CSCI 572: Information Retrieval and Web Search Engines
Homework 4: Comparing Search Engine Ranking Algorithms

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Website Indexed: LATimes

Step 1: Solr Installation:

- Installed Ubuntu 16 on my Windows laptop in dual boot mode.
- I downloaded solr 7.5.0 from the mentioned website and unzipped the tar.
- I started the solr using bin/solr start.
- Post which, I created a core using the command: bin/solr create -c myexample, as suggested in the document and named it 'myexample'.
- Solr was launched in the web browser at port 8983: localhost:8983/solr/#

Difficulties faced:

- I installed java 1.8.0_45,(Version:8), and solr was starting because of the old java version. I upgraded java 8 to java 8-1.8.0_141, and then solr was able to come up.

Step 2: Indexing the HTML files:

- Started the solr server using bin/solr start.
- I edited the managed-schema file in the conf folder so that all the text content can be mapped properly.
- This was reflected in Solr admin page in the dropdown.

    Step 3: Apache, PHP installation:

- I installed both using the below commands:

                sudo apt-get install apache2

                sudo apt-get install libapache2-mod-php

- Post which the files are kept in var/www/html and tested for basic configuration.

    Step 4: Page Rank algorithm:

- I downloaded Jsoup from the Web and wrote a Java file List.java to find the edgelist for the websites
- Unnecessary files were deleted and only .html files are kept in a separate folder.

- Written the code to construct various data structures such as: map*, urlFileMap and fileUrlMap to construct the edgelist.
- All the outputs are consolidated in a separate file called edgelist.txt.
- The above program was written with the help of external library: jSoup and contains web page files as vertices and edge between two indicates a link between them.

  In summary:
- a) Extract outgoing links
- b) Find the file name for each outgoing link using the provided map* files
- c) Create edges between files that have links connecting them (You can either use the

Step 5: Python program to compute PageRanks:

Downloaded and installed the NetworkX python library from https://pypi.python.org/pypi/networkx/

- G = nx.read_edgelist("edgeList.txt", create_using=nx.DiGraph())
- I used the below parameters for conversion:
- **alpha=0.85, personalization=None, max_iter=30, tol=1e-06, nstart=None, weight='weight',dangling=None**

Step 6: Modified managed-schema as below to take care of PageRank external file:

- <fieldType name="external" keyField="id" defVal="0" class="solr.ExternalFileField" />
- <field name="pageRankFile" type="external" stored="false" indexed="false" />

Step 7: Same has been done for solrconfig.xml:

- <listener event="newSearcher" class="org.apache.solr.schema.ExternalFileFieldReloader" />
- <listener event="firstSearcher" class="org.apache.solr.schema.ExternalFileFieldReloader" />

Step 8: Additional changes:

- I placed the calculated external_pageRankFile.txt file in data folder of the created core. Post which, solr was reloaded to take care of new changes.
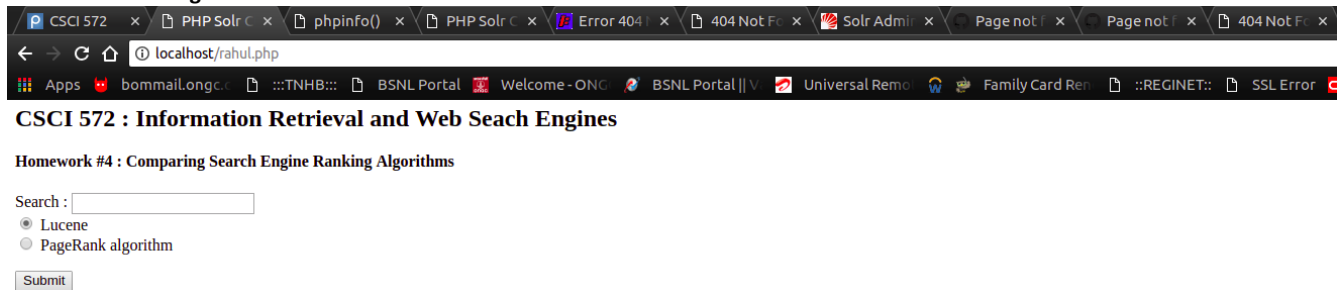
Explanation regarding why some pages have higher PageRank values than others:

Some pages have higher PageRank because the algorithm calculates score for each page by computing the number of incoming links to itself. In our case, this data is being fed from external_edgelist.txt file. PageRank works by counting the number and quality of links to a page to determine a rough estimate of how important the website is. The underlying assumption is that more important websites are likely to receive more links from other websites.

