**CSCI-572 Information Retrieval - Assignment 4**

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1. **STEPS FOLLOWED TO COMPLETE THE ASSIGNMENT**
2. Installation of XAMPP

XAMPP is a free and open-source cross-platform web server solution stack package developed by Apache Friends, consisting mainly of the Apache HTTP Server, interpreters for scripts written in the PHP and Perl programming languages.

* 1. Installed XAMPP from [Apache Friends](https://www.apachefriends.org/download.html) which came bundled with PHP 8.0.17 and Apache.
  2. Created a folder in the ‘XAMPP/htdocs’, with the name of ‘solr-web’. This folder was then used to write all the PHP source code.
  3. Go to the XAMPP application and start the apache server.

Graphical user interface

Description automatically generated

1. Installation of Solr
   1. Downloaded the solr-7.7.3.zip from https://solr.apache.org/downloads.html.
   2. Unzipped the contents of the downloaded file.
   3. Started solr using ‘bin/solr start’. It starts by default on port 8983.
   4. Created a new core named ‘myexample’. One can do this from http://localhost:8983/ or from the terminal.
   5. Went to the conf folder of the core “myexample”. Opened a file named – “managed-schema” and uncommented the following line

<copyField source="\*" dest="\_text\_"/>

* 1. Configured Solr to default querying from the field \_text\_ by defining the default field in the requestHandler in solrconfig.xml file.

Text

Description automatically generated

1. Downloaded the HTML Crawled Pages from Drive Link

3.1 Downloaded the LATIMES zipped file from the drive link provided to us.

3.2 Unzip the folder.

3.3 Move the unzipped folder to the same directory as of solr-7.7.3.

1. Performed Indexing using TIKA Parser

4.1 Used Apache TIKA post command, to index all of the crawled data in the ‘myexample’ core.

4.2 Successfully indexed 19193 files.

4.3 Tested the query as “Cannes” from user interface provided by Solr.

Graphical user interface, text, application, email

Description automatically generated

1. Construction of Edgelist.txt
   1. Download the jsoup jar from <https://jsoup.org/download>
   2. Created a java file which uses jsoup library to extract the link structure from the downloaded web pages and created an edgelist.txt file.
   3. The created edgelist.txt file was then used to compute the page-rank for each page.
2. Construction of external\_PageRankFile.txt
   1. Used NetworkX(python package) to create a directional graph such that the vertex/node represented document ids and the edges represented the links.
   2. Calculated the page rank using the DiGraph.

*The following parameters were used to compute the scores:*

|  |  |
| --- | --- |
| Alpha | 0.85 |
| Max iterations | 30 |
| Error Tolerance | 1e-06 |
| Personalization | None |
| Nstart | None |
| Weight | ‘weight’ |
| Dangling | None |

* 1. The file external\_PageRankFile.txt created after runnning the python script.
  2. It was then placed in the ‘solr/myexample/data’ folder.
  3. Added fieldType external and file entries in managed-schema. Also, added listeners in the solrconfig.xml file. The core was then reloaded.
  4. Tested in Solr UI a query with keyword “Cannes” and sort parameter as “pageRankFile desc”.

Graphical user interface, text, application

Description automatically generated

1. **Explanation regarding why some pages have higher PageRank values than others.**

Answer:

Page Rank is an algorithm that **counts the number and quality of links to a page** to get a general idea of the **page’s importance**. The underlying assumption is that more important websites are likely to receive more links from other websites. There are multiple reasons why some pages have a higher PageRank values than others. Firstly, the number of links is important. The more links you have coming into a page (**inbound links**) the higher the PageRank will be. However, by just looking at the number of links to the page, one can anticipate incorrect/irrelevant results. It is evident that the parent and category pages will have a higher number of inbound links since a lot of child pages points to them. Therefore, Google/PageRank algorithm uses multiple parameters such as **high-quality information** (link authority and domain authority), and **logical structure** of the site, etc to compute the overall ranking of multiple pages. Link authority can be determined by the authority of the domain linking to a page. **Domain authority** is evaluated by looking at the number of links pointing to a page and the quality of those links. Links from pages with a high domain authority will have more weight than those from pages with a low domain authority. For instance, spam pages usually have a low domain authority thus ranked lower.

