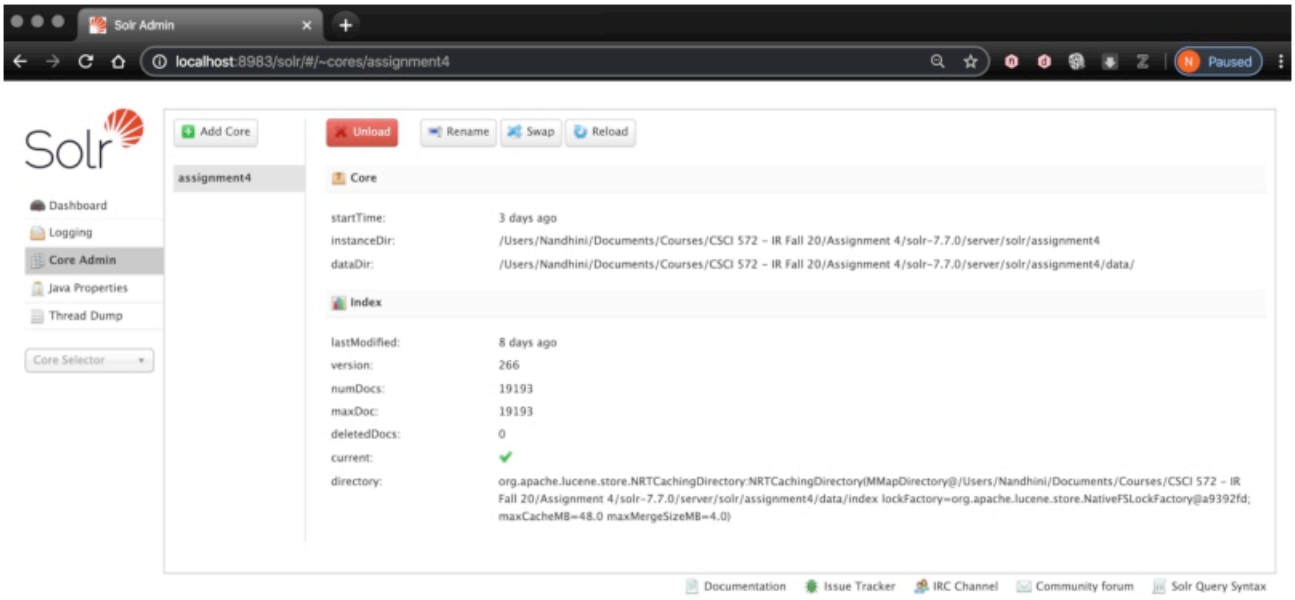
CSCI 572 – Indexing the Web using Solr

Name: Nandhini Rengaraj
New Site: LA Times

Step 1: Solr Installation

1. Downloaded the solr-7.7.0.zip source from the website. Started Solr using bin/start to run Solr admin in http://localhost:8983/.
2. Created the core "assignment4" using the command *bin/solr –c assignment4*. The html files downloaded from the Google drive were stored in *"/Users/Nandhini/Documents/Courses/CSCI 572 - IR Fall 20/Assignment 4/LATIMES/latimes/"*. Edited the managed_scheme XML to include copyField elements that combines all the fields to _text_ field.
3. Indexed these files in Solr using the command *bin/post –c assignment4 –filetypes html /Users/Nandhini/Documents/Courses/CSCI 572 - IR Fall 20/Assignment 4/LATIMES/latimes/*
4. The Solr Admin showed that the files were indexed. Confirmed it using sample queries.



Screenshot showing Solr core - assignment4 created and indexed

Step 2: Creating the EdgeList using Java and collecting NetworkX Pagerank scores

1. In the java program PreProcessEdges.java, created the fileURLMap and URLfileMap to create mappings between the html files and the urls specified in the *URLtoHTML_latimes_news.csv*
2. Using Jsoup to parse the files, the outgoing links are extracted to create an *edge_dist.txt*.