The graph is calculated using jSoup and the algorithm calculated the vector space model based on term frequency. The Boolean model is first used to narrow down the documents that need to be scored based on the use of Boolean logic in the query specification. However, all these weights are directly dependable on the number of incoming links to it.

Flow for the query "North Korea":

Initial Page:

Results for Lucene:

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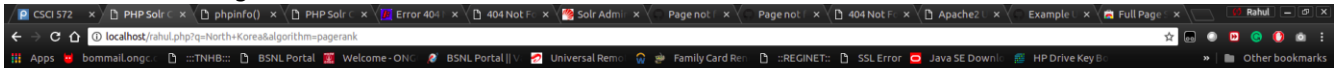
Search : North Korea

- Lucene
- PageRank algorithm

Submit

Results 1 - 10 of 8163:

1. Title : Will Trump bring up North Korea's dreadful human rights record when he meets Kim?
URL : http://www.latimes.com/world/la-fg-trump-kim-north-korea-summit-will-president-trump-bring-up-north-1528706649-htmlstory.html
ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/6aa59967-8a2e-46e1-a93d-42c64e327968.html
Description : The top billing at Tuesday's summit between President Trump and North Korea's Kim Jong Un is undoubtedly the reclusive regime's nuclear weapons. That's left some observers and analysts concerned that long-running concerns about North Korea's checkered history on human rights will be completely s...

2. Title : Trump becomes first U.S. president to meet a North Korean head of state
URL : http://www.latimes.com/world/la-fg-trump-kim-north-korea-summit-trump-becomes-first-u-s-president-to-1528766878-htmlstory.html
ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/bce3e78b-3348-43db-82ce-cebce863c3ca.html
Description : The world's most powerful leader and its most reviled shook hands in front of an array of six U.S. and six North Korean flags Tuesday as President Trump greeted North Korean despot Kim Jong Un before they sat down to negotiate over nuclear disarmament on the Korean peninsula. The two initially me...

3. Title : Kimchi-flavored ice cream: A small gesture for world peace?
URL : http://www.latimes.com/world/la-fg-trump-kim-north-korea-summit-kimchi-flavored-ice-cream-a-small-1528697996-htmlstory.html
ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/8ed95def-5e56-4f7f-9066-b9d079907089.html
Description : More than 2,000 foreign journalists are packing a downtown Singapore convention center that typically hosts media for Formula One racing to cover the historic meeting between President Trump and North Korean leader Kim Jong Un. The media pack is following the news, but it also needs to eat.

4. Title : Swift North Korean coverage of Kim Jong Un's trip a departure for nation's typically delayed media
URL : http://www.latimes.com/world/la-fg-trump-kim-north-korea-summit-swift-north-korean-coverage-of-kim-jong-1528782028-htmlstory.html
ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/3b367e2c-7794-4b2e-94e6-d981e1a462e5.html
Description : The images so far from the summit between President Trump and North Korean leader Kim Jong Un are historically striking, but so too perhaps is an image reported in the totalitarian state's official newspaper.

5. Title : North Korea says it will suspend nuclear and missile testing - Los Angeles Times
URL : http://www.latimes.com/world/la-fg-north-korea-nuclear-20180420-story.html
ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/53ba4999-c415-4bf3-af51-9264128be5d0.html
Description : The North's official Korean Central News Agency said the suspension of nuclear and ICBM tests went into effect Saturday.

6. Title : Pompeo concludes 'productive' meeting with Kim Jong Un: Another 'step forward' in nuclear talks - Los Angeles Times
URL : http://www.latimes.com/nation/la-na-pol-pompeo-north-korea-20181007-story.html
ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/57c53b91-2d68-4b44-b003-434390dadab1.html
Description : Secretary of State Michael R. Pompeo concluded what he called a "productive" meeting with North Korean leader Kim Jong Un, calling it another "step forward" in tortuous talks to dismantle the nation's nuclear arsenal.

7. Title : The first casualty of North Korean nuclear tests? The country's environment - Los Angeles Times
URL : http://www.latimes.com/world/la-fg-north-korea-environment-20171006-story.html
ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/f80a0652-8064-4673-8abb-201bf2f90df2.html
Description : Weeks after North Korea's sixth and largest nuclear test, the ground is still rumbling. Two small earthquakes have occurred since then.

