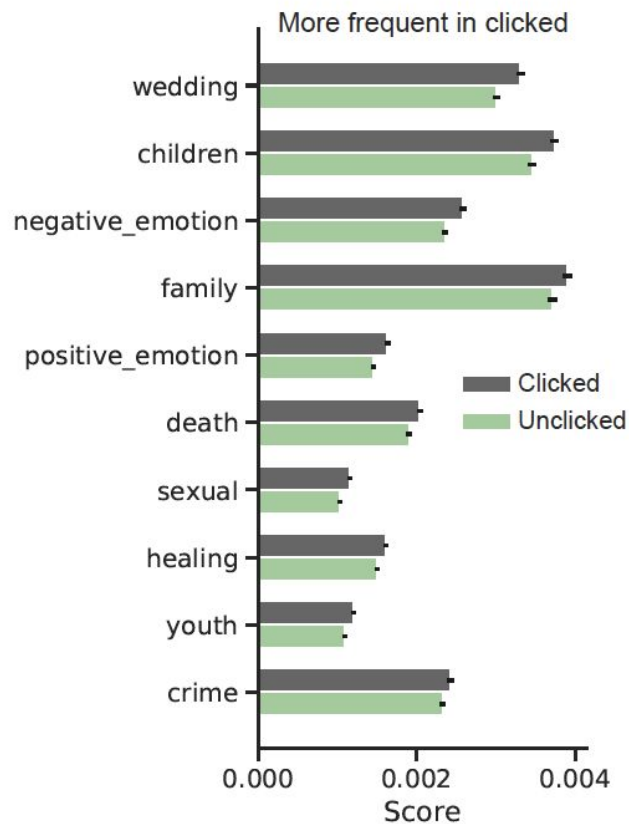*Free, PDF*

Case 3: about human aspects
born, died, relationship, family, wife, …

Empath Categories

Click event

Hover event

Sorted by decreasing difference between positive and negative

46

What we learned

- **RQ1:** 1 in 340 page-views has clicks on the references, and 1 in 70 has hover events

- **RQ2:** Readers tend to engage more with the references of short pages. In relative terms (CTR), popular pages shows less interaction with the references

- **RQ3:** Readers engage more with references about recent events, describing human aspects, and offering open access

What are the implications?

Results enable researchers to **develop novel theories** about readers' **information needs**.

Results can support prioritizing efforts towards **improving information reliability**.

We observed the **importance** of **open access** and **open science initiatives**.

In Practice for Wikipedia?

Design of model to predict lack of information by using signal from interaction patterns.

Prioritize the content to expand based not the interaction level.

Prioritize the sentences that need a reference based on the readers interest.

Thank You

From Wikipedia, the free encyclopedia

"Thank you" is a common expression of gratitude.

✉ tiziano.piccardi@epfl.ch

🐦 @tizianopiccardi

https://meta.wikimedia.org/wiki/Research:Characterizing_Wikipedia_Citation_Usage