

Report of Assignment 1 :

Quality of Retrieval by Major Search Engines

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Introduction

We have chosen 4 different information needs and 3 different search engines. Those choices are depicted in the following tables.

Identification number	Information need
N1	You want to explain to a ten years old child who Harry Potter is.
N2	You are interested in the recent activities of Greenpeace.
N3	What is the difference between iPhone and Samsung Galaxy?
N4	What is the relation between a person's gender and income in Sweden?

Identification number	Search engine
E1	Google
E2	Ecosia
E3	WebCrawler

We will use the identification numbers in this report to refer to one of the information needs or to one of the search engines.

Polling

Method description

For all the information need, we define the following query:

- q1: who is harry+potter .
- q2: greenpeace recent activities
- q3: compare (iPhone AND "Samsung Galaxy")
- q4: gender+income in Sweden

For each question we run the same query on the three search engine E1, E2 and E3. You can have a look at the different search results for each information need:

- q1 : [who is harry+potter](#) from Google.com
- q1 : [who is harry+potter](#) from Ecosia.org
- q1 : [who is harry+potter](#) from WebCrawler.com

q2 : [greenpeace recent activities](#) from Google.com
 q2 : [greenpeace recent activities](#) from Ecosia.org
 q2 : [greenpeace recent activities](#) from WebCrawler.com

q3 : [compare \(iPhone AND "Samsung Galaxy"\)](#) from Google.com
 q3 : [compare \(iPhone AND "Samsung Galaxy"\)](#) from Ecosia.org
 q3 : [compare \(iPhone AND "Samsung Galaxy"\)](#) from WebCrawler.com

q4 : [gender+income in Sweden](#) from Google.com
 q4 : [gender+income in Sweden](#) from Ecosia.org
 q4 : [gender+income in Sweden](#) from WebCrawler.com

For each result, we retrieve the relevant documents among the 30 first pages. The decision is individual but we apply the same judgment on the 3 search engines given the query. If a relevant link appears more than once, it retrieves only once. In this way, we build a common pool of the relevant documents given the query and ignoring adds, no relevant and repeating links.

Information need *N1*

Among the 90 links (30+30+30), we have marked the 21 following one as relevant for the query q1:

- [https://fr.wikipedia.org/wiki/Harry_Potter_\(personnage\)](https://fr.wikipedia.org/wiki/Harry_Potter_(personnage)) (Google)
- [https://en.wikipedia.org/wiki/Harry_Potter_\(character\)](https://en.wikipedia.org/wiki/Harry_Potter_(character)) (Google, Ecosia, WebCrawler)
- https://fr.wikipedia.org/wiki/Harry_Potter (Google)
- https://en.wikipedia.org/wiki/Harry_Potter (Google, Ecosia, WebCrawler)
- http://harrypotter.wikia.com/wiki/Harry_Potter (Google, Ecosia, WebCrawler)
- <https://www.pottermore.com/explore-the-story/harry-potter> (Google, Ecosia, WebCrawler)
- <https://www.pottermore.com/features/10-things-we-love-about-harry-potter-and-the-philosophers-stone> (Google)
- <https://www.britannica.com/topic/Harry-Potter> (Google)
- <https://www.scholastic.com/kids/books/harry-potter/> (Google, Ecosia)
- [https://en.wikiquote.org/wiki/Harry_Potter_\(series\)](https://en.wikiquote.org/wiki/Harry_Potter_(series)) (Google)
- <https://www.youtube.com/user/HarryPotter> (Google, WebCrawler)
- <https://www.hbo.com/movies/harry-potter> (Google, WebCrawler)
- <https://harrypotter.bloomsbury.com/uk/fun-stuff/harry-potter-whos-who/> (Ecosia, WebCrawler)
- http://arts.answers.com/Q/Who_is_Harry_Potter%27s_girlfriend (Ecosia)
- https://sv.wikipedia.org/wiki/Harry_Potter_%28litter%C3%A4r_figur%29 (Ecosia)
- https://en.m.wikipedia.org/wiki/Harry_Potter_%28character%29 (Ecosia)
- https://simple.wikipedia.org/wiki/Harry_Potter_%28character%29 (Ecosia)
- http://harry-potter.wikia.com/wiki/Harry_Potter (Ecosia, WebCrawler)
- https://sv.wikipedia.org/wiki/Harry_Potter (Ecosia)
- https://simple.wikipedia.org/wiki/Harry_Potter (WebCrawler)
- <https://www.quora.com/Who-is-Harry-Potter> (WebCrawler)

Information need *N2*

Among the 90 links (30+30+30), we have marked the 35 following one as relevant for the query q2:

- <https://www.independent.co.uk/topic/Greenpeace> (Google, WebCrawler)
- <https://www.greenpeace.org/usa/> (Google, Ecosia, WebCrawler)
- <https://www.crunchbase.com/organization/greenpeace/timeline/timeline#section-recent-news-activity> (Google, Ecosia)