8. Title : North Korea says Trump declared war via tweet. The White House says it didn't - Los Angeles Times
URL : http://www.latimes.com/world/asia/la-fg-north-korea-war-threat-20170925-story.html
ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/ec5e9c55-0652-4560-8aea-d34a80038f76.html
Description : North Korea's Foreign Minister Ri Yong Ho said a tweet by President Trump was a declaration of war on the nation, but the White House says it seeks peaceful denuclearization.

9. Title : North Korea foreign minister says Trump's insults make rocket attack on U.S. 'inevitable all the more' - Los Angeles Times
URL : http://www.latimes.com/nation/la-fg-north-korea-foreign-minister-20170923-story.html
ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/e2122618-6b12-43b6-9379-fa5cee48dc76.html
Description : President Trump's insults of North Korea's leader make war more likely, the country's foreign minister says.

10. Title : Whatever comes next, North Korea's Kim Jong Un can claim a win against Trump - Los Angeles Times
URL : http://www.latimes.com/world/asia/la-fg-trump-north-korea-analysis-20180309-story.html
ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/ba84b5a3-e4fe-40fc-b4c5-1375c0f13d77.html
Description : North Korean leader Kim Jong Un has scored a huge win with President Trump's agreement to sit down for a meeting.

1st Result of Lucene:

www.latimes.com/world/la-fg-trump-kim-north-korea-summit-will-president-trump-bring-up-north-1528706649-htmlstory.html

Los Angeles Times

WORLD

Singapore summit: Historic meeting between President Trump and North Korea's Kim Jong Un

32 POSTS   EXPLAINERS   SCENE   ✕ CLEAR

...dreadful ... Kim?

Results for PageRank:

CSCI 572 | PHP Solr C | phpinfo() | PHP Solr C | Error 404 | 404 Not Fo | Solr Admin | Page not | Page not | 404 Not Fo | Apache2 | Example | Full Page   Rahul

localhost/rahul.php?q=North+Korea&algorithm=pagerank

Apps   bommail.ongc   :::TNHB:::   BSNL Portal   Welcome - ONG   BSNL Portal || Universal Remc   Family Card Ren   ::REGINET::   SSL Error   Java SE Downlc   HP Drive Key Bc   »   Other bookmarks

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Homework #4 : Comparing Search Engine Ranking Algorithms
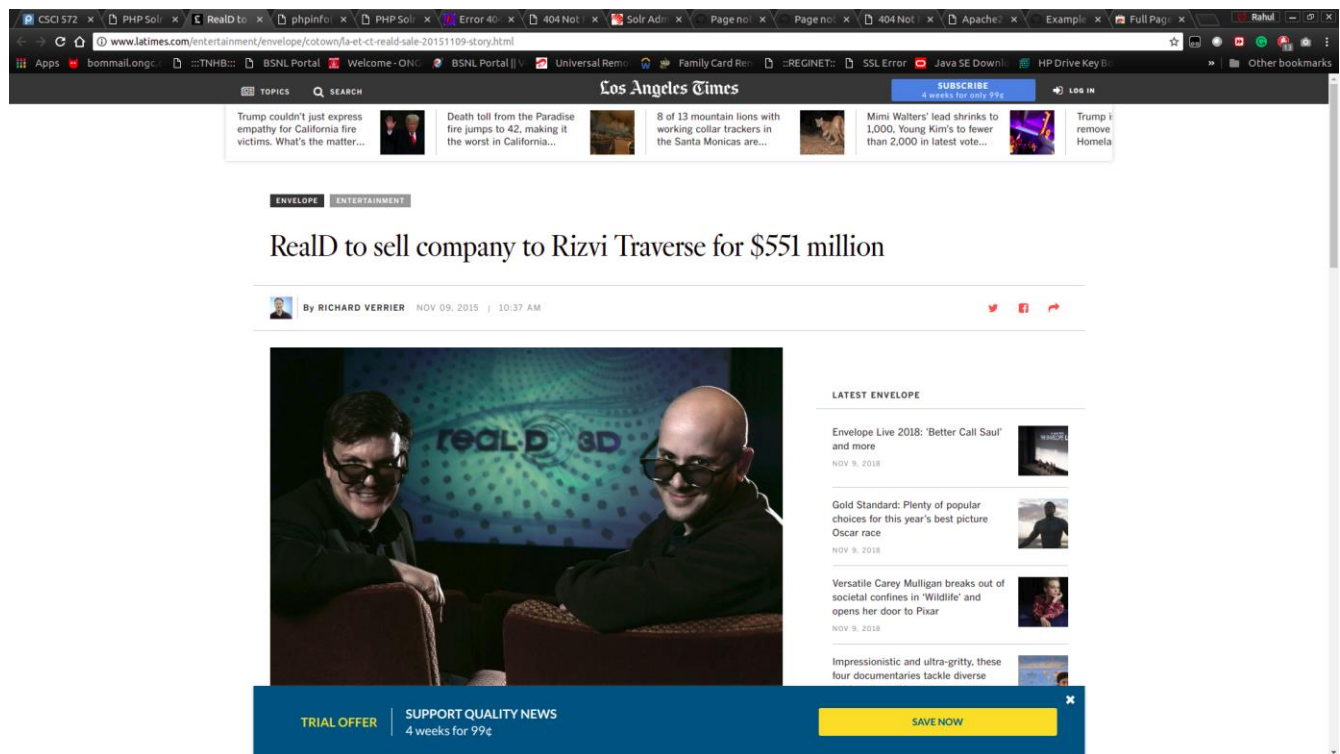
Search : North Korea