1. **FLOW DOCUMENT**
   1. **Screenshot of initial page where you enter the query in input box.**

**Graphical user interface, application

Description automatically generated**

* User is required to enter something before clicking on the submit button, otherwise, an alert is shown which asks the user to type something before clicking on the submit button.
* Also, it can be seen in the screenshot, that by default **Lucene** is selected for the user.
  1. **Screenshot of page which shows the results for Lucene(Default).**

**Graphical user interface, application

Description automatically generatedGraphical user interface, text, application, timeline

Description automatically generated**

* The above screenshots shows the top 10 ranked result for the keyword – *Cannes* by **Lucene,** our default ranking algorithm.
  1. **Screenshot of page which shows the results for PageRank.**

**Graphical user interface, application

Description automatically generatedGraphical user interface, text, application, timeline

Description automatically generated**

* The above screenshots shows the top 10 ranked result for the keyword – *Cannes* by **PageRank,** which uses external\_pageRankFile for ranking the html pages.
  1. **Screenshot of the actual webpage that opens when clicking on one of the result’s link.**

**Graphical user interface, text

Description automatically generated**

* On clicking the top ranked result by PageRank, we got the above HTML page.

**Graphical user interface, application

Description automatically generated**

1. **A table containing list of URLs of the top ten results produced by both ranking methods for each query.**
2. ***Cannes***

|  |  |
| --- | --- |
| Lucene | Page Rank |
| <https://www.latimes.com/topic/cannes-film-festival> | <https://www.latimes.com/entertainment/la-et-carrie-fisher-over-the-edge-and-back-19870731-story.html> |
| <https://www.latimes.com/entertainment/movies/la-et-mn-cannes-wrap-critics-conversation-20190526-story.html> | <https://www.latimes.com/entertainment-arts/story/2019-08-05/asap-rocky-arrest-in-sweden-coverage> |
| <https://www.latimes.com/entertainment/movies/moviesnow/la-et-mn-cannes-2015-winners-20150524-story.html> | <https://www.latimes.com/entertainment/movies/la-et-mn-cannes-quentin-tarantino-once-upon-a-time-in-hollywood-20190521-story.html> |
| <https://www.latimes.com/entertainment/movies/la-et-mn-cannes-film-festival-award-winners-20190525-story.html> | <https://www.latimes.com/entertainment-arts/movies/story/2019-09-13/toronto-film-festival-best-of-wrap-parasite> |
| <https://www.latimes.com/entertainment/movies/la-et-mn-cannes-parasite-atlantics-awards-20190526-story.html> | <https://www.latimes.com/entertainment-arts/music/story/2019-10-14/elton-john-me-autobiography-farewell-tour> |
| <https://www.latimes.com/entertainment/movies/la-et-mn-cannes-once-upon-a-time-in-hollywood-20190522-story.html> | <https://www.latimes.com/entertainment-arts/movies/story/2019-10-24/lighthouse-explained-robert-pattinson-willem-dafoe> |
| <https://www.latimes.com/entertainment/movies/la-ca-mn-cannes-genre-parasite-wild-goose-lake-tarantino-20190522-story.html> | <https://www.latimes.com/local/obituaries/la-me-blake-edwards-20101217-story.html> |
| <https://www.latimes.com/entertainment/movies/la-et-mn-cannes-mektoub-my-love-intermezzo-abdellatif-kechiche-20190523-story.html> | <https://www.latimes.com/local/california/la-me-hugh-hefner-snap-story.html> |
| <https://www.latimes.com/entertainment/movies/la-et-mn-cannes-quentin-tarantino-once-upon-a-time-in-hollywood-20190521-story.html> | <https://www.latimes.com/archives/la-xpm-2003-dec-31-me-dunne31-story.html> |
| <https://www.latimes.com/entertainment/movies/la-et-mn-cannes-robert-eggers-the-lighthouse-robert-pattinson-20190524-story.html> | <https://www.latimes.com/local/lanow/la-me-ln-bel-air-building-20170530-htmlstory.html> |