- <https://www.greenpeace.org.uk/> (Google,Ecosia)
- <https://www.theguardian.com/environment/greenpeace> ((Google,WebCrawler)
- <https://www.nytimes.com/topic/organization/greenpeace> (Google,Ecosia, WebCrawler)
- <https://www.biggreenradicals.com/group/greenpeace/> (Google,Ecosia, WebCrawler)
- <https://www.activistfacts.com/organizations/131-greenpeace/> (Google,Ecosia, WebCrawler)
- <http://www.ngopulse.org/organisation/greenpeace-africa-0> (Google)
- https://www.sourcewatch.org/index.php/Greenpeace#Current_campaigns (Google)
- <https://www.msf.org/migration-msf-and-greenpeace-launch-life-saving-operations-aegean-sea> (Google)
- https://www.vice.com/en_us/article/wd7zjm/greenpeace-polar-bear-649 (Google)
- <https://www.ndtv.com/topic/greenpeace-india> (Google)
- <https://greenpeacefilmfestival.org/en/> (Google)
- <https://www.theland.com.au/story/3907598/failed-greenpeace-anti-gm-campaign-exposed/> (Google)
- <https://www.theguardian.com/sustainable-business/blog/greenpeace-campaigns-companies-lego-mattel-barbie-shell> (Webcrawler, Ecosia)
- <https://en.wikipedia.org/wiki/Greenpeace> (Webcrawler, Ecosia)
- <https://timesofindia.indiatimes.com/topic/Greenpeace> (Webcrawler)
- <https://master.k8s.p4.greenpeace.org/africa/en/explore/environment/> (Webcrawler)
- <http://inafrica24.com/recent-news/south-africa/greenpeace-africa-celebrates-a-decade-of-environmental-activism/> (Webcrawler)
- <https://greenwire.greenpeace.org/canada/en/news/local-groups-are-awesome-updates-greenpeace-groups-around-c-anada> (Webcrawler)
- <http://www.osbar.org/docs/sections/NOLS/greenpeace.pdf> (Webcrawler)
- https://everipedia.org/wiki/Greenpeace_UK/ (Webcrawler)
- <http://www.datacenterjournal.com/greenpeace-nitpicks-data-center-companies/> (Webcrawler)
- <https://medium.com/greenpeace/this-week-in-greenpeace-pictures-52923057ec7b> (Webcrawler)
- <https://www.cbc.ca/news/technology/greenpeace-plastic-brand-audits-1.4855450> (Webcrawler)
- <https://www.greenpeace.org/canada/en/> (Ecosia)
- <https://geneticliteracyproject.org/glp-facts/greenpeace/> (Ecosia)
- <https://unearthed.greenpeace.org/2017/11/07/bialowieza-forest-poland-photos/> (Ecosia)
- <https://www.commondreams.org/organization/greenpeace> (Ecosia)
- <https://prezi.com/ylofydmxfive/illegal-greenpeace-activities/> (Ecosia)
- <https://www.naturalnews.com/Greenpeace.html> (Ecosia)
- <https://www.nytimes.com/2017/01/25/us/greenpeace-resist-banner-protest-trump.html> (Ecosia)
- <https://indianexpress.com/article/india/india-others/greenpeace-activist-would-do-anti-national-activities-govt-tells-hc/> (Ecosia)
- <https://www.greenpeace.org.au/blog/> (Ecosia)

Information need N3

Among the 90 links (30+30+30), we have marked the 46 following one as relevant for the query q3:

- <https://www.trustedreviews.com/news/samsung-galaxy-s8-vs-iphone-7-2950520> (Google)
- <https://www.gadgetsnow.com/compare-mobile-phones/Apple-iPhone-X-vs-Samsung-Galaxy-S9> (Google, Ecosia)
- <https://www.zdnet.com/article/apple-vs-samsung-phones-we-compare-the-galaxy-s-series-and-the-iphone-xs/> (Google)
- <https://www.digitaltrends.com/mobile/iphone-xs-vs-galaxy-s9/> (Google, WebCrawler)
- <https://www.techradar.com/news/iphone-xs-vs-galaxy-s9> (Google)
- <https://www.cnbc.com/2018/09/21/comparing-iphone-to-samsung-galaxy-note-9.htm> (Google)
- <https://www.pcmag.com/article/359419/samsung-galaxy-s9-vs-iphone-x-flagship-phones-compared> (Google)
- <https://gadgets.ndtv.com/samsung-galaxy-s8-4009-vs-apple-iphone-7-3766> (Google)
- <https://www.cnet.com/news/iphone-x-vs-galaxy-s9-which-is-best/> (Google, WebCrawler)
- <https://www.crn.com/slide-shows/mobility/head-to-head-apple-iphone-xs-vs-samsung-galaxy-s9> (Google)
- <https://www.youtube.com/watch?v=fqcN2uLkPi4> (Google)
- <https://www.t3.com/features/new-iphone-xs-vs-samsung-galaxy-s9-how-does-apples-new-flagship-compare> (Google)
- <https://www.vodafone.co.uk/compare/> (Google, Ecosia)
- <https://www.forbes.com/sites/gordonkelly/2017/10/10/apple-iphone-x-vs-samsung-galaxy-s8-whats-the-difference-up-grade-guide/> (Google, WebCrawler)
- <https://www.stuff.tv/features/apple-iphone-xs-vs-samsung-galaxy-note-9-which-best> (Google)