- ⦿ Lucene
- ◯ PageRank algorithm

Submit

Results 1 - 10 of 8163:

1. Title : RealD to sell company to Rizvi Traverse for $551 million - Los Angeles Times
   URL : http://www.latimes.com/entertainment/envelope/cotown/la-et-ct-reald-sale-20151109-story.html
   ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/latimes/b3afb350-34dc-4292-baa5-9e8d2ecd339b.html
   Description : N/A
2. Title : WarnerMedia announces new streaming service to compete with Netflix and Disney - Los Angeles Times
   URL : http://www.latimes.com/business/hollywood/la-fi-ct-att-streaming-service-20181010-story.html
   ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/latimes/c98d4a99-6ad9-403a-a8e6-b81ccca4ddb3.html
   Description : The AT&T-owned media company is planning a streaming service that will launch late next year, said WarnerMedia Chief Executive John Stankey.
3. Title : New LAFD recruit class is nearly all male, overwhelmingly white - Los Angeles Times
   URL : http://www.latimes.com/local/lanow/la-me-ln-new-lafd-recruit-class-nearly-all-male-overwhelmingly-white-20140106-story.html
   ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/latimes/5eb33733-883d-4eff-a94b-0164b6ef8258.html
   Description : N/A
4. Title : When Pope Francis lands in Ireland, he'll confront the legacy of the Catholic Church's sex abuse scandal - Los Angeles Times
   URL : http://www.latimes.com/world/europe/la-fg-ireland-pope-visit-20180822-story.html
   ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/latimes/5b65c73d-8b57-4a30-b466-9fd0e4a11544.html
   Description : When Pope Francis lands in Dublin on Saturday morning, he will encounter a much-changed land to the one that gave predecessor John Paul II a euphoric welcome nearly four decades ago.
5. Title : Hawaii defeats South Korea 3-0 to win Little League title - Los Angeles Times
   URL : http://www.latimes.com/sports/sportsnow/la-sp-little-league-world-series-20180826-story.html
   ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/latimes/8cc4878-26c4-4dcb-8945-9d9613536696.html
   Description : It only took one pitch for Mana Lau Kong to deliver Hawaii its first Little League World Series title in a decade.
6. Title : California prosecutors have turned the tables on Planned Parenthood's undercover video tormentors - Los Angeles Times
   URL : http://www.latimes.com/local/abcarian/la-me-abcarian-ppfa-charges-20170412-story.html
   ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/latimes/3bb6103d-fd9f-416c-a562-65cb27239a39.html
   Description : California Atty. Gen. Javier Becerra did not go far enough when he filed felony charges against David Daleiden and Sandra Merritt
7. Title : 'Inside the Actors Studio' is moving to Ovation TV: James Lipton will fade to a behind-the-scenes role - Los Angeles Times
   URL : http://www.latimes.com/business/hollywood/la-et-st-inside-actors-studio-ovation-20180924-story.html
   ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/latimes/715ae31c-f82e-4963-8e61-298d1ac043cb.html
   Description : After 24 years on Bravo, the Actors Studio is moving its iconic show "Inside the Actors Studio" to Ovation TV, the small independent channel dedicated to the arts.
8. Title : Rise of California's no-party voter - Los Angeles Times
   URL : http://www.latimes.com/local/la-ca-g-rise-of-californias-no-party-voter-20141026-htmlstory.html
   ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/latimes/e93d0c1a-4d9c-4bd9-bc3b-f2129947e745.html
   Description : N/A
9. Title : Top surfers to compete in May just south of ... Fresno? - Los Angeles Times
   URL : http://www.latimes.com/local/california/la-me-ln-slater-inland-surf-contest-20180228-story.html
   ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/latimes/1702ae7a-cd6b-4a77-928e-4f6da471d987.html
   Description : The top professional surfers from around the world will converge south of Fresno in May to compete at Kelly Slater's wave pool.
10. Title : More than a dozen women and a man among those accusing Orange County surgeon of sexual assault - Los Angeles Times
    URL : http://www.latimes.com/local/lanow/la-me-ln-robicheaux-charges-update-20180921-story.html
    ID : /home/rahul/Desktop/HW4-Rahul/Data/latimes-20181112T035524Z-001/latimes/latimes/latimes/869aca29-3004-47b9-ab54-bd9d62a95bed.html
    Description : More than a dozen women plus a man have come forward this week to accuse a Newport Beach surgeon, who has already been charged with drugging and raping two women, of additional sexual assaults with at least one dating back two decades.