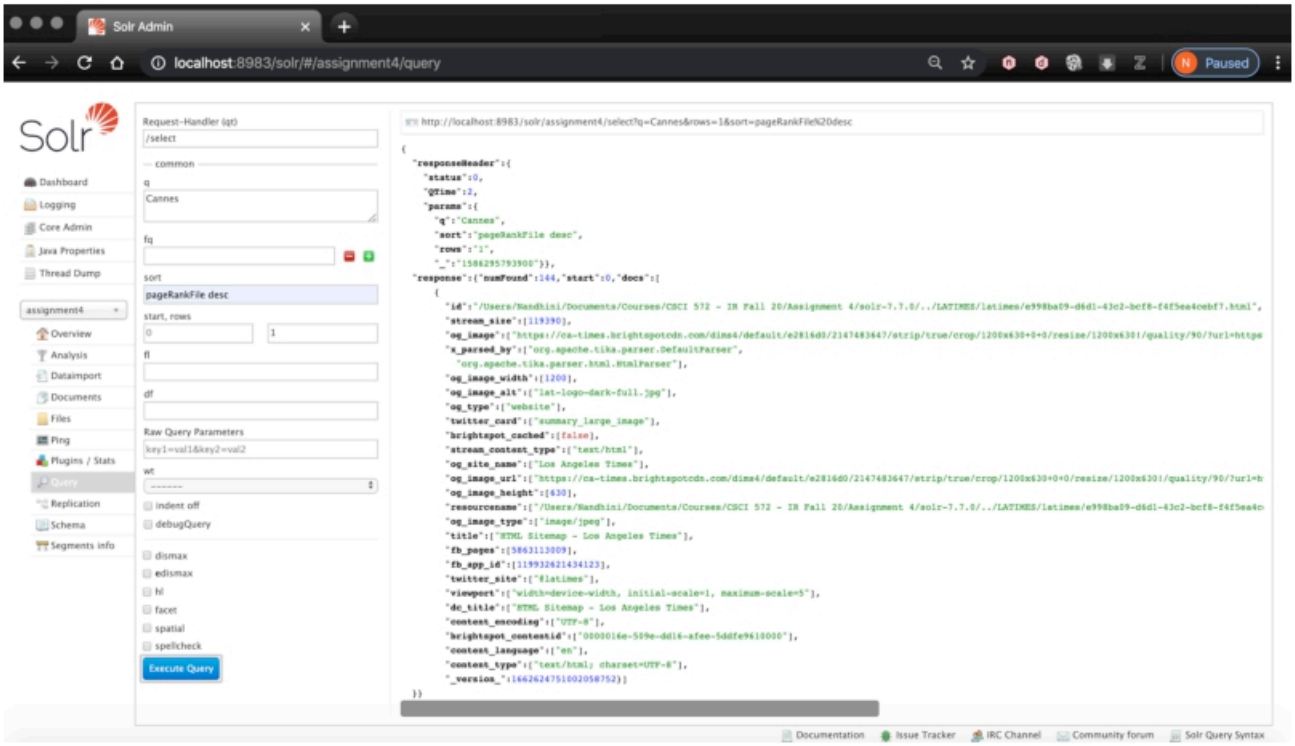
3. The edge_dist.txt contains filenames that contain an edge between them in the graph.
4. Using networkx module in Python, by feeding the *edge_dist.txt* and setting the parameters, the pagerank scores were computed. The parameters are as follows:

```
g = nx.read_edgelist("edge_dist.txt", create_using=nx.DiGraph())
pagerank = nx.pagerank(g, alpha=0.85, personalization=None, max_iter=30, tol=1e-06, nstart=None,
weight='weight', dangling=None)
```

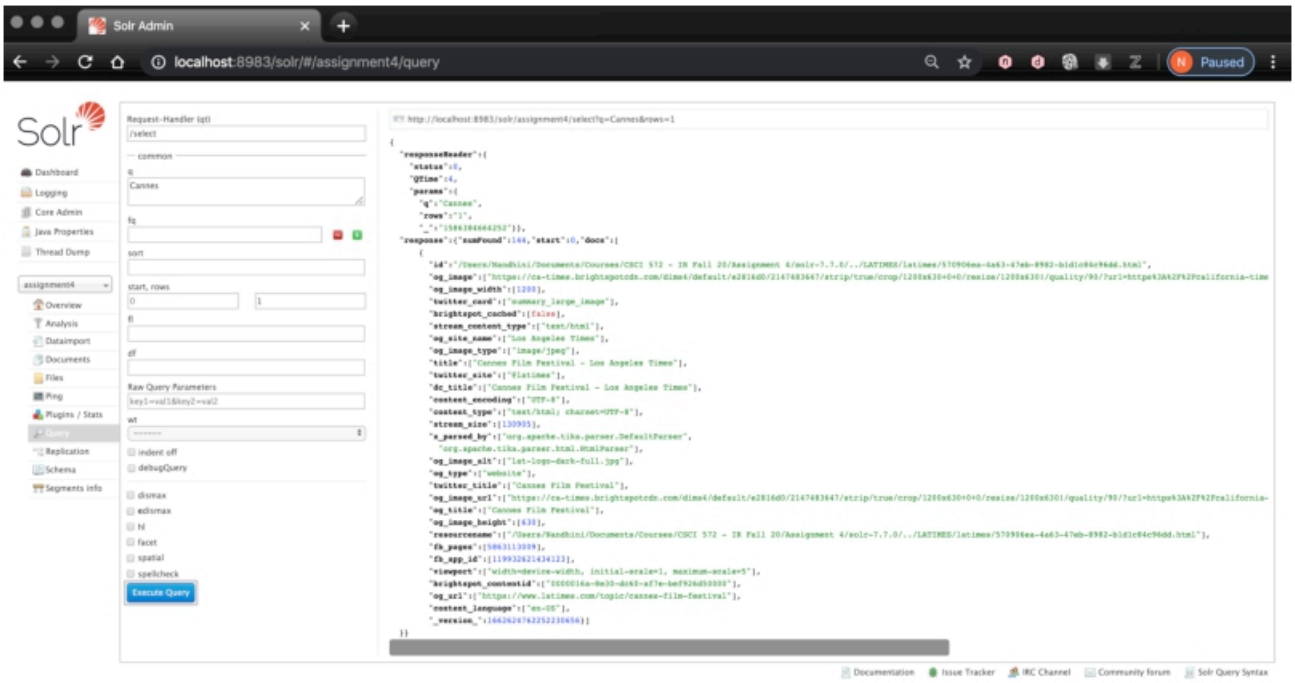
5. The computed pagerank scores were written to external_pageRankFile.txt in the format "path_to_filename/filename=score".
6. Copied the *external_pageRankFile.txt* to */solr-7.7.0/server/solr/assignment4/data*.
7. Modified the *solrconfig.xml* and *managed-scheme.xml* to include this file to score the results by following the instructions specified in the PDF.