- <https://newatlas.com/iphone-xr-xs-max-vs-samsung-galaxy-s9-plus-comparison/56423/> (Google, Ecosia)
- <https://www.macworld.co.uk/review/iphone/iphone-x-vs-samsung-note-9-3682130/> (Google, Ecosia)
- <https://appleinsider.com/articles/18/08/23/comparing-the-samsung-galaxy-note-9-performance-versus-the-iphone-x> (Google)
- <https://ios.gadgethacks.com/news/iphone-xr-vs-samsung-galaxy-s9-comparing-second-largest-screens-bunch-0187376/> (Google)
- <https://www.phonearena.com/phones/compare/Apple-iPhone-X,Samsung-Galaxy-S9/phones/10414,10716> (Google, Ecosia, WebCrawler)
- <https://economictimes.indiatimes.com/magazines/panache/is-the-apple-iphone-xr-at-rs-76900-a-good-buy-in-comparison-to-samsung-galaxy-note-9-or-how-the-apple-iphone-xr-stacks-up-against-the-samsung-galaxy-note-9/articleshow/65794413.cms> (Google)
- <https://www.androidcentral.com/samsung-galaxy-note-9-vs-iphone-xs-max> (Google)
- <https://www.androidauthority.com/samsung-galaxy-note-9-vs-iphone-xs-max-909222/> (Google)
- <https://www.pcworld.com/article/3305840/mobile/iphone-xs-max-vs-galaxy-note-9.html> (Google)
- <https://www.finder.com.au/apple-iphone-xs-vs-samsung-galaxy-s9> (Google)
- <https://www.youtube.com/watch?v=vDppSzluXfs> (Ecosia)
- <https://www.zdnet.com/article/iphone-xs-max-vs-samsung-galaxy-note-9-we-compare-the-big-phones/> (Ecosia, WebCrawler)
- <https://www.zdnet.com/article/spec-showdown-apples-iphone-lineup-vs-samsungs-galaxy-lineup/> (Ecosia)
- <https://maccablo.com/iphone-vs-samsung-compared/> (Ecosia)
- <https://www.detroitnews.com/story/tech/2018/02/25/compare-samsung-apple-iphone-features/110845072/> (Ecosia, WebCrawler)
- <https://www.bloomberg.com/news/articles/2018-02-26/how-the-new-samsung-galaxy-s9-and-iphone-x-compare-in-review> (Ecosia)
- <https://newatlas.com/samsung-galaxy-s9-plus-iphone-x-8-specs-comparison/53563/> (Ecosia)
- <https://www.youtube.com/watch?v=71GyNf-JirY> (Ecosia)
- <http://time.com/5191354/samsung-galaxy-s9-apple-iphone-x/> (Ecosia)
- <https://www.macworld.co.uk/review/iphone/iphone-x-samsung-galaxy-s9-3673095/> (WebCrawler)
- <https://www.zdnet.com/article/galaxy-note-9-vs-iphone-x-we-compare-specs-and-features/> (WebCrawler)
- <https://www.androidauthority.com/samsung-galaxy-s9-vs-iphone-x-camera-850808/> (WebCrawler)
- <https://tech.co/apple-iphone-xs-vs-samsung-galaxy-s9-2018-10> (WebCrawler)
- <https://www.usatoday.com/story/tech/talkingtech/2018/03/08/how-samsung-galaxy-s-9-stacks-up-iphone-x-8-pixel/407968002/> (WebCrawler)
- <https://www.macrumors.com/2018/03/09/samsung-galaxy-s9-vs-iphone-x/> (WebCrawler)
- <https://www.forbes.com/sites/amitchowdhry/2018/05/31/iphone-x-vs-samsung-galaxy-s9/> (WebCrawler)
- <https://versus.com/en/apple-iphone-x-vs-samsung-galaxy-s9-plus> (WebCrawler)
- <https://www.digitaltrends.com/mobile/iphone-x-vs-galaxy-note-8/> (WebCrawler)
- <https://www.komando.com/tips/445607/iphone-10-vs-samsung-galaxy-s9-which-is-better> (WebCrawler)
- <http://www.iphonehacks.com/2018/09/iphone-xs-vs-galaxy-s9-whats-the-difference.html> (WebCrawler)
- <https://www.androidauthority.com/samsung-galaxy-s9-vs-iphone-x-847050/> (WebCrawler)