1st result of PageRank:

Los Angeles Times

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TOPICS | SEARCH

Trump couldn't just express empathy for California fire victims. What's the matter... | Death toll from the Paradise fire jumps to 42, making it the worst in California... | 8 of 13 mountain lions with working collar trackers in the Santa Monicas are... | Mimi Walters' lead shrinks to 1,000, Young Kim's to fewer than 2,000 in latest vote... | Trump remove Homela

ENVELOPE | ENTERTAINMENT

RealD to sell company to Rizvi Traverse for $551 million

By RICHARD VERRIER | NOV 09, 2015 | 10:37 AM

LATEST ENVELOPE

Envelope Live 2018: 'Better Call Saul' and more
NOV 9, 2018

Gold Standard: Plenty of popular choices for this year's best picture Oscar race
NOV 9, 2018

Versatile Carey Mulligan breaks out of societal confines in 'Wildlife' and opens her door to Pixar
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Query Results

Donald Trump	
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http://www.latimes.com/nation/politics/trailguide/la-na-trailguide-updates-donald-trump-open-to-allowing-those-in-1473296491-htmlstory.html	http://www.latimes.com/fashion/la-ig-wwd-estee-lauder-sues-deciem-founder-20181011-story.html
http://www.latimes.com/politics/la-pol-ca-donald-trump-california-races-downticket-20160527-snap-htmlstory.html	http://www.latimes.com/sports/ducks/la-sp-ducks-what-we-learned-20181011-story.html
http://www.latimes.com/opinion/op-ed/la-oe-johnston-trump-cons-and-cheats-20181004-story.html	http://www.latimes.com/local/lanow/la-me-ln-adelanto-oig-20181002-story.html
http://www.latimes.com/sports/olympics/la-sp-olympics-live-updates-the-	http://www.latimes.com/health/la-he-safety-tips-for-women-who-run-20180922-story.html

[moment-when-the-donald-trump-and-kim-1518187562-htmlstory.html](#)	
[Whom do you believe, Michael Cohen or Donald Trump? Yes, that's a rhetorical question](#)	[http://www.latimes.com/local/education/la-me-edu-puc-charter-closes-20180824-story.html](#)
[http://www.latimes.com/espanol/politica/la-es-dos-funerales-y-una-boda-el-rechazo-a-donald-trump-20180828-story.html](#)	[http://www.latimes.com/local/lanow/la-me-ln-new-lafd-recruit-class-nearly-all-male-overwhelmingly-white-20140106-story.html](#)
[http://www.latimes.com/nation/politics/trailguide/la-na-live-updates-trailguide-1475872277-htmlstory.html](#)	[http://www.latimes.com/politics/essential/la-pol-ca-essential-politics-may-2018-california-lawmakers-pass-bill-designed-1535781153-htmlstory.html](#)
[http://www.latimes.com/opinion/la-ol-enter-the-fray-donald-trump-might-actually-have-to-1535040294-htmlstory.html](#)	[http://www.latimes.com/world/europe/la-fg-ireland-pope-visit-20180822-story.html](#)
[http://www.latimes.com/entertainment/tv/la-et-st-donald-trump-60-minutes-20161110-story.html](#)	[http://www.latimes.com/business/la-fi-himi-jurich-sunrun-20180318-htmlstory.html](#)

