

## IR - Assignment 4

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### Step 1: Solr Installation

- I downloaded solr and configured it by following the steps mentioned in the guidelines
- Started the solr using the command - bin/solr start
- Then i created the core using the command - bin/solr create\_core -c myexample
- Launched the solr admin panel on port 8983- <http://localhost:8983/solr/#>

### Step 2: Indexing

- Downloaded the NBC News Data from the google drive link in the guidelines.
- Indexed the html files using the command - bin/post -c myexample -filetypes html /Users/parth/desktop/usc/ir/assignment4/NBC\_News/HTMLfiles

The screenshot shows the Solr Admin interface for the 'myexample' core. The left sidebar lists various sections: Dashboard, Logging, Core Admin, Java Properties, Thread Dump, Overview, Analysis, Dataimport, Documents, Files, Ping, Plugins / Stats, Query, Replication, Schema, and Segments info. The main area has two tabs: Statistics and Instance. The Statistics tab displays metrics like Last Modified (2 days ago), Num Docs (15725), Max Doc (15725), Heap Memory (-1), Deleted Docs (0), Version (118), Segment Count (19), and Current (✓). The Instance tab shows CWD: /Users/parth/Desktop/USC/IR/Assignment4/solr-7.3.0/server, Instance: /Users/parth/Desktop/usc/ir/assignment4/solr-7.3.0/server/solr/myexample, Data: /Users/parth/Desktop/USC/IR/Assignment4/solr-7.3.0/server/solr/myexample/data, Index: /Users/parth/Desktop/USC/IR/Assignment4/solr-7.3.0/server/solr/myexample/data/index, and Imp: org.apache.solr.core.NRTCachingDirectoryFactory. Below these tabs is a Healthcheck section stating "Ping request handler is not configured with a healthcheck file." The Replication (Master) section shows a table with columns Version, Gen, and Size. It lists two master instances: one searching (Version 1523239648346, Gen 20, Size 350.76 MB) and one replicable (Version -, Gen -, Size -). At the bottom of the interface are links to Documentation, Issue Tracker, IRC Channel, Community forum, and Solr Query Syntax.

### Step 3 : Implementation of Page Rank algorithm

- Download jsoup jar and write List1.java to find edge list for the given website data.

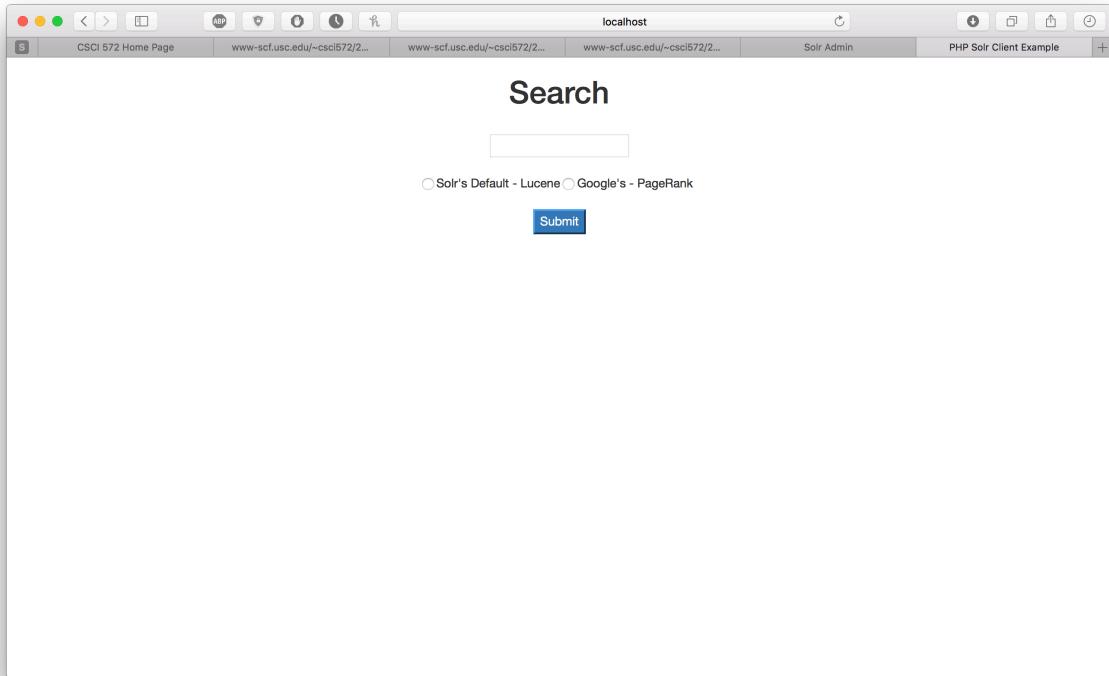
The terminal window displays the output of the List1.java program, which is a list of URLs. The list starts with:

```
43212b2bab978501b9f2ff61f06cd19c.html ff129bd5d9fe133519b39358657f57c5.html  
88510cbffcc0a32130c20c32a1a0ecfa.html 980defef9ff4d1022b26a791fc9b9f248.html  
04c528f2dc553ea3b327ef6d65ddd04ff.html 76d165fb69365bd2f1f08ceff66b437ba.html  
e0987f1d1bb1d10f4f449fc22ab1df5ed8.html 58a22b26788b93835aab8770a4a973.html  
3f208c8ad6d1f3c288910bf2a677dbd.html ad48d011d907535eb026008eaca5d0b9.html  
f2dc7af9c20345b7238aad3488b2f6c.html 98fb56cacf81c4f46fea84b08a9a35b7f.html  
765beb0319188ed07cef0eda52a5a7f.html aaca8cd739676b9fbcc6052623d59432.html  
416e4ee8e040fd1d844a5f3698adac4dc5.html 370b223e504c72d724dd79b8ca3d4e.html  
8f59622e7c315b9e8ca568289799bad.html 77b86639d1384ac68141803e5db27c8.html  
bd78ac0e4fa6e6d6bb0d04876b9f98.html 96c623e46dale24c7a9186a87738a9.html  
d2f51ddaa956245c0005e05a08f24.html 37d475c89bbb5a2133bd58fd7fae5c7.html  
b76300e39f10467d1d0c5ea135db51d1.html 97adc5f059794a9fb2869443ae302b.html  
c7835e7fff9d4ddffafab0c78f167cc970.html 4c6cb747c24dc4b2a063c2586d7e4a13.html  
a58080de4d26ded57f94d124e77fc89a.html f0cdde49a2deab19f79483edd0d97795.html  
3b3258a1b33a0edebebe4f3fd785f6.html 87e17622127da534c1d30ed8698d0c.html  
a680fd9530438ce876dd6f9174b61fe.html 77b86639d1384ac68141803e5db27c8.html  
7fa5f17074d719cd09ed4f19b708094.html a04afcde4642feda57c5d668361b6e45.html  
0172bc28482a9b876d592db0a1d99b0.html 9ab7164396bbc17f133797ff3de9499a.html  
916b6c94a3a5c69991c1752c0988c9364.html 3e65126257871132c203bea129262b1.html  
fc6ta9f057dd5d6711de1a14363833.html c567743bd047f363b9c7f7deab8126494.html  
aa83c7489ee153a6310f2fba50c71d.html 582a22026788b93835aab8770a4a973.html  
765beb0319188ed07cef0eda52a5a7f.html 03190167031f6ctef7c7ba9b8cd5568.html  
d18659e13d77abe3501c5458468806.html 526e34baa0856a707401d43105abd2d1.html  
2849b1ed5b0b6c21a59ad07822108c8.html 7f16393dd23388b6c56ae7732972742.html  
f5f2028cb0e60f86d0cc6a6d8802709.html 4048a864c02625276e277de6f2695246.html  
eed4616b94d7c0d4f06bdcc557512d1.html af1fed9a89269534a7116bf1a2d49e62c7.html  
e0916e0a6fc87f049802941061447109.html 9c6c23e460a1e24c7a9186ac8738aa9.html  
3f168dddc1a1c2729c71cf196246428.html 03190167031f6ctef7c7ba9b8cd5568.html  
c0f6596b72e994b988432ee07dcf595.html 4c170cde13f12c57669706e4e0d1a7080.html  
1084269353f130d1cfd86d933e35923f.html 77b86639d1384ac68141803e5db27c8.html
```

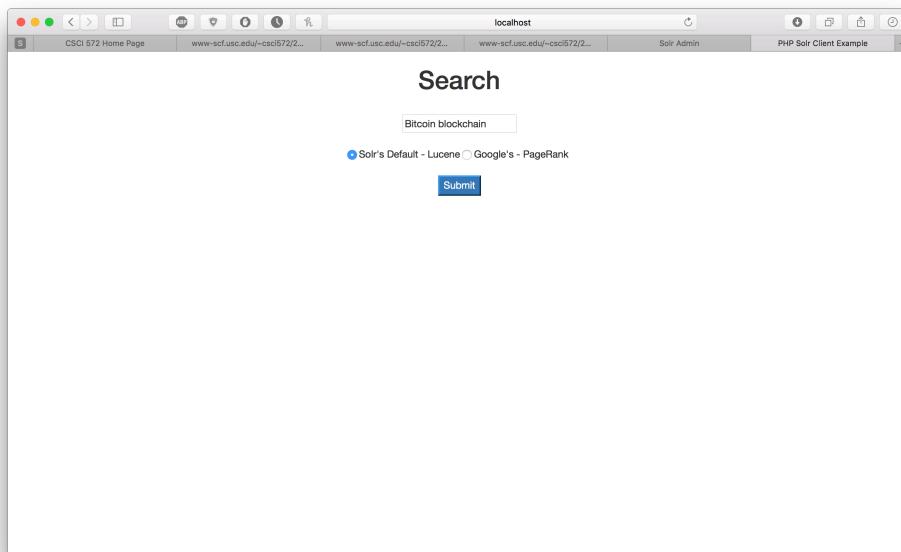
- Use networkx library to read the edge list and generate page rank for each file and store it in external\_pageRankFile.txt
- The following page rank parameters are to be used : alpha=0.85, personalization=None, max\_iter=30, tol=1e-06, nstart=None, weight='weight', dangling=None
- Copy the external\_pageRankFile.txt to the data folder of the working core.

## Working Flow

1. Running the assignment4.php on apace server, gives the following GUI



Enter the query in the search box and select the algorithm to be executed – Lucene or PageRank. On pressing the submit button the results are shown on the same page as shown in the below screenshot. The clickable links in the result redirect to the source URL. The process for querying is shown in the below screenshots.



localhost

S CSCI 572 Home Page www-scf.usc.edu/~csci572/2... www-scf.usc.edu/~csci572/2... www-scf.usc.edu/~csci572/2... Solr Admin PHP Solr Client Example +

## Search

Bitcoin blockchain

Solr's Default - Lucene  Google's - PageRank

**Submit**

Results 1 - 10 of 16:

ID	/Users/parth/desktop/usc/ir/assignment4/NBC_News/HTMLfiles/27640bb3f3bb0345f023330f021248e0.html
Title	How Bitcoin and other cryptocurrencies could kill off cash
Description	N/A
URL	<a href="https://www.nbcnews.com/mach/science/how-bitcoin-other-cryptocurrencies-could-kill-cash-ncna857036">https://www.nbcnews.com/mach/science/how-bitcoin-other-cryptocurrencies-could-kill-cash-ncna857036</a>
ID	/Users/parth/desktop/usc/ir/assignment4/NBC_News/HTMLfiles/c346a4bb29558ea93d980d10cc15b5db.html
Title	Bitcoin pays for entire wedding as its price soars past \$16,000
Description	N/A
URL	<a href="https://www.nbcnews.com/tech/innovation/bitcoin-pays-entire-wedding-its-price-soars-past-16-000-n826776">https://www.nbcnews.com/tech/innovation/bitcoin-pays-entire-wedding-its-price-soars-past-16-000-n826776</a>
ID	/Users/parth/desktop/usc/ir/assignment4/NBC_News/HTMLfiles/9ba27c9494397c038fe869bcb1e76a27.html
Title	What is Bitcoin? And should you invest in it?
Description	N/A
URL	<a href="https://www.nbcnews.com/better/business/what-bitcoin-should-you-invest-it-ncna844106">https://www.nbcnews.com/better/business/what-bitcoin-should-you-invest-it-ncna844106</a>
ID	/Users/parth/desktop/usc/ir/assignment4/NBC_News/HTMLfiles/b4f26bcd9d8731708d5e1972ccf26fd7.html
Title	Middle America Is Crazy in Love With Bitcoin
Description	N/A
URL	<a href="https://www.nbcnews.com/business/economy/middle-america-crazy-love-bitcoin-n789011">https://www.nbcnews.com/business/economy/middle-america-crazy-love-bitcoin-n789011</a>
ID	/Users/parth/desktop/usc/ir/assignment4/NBC_News/HTMLfiles/bd4b5429a95df351b03e78a7296fb9c3.html
Title	How Bitcoin and other cryptocurrencies could kill off cash
Description	As retailers embrace cryptocurrencies like Bitcoin, Ethereum, and Ripple, national governments are looking into creating virtual currencies of their own.
URL	<a href="https://www.nbcnews.com/technology/how-bitcoin-and-other-cryptocurrencies-could-kill-off-cash-ncna857036">https://www.nbcnews.com/technology/how-bitcoin-and-other-cryptocurrencies-could-kill-off-cash-ncna857036</a>

nbcnews.com

S CSCI 572 Home Page www-scf.usc.edu/~csci572/2... www-scf.usc.edu/~csci572/2... www-scf.usc.edu/~csci572/2... Solr Admin How Bitcoin and other crypto...

**MACH**

TECHNOLOGY

## How Bitcoin and other cryptocurrencies could kill off cash

National governments are also looking into creating virtual currencies of their own.

by David Cox / Mar. 16, 2018 / 8:50 AM ET

ID	Title	Description	URL
/Users/parth/Desktop/usc/ir/assignment4/NBC_News/HTMLFiles/bd4b5429a95df351b03e78a7296fb9c3.html	How Bitcoin and other cryptocurrencies could kill off cash	As retailers embrace cryptocurrencies like Bitcoin, Ethereum, and Ripple, national governments are looking into creating virtual currencies of their own.	<a href="https://www.nbcnews.com/mach/science/how-bitcoin-other-cryptocurrencies-could-kill-cash-ncna857036">https://www.nbcnews.com/mach/science/how-bitcoin-other-cryptocurrencies-could-kill-cash-ncna857036</a>
/Users/parth/Desktop/usc/ir/assignment4/NBC_News/HTMLFiles/6a42ececce3dd5fc9374810dd3a80e33.html	Bitcoin, other cryptocurrencies plunge on wave of bad news	Google said it will ban cryptocurrency-related ads, the IMF called for global regulation and members of Congress slammed them at a hearing Wednesday.	<a href="https://www.nbcnews.com/tech/tech-news/bitcoin-other-cryptocurrencies-plunge-wave-bad-news-n856821">https://www.nbcnews.com/tech/tech-news/bitcoin-other-cryptocurrencies-plunge-wave-bad-news-n856821</a>
/Users/parth/Desktop/usc/ir/assignment4/NBC_News/HTMLFiles/8cd735f82094cc96ccb46de189b7fb3.html	Bitcoin pays for entire wedding as its price soars past \$16,000	With Bitcoin hitting a record high of over \$16,000, one wedding in Indiana just got bigger.	<a href="https://www.nbcnews.com/tech/innovation/bitcoin-pays-entire-wedding-its-price-soars-past-16-000-n826776">https://www.nbcnews.com/tech/innovation/bitcoin-pays-entire-wedding-its-price-soars-past-16-000-n826776</a>
/Users/parth/Desktop/usc/ir/assignment4/NBC_News/HTMLFiles/a614919ada2c3db1fe0a718f0a301a.html	The hidden dangers of buying virtual currency go beyond a simple hack	Bitcoin and other virtual currencies are as vulnerable to hackers as your smartphone or any other digital device, security experts are warning.	<a href="https://www.nbcnews.com/business/business-news/hidden-dangers-buying-virtual-currency-go-beyond-simple-hack-n852706">https://www.nbcnews.com/business/business-news/hidden-dangers-buying-virtual-currency-go-beyond-simple-hack-n852706</a>
/Users/parth/Desktop/usc/ir/assignment4/NBC_News/HTMLFiles/eaa75aac08fe9029b9cdfd6f1721d149.html	What is Bitcoin? And should you invest in it?	If you've heard Bitcoin as a buzzword but are at a loss when it comes to the definition, you're not alone. Here's what you need to know.	<a href="https://www.nbcnews.com/tech/innovation/what-is-bitcoin-and-should-you-invest-it-n844106">https://www.nbcnews.com/tech/innovation/what-is-bitcoin-and-should-you-invest-it-n844106</a>

## 2. Reason : some pages have higher page rank values

- PageRank computes weight for each page based on the number of links that points to the page. we create a graph that decides the list of edges pointing the page. This graph is then used to find the importance of any given page in the web. Solr - Lucene algorithm uses only the Boolean and vector model that just scans the tf-idf value and outputs the results. However, PageRank determines the weight of the page and then outputs it in a required order. Major reason that pagerank has higher page rank value is the fact that it analyses the weight of page on the number of links that point it.

## 3. Results

- Query 1 – “Bitcoin blockchain”

Lucene	Page Rank
<a href="https://www.nbcnews.com/mach/science/how-bitcoin-other-cryptocurrencies-could-kill-cash-ncna857036">https://www.nbcnews.com/mach/science/how-bitcoin-other-cryptocurrencies-could-kill-cash-ncna857036</a>	<a href="https://www.nbcnews.com/mach/science/how-bitcoin-other-cryptocurrencies-could-kill-cash-ncna857036">https://www.nbcnews.com/mach/science/how-bitcoin-other-cryptocurrencies-could-kill-cash-ncna857036</a>
<a href="https://www.nbcnews.com/tech/innovation/bitcoin-pays-entire-wedding-its-price-soars-past-16-000-n826776">https://www.nbcnews.com/tech/innovation/bitcoin-pays-entire-wedding-its-price-soars-past-16-000-n826776</a>	<a href="https://www.nbcnews.com/tech/tech-news/bitcoin-other-cryptocurrencies-plunge-wave-bad-news-n856821">https://www.nbcnews.com/tech/tech-news/bitcoin-other-cryptocurrencies-plunge-wave-bad-news-n856821</a>
<a href="https://www.nbcnews.com/tech/innovation/what-is-bitcoin-and-should-you-invest-it-n844106">https://www.nbcnews.com/tech/innovation/what-is-bitcoin-and-should-you-invest-it-n844106</a>	<a href="https://www.nbcnews.com/tech/innovation/bitcoin-pays-entire-wedding-its-price-soars-past-16-000-n826776">https://www.nbcnews.com/tech/innovation/bitcoin-pays-entire-wedding-its-price-soars-past-16-000-n826776</a>
<a href="https://www.nbcnews.com/business/economy/middle-america-crazy-love-bitcoin-n789011">https://www.nbcnews.com/business/economy/middle-america-crazy-love-bitcoin-n789011</a>	<a href="https://www.nbcnews.com/business/business-news/hidden-dangers-buying-virtual-currency-go-beyond-simple-hack-n852706">https://www.nbcnews.com/business/business-news/hidden-dangers-buying-virtual-currency-go-beyond-simple-hack-n852706</a>
<a href="https://www.nbcnews.com/mach/science/how-bitcoin-other-cryptocurrencies-could-kill-cash-ncna857036">https://www.nbcnews.com/mach/science/how-bitcoin-other-cryptocurrencies-could-kill-cash-ncna857036</a>	<a href="https://www.nbcnews.com/better/business/what-bitcoin-should-you-invest-it-n844106">https://www.nbcnews.com/better/business/what-bitcoin-should-you-invest-it-n844106</a>
<a href="https://www.nbcnews.com/business/business-news/hidden-dangers-buying-virtual-currency-go-beyond-simple-hack-n852706">https://www.nbcnews.com/business/business-news/hidden-dangers-buying-virtual-currency-go-beyond-simple-hack-n852706</a>	<a href="https://www.nbcnews.com/business/economy/middle-america-crazy-love-bitcoin-n789011">https://www.nbcnews.com/business/economy/middle-america-crazy-love-bitcoin-n789011</a>
<a href="https://www.nbcnews.com/tech/innovation/bitcoin-pays-entire-wedding-its-price-soars-past-16-000-n826776">https://www.nbcnews.com/tech/innovation/bitcoin-pays-entire-wedding-its-price-soars-past-16-000-n826776</a>	<a href="https://www.nbcnews.com/business/business-news/what-s-all-bitcoin-hate-n813351">https://www.nbcnews.com/business/business-news/what-s-all-bitcoin-hate-n813351</a>
<a href="https://www.nbcnews.com/business/economy/middle-america-crazy-love-bitcoin-n789011">https://www.nbcnews.com/business/economy/middle-america-crazy-love-bitcoin-n789011</a>	<a href="https://www.nbcnews.com/news/world/bitcoin-heist-600-powerful-computers-stolen-iceland-n852811">https://www.nbcnews.com/news/world/bitcoin-heist-600-powerful-computers-stolen-iceland-n852811</a>
<a href="https://www.nbcnews.com/better/business/what-bitcoin-should-you-invest-it-n844106">https://www.nbcnews.com/better/business/what-bitcoin-should-you-invest-it-n844106</a>	<a href="https://www.nbcnews.com/business/business-news/hidden-dangers-buying-virtual-currency-go-beyond-simple-hack-n852706">https://www.nbcnews.com/business/business-news/hidden-dangers-buying-virtual-currency-go-beyond-simple-hack-n852706</a>
<a href="https://www.nbcnews.com/business/business-news/hidden-dangers-buying-virtual-currency-go-beyond-simple-hack-n852706">https://www.nbcnews.com/business/business-news/hidden-dangers-buying-virtual-currency-go-beyond-simple-hack-n852706</a>	<a href="https://www.nbcnews.com/news/world/bitcoin-heist-600-powerful-computers-stolen-iceland-n852811">https://www.nbcnews.com/news/world/bitcoin-heist-600-powerful-computers-stolen-iceland-n852811</a>

ii. Query 2 – “Stephen hawking”

Lucene	Page Rank
<a href="https://www.nbcnews.com/mach/science/brief-history-stephen-hawking-cambridge-cultural-icon-ncsl856456">https://www.nbcnews.com/mach/science/brief-history-stephen-hawking-cambridge-cultural-icon-ncsl856456</a>	<a href="https://www.nbcnews.com/">https://www.nbcnews.com/</a>
<a href="https://www.nbcnews.com/news/world/british-physicist-stephen-hawking-among-world-s-greatest-minds-science-n702301">https://www.nbcnews.com/news/world/british-physicist-stephen-hawking-among-world-s-greatest-minds-science-n702301</a>	<a href="https://www.nbcnews.com/mach">https://www.nbcnews.com/mach</a>
<a href="https://www.nbcnews.com/think/opinion/stephen-hawking-s-life-was-made-possible-access-great-health-ncna856971">https://www.nbcnews.com/think/opinion/stephen-hawking-s-life-was-made-possible-access-great-health-ncna856971</a>	<a href="https://www.nbcnews.com/think">https://www.nbcnews.com/think</a>
<a href="https://www.nbcnews.com/science/space/i-m-atheist-stephen-hawking-god-space-travel-n210076">https://www.nbcnews.com/science/space/i-m-atheist-stephen-hawking-god-space-travel-n210076</a>	<a href="https://www.nbcnews.com/health">https://www.nbcnews.com/health</a>
<a href="https://www.nbcnews.com/science/space/i-m-atheist-stephen-hawking-god-space-travel-n210076">https://www.nbcnews.com/science/space/i-m-atheist-stephen-hawking-god-space-travel-n210076</a>	<a href="https://www.nbcnews.com/science">https://www.nbcnews.com/science</a>
<a href="https://www.nbcnews.com/news/world/british-physicist-stephen-hawking-among-world-s-greatest-minds-science-n702301">https://www.nbcnews.com/news/world/british-physicist-stephen-hawking-among-world-s-greatest-minds-science-n702301</a>	<a href="https://www.nbcnews.com/news/photo">https://www.nbcnews.com/news/photo</a>
<a href="https://www.nbcnews.com/mach/science/stephen-hawking-says-humans-must-leave-earth-within-600-years-ncna818926">https://www.nbcnews.com/mach/science/stephen-hawking-says-humans-must-leave-earth-within-600-years-ncna818926</a>	<a href="https://www.nbcnews.com/video">https://www.nbcnews.com/video</a>
<a href="http://www.nbcnews.com/science/science-news/six-years-after-zero-g-flight-stephen-hawking-still-space-f6C9703084">http://www.nbcnews.com/science/science-news/six-years-after-zero-g-flight-stephen-hawking-still-space-f6C9703084</a>	<a href="https://www.nbcnews.com/news">https://www.nbcnews.com/news</a>
<a href="https://www.nbcnews.com/mach/science/what-stephen-hawking-taught-us-about-black-holes-ncna857471">https://www.nbcnews.com/mach/science/what-stephen-hawking-taught-us-about-black-holes-ncna857471</a>	<a href="https://www.nbcnews.com/mach/video/this-futuristic-jet-pack-that-lets-users-fly-up-to-10-000-feet-in-the-sky-1189436995946">https://www.nbcnews.com/mach/video/this-futuristic-jet-pack-that-lets-users-fly-up-to-10-000-feet-in-the-sky-1189436995946</a>
<a href="https://www.nbcnews.com/mach/science/stephen-hawking-says-humans-must-leave-earth-within-600-years-ncna818926">https://www.nbcnews.com/mach/science/stephen-hawking-says-humans-must-leave-earth-within-600-years-ncna818926</a>	<a href="https://www.nbcnews.com/mach/video/why-youtube-s-algorithm-boosted-conspiracy-theory-videos-in-the-wake-of-the-parkland-shooting-1187660355671">https://www.nbcnews.com/mach/video/why-youtube-s-algorithm-boosted-conspiracy-theory-videos-in-the-wake-of-the-parkland-shooting-1187660355671</a>

iii. Query 3 – “Falcon Heavy”

Lucene	Page Rank
<a href="https://www.nbcnews.com/mach/science/spacex-s-falcon-heavy-launch-gives-big-boost-elon-musk-ncna845256">https://www.nbcnews.com/mach/science/spacex-s-falcon-heavy-launch-gives-big-boost-elon-musk-ncna845256</a>	<a href="https://www.nbcnews.com/science">https://www.nbcnews.com/science</a>
<a href="https://www.nbcnews.com/mach/science/watch-spacex-s-falcon-heavy-rocket-make-its-maiden-flight-ncna845096">https://www.nbcnews.com/mach/science/watch-spacex-s-falcon-heavy-rocket-make-its-maiden-flight-ncna845096</a>	<a href="https://www.nbcnews.com/mach/video/this-futuristic-jet-pack-that-lets-users-fly-up-to-10-000-feet-in-the-sky-1189436995946">https://www.nbcnews.com/mach/video/this-futuristic-jet-pack-that-lets-users-fly-up-to-10-000-feet-in-the-sky-1189436995946</a>
<a href="https://www.nbcnews.com/mach/science/watch-spacex-s-falcon-heavy-rocket-make-its-maiden-flight-ncna845096">https://www.nbcnews.com/mach/science/watch-spacex-s-falcon-heavy-rocket-make-its-maiden-flight-ncna845096</a>	<a href="https://www.nbcnews.com/mach/video/why-youtube-s-algorithm-boosted-conspiracy-theory-videos-in-the-wake-of-the-parkland-shooting-1187660355671">https://www.nbcnews.com/mach/video/why-youtube-s-algorithm-boosted-conspiracy-theory-videos-in-the-wake-of-the-parkland-shooting-1187660355671</a>
<a href="https://www.nbcnews.com/mach/science/spacex-s-falcon-heavy-launch-gives-big-boost-elon-musk-ncna845256">https://www.nbcnews.com/mach/science/spacex-s-falcon-heavy-launch-gives-big-boost-elon-musk-ncna845256</a>	<a href="https://www.nbcnews.com/mach/video/from-space-dream-to-space-junk-the-vanguard-1-satellite-completes-60-years-in-space-today-118809453164">https://www.nbcnews.com/mach/video/from-space-dream-to-space-junk-the-vanguard-1-satellite-completes-60-years-in-space-today-118809453164</a>
<a href="https://www.nbcnews.com/mach/science/spacex-s-falcon-feat-may-be-just-prelude-main-event-ncna846446">https://www.nbcnews.com/mach/science/spacex-s-falcon-feat-may-be-just-prelude-main-event-ncna846446</a>	<a href="https://www.nbcnews.com/mach/video/pi-in-the-sky-how-a-nasa-scientist-uses-pi-to-look-for-life-beyond-earth-1185847363999">https://www.nbcnews.com/mach/video/pi-in-the-sky-how-a-nasa-scientist-uses-pi-to-look-for-life-beyond-earth-1185847363999</a>
<a href="https://www.nbcnews.com/mach/science/here-s-what-will-happen-tesla-spacex-shot-space-ncna845566">https://www.nbcnews.com/mach/science/here-s-what-will-happen-tesla-spacex-shot-space-ncna845566</a>	<a href="https://www.nbcnews.com/mach/video/astronaut-scott-kelly-s-genes-show-long-term-changes-after-a-year-in-space-1186826819794">https://www.nbcnews.com/mach/video/astronaut-scott-kelly-s-genes-show-long-term-changes-after-a-year-in-space-1186826819794</a>
<a href="https://www.nbcnews.com/mach/science/month-space-pictures-cosmic-penguin-playing-mars-ncsl852081">https://www.nbcnews.com/mach/science/month-space-pictures-cosmic-penguin-playing-mars-ncsl852081</a>	<a href="https://www.nbcnews.com/mach/video/a-wrinkle-in-time-is-probably-right-about-multiple-dimensions-1182239299525">https://www.nbcnews.com/mach/video/a-wrinkle-in-time-is-probably-right-about-multiple-dimensions-1182239299525</a>
<a href="https://www.nbcnews.com/mach/science/spacex-s-falcon-feat-may-be-just-prelude-main-event-ncna846446">https://www.nbcnews.com/mach/science/spacex-s-falcon-feat-may-be-just-prelude-main-event-ncna846446</a>	<a href="https://www.nbcnews.com/mach/video/this-futuristic-jet-pack-that-lets-users-fly-up-to-10-000-feet-in-the-sky-1189436995946">https://www.nbcnews.com/mach/video/this-futuristic-jet-pack-that-lets-users-fly-up-to-10-000-feet-in-the-sky-1189436995946</a>
<a href="https://www.nbcnews.com/science/space">https://www.nbcnews.com/science/space</a>	<a href="https://www.nbcnews.com/mach/video/why-5g-is-a-national-security-issue-1185076291808">https://www.nbcnews.com/mach/video/why-5g-is-a-national-security-issue-1185076291808</a>
<a href="https://www.nbcnews.com/mach/science/how-spacex-aims-bring-high-speed-internet-whole-world-ncna853766">https://www.nbcnews.com/mach/science/how-spacex-aims-bring-high-speed-internet-whole-world-ncna853766</a>	<a href="https://www.nbcnews.com/science/space">https://www.nbcnews.com/science/space</a>

iv. Query 4 – “Syrian War”

Lucene	Page Rank
<a href="https://www.nbcnews.com/storyline/syrias-children">https://www.nbcnews.com/storyline/syrias-children</a>	<a href="https://www.nbcnews.com/">https://www.nbcnews.com/</a>
<a href="https://www.nbcnews.com/storyline/syrias-children/syrian-civil-war-photo-photographer-s-rescue-goes-viral-n748146">https://www.nbcnews.com/storyline/syrias-children/syrian-civil-war-photo-photographer-s-rescue-goes-viral-n748146</a>	<a href="https://www.nbcnews.com/meet-the-press">https://www.nbcnews.com/meet-the-press</a>
<a href="https://www.nbcnews.com/storyline/aleppos-children">https://www.nbcnews.com/storyline/aleppos-children</a>	<a href="https://www.nbcnews.com/nightly-news">https://www.nbcnews.com/nightly-news</a>
<a href="https://www.nbcnews.com/news/mideast/syria-s-civil-war-has-been-raging-7-years-what-n849851">https://www.nbcnews.com/news/mideast/syria-s-civil-war-has-been-raging-7-years-what-n849851</a>	<a href="https://www.nbcnews.com/video">https://www.nbcnews.com/video</a>
<a href="https://www.nbcnews.com/news/mideast/syria-s-civil-war-has-been-raging-7-years-what-n849851">https://www.nbcnews.com/news/mideast/syria-s-civil-war-has-been-raging-7-years-what-n849851</a>	<a href="https://www.nbcnews.com/news">https://www.nbcnews.com/news</a>
<a href="http://www.nbcnews.com/news/other/barrel-bombs-just-another-symbol-brutality-syrian-civil-war-f2D11765640">http://www.nbcnews.com/news/other/barrel-bombs-just-another-symbol-brutality-syrian-civil-war-f2D11765640</a>	<a href="https://www.nbcnews.com/video/andrew-mccabe-the-latest-ousted-by-trump-s-white-house-1014003779549">https://www.nbcnews.com/video/andrew-mccabe-the-latest-ousted-by-trump-s-white-house-1014003779549</a>
<a href="https://www.nbcnews.com/slideshow/children-among-injured-besieged-damascus-suburb-n834526">https://www.nbcnews.com/slideshow/children-among-injured-besieged-damascus-suburb-n834526</a>	<a href="https://www.nbcnews.com/nightly-news/video/white-house-prepares-to-roll-out-plan-addressing-opioid-crisis-1189063747908">https://www.nbcnews.com/nightly-news/video/white-house-prepares-to-roll-out-plan-addressing-opioid-crisis-1189063747908</a>
<a href="https://www.nbcnews.com/slideshow/children-among-injured-besieged-damascus-suburb-n834526">https://www.nbcnews.com/slideshow/children-among-injured-besieged-damascus-suburb-n834526</a>	<a href="https://www.nbcnews.com/nightly-news-netcast/video/nightly-news-full-broadcast-march-18th-1189093955837">https://www.nbcnews.com/nightly-news-netcast/video/nightly-news-full-broadcast-march-18th-1189093955837</a>
<a href="https://www.nbcnews.com/storyline/syrias-suffering-families">https://www.nbcnews.com/storyline/syrias-suffering-families</a>	<a href="https://www.nbcnews.com/nightly-news/video/vladimir-putin-wins-re-election-for-fourth-term-1189048387506">https://www.nbcnews.com/nightly-news/video/vladimir-putin-wins-re-election-for-fourth-term-1189048387506</a>
<a href="https://www.nbcnews.com/news/mideast/syria-s-civil-war-has-been-raging-7-years-what-n849851">https://www.nbcnews.com/news/mideast/syria-s-civil-war-has-been-raging-7-years-what-n849851</a>	<a href="https://www.nbcnews.com/nightly-news/video/are-married-priests-the-solution-to-global-catholic-clergy-shortage-1189049411560">https://www.nbcnews.com/nightly-news/video/are-married-priests-the-solution-to-global-catholic-clergy-shortage-1189049411560</a>

v. Query 5 – “LA Rams”

Lucene	Page Rank
<a href="https://www.nbcnews.com/news/sports/how-history-informs-colin-kaepernick-s-national-anthem-protest-n639366">https://www.nbcnews.com/news/sports/how-history-informs-colin-kaepernick-s-national-anthem-protest-n639366</a>	<a href="https://www.nbcnews.com/news/sports/sports-broadcasting-legend-dick-enberg-dies-82-n832076">https://www.nbcnews.com/news/sports/sports-broadcasting-legend-dick-enberg-dies-82-n832076</a>
<a href="https://www.nbcnews.com/news/sports/how-history-informs-colin-kaepernick-s-national-anthem-protest-n639366">https://www.nbcnews.com/news/sports/how-history-informs-colin-kaepernick-s-national-anthem-protest-n639366</a>	<a href="https://www.nbcnews.com/news/sports/sports-broadcasting-legend-dick-enberg-dies-82-n832076">https://www.nbcnews.com/news/sports/sports-broadcasting-legend-dick-enberg-dies-82-n832076</a>
<a href="https://www.nbcnews.com/news/sports/sports-broadcasting-legend-dick-enberg-dies-82-n832076">https://www.nbcnews.com/news/sports/sports-broadcasting-legend-dick-enberg-dies-82-n832076</a>	<a href="https://www.nbcnews.com/news/sports/how-history-informs-colin-kaepernick-s-national-anthem-protest-n639366">https://www.nbcnews.com/news/sports/how-history-informs-colin-kaepernick-s-national-anthem-protest-n639366</a>
<a href="https://www.nbcnews.com/news/sports/sports-broadcasting-legend-dick-enberg-dies-82-n832076">https://www.nbcnews.com/news/sports/sports-broadcasting-legend-dick-enberg-dies-82-n832076</a>	<a href="https://www.nbcnews.com/news/sports/how-history-informs-colin-kaepernick-s-national-anthem-protest-n639366">https://www.nbcnews.com/news/sports/how-history-informs-colin-kaepernick-s-national-anthem-protest-n639366</a>

vi. Query 6 – “Black Panther”

Lucene	Page Rank
<a href="https://www.nbcnews.com/news/nbcblk/black-panther-s-wakanda-sheds-light-black-excellence-n844801">https://www.nbcnews.com/news/nbcblk/black-panther-s-wakanda-sheds-light-black-excellence-n844801</a>	<a href="https://www.nbcnews.com/">https://www.nbcnews.com/</a>
<a href="https://www.nbcnews.com/news/nbcblk/black-panther-sets-fandango-record-top-pre-selling-marvel-movie-n836631">https://www.nbcnews.com/news/nbcblk/black-panther-sets-fandango-record-top-pre-selling-marvel-movie-n836631</a>	<a href="https://www.nbcnews.com/nightly-news">https://www.nbcnews.com/nightly-news</a>
<a href="https://www.nbcnews.com/news/nbcblk/black-panther-novelist-journalism-sci-fi-bring-hidden-light-n848011">https://www.nbcnews.com/news/nbcblk/black-panther-novelist-journalism-sci-fi-bring-hidden-light-n848011</a>	<a href="https://www.nbcnews.com/think">https://www.nbcnews.com/think</a>
<a href="https://www.nbcnews.com/tech/internet/plot-destroy-black-panther-ratings-thwarted-facebook-n844226">https://www.nbcnews.com/tech/internet/plot-destroy-black-panther-ratings-thwarted-facebook-n844226</a>	<a href="https://www.nbcnews.com/pop-culture">https://www.nbcnews.com/pop-culture</a>
<a href="https://www.nbcnews.com/pop-culture/movies/black-panther-blows-away-box-office-192-million-weekend-n849246">https://www.nbcnews.com/pop-culture/movies/black-panther-blows-away-box-office-192-million-weekend-n849246</a>	<a href="https://www.nbcnews.com/news/nbcblk">https://www.nbcnews.com/news/nbcblk</a>
<a href="https://www.nbcnews.com/news/nbcblk/black-panther-black-comic-creators-spent-years-breaking-down-barriers-n848461">https://www.nbcnews.com/news/nbcblk/black-panther-black-comic-creators-spent-years-breaking-down-barriers-n848461</a>	<a href="https://www.nbcnews.com/news/asian-america">https://www.nbcnews.com/news/asian-america</a>
<a href="https://www.nbcnews.com/news/nbcblk/black-panther-actress-janeshia-adams-ginyard-talks-living-stuntwoman-life-n847646">https://www.nbcnews.com/news/nbcblk/black-panther-actress-janeshia-adams-ginyard-talks-living-stuntwoman-life-n847646</a>	<a href="https://www.nbcnews.com/tech">https://www.nbcnews.com/tech</a>
<a href="https://www.nbcnews.com/think/opinion/defeat-killmonger-black-panther-holds-lessons-israel-ncna850831">https://www.nbcnews.com/think/opinion/defeat-killmonger-black-panther-holds-lessons-israel-ncna850831</a>	<a href="https://www.nbcnews.com/news">https://www.nbcnews.com/news</a>
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<a href="https://www.nbcnews.com/news/nbcblk/stars-black-panther-discuss-hope-marvel-film-impact-n847706">https://www.nbcnews.com/news/nbcblk/stars-black-panther-discuss-hope-marvel-film-impact-n847706</a>	<a href="https://www.nbcnews.com/nightly-news-netcast/video/nightly-news-full-broadcast-march-18th-1189093955837">https://www.nbcnews.com/nightly-news-netcast/video/nightly-news-full-broadcast-march-18th-1189093955837</a>

vii. Query 7 – “Austin Bombings”

Lucene	Page Rank
<a href="https://www.nbcnews.com/news/us-news/police-identify-teen-killed-austin-package-bombing-investigation-grows-n856371">https://www.nbcnews.com/news/us-news/police-identify-teen-killed-austin-package-bombing-investigation-grows-n856371</a>	<a href="https://www.nbcnews.com/">https://www.nbcnews.com/</a>
<a href="https://www.nbcnews.com/news/us-news/deadly-austin-bombings-were-meant-send-message-police-chief-says-n857786">https://www.nbcnews.com/news/us-news/deadly-austin-bombings-were-meant-send-message-police-chief-says-n857786</a>	<a href="https://www.nbcnews.com/meet-the-press">https://www.nbcnews.com/meet-the-press</a>
<a href="https://www.nbcnews.com/news/us-news/deadly-austin-bombings-were-meant-send-message-police-chief-says-n857786">https://www.nbcnews.com/news/us-news/deadly-austin-bombings-were-meant-send-message-police-chief-says-n857786</a>	<a href="https://www.nbcnews.com/nightly-news">https://www.nbcnews.com/nightly-news</a>
<a href="https://www.nbcnews.com/widget/video-embed/1184733251954">https://www.nbcnews.com/widget/video-embed/1184733251954</a>	<a href="https://www.nbcnews.com/dateline">https://www.nbcnews.com/dateline</a>
<a href="https://www.nbcnews.com/news/us-news/police-identify-teen-killed-austin-package-bombing-investigation-grows-n856371">https://www.nbcnews.com/news/us-news/police-identify-teen-killed-austin-package-bombing-investigation-grows-n856371</a>	<a href="https://www.nbcnews.com/better">https://www.nbcnews.com/better</a>
<a href="https://www.nbcnews.com/news/us-news/austin-texas-edge-after-spate-package-bombs-kill-two-n855956">https://www.nbcnews.com/news/us-news/austin-texas-edge-after-spate-package-bombs-kill-two-n855956</a>	<a href="https://www.nbcnews.com/mach">https://www.nbcnews.com/mach</a>
<a href="https://www.nbcnews.com/news/us-news/austin-texas-edge-after-spate-package-bombs-kill-two-n855956">https://www.nbcnews.com/news/us-news/austin-texas-edge-after-spate-package-bombs-kill-two-n855956</a>	<a href="https://www.nbcnews.com/leftfield">https://www.nbcnews.com/leftfield</a>
<a href="http://www.nbcnews.com/">http://www.nbcnews.com/</a>	<a href="https://www.nbcnews.com/think">https://www.nbcnews.com/think</a>
<a href="https://www.nbcnews.com/news/latino/celia-cruz-be-remembered-grammy-lifetime-achievement-award-n516956">https://www.nbcnews.com/news/latino/celia-cruz-be-remembered-grammy-lifetime-achievement-award-n516956</a>	<a href="https://www.nbcnews.com/news/us-news">https://www.nbcnews.com/news/us-news</a>
<a href="https://www.nbcnews.com/news/latino/california-affirmative-action-bill-sparks-fierce-debate-n87426">https://www.nbcnews.com/news/latino/california-affirmative-action-bill-sparks-fierce-debate-n87426</a>	<a href="https://www.nbcnews.com/news/nbcblk">https://www.nbcnews.com/news/nbcblk</a>

viii. Query 8 – “Paris Climate Deal”

Lucene	Page Rank
<a href="https://www.nbcnews.com/storyline/trump-s-first-foreign-trip/trump-declines-endorsing-paris-climate-change-deal-g7-summit-will-n765406">https://www.nbcnews.com/storyline/trump-s-first-foreign-trip/trump-declines-endorsing-paris-climate-change-deal-g7-summit-will-n765406</a>	<a href="https://www.nbcnews.com/better/science/fighting-pollution-avoiding-plastic-straws-ncna856296">https://www.nbcnews.com/better/science/fighting-pollution-avoiding-plastic-straws-ncna856296</a>
<a href="https://www.nbcnews.com/storyline/trump-s-first-foreign-trip/trump-declines-endorsing-paris-climate-change-deal-g7-summit-will-n765406">https://www.nbcnews.com/storyline/trump-s-first-foreign-trip/trump-declines-endorsing-paris-climate-change-deal-g7-summit-will-n765406</a>	<a href="https://www.nbcnews.com/tech/social-media/tech-companies-struggle-human-side-fake-news-n857426">https://www.nbcnews.com/tech/social-media/tech-companies-struggle-human-side-fake-news-n857426</a>
<a href="https://www.nbcnews.com/politics/white-house/trump-pulls-u-s-out-paris-climate-agreement-n767066">https://www.nbcnews.com/politics/white-house/trump-pulls-u-s-out-paris-climate-agreement-n767066</a>	<a href="https://www.nbcnews.com/think/opinion/american-idol-back-more-patriotic-ever-no-wonder-it-s-ncna857296">https://www.nbcnews.com/think/opinion/american-idol-back-more-patriotic-ever-no-wonder-it-s-ncna857296</a>
<a href="https://www.nbcnews.com/politics/white-house/here-s-what-happens-if-trump-leaves-paris-climate-agreement-n766761">https://www.nbcnews.com/politics/white-house/here-s-what-happens-if-trump-leaves-paris-climate-agreement-n766761</a>	<a href="https://www.nbcnews.com/think/opinion/time-conservatives-accept-trump-s-imperfections-learn-how-work-him-ncna856771">https://www.nbcnews.com/think/opinion/time-conservatives-accept-trump-s-imperfections-learn-how-work-him-ncna856771</a>
<a href="https://www.nbcnews.com/politics/politics-news/forget-trump-u-s-storms-ahead-climate-change-never-n801826">https://www.nbcnews.com/politics/politics-news/forget-trump-u-s-storms-ahead-climate-change-never-n801826</a>	<a href="https://www.nbcnews.com/mach/science/babcock-ranch-aims-be-america-s-greenest-city-inspiration-ncna854076">https://www.nbcnews.com/mach/science/babcock-ranch-aims-be-america-s-greenest-city-inspiration-ncna854076</a>
<a href="https://www.nbcnews.com/meet-the-press/meet-press-june-4-2017-n768046">https://www.nbcnews.com/meet-the-press/meet-press-june-4-2017-n768046</a>	<a href="https://www.nbcnews.com/mach/science/scientists-hatch-bold-plan-save-polar-bears-ncna851356">https://www.nbcnews.com/mach/science/scientists-hatch-bold-plan-save-polar-bears-ncna851356</a>
<a href="https://www.nbcnews.com/news/world/analysis-trump-s-america-first-foreign-policy-isolates-u-s-n833046">https://www.nbcnews.com/news/world/analysis-trump-s-america-first-foreign-policy-isolates-u-s-n833046</a>	<a href="https://www.nbcnews.com/mach/science/death-may-not-be-so-final-thanks-these-creepy-technologies-ncna821596">https://www.nbcnews.com/mach/science/death-may-not-be-so-final-thanks-these-creepy-technologies-ncna821596</a>
<a href="https://www.nbcnews.com/storyline/trump-s-first-foreign-trip/trump-end-first-foreign-trip-pledges-unwavering-support-u-s-n765446">https://www.nbcnews.com/storyline/trump-s-first-foreign-trip/trump-end-first-foreign-trip-pledges-unwavering-support-u-s-n765446</a>	<a href="https://www.nbcnews.com/mach/science/what-happens-next-if-we-find-proof-space-aliens-ncna788511">https://www.nbcnews.com/mach/science/what-happens-next-if-we-find-proof-space-aliens-ncna788511</a>
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4. Overlap Table

Query	Number of Overlaps
Bitcoin blockchain	5
Stephen hawking	0
Falcon Heavy	1
Syrian War	0
LA Rams	4
Black Panther	0
Austin Bombings	1
Paris Climate Deal	0