Information need N4

Among the 90 links (30+30+30), we have marked the 21 following one as relevant for the query q4:

- <https://sweden.se/society/sweden-gender-equality/> (Google, Ecosia, WebCrawler)
- <https://www.eurofound.europa.eu/publications/article/2015/sweden-new-research-on-the-gender-pay-gap> (Google, Ecosia, WebCrawler)
- <https://www.statista.com/statistics/740048/monthly-salary-in-sweden-by-gender-and-class/> (Google)
- <https://www.ft.com/content/2a9274be-72aa-11e7-93ff-99f383b09ff9> (Google)
- <https://sharingsweden.se/materials/the-pay-gap-in-sweden/> (Google)
- <https://www.scb.se/en/finding-statistics/statistics-by-subject-area/living-conditions/gender-statistics/gender-statistics/poq/statistical-news/women-and-men-in-sweden-2016/> (Google)
- <http://www.diva-portal.org/smash/get/diva2:24912/fulltext01.pdf> (Google)
- https://www.etaq.ee/wp-content/uploads/2017/09/Salary_statistics_of_researchers_in_Sweden.pdf (Google)
- <https://www.everywoman.com/news-insight/gender-pay-gap-around-world> (Google)
- <http://datatopics.worldbank.org/gender/country/sweden> (Google)
- http://www.equineteurope.org/IMG/pdf/sweden_summary-justified-pay-related-gender.pdf (Google)

- https://www.stjornarradid.is/media/velferdarraduneyti-media/media/rit-og-skyrslur-2014/EqualPay_Recent_and_absent_trends_Sweden_MalinWREDER.pdf (Google)
- <https://sweden.se/society/gender-equality-in-sweden/> (Ecosia, WebCrawler)
- https://ec.europa.eu/eurostat/statistics-explained/index.php/Gender_pay_gap_statistics (Ecosia)
- https://ec.europa.eu/eurostat/statistics-explained/index.php/Gender_statistics (Ecosia)
- https://www.scb.se/Statistik/Publikationer/LE0201_2015B16_BR_X10BR1601ENG.pdf (Ecosia)
- <https://www.euronews.com/2015/03/06/which-eu-country-has-the-biggest-gender-pay-gap> (Ecosia, WebCrawler)
- <https://www.nationmaster.com/country-info/stats/Economy/Gender-income-ratio> (Ecosia)
- <http://reports.weforum.org/global-gender-gap-report-2016/rankings/> (Ecosia)
- <https://stats.oecd.org/index.aspx?queryid=54751> (Ecosia)
- <http://reports.weforum.org/global-gender-gap-report-2016/gender-gaps-and-income/> (WebCrawler)

Precision-recall pictures

Measuring explanation

After collecting all the relevant links for each of the 4 information needs, we want to evaluate the different search engines. In this way we will calculate different precision and recall numbers according to the following formulas.

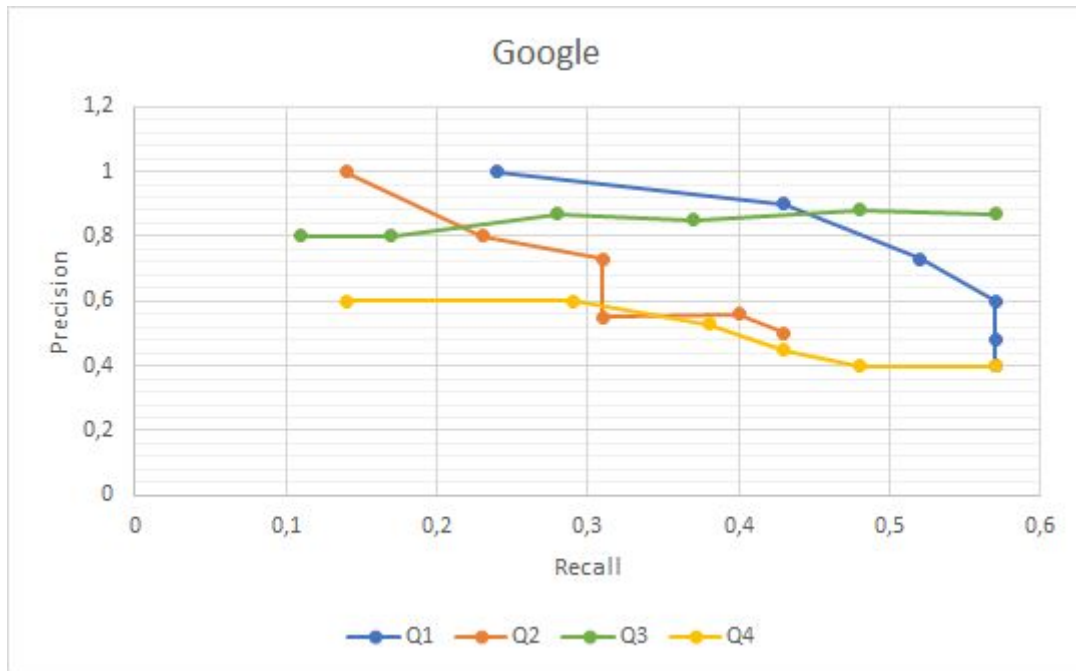
$$\text{precision} = \frac{\text{relevant links that have been retrieved}}{\text{all the retrieved links}}$$