1. ***Congress***

|  |  |
| --- | --- |
| Lucene | Page Rank |
| <https://www.latimes.com/opinion/enterthefray/la-ol-new-york-rhode-island-congress-marijuana-20190116-story.html> | <https://www.latimes.com/politics/la-na-pol-congress-obamacare-repeal-20170113-story.html> |
| <https://www.latimes.com/politics/story/2019-10-28/jerry-brown-to-testify-to-congress-rebutting-trumps-criticism-of-california> | <https://www.latimes.com/business/story/2019-08-23/trump-employer-health-insurance> |
| <https://www.latimes.com/politics/la-na-pol-congress-sexual-harassment-20181212-story.html> | <https://www.latimes.com/california/story/2019-08-06/gilroy-el-paso-dayton-shootings-gun-control-steve-lopez> |
| <https://www.latimes.com/politics/la-pol-ca-richest-california-lawmakers-20180305-story.html> | <https://www.latimes.com/local/california/la-me-ln-crenshaw-development-20170915-story.html> |
| <https://www.latimes.com/politics/story/2019-09-09/congress-gun-control-government-shutdown> | <https://www.latimes.com/opinion/op-ed/la-ol-patt-morrison-daniel-dale-trump-toronto-star-20190529-htmlstory.html> |
| <https://www.latimes.com/opinion/story/2019-10-16/democratic-debate-trump-congress-executive-action> | <https://www.latimes.com/entertainment-arts/tv/story/2019-10-06/cw-batwoman-ruby-rose-supreme-court-lgbtq> |
| <https://www.latimes.com/politics/story/2019-10-14/trump-ukraine-aid-congress-impeachment> | <https://www.latimes.com/opinion/story/2019-10-18/sondland-mulvaney-trump-ukraine-quid-pro-quo> |
| <https://www.latimes.com/politics/la-na-pol-congress-bioweapons-detection-system-20190414-story.html> | <https://www.latimes.com/sitemap/1995/1> |
| <https://www.latimes.com/politics/la-na-pol-congress-mueller-pressure-impeachment-20190529-story.html> | |  | | --- | |  |   <https://www.latimes.com/business/technology/story/2019-09-09/48-states-are-probing-google-on-antitrust-grounds-why-isnt-california> |
| <https://www.latimes.com/politics/la-pol-ca-richest-in-congress-darrell-issa-story.html> | <https://www.latimes.com/sports/story/2019-10-07/nba-china-houston-rockets-gm-tweet-controversy-daryl-morey> |

1. ***Democrats***

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| --- | --- |
| Lucene | Page Rank |
| <https://www.latimes.com/politics/story/2019-11-07/house-democrats-subpoena-mick-mulvaney-in-impeachment-probe> | <https://www.latimes.com/politics/la-na-pol-congress-obamacare-repeal-20170113-story.html> |
| <https://www.latimes.com/opinion/story/2019-11-05/impeachment-donald-trump-democrats-political-cost-elections> | <https://www.latimes.com/local/lanow/la-me-edu-lausd-board-election-analysis-20190516-story.html> |
| <https://www.latimes.com/politics/story/2019-11-03/iowa-democrats-candidate-beat-trump> | <https://www.latimes.com/politics/story/2019-09-10/what-time-democratic-debate-who-is-on-stage> |
| <https://www.latimes.com/politics/story/2019-10-17/democrats-quick-impeachment-timing-complicated> | <https://www.latimes.com/opinion/op-ed/la-ol-patt-morrison-daniel-dale-trump-toronto-star-20190529-htmlstory.html> |
| <https://www.latimes.com/politics/story/2019-10-08/impeachment-trump-democrats-whistleblower-identity-testimony> | <https://www.latimes.com/local/lanow/la-me-ln-ed-buck-west-hollywood-death-20190107-story.html> |
| <https://www.latimes.com/politics/story/2019-09-24/democrats-and-pelosi-appear-close-to-tipping-point-on-impeachment> | <https://www.latimes.com/topic/health> |
| <https://www.latimes.com/politics/story/2019-09-29/trump-allies-and-democrats-reveal-the-deep-divisions-over-impeachment-inquiry> | <https://www.latimes.com/politics/la-pol-ca-uc-investigation-janet-napolitano-20171115-story.html> |
| <https://www.latimes.com/politics/story/2019-08-01/assignment-post-debate-health-care-analysis-new-story> | <https://www.latimes.com/sitemap/2002/10> |
| <https://www.latimes.com/nation/ct-democrats-economic-plan-20170824-story.html> | <https://www.latimes.com/people/maloy-moore> |
| <https://www.latimes.com/politics/story/2019-11-07/democrats-to-build-abuse-of-power-case-against-trump-next-week> | <https://www.latimes.com/topic/education> |