Step 3: Creating the UI and PHP Server to query the results from Solr

1. Using the Apache_Solr_Service in PHP, the solr admin was queried to get the results. The results were displayed in a table format with the fields – Title [*title*] , Description [*og_description*], ID [*id*] and URL[*og_url*]. The Title and URL fields are made clickable.
2.A radio button was used to alternate between the default (Lucene) ranking used by Solr and the pagerank algorithm included manually (*external_pageRankFile.txt*). The external pagerank scores can be used by setting *sort=pageRankFile desc*.
3.The results were verified on both the UI and the Solr Admin.
4.The results of the both the ranking algorithms were compared.



Screenshot showing Solr results for query="Cannes' sorted by decreasing pagerank score



Screenshot showing Solr results for query="Cannes' using lucene results

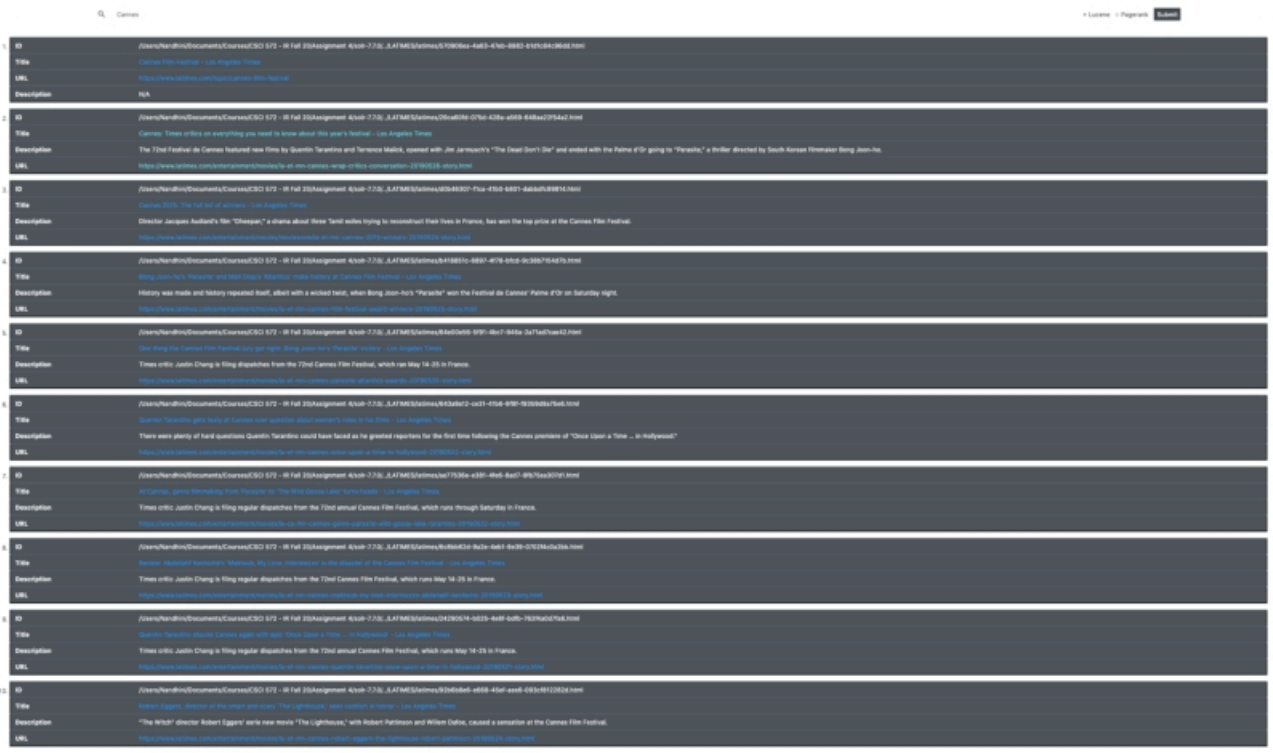
Why some pages have higher Pagerank than others?

Some pages have a higher pagerank than other pages because these pages have more links pointing towards it. Every link to a page is interpreted as a vote of confidence for that page by the other pages. In essence, a link from page S to page P is considered as a vote by page P to page S. The Algorithm for pagerank computation calculates pagerank of a page by accumulating the scores recursively. That is, the score of a page A increases in accordance to the pagerank of the voting page B. Hence, by inference, pages with a higher in-degree and links from pages with higher page ranks tend to have a higher page rank than other pages.

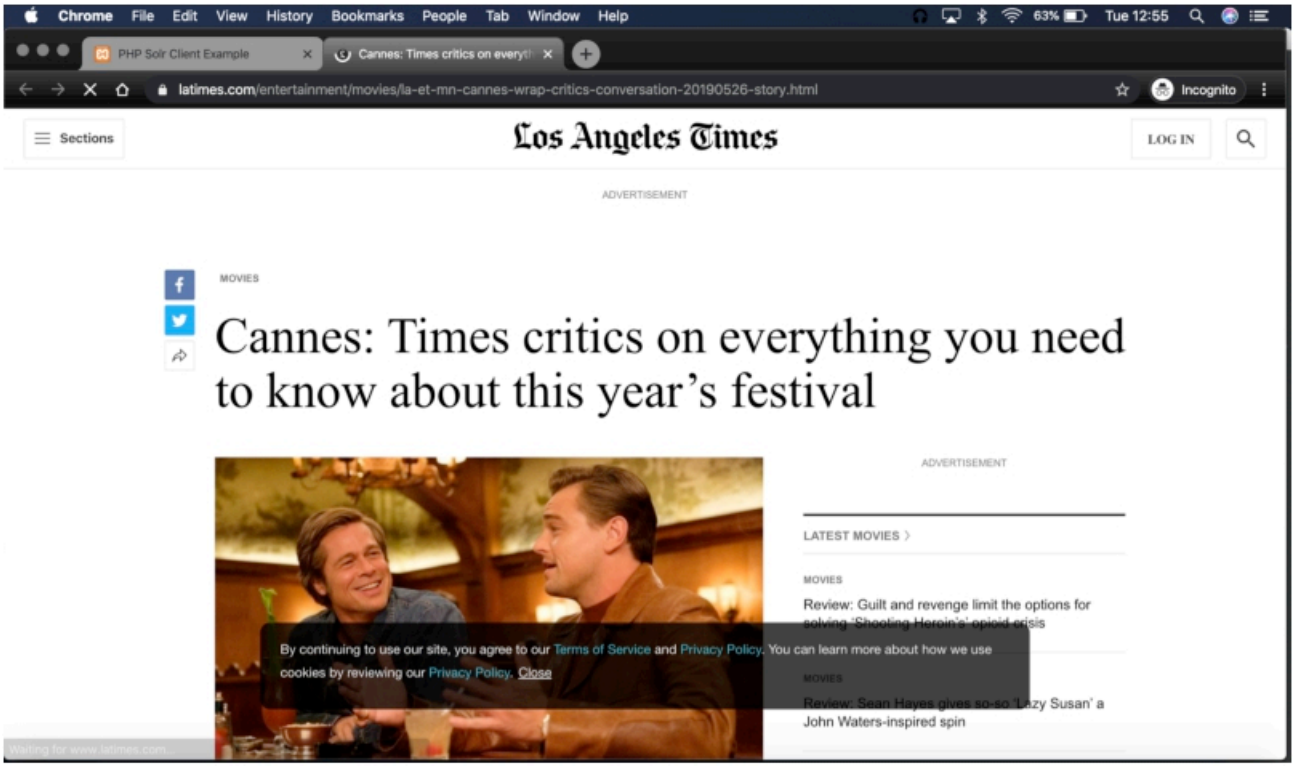
Screenshots of Client Side Query Flow

Query = Cannes

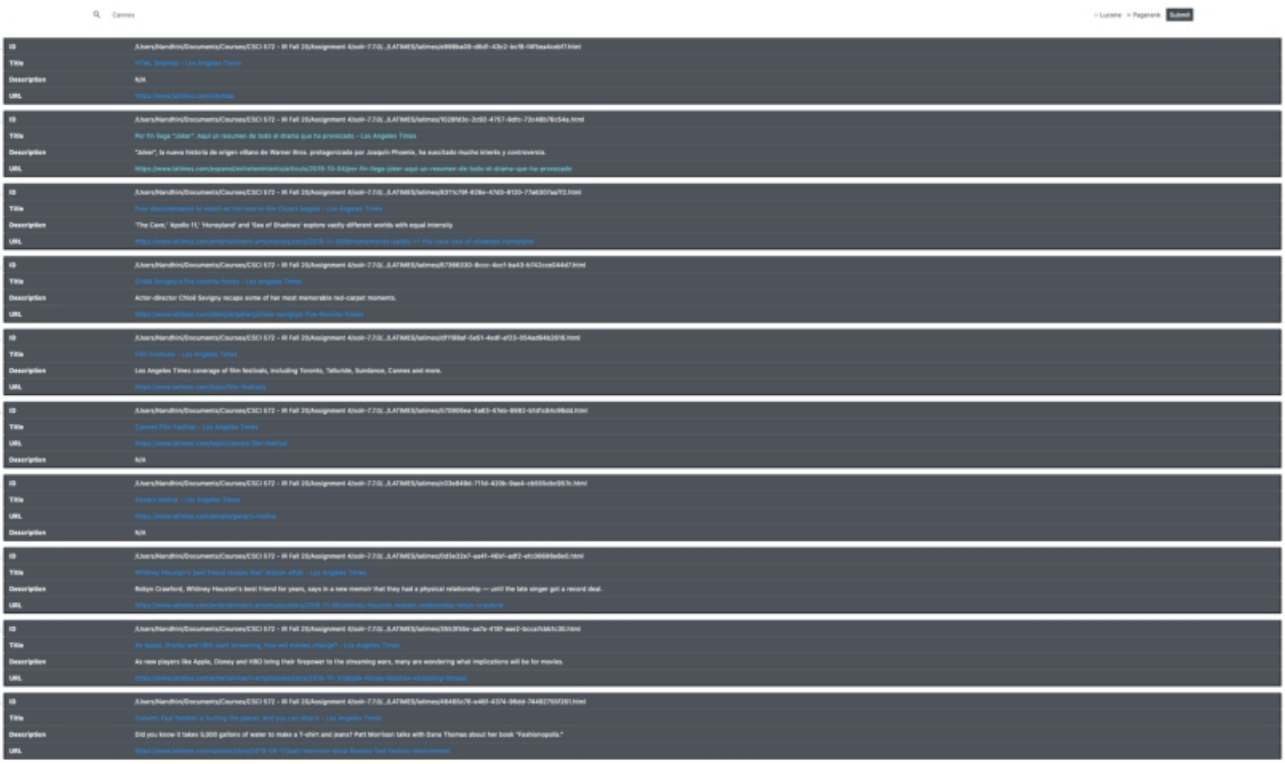
Screenshot of Query box with radio button for ranking options



Screenshot of Query results for “Cannes” using default Lucene ranking



Screenshot of a clickable link for Lucene results ranking
https://www.latimes.com/entertainment/movies/la-et-mn-cannes-wrap-critics-conversation-20190526-story.html



Screenshot of query results for “Cannes” using external Pagerank ranking

Screenshot of a clickable link for Pagerank results ranking
https://www.latimes.com/espanol/entretenimiento/articulo/2019-10-04/por-fin-llega-joker-aqui-un-resumen-de-todo-el-drama-que-ha-provocado

Comparison of Query Results between Ranking Algorithms

QUERY: CANNES

LUCENE	PAGERANK
https://www.latimes.com/topic/cannes-film-festival	https://www.latimes.com/sitemap
https://www.latimes.com/entertainment/movies/la-et-mn-cannes-wrap-critics-conversation-20190526-story.html	https://www.latimes.com/espanol/entretenimiento/articulo/2019-10-04/por-fin-llega-joker-aqui-un-resumen-de-todo-el-drama-que-ha-provocado
https://www.latimes.com/entertainment/movies/moviesnow/la-et-mn-cannes-2015-winners-20150524-story.html	https://www.latimes.com/entertainment-arts/movies/story/2019-11-08/documentaries-apollo-11-the-cave-sea-of-shadows-honeyland
https://www.latimes.com/entertainment/movies/la-et-mn-cannes-film-festival-award-winners-20190525-story.html	https://www.latimes.com/lifestyle/gallery/chloe-sevignys-five-favorite-frocks
https://www.latimes.com/entertainment/movies/la-et-mn-cannes-parasite-atlantics-awards-20190526-story.html	https://www.latimes.com/topic/film-festivals
https://www.latimes.com/entertainment/movies/la-et-mn-cannes-once-upon-a-time-in-hollywood-20190522-story.html	https://www.latimes.com/topic/cannes-film-festival
https://www.latimes.com/entertainment/movies/la-ca-mn-cannes-genre-parasite-wild-goose-lake-tarantino-20190522-story.html	https://www.latimes.com/people/genaro-molina
https://www.latimes.com/entertainment/movies/la-et-mn-cannes-mektoub-my-love-intermezzo-abdellatif-kechiche-20190523-story.html	https://www.latimes.com/entertainment-arts/music/story/2019-11-06/whitney-houston-lesbian-relationship-robyn-crawford
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-arts/movies/story/2019-10-31/apple-disney-hbomax-streaming-movies
https://www.latimes.com/entertainment/movies/la-et-mn-cannes-robert-eggers-the-lighthouse-robert-pattinson-20190524-story.html	https://www.latimes.com/opinion/story/2019-09-17/patt-morrison-dana-thomas-fast-fashion-environment

QUERY: CONGRESS

LUCENE	PAGERANK
https://www.latimes.com/opinion/enterthefray/la-ol-new-york-rhode-island-congress-marijuana-20190116-story.html	https://www.latimes.com/opinion
https://www.latimes.com/politics/story/2019-10-28/jerry-brown-to-testify-to-congress-rebutting-trumps-criticism-of-california	https://www.latimes.com/espanol/politica
https://www.latimes.com/politics/la-na-pol-congress-sexual-harassment-20181212-story.html	https://www.latimes.com/politics/story/2019-11-08/michael-bloomberg-files-papers-for-2020-democratic-presidential-primary
https://www.latimes.com/politics/la-pol-ca-richest-california-lawmakers-20180305-story.html	https://www.latimes.com/opinion/story/2019-11-09/facebook-twitter-political-ads-lies
https://www.latimes.com/politics/story/2019-09-09/congress-gun-control-government-shutdown	https://www.latimes.com/politics/story/2019-11-08/elizabeth-warren-used-bare-knuckle-tactics-to-take-down-an-obama-nominee
https://www.latimes.com/opinion/story/2019-10-16/democratic-debate-trump-congress-executive-action	https://www.latimes.com/opinion/story/2019-11-09/devin-nunes-impeachment-witness-list
https://www.latimes.com/politics/story/2019-10-14/trump-ukraine-aid-congress-impeachment	https://www.latimes.com/politics/story/2019-11-08/steve-bannon-roger-stone-trump-campaign-wikileaks
https://www.latimes.com/politics/la-na-pol-congress-bioweapons-detection-system-20190414-story.html	https://www.latimes.com/environment/story/2019-11-08/eastern-sierra-towns-recreation-tourism-forest-service
https://www.latimes.com/politics/la-na-pol-congress-mueller-pressure-impeachment-20190529-story.html	https://www.latimes.com/opinion/story/2019-11-08/impeachment-trump-republicans-toomey
https://www.latimes.com/politics/la-pol-ca-richest-in-congress-darrell-issa-story.html	https://www.latimes.com/politics/story/2019-11-08/alexander-vindman-fiona-hill-impeachment-transcripts

QUERY: DEMOCRATS

LUCENE	PAGERANK
https://www.latimes.com/politics/story/2019-11-07/house-democrats-subpoena-mick-mulvaney-in-impeachment-probe	https://www.latimes.com/california
https://www.latimes.com/opinion/story/2019-11-05/impeachment-donald-trump-democrats-political-cost-elections	https://www.latimes.com/opinion
https://www.latimes.com/politics/story/2019-11-03/iowa-democrats-candidate-beat-trump	https://www.latimes.com/politics
https://www.latimes.com/politics/story/2019-10-17/democrats-quick-impeachment-timing-complicated	https://www.latimes.com/politics/story/2019-11-08/michael-bloomberg-files-papers-for-2020-democratic-presidential-primary
https://www.latimes.com/politics/story/2019-10-08/impeachment-trump-democrats-whistleblower-identity-testimony	https://www.latimes.com/politics/story/2019-11-08/democratic-primary-debate-moves-from-ucla-to-loyola-marymount-university
https://www.latimes.com/politics/story/2019-09-24/democrats-and-pelosi-appear-close-to-tipping-point-on-impeachment	https://www.latimes.com/politics/story/2019-11-08/elizabeth-warren-used-bare-knuckle-tactics-to-take-down-an-obama-nominee
https://www.latimes.com/politics/story/2019-09-29/trump-allies-and-democrats-reveal-the-deep-divisions-over-impeachment-inquiry	https://www.latimes.com/opinion/story/2019-11-09/elizabeth-warren-trump
https://www.latimes.com/politics/story/2019-08-01/assignment-post-debate-health-care-analysis-new-story	https://www.latimes.com/opinion/story/2019-11-09/devin-nunes-impeachment-witness-list
https://www.latimes.com/nation/ct-democrats-economic-plan-20170824-story.html	https://www.latimes.com/politics/story/2019-11-08/steve-bannon-roger-stone-trump-campaign-wikileaks
https://www.latimes.com/politics/story/2019-11-07/democrats-to-build-abuse-of-power-case-against-trump-next-week	https://www.latimes.com/opinion/story/2019-11-08/impeachment-trump-republicans-toomey

QUERY: PATRIOT MOVEMENT

LUCENE	PAGERANK
https://www.latimes.com/archives/la-xpm-2012-oct-23-la-me-russell-means-20121023-story.html	https://www.latimes.com/environment
https://www.latimes.com/staff/megan-garvey	https://www.latimes.com/science
https://www.latimes.com/archives/la-xpm-2001-jun-10-mn-8792-story.html	https://www.latimes.com/california/story/2019-11-09/prop-187-anniversary-commemoration
https://www.latimes.com/entertainment-arts/books/story/2019-10-25/shadowlands-anthony-mccann-oregon-standoff	https://www.latimes.com/entertainment-arts/story/2019-11-09/classical-music-things-to-do-in-la-this-week-nov-10-17-magic-flute-la-opera
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/2019-11-09/theater-things-to-do-in-la-this-week-nov-10-17-dr-seusss-how-the-grinch-stole-christmas-old-globe-key-largo-andy-garcia-geffen-playhouse
https://www.latimes.com/politics/story/2019-09-20/bernie-sanders-muslim-voters-2020	https://www.latimes.com/food/story/2019-11-07/kung-pao-chicken-history-recipe-gong-bao
https://www.latimes.com/sports/nba/la-sp-nba-best-game-ever-20181222-story.html	https://www.latimes.com/obituaries/story/2019-11-04/james-stern-obit-black-activist-who-led-neo-nazi-group-dies-amid-bid-to-destroy-it
https://www.latimes.com/sports/highschool/story/2019-11-06/girls-tennis-southern-section-playoff-results-and-updated-pairings	https://www.latimes.com/topic/column-one
https://www.latimes.com/entertainment/movies/la-et-mn-july-4-box-office-history-20180629-story.html	https://www.latimes.com/topic/mexico-americas
https://www.latimes.com/entertainment/movies/la-et-mn-july-4-box-office-history-20180629-story.html	https://www.latimes.com/topic/museums

QUERY: REPUBLICANS

LUCENE	PAGERANK
https://www.latimes.com/opinion/story/2019-10-23/house-republicans-storm-hearing-impeachment	https://www.latimes.com/
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
https://www.latimes.com/opinion/story/2019-11-08/impeachment-trump-republicans-toomey	https://www.latimes.com/opinion/la-letter-to-the-editor-htmlstory.html
https://www.latimes.com/politics/story/2019-10-04/vulnerable-senate-republicans-impeachment	https://www.latimes.com/opinion/story/2019-11-09/facebook-twitter-political-ads-lies
https://www.latimes.com/california/story/2019-10-16/california-republicans-democrats-wildfires-homelessness	https://www.latimes.com/opinion/story/2019-11-08/berlin-wall-30th-anniversary-cold-war-donald-trump
https://www.latimes.com/politics/story/2019-10-23/impeachment-deposition-room-stormed-by-republicans	https://www.latimes.com/politics/story/2019-11-08/elizabeth-warren-used-bare-knuckle-tactics-to-take-down-an-obama-nominee
https://www.latimes.com/opinion/story/2019-09-17/california-republicans-trump-fundraising-president	https://www.latimes.com/opinion/story/2019-11-09/elizabeth-warren-trump
https://www.latimes.com/politics/story/2019-10-28/katie-hill-resignation-trump-obstacle-for-republicans	https://www.latimes.com/opinion/story/2019-11-09/sat-uc-college-admissions
https://www.latimes.com/opinion/story/2019-11-06/trump-republicans-democrats-predictions-polling-2020	https://www.latimes.com/opinion/story/2019-11-09/devin-nunes-impeachment-witness-list
https://www.latimes.com/politics/story/2019-11-06/republicans-election-trump-candidate-loses-kentucky	https://www.latimes.com/opinion/story/2019-11-08/impeachment-trump-republicans-toomey

QUERY: SENATE

LUCENE	PAGERANK
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/
https://www.latimes.com/politics/story/2019-10-30/california-donors-spend-millions-on-2020-senate-races-across-the-country	https://www.latimes.com/opinion
https://www.latimes.com/politics/story/2019-10-04/vulnerable-senate-republicans-impeachment	https://www.latimes.com/california/story/2019-11-09/prop-187-anniversary-commemoration
https://www.latimes.com/politics/la-na-pol-kavanaugh-hearing-20180927-story.html	https://www.latimes.com/opinion/la-letter-to-the-editor-htmlstory.html
https://www.latimes.com/nation/la-pol-scotus-confirmation-votes-over-the-years-20181005-htmlstory.html	https://www.latimes.com/opinion/story/2019-11-09/facebook-twitter-political-ads-lies
https://www.latimes.com/politics/story/2019-08-14/2020-senate-control-presidential-race	https://www.latimes.com/opinion/story/2019-11-08/berlin-wall-30th-anniversary-cold-war-donald-trump
https://www.latimes.com/politics/story/2019-08-14/john-hickenlooper-quits-presidential-race-for-senate-run	https://www.latimes.com/politics/story/2019-11-08/elizabeth-warren-used-bare-knuckle-tactics-to-take-down-an-obama-nominee
https://www.latimes.com/politics/story/2019-10-30/california-donors-spend-millions-on-2020-senate-races-across-the-country	https://www.latimes.com/opinion/story/2019-11-09/elizabeth-warren-trump
https://www.latimes.com/politics/la-na-pol-william-barr-senate-confirm-attorney-general-20190214-story.html	https://www.latimes.com/opinion/story/2019-11-09/sat-uc-college-admissions
https://www.latimes.com/opinion/story/2019-10-15/wmcaleen-homeland-security-trump-nielsen-senate-acting-secretary	https://www.latimes.com/opinion/story/2019-11-09/devin-nunes-impeachment-witness-list

QUERY: OLYMPICS 2020

LUCENE	PAGERANK
https://www.latimes.com/sports/olympics/story/2019-08-15/2020-tokyo-olympics-searching-for-answers-amid-heat-wave	https://www.latimes.com/
https://www.latimes.com/sports/olympics	https://www.latimes.com/sitemap
https://www.latimes.com/people/david-wharton	https://www.latimes.com/sports
https://www.latimes.com/people/david-wharton	https://www.latimes.com/opinion
https://www.latimes.com/sports/olympics/story/2019-10-16/2020-tokyo-olympics-marathon-sapporo-avoid-heat	https://www.latimes.com/entertainment-arts
https://www.latimes.com/sports/olympics/story/2019-07-31/deadly-heat-wave-2020-summer-olympics-tokyo	https://www.latimes.com/business
https://www.latimes.com/sports/story/2019-11-05/ioc-anti-doping-2020-tokyo-olympics	https://www.latimes.com/world-nation
https://www.latimes.com/sports/olympics/story/2019-10-10/naomi-osaka-chooses-japan-over-u-s-2020-tokyo-olympics	https://www.latimes.com/environment
https://www.latimes.com/sports/story/2019-07-23/tokyos-rough-road-to-2020-summer-olympics	https://www.latimes.com/politics
https://www.latimes.com/people/david-wharton	https://www.latimes.com/newsroom-directory

QUERY: STOCK

LUCENE	PAGERANK
https://www.latimes.com/business/story/2019-11-06/uber-lock-up-period-ends-with-falling-stock-protests	https://www.latimes.com/
https://www.latimes.com/business/la-fi-lyft-stock-20190401-story.html	https://www.latimes.com/business
https://www.latimes.com/business/la-fi-hy-tesla-stock-20160518-snap-story.html	https://www.latimes.com/business/real-estate
https://www.latimes.com/business/story/2019-11-06/uber-lock-up-period-ends-with-falling-stock-protests	https://www.latimes.com/business/story/2019-11-08/trump-china-tariffs
https://www.latimes.com/business/story/2019-11-09/stock-managers-who-played-defense-in-2019-are-left-scrambling-to-make-up-ground	https://www.latimes.com/business/real-estate/story/2019-11-09/hulu-looking-for-alaska-landry-bender
https://www.latimes.com/business/la-fi-uber-ipo-stock-trading-price-20190510-story.html	https://www.latimes.com/business/real-estate/story/2019-11-09/hot-property-very-brady-sale-malibu
https://www.latimes.com/business/story/2019-09-09/at-t-stock-surges-elliott-reveals-3-2-billion-stake	https://www.latimes.com/politics/story/2019-11-08/elizabeth-warren-used-bare-knuckle-tactics-to-take-down-an-obama-nominee
https://www.latimes.com/business/la-fi-stock-market-status-update-20180209-story.html	https://www.latimes.com/business/story/2019-11-08/gap-ceo-was-done-in-by-fashion-missteps-and-fading-brands
https://www.latimes.com/business/la-fi-stock-market-correction-20180212-story.html	https://www.latimes.com/business/real-estate/story/2019-11-09/hot-property-newsletter-rifleman-leads-the-posse-on-a-little-mosey-down-memory-lane
https://www.latimes.com/business/la-fi-stock-market-cpi-roundup-20180214-story.html	https://www.latimes.com/business/story/2019-11-09/stock-managers-who-played-defense-in-2019-are-left-scrambling-to-make-up-ground

QUERY: VIRUS

LUCENE	PAGERANK
https://www.latimes.com/espanol/internacional/articulo/2019-11-09/monos-se-volvieron-inmunes-tras-inocularles-virus-del-ebola-con-mutacion	https://www.latimes.com/terms-of-service
https://www.latimes.com/science/sciencenow/la-sci-science-of-zika-five-ways-20160223-htmlstory.html	https://www.latimes.com/espanol/
https://www.latimes.com/espanol/internacional/articulo/2019-11-09/monos-se-volvieron-inmunes-tras-inocularles-virus-del-ebola-con-mutacion	https://www.latimes.com/science
https://www.latimes.com/science/story/2019-10-21/virus-afm-illness-paralyzing-kids	https://www.latimes.com/espanol/internacional
https://www.latimes.com/science/story/2019-10-21/virus-afm-illness-paralyzing-kids	https://www.latimes.com/espanol/deportes/articulo/2019-11-09/como-ser-campeon-de-league-of-legends
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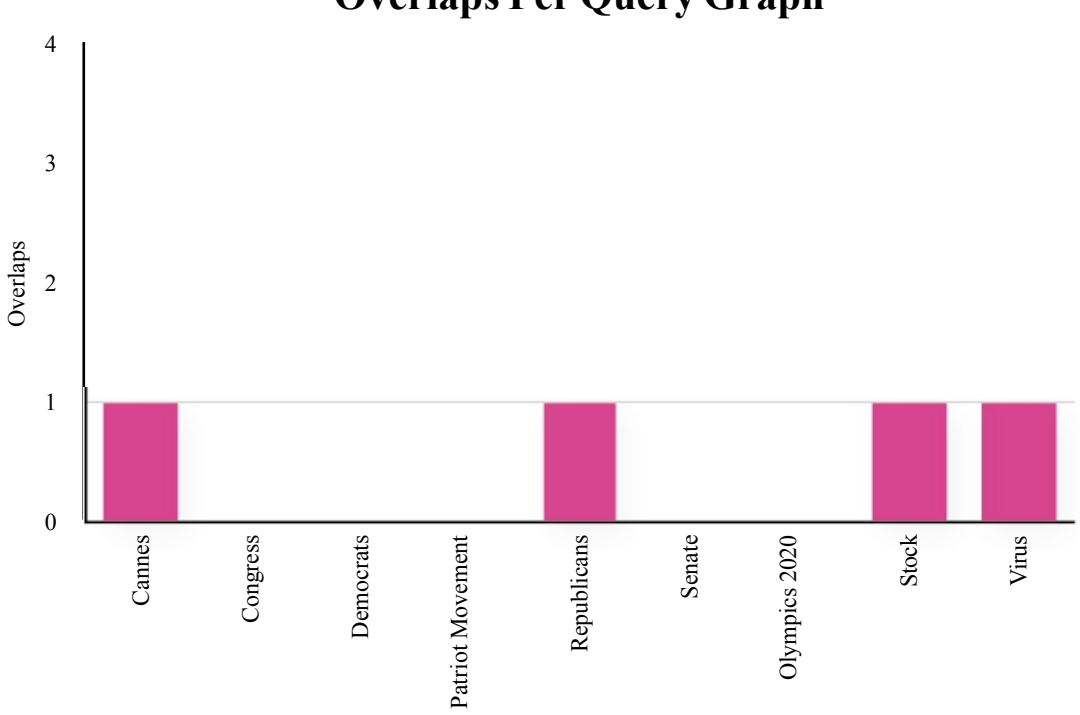
Overlaps Per Query Graph
Overlaps
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Cannes
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