$$\text{recall} = \frac{\text{relevant links that have been retrieved}}{\text{all the relevant links}}$$

The results are collected in the following tables and associated curves.

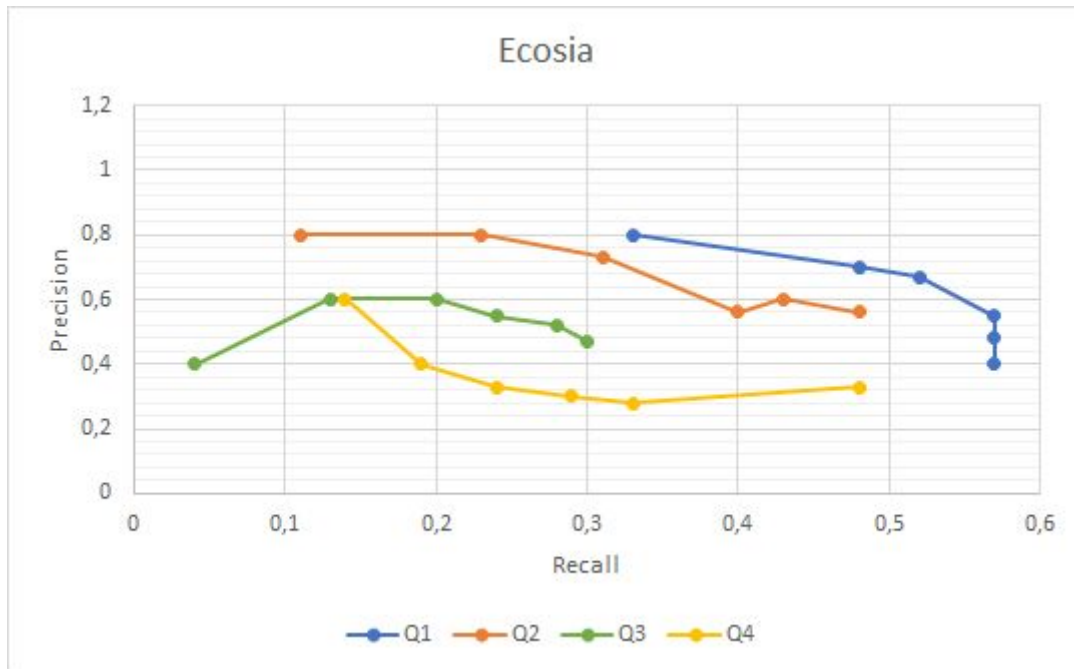
Search engine E1

Google								
	q1 :Query for N1		q2 :Query for N2		q3 :Query for N3		q4 :Query for N4	
	precision	recall	precision	recall	precision	recall	precision	recall
Top 5	$\frac{5}{5} = 1,00$	$\frac{5}{21} = 0,24$	$\frac{5}{5} = 1,00$	$\frac{5}{33} = 0,14$	$\frac{4}{5} = 0,80$	$\frac{5}{46} = 0,11$	$\frac{3}{5} = 0,60$	$\frac{3}{21} = 0,14$
Top 10	$\frac{9}{10} = 0,90$	$\frac{9}{21} = 0,43$	$\frac{8}{10} = 0,80$	$\frac{8}{35} = 0,23$	$\frac{8}{10} = 0,80$	$\frac{8}{46} = 0,17$	$\frac{6}{10} = 0,60$	$\frac{6}{21} = 0,29$
Top 15	$\frac{11}{15} = 0,73$	$\frac{11}{21} = 0,52$	$\frac{11}{15} = 0,73$	$\frac{11}{35} = 0,31$	$\frac{13}{15} = 0,87$	$\frac{13}{46} = 0,28$	$\frac{8}{15} = 0,53$	$\frac{8}{21} = 0,38$
Top 20	$\frac{12}{20} = 0,60$	$\frac{12}{21} = 0,57$	$\frac{11}{20} = 0,55$	$\frac{11}{35} = 0,31$	$\frac{17}{20} = 0,85$	$\frac{17}{46} = 0,37$	$\frac{9}{20} = 0,45$	$\frac{9}{21} = 0,43$
Top 25	$\frac{12}{25} = 0,48$	$\frac{12}{21} = 0,57$	$\frac{14}{25} = 0,56$	$\frac{14}{35} = 0,40$	$\frac{22}{25} = 0,88$	$\frac{22}{46} = 0,48$	$\frac{10}{25} = 0,40$	$\frac{10}{21} = 0,48$
Top 30	$\frac{12}{30} = 0,40$	$\frac{12}{21} = 0,57$	$\frac{15}{30} = 0,5$	$\frac{15}{35} = 0,43$	$\frac{26}{30} = 0,87$	$\frac{26}{46} = 0,57$	$\frac{12}{30} = 0,40$	$\frac{12}{21} = 0,57$