1. ***Patriot Movement***

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| Lucene | Page Rank |
| <https://www.latimes.com/archives/la-xpm-2012-oct-23-la-me-russell-means-20121023-story.html> | <https://www.latimes.com/california/story/2019-08-15/the-street-within-part-two-broadway-place-homeless-residents-struggle> |
| <https://www.latimes.com/staff/megan-garvey> | <https://www.latimes.com/entertainment-arts/movies/story/2019-10-29/robert-evans-dead-metoo-brett-morgen-kid-stays-in-the-picture> |
| <https://www.latimes.com/archives/la-xpm-2001-jun-10-mn-8792-story.html> | <https://www.latimes.com/california/story/2019-08-06/gilroy-el-paso-dayton-shootings-gun-control-steve-lopez> |
| <https://www.latimes.com/entertainment-arts/books/story/2019-10-25/shadowlands-anthony-mccann-oregon-standoff> | <https://www.latimes.com/entertainment-arts/story/2019-10-21/nintendo-ring-fit-adventure-fitness-dragon> |
| <https://www.latimes.com/sports/highschool/story/2019-11-06/girls-tennis-southern-section-playoff-results-and-updated-pairings> | <https://www.latimes.com/california/story/2019-07-22/ridgecrest-earthquake-images-broken-ground> |
| <https://www.latimes.com/politics/story/2019-09-20/bernie-sanders-muslim-voters-2020> | <https://www.latimes.com/home/la-hm-laird-hamilton-at-home-20190628-story.html> |
| <https://www.latimes.com/sports/nba/la-sp-nba-best-game-ever-20181222-story.html> | <https://www.latimes.com/world-nation/story/2019-11-08/hong-kong-protesters-call-for-revenge-after-22-year-old-student-dies-in-fall> |
| <https://www.latimes.com/sports/highschool/story/2019-11-06/girls-tennis-southern-section-playoff-results-and-updated-pairings> | <https://www.latimes.com/entertainment-arts/story/2019-11-07/datebook-hugo-crosthwaite-luis-de-jesus-los-angeles> |
| <https://www.latimes.com/entertainment/movies/la-et-mn-july-4-box-office-history-20180629-story.html> | <https://www.latimes.com/food/jonathan-gold/la-fo-gold-restaurant-of-the-year-2018-food-bowl-20180505-story.html> |
| <https://www.latimes.com/entertainment/movies/la-et-mn-july-4-box-office-history-20180629-story.html> | <https://www.latimes.com/sitemap/1993/9> |