LA Lakers	
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[http://www.latimes.com/sports/lakers/la-sp-lakers-plaschke-20180924-story.html](#)	[http://www.latimes.com/fashion/la-ig-wwd-estee-lauder-sues-deciem-founder-20181011-story.html](#)
[http://www.latimes.com/sports/lakers/la-sp-lakers-plaschke-20180924-story.html](#)	[http://www.latimes.com/entertainment/arts/culture/la-ca-cm-ann-philbin-20180615-story.html](#)
[http://www.latimes.com](#)	[http://www.latimes.com/business/hollywood/la-fi-](#)

	ct-att-streaming-service-20181010-story.html
http://www.latimes.com	http://www.latimes.com/sports/ducks/la-sp-ducks-what-we-learned-20181011-story.html
http://www.latimes.com/sports/lakers/la-sp-lakers-media-day-20180924-story.html	http://www.latimes.com/world/middleeast/la-fg-israel-temple-mount-20160422-story.html
http://www.latimes.com	http://www.latimes.com/opinion/op-ed/la-oe-0111-quartz-lausd-schools-20160111-story.html
http://www.latimes.com/sports/lakers/la-sp-lakers-sidebar-20180924-story.html	http://www.latimes.com/local/lanow/la-me-ln-adelanto-oig-20181002-story.html
http://www.latimes.com/sports/lakers/la-sp-lakers-5-questions-20181013-story.html	http://www.latimes.com/health/la-he-safety-tips-for-women-who-run-20180922-story.html

Star Wars	
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http://www.latimes.com/entertainment/movies/la-ca-mn-star-wars-timeline-20180516-story.html	http://www.latimes.com/entertainment/envelope/cotown/la-et-ct-reald-sale-20151109-story.html
http://www.latimes.com/entertainment/movies/la-et-mn-star-wars-last-jedi-characters-20171214-htmlstory.html	http://www.latimes.com/business/hollywood/la-fi-ct-att-streaming-service-20181010-story.html
http://www.latimes.com/travel/themeparks/la-trb-star-wars-land-disneyland-20150817-story.html	http://www.latimes.com/entertainment/la-et-tiff-2018-toronto-film-festival-the-weekend-cast-describe-working-with-1536761909-htmlstory.html
http://www.latimes.com/entertainment/movies/la-et-mn-ron-howard-star-wars-han-solo-20170622-story.html	http://www.latimes.com/local/lanow/la-me-ln-new-lafd-recruit-class-nearly-all-male-overwhelmingly-white-20140106-story.html
http://www.latimes.com/fashion/la-ig-wwd-rag-and-bones-star-wars-20171106-story.html	http://www.latimes.com/world/europe/la-fg-ireland-pope-visit-20180822-story.html

http://www.latimes.com/fashion/la-ig-wwd-rag-and-bones-star-wars-20171106-story.html	http://www.latimes.com/local/abcarian/la-me-abcarian-ppfa-charges-20170412-story.html
http://www.latimes.com/entertainment/herocomplex/la-et-hc-jon-favreau-star-wars-mandalorian-20181003-htmlstory.html	http://www.latimes.com/entertainment/la-et-entertainment-news-updates-august-one-mississippi-season-2-1503947289-htmlstory.html
http://www.latimes.com/entertainment/herocomplex/la-et-hc-comic-con-star-wars-fandom-20180723-htmlstory.html	http://www.latimes.com/business/hollywood/la-et-st-inside-actors-studio-ovation-20180924-story.html
http://www.latimes.com/brandpublishing/travelplus/lasvegasguide/features/la-ss-vegas-the-hot-list-burlesque-star-wars-speakeasies-20180620dto-story.html	http://www.latimes.com/local/la-ca-g-rise-of-californias-no-party-voter-20141026-htmlstory.html
http://www.latimes.com/entertainment/music/la-et-ms-star-wars-secrets-empire-20180116-story.html	http://www.latimes.com/projects/la-et-mn-film-critics-diversity/

Lebron James	
LUCENE	**PAGERANK**
http://www.latimes.com/sports/lakers/la-sp-lakers-lebron-james-diet-20181004-story.html	http://www.latimes.com/entertainment/envelope/cotown/la-et-ct-reald-sale-20151109-story.html
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Overlaps:

No overlaps seen for all queries.