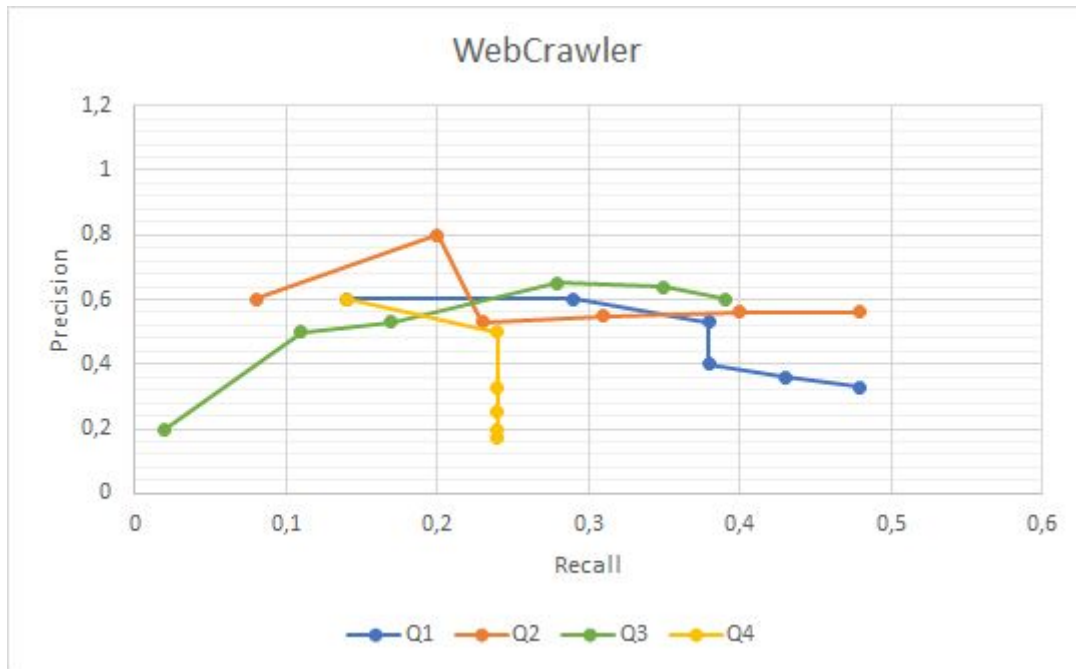
Search engine *E2*

	Ecosia							
	q1 :Query for N1		q2 :Query for N2		q3 :Query for N3		q4 :Query for N4	
	precision	recall	precision	recall	precision	recall	precision	recall
Top 5	$\frac{4}{5} = \mathbf{0,80}$	$\frac{4}{21} = \mathbf{0,19}$	$\frac{4}{5} = \mathbf{0,80}$	$\frac{4}{35} = \mathbf{0,11}$	$\frac{2}{5} = \mathbf{0,40}$	$\frac{2}{46} = \mathbf{0,04}$	$\frac{3}{5} = \mathbf{0,60}$	$\frac{3}{21} = \mathbf{0,14}$
Top 10	$\frac{7}{10} = \mathbf{0,70}$	$\frac{7}{21} = \mathbf{0,33}$	$\frac{8}{10} = \mathbf{0,80}$	$\frac{8}{35} = \mathbf{0,23}$	$\frac{6}{10} = \mathbf{0,60}$	$\frac{6}{46} = \mathbf{0,13}$	$\frac{4}{10} = \mathbf{0,40}$	$\frac{4}{21} = \mathbf{0,19}$
Top 15	$\frac{10}{15} = \mathbf{0,67}$	$\frac{10}{21} = \mathbf{0,48}$	$\frac{11}{15} = \mathbf{0,73}$	$\frac{11}{35} = \mathbf{0,31}$	$\frac{9}{15} = \mathbf{0,60}$	$\frac{9}{46} = \mathbf{0,20}$	$\frac{5}{15} = \mathbf{0,33}$	$\frac{5}{21} = \mathbf{0,24}$
Top 20	$\frac{11}{20} = \mathbf{0,55}$	$\frac{11}{21} = \mathbf{0,52}$	$\frac{14}{20} = \mathbf{0,56}$	$\frac{14}{35} = \mathbf{0,40}$	$\frac{11}{20} = \mathbf{0,55}$	$\frac{11}{46} = \mathbf{0,24}$	$\frac{6}{20} = \mathbf{0,30}$	$\frac{6}{21} = \mathbf{0,29}$
Top 25	$\frac{12}{25} = \mathbf{0,48}$	$\frac{12}{21} = \mathbf{0,57}$	$\frac{15}{25} = \mathbf{0,60}$	$\frac{15}{35} = \mathbf{0,43}$	$\frac{13}{25} = \mathbf{0,52}$	$\frac{13}{46} = \mathbf{0,28}$	$\frac{7}{25} = \mathbf{0,28}$	$\frac{7}{21} = \mathbf{0,33}$
Top 30	$\frac{12}{30} = \mathbf{0,40}$	$\frac{12}{21} = \mathbf{0,57}$	$\frac{17}{30} = \mathbf{0,56}$	$\frac{17}{35} = \mathbf{0,48}$	$\frac{14}{30} = \mathbf{0,47}$	$\frac{14}{46} = \mathbf{0,30}$	$\frac{10}{30} = \mathbf{0,33}$	$\frac{10}{21} = \mathbf{0,48}$



Search engine *E3*

WebCrawler								
q1 :Query for N1		q2 :Query for N2		q3 :Query for N3		q4 :Query for N4		
precision	recall	precision	recall	precision	recall	precision	recall	
<i>Top 5</i>	$\frac{3}{5} = 0,60$	$\frac{3}{21} = 0,14$	$\frac{3}{5} = 0,60$	$\frac{3}{35} = 0,08$	$\frac{1}{5} = 0,20$	$\frac{1}{46} = 0,02$	$\frac{3}{5} = 0,60$	$\frac{3}{21} = 0,14$
<i>Top 10</i>	$\frac{6}{10} = 0,60$	$\frac{6}{21} = 0,29$	$\frac{7}{10} = 0,80$	$\frac{7}{35} = 0,20$	$\frac{5}{10} = 0,50$	$\frac{5}{46} = 0,11$	$\frac{5}{10} = 0,50$	$\frac{5}{21} = 0,24$
<i>Top 15</i>	$\frac{8}{15} = 0,53$	$\frac{8}{21} = 0,38$	$\frac{8}{15} = 0,53$	$\frac{8}{35} = 0,23$	$\frac{8}{15} = 0,53$	$\frac{8}{46} = 0,17$	$\frac{5}{15} = 0,33$	$\frac{5}{21} = 0,24$
<i>Top 20</i>	$\frac{8}{20} = 0,40$	$\frac{8}{21} = 0,38$	$\frac{11}{20} = 0,55$	$\frac{11}{35} = 0,31$	$\frac{13}{20} = 0,65$	$\frac{13}{46} = 0,28$	$\frac{5}{20} = 0,25$	$\frac{5}{21} = 0,24$
<i>Top 25</i>	$\frac{9}{25} = 0,36$	$\frac{9}{21} = 0,43$	$\frac{14}{25} = 0,56$	$\frac{14}{35} = 0,40$	$\frac{16}{25} = 0,64$	$\frac{16}{46} = 0,35$	$\frac{5}{25} = 0,20$	$\frac{5}{21} = 0,24$
<i>Top 30</i>	$\frac{10}{30} = 0,33$	$\frac{10}{21} = 0,48$	$\frac{17}{30} = 0,56$	$\frac{17}{35} = 0,48$	$\frac{18}{30} = 0,60$	$\frac{18}{46} = 0,39$	$\frac{5}{30} = 0,17$	$\frac{5}{21} = 0,24$



Interpolated precision and recall and average precision curves

Based on the above precision-recall values, we want to calculate the interpolated precision values for each query on each search engine. In this way, we select the higher precision value among all the precision values corresponding to a recall value equal or higher than the standard recall. The standard recall can take the following values : 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, 0.7, 0.8, 0.9 and 1.0.

For each query and each search engine we calculate the different interpolated values according to the following formula.

$$\text{interpolated precision}_{\text{standard recall}} = \{\max \text{ precision value} \mid \text{recall value} \geq \text{standard recall}\}$$

According to the interpolated precision values, we calculate the average value for each standard values using the following formula.

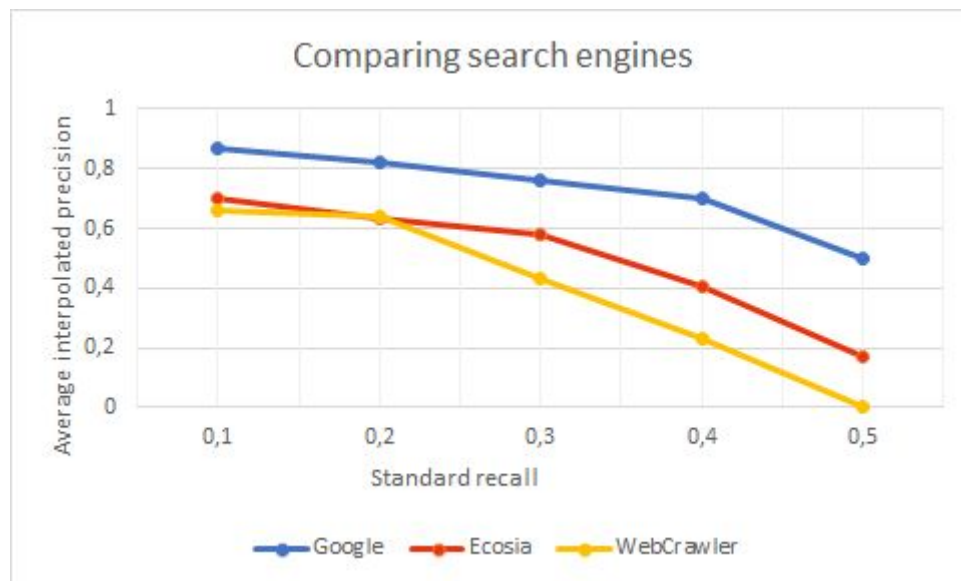
$$\text{average precision}_{\text{search engine } E_i} = \frac{\text{precision}_{Q1} + \text{precision}_{Q2} + \text{precision}_{Q3} + \text{precision}_{Q4}}{4}$$

Google, interpolated precision					
Standard recall	<i>q1</i>	<i>q2</i>	<i>q3</i>	<i>q4</i>	average
0,1	1	1	0,88	0,6	0,87
0,2	1	0,8	0,88	0,6	0,82
0,3	0,9	0,73	0,88	0,53	0,76
0,4	0,9	0,56	0,88	0,45	0,6975
0,5	0,73	0	0,87	0,4	0,5
0,6	-	-	-	-	-
0,7	-	-	-	-	-
0,8	-	-	-	-	-
0,9	-	-	-	-	-
1	-	-	-	-	-

Ecosia, interpolated precision					
Standard recall	<i>q1</i>	<i>q2</i>	<i>q3</i>	<i>q4</i>	average
0,1	0,8	0,8	0,6	0,6	0,7
0,2	0,8	0,8	0,6	0,33	0,6325
0,3	0,8	0,73	0,47	0,33	0,5825
0,4	0,7	0,6	0	0,33	0,4075
0,5	0,67	0	0	0	0,1675
0,6	-	-	-	-	-
0,7	-	-	-	-	-
0,8	-	-	-	-	-
0,9	-	-	-	-	-
1	-	-	-	-	-

WebCrawler, interpolated precision					
Standard recall	<i>q1</i>	<i>q2</i>	<i>q3</i>	<i>q4</i>	average
0,1	0,6	0,8	0,65	0,6	0,6625
0,2	0,6	0,8	0,65	0,5	0,6375
0,3	0,53	0,56	0,65	0	0,435
0,4	0,36	0,56	0	0	0,23
0,5	-	-	-	-	-
0,6	-	-	-	-	-
0,7	-	-	-	-	-
0,8	-	-	-	-	-
0,9	-	-	-	-	-
1	-	-	-	-	-

We want to be able to compare the 3 search engines. Hence, we build the average interpolated precision curve for all of the search engines based on the above averages precision values.



According to this average precision plot, we can say that Google provides the best results for those queries. Indeed, the Google curve has always a better precision than the Ecosia and WebCrawler curves for the same recall value.

Conclusion

In a critical view, we have to consider that this is an example. We collected and analyzed only 30 links for each information need and search engine that may not represent all of the relevant documents. Furthermore, the formulation of the query may influence our retrieved links. Eventually, we made the choice to not change the location when we searched information, so the search engines are affected by the country (Sweden). With these assumptions we can affirm that the best search engine, given our information needs, is Google.

We think that it's important to consider that Google is the search engines we use daily, so we probably are somehow "specialized" in formulating queries that gives us good results with Google. This fact could have inflated Google's performance. However, the Google curve is much higher than the others search engines' curves. Therefore, we could think that it would be better than the others with different queries' formulations too.

Finally, if we want to make our results more realistic, it would be good to add more information needs, involving different people for both: queries' formulation and evaluation of relevant links.