1. ***Republicans***

|  |  |
| --- | --- |
| Lucene | Page Rank |
| <https://www.latimes.com/opinion/story/2019-10-23/house-republicans-storm-hearing-impeachment> | <https://www.latimes.com/politics/la-na-pol-congress-obamacare-repeal-20170113-story.html> |
| <https://www.latimes.com/politics/story/2019-10-30/democrats-hoped-theyd-win-over-republicans-on-impeachment-but-its-not-looking-that-way-so-far> | <https://www.latimes.com/opinion/opinion-la/la-ol-starks-los-angeles-homeless-20160203-story.html> |
| <https://www.latimes.com/opinion/story/2019-11-08/impeachment-trump-republicans-toomey> | <https://www.latimes.com/opinion/op-ed/la-ol-patt-morrison-daniel-dale-trump-toronto-star-20190529-htmlstory.html> |
| <https://www.latimes.com/politics/story/2019-10-04/vulnerable-senate-republicans-impeachment> | <https://www.latimes.com/opinion/livable-city/la-ol-public-transit-freeway-traffic-20151117-story.html> |
| <https://www.latimes.com/california/story/2019-10-16/california-republicans-democrats-wildfires-homelessness> | <https://www.latimes.com/opinion/story/2019-11-01/should-uc-stop-considering-sat-and-act-scores-in-admissions> |
| <https://www.latimes.com/politics/story/2019-10-23/impeachment-deposition-room-stormed-by-republicans> | <https://www.latimes.com/opinion/livable-city/la-ol-shoup-dtla-parking-cash-out-20170328-story.html> |
| <https://www.latimes.com/opinion/story/2019-09-17/california-republicans-trump-fundraising-president> | <https://www.latimes.com/opinion/livable-city/la-oe-babin-bicycle-laws-20161003-snap-story.html> |
| <https://www.latimes.com/politics/story/2019-10-28/katie-hill-resignation-trump-obstacle-for-republicans> | <https://www.latimes.com/opinion/story/2019-10-18/sondland-mulvaney-trump-ukraine-quid-pro-quo> |
| <https://www.latimes.com/opinion/story/2019-11-06/trump-republicans-democrats-predictions-polling-2020> | <https://www.latimes.com/opinion/opinion-la/la-ol-opinion-newsletter-brexit-20160625-snap-htmlstory.html> |
| <https://www.latimes.com/politics/story/2019-11-06/republicans-election-trump-candidate-loses-kentucky> | <https://www.latimes.com/business/technology/story/2019-09-09/48-states-are-probing-google-on-antitrust-grounds-why-isnt-california> |

1. ***Senate***

|  |  |
| --- | --- |
| Lucene | Page Rank |
| <https://www.latimes.com/politics/story/2019-11-07/gop-is-already-thinking-about-how-to-turn-a-senate-impeachment-trial-to-trumps-advantage> | <https://www.latimes.com/business/la-fi-affordable-housing-transit-zoning-20190526-story.html> |
| <https://www.latimes.com/politics/story/2019-10-30/california-donors-spend-millions-on-2020-senate-races-across-the-country> | <https://www.latimes.com/politics/la-na-pol-congress-obamacare-repeal-20170113-story.html> |
| <https://www.latimes.com/politics/story/2019-10-04/vulnerable-senate-republicans-impeachment> | <https://www.latimes.com/opinion/op-ed/la-ol-patt-morrison-daniel-dale-trump-toronto-star-20190529-htmlstory.html> |
| <https://www.latimes.com/politics/la-na-pol-kavanaugh-hearing-20180927-story.html> | <https://www.latimes.com/opinion/livable-city/la-ol-public-transit-freeway-traffic-20151117-story.html> |
| <https://www.latimes.com/nation/la-pol-scotus-confirmation-votes-over-the-years-20181005-htmlstory.html> | <https://www.latimes.com/local/lanow/la-me-ln-ed-buck-west-hollywood-death-20190107-story.html> |
| <https://www.latimes.com/politics/story/2019-08-14/2020-senate-control-presidential-race> | <https://www.latimes.com/opinion/story/2019-11-01/should-uc-stop-considering-sat-and-act-scores-in-admissions> |
| <https://www.latimes.com/politics/story/2019-08-14/john-hickenlooper-quits-presidential-race-for-senate-run> | <https://www.latimes.com/opinion/livable-city/la-ol-shoup-dtla-parking-cash-out-20170328-story.html> |
| <https://www.latimes.com/politics/story/2019-10-30/california-donors-spend-millions-on-2020-senate-races-across-the-country> | <https://www.latimes.com/entertainment-arts/story/2019-10-03/trumps-impeachment-inquiry-watergate-tv-spectacle-whistleblower> |
| <https://www.latimes.com/politics/la-na-pol-william-barr-senate-confirm-attorney-general-20190214-story.html> | <https://www.latimes.com/opinion/livable-city/la-oe-babin-bicycle-laws-20161003-snap-story.html> |
| <https://www.latimes.com/opinion/story/2019-10-15/wmcaleen-homeland-security-trump-nielsen-senate-acting-secretary> | <https://www.latimes.com/opinion/story/2019-10-18/sondland-mulvaney-trump-ukraine-quid-pro-quo> |

