

## HW #4: COMPARING SEARCH ENGINE RANKING ALGORITHMS

### PART A: STEPS TAKEN TO EXECUTE THIS HOMEWORK

#### I. DOWNLOAD REFERENCE NEWS WEBSITE

The news website assigned to me based upon my USC ID (ending with 50) is Boston Globe. Hence, the dataset comprising of the corpus of web pages for Boston Globe (BG folder) and the CSV map file (Boston\_Global\_Map.csv) was downloaded from the Google Drive link (<https://drive.google.com/open?id=0B7BKThqBZau-aWI1TTZONjBiRTA>) and stored at a location on my computer (/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/BG).

NOTE: Since this homework was done on a MAC, the installation of Ubuntu was skipped.

#### II. DOWNLOAD, INSTALL AND SETUP APACHE SOLR

The latest release of Apache Solr (Version 7.1.10) was downloaded from the page <http://lucene.apache.org/solr/downloads.html> and unzipped in a specific directory on my local machine (/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0).

Using Terminal, the directory where Apache Solr was saved was navigated into. The following steps were adhered to spin up the Solr server:

1. Change directory to the location of Solr using the command:  
cd /Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0
2. Start the Solr server using the command:  
bin/solr start
3. Create a new core named 'irhw4' using the command:  
bin/solr create -c irhw4
4. Once the core was successfully created, the location of the core is displayed under the field 'Setup new core instance directory'. This was made a note of for future reference.
5. Now, the directory of new core created was navigated into.  
cd /Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/
6. The directory of the new core created 'irhw4' contains three components: data, conf and core.properties. Now, certain configuration changes are made in the files in the conf folder.
7. Open conf folder:  
cd conf/
8. Make a copy of the file titled 'managed-schema' in the conf folder and name it to be 'schema.xml'. This newly created file is opened with the Brackets text editor and the following set of 4 lines are located:

```
<!-- ORIGINAL -->
<field name="id" type="string" indexed="true" stored="true" required="true" multiValued="false" />
<field name="_version_" type="plong" indexed="false" stored="false"/>
<field name="_root_" type="string" indexed="true" stored="false" docValues="false" />
<field name="_text_" type="text_general" indexed="true" stored="false" multiValued="true"/>
```

Then, these lines are replaced with the set of lines shown below:

```

<field name="id" type="string" indexed="true" stored="true" required="true" multiValued="false" />
<field name="_version_" type="plong" indexed="true" stored="true"/>
<field name="_root_" type="string" indexed="true" stored="false"/>
<field name="_text_" type="text_general" indexed="true" stored="false" multiValued="true"/>
<copyField source="*" dest="_text_" />

```

The changes made to the schema.xml file are saved.

9. Next, the 'solrconfig.xml' file located in the same conf directory within the core is opened. The following line is added to it.

```
<schemaFactory class="ClassicIndexSchemaFactory"/>
```

Also, the following set of lines are located in the same file:

```

<requestHandler name="/select" class="solr.SearchHandler">
    <!-- default values for query parameters can be specified, these
        will be overridden by parameters in the request
    -->
    <lst name="defaults">
        <str name="echoParams">explicit</str>
        <int name="rows">10</int>
        <!-- <str name="df">_text_</str> -->
        <!-- Change from JSON to XML format (the default prior to Solr 7.0)
            <str name="wt">xml</str>
        -->
    </lst>

```

And are changed to the following:

```

<requestHandler name="/select" class="solr.SearchHandler">
    <!-- default values for query parameters can be specified, these
        will be overridden by parameters in the request
    -->
    <lst name="defaults">
        <str name="echoParams">explicit</str>
        <int name="rows">10</int>
        <kstr name="df">_text_</str>
        <!-- Change from JSON to XML format (the default prior to Solr 7.0)
            <str name="wt">xml</str>
        -->
    </lst>

```

Changes made to solrconfig.xml are saved.

### III. TESTING THE SOLR SETUP AND INDEXING FILES

The Boston Globe website files downloaded in Step I are now indexed using the command:

```
bin/post -c irhw4 -filetypes html /Users/nehapatapati/Desktop/CSCI 572 - IR/Homework 4/BG/
```

Once this command successfully executes, Solr prints out the number of files successfully indexed.

The Boston Globe corpus has 19772 documents. Since Solr displayed a message saying it has indexed 19772 files, this step was confirmed to be successful.

### IV. TESTING SOLR UI

To test if the files have been indexed, the Solr UI is accessed using the URL

<http://localhost:8983/solr/> in a browser. The core created 'irhw4' is selected from the dropdown and its statistics are verified with that given in the homework description. A couple of queries are tested out in the Query page.

A screenshot of the core 'irhw4' on Solr UI is shown below:

The screenshot shows the Solr UI interface. On the left, there's a sidebar with links for Dashboard, Logging, Core Admin (which is selected), Java Properties, and Thread Dump. Below that is a 'Core Selector' dropdown set to 'irhw4'. The main content area has a header with buttons for 'Add Core', 'Unload' (disabled), 'Rename', 'Swap', and 'Reload'. Under the 'Core' section, it says 'myexample'. Below that, 'Index' statistics are listed:

lastModified:	10 days ago
version:	118
numDocs:	19772
maxDoc:	19772
deletedDocs:	0
optimized:	✓
current:	✓
directory:	org.apache.lucene.store.NRTCachingDirectory:NRTCachingDirectory(MMapDirectory@/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/data/index lockFactory=org.apache.lucene.store.NativeFSLockFactory@2c0e01e7; maxCacheMB=48.0 maxMergeSizeMB=4.0)

At the bottom, there are links for Documentation, Issue Tracker, IRC Channel, Community forum, and Solr Query Syntax.

## V. PHP CLIENT TO ACCESS SOLR API

A PHP code is written to get the user's search term from the HTML file, and to send the query term to the Solr server. The results returned by the Solr server after processing is displayed in a tabular format.