1. ***Olympics 2020***

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| Lucene | Page Rank |
| <https://www.latimes.com/sports/olympics/story/2019-08-15/2020-tokyo-olympics-searching-for-answers-amid-heat-wave> | <https://www.latimes.com/fashion/la-ig-louis-vuitton-mens-collection-michael-jackson-leaving-neverland-20190315-story.html> |
| <https://www.latimes.com/sports/olympics> | <https://www.latimes.com/entertainment-arts/story/2019-11-02/5-games-afterparty-luigis-mansion-3-the-outer-worlds-must-play-games> |
| <https://www.latimes.com/people/david-wharton> | <https://www.latimes.com/topic/la-affairs> |
| <https://www.latimes.com/people/david-wharton> | <https://www.latimes.com/politics/la-na-pol-congress-obamacare-repeal-20170113-story.html> |
| <https://www.latimes.com/sports/olympics/story/2019-10-16/2020-tokyo-olympics-marathon-sapporo-avoid-heat> | <https://www.latimes.com/espanol/https:/www.latimes.com/travel/articulo/2019-09-22/pase-la-noche-en-el-castillo-de-highclere-el-verdadero-downton-abbey> |
| <https://www.latimes.com/sports/olympics/story/2019-07-31/deadly-heat-wave-2020-summer-olympics-tokyo> | <https://www.latimes.com/people/andrea-castillo> |
| <https://www.latimes.com/sports/story/2019-11-05/ioc-anti-doping-2020-tokyo-olympics> | <https://www.latimes.com/entertainment-arts/music/story/2019-08-21/dueto-dos-rosas-viva-pomona> |
| <https://www.latimes.com/sports/olympics/story/2019-10-10/naomi-osaka-chooses-japan-over-u-s-2020-tokyo-olympics> | <https://www.latimes.com/politics/story/2019-09-10/what-time-democratic-debate-who-is-on-stage> |
| <https://www.latimes.com/sports/story/2019-07-23/tokyos-rough-road-to-2020-summer-olympics> | <https://www.latimes.com/opinion/op-ed/la-ol-patt-morrison-daniel-dale-trump-toronto-star-20190529-htmlstory.html> |
| <https://www.latimes.com/people/david-wharton> | <https://www.latimes.com/sports/ucla> |

1. ***Stock***

|  |  |
| --- | --- |
| Lucene | Page Rank |
| <https://www.latimes.com/business/story/2019-11-06/uber-lock-up-period-ends-with-falling-stock-protests> | <https://www.latimes.com/business/story/2019-11-01/google-to-buy-fitness-wearables-giant-fitbit-for-about-2-1-billion> |
| <https://www.latimes.com/business/la-fi-lyft-stock-20190401-story.html> | <https://www.latimes.com/business/la-fi-affordable-housing-transit-zoning-20190526-story.html> |
| <https://www.latimes.com/business/la-fi-hy-tesla-stock-20160518-snap-story.html> | <https://www.latimes.com/business/story/2019-08-23/trump-employer-health-insurance> |
| <https://www.latimes.com/business/story/2019-11-06/uber-lock-up-period-ends-with-falling-stock-protests> | <https://www.latimes.com/entertainment-arts/story/2019-10-21/nintendo-ring-fit-adventure-fitness-dragon> |
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1. ***Virus***

|  |  |
| --- | --- |
| Lucene | Page Rank |
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1. **An overlap graph showing the amount of overlap between the two ranking strategies for all queries.**

Answer:

Graphical user interface, text, application

Description automatically generated

|  |  |
| --- | --- |
| Query Name/Keywords | Number of Overlaps |
| Cannes | 1 |
| Congress | 0 |
| Democrats | 0 |
| Patriot Movement | 0 |
| Republicans | 0 |
| Senate | 0 |
| Olympics 2020 | 0 |
| Stock | 0 |
| Virus | 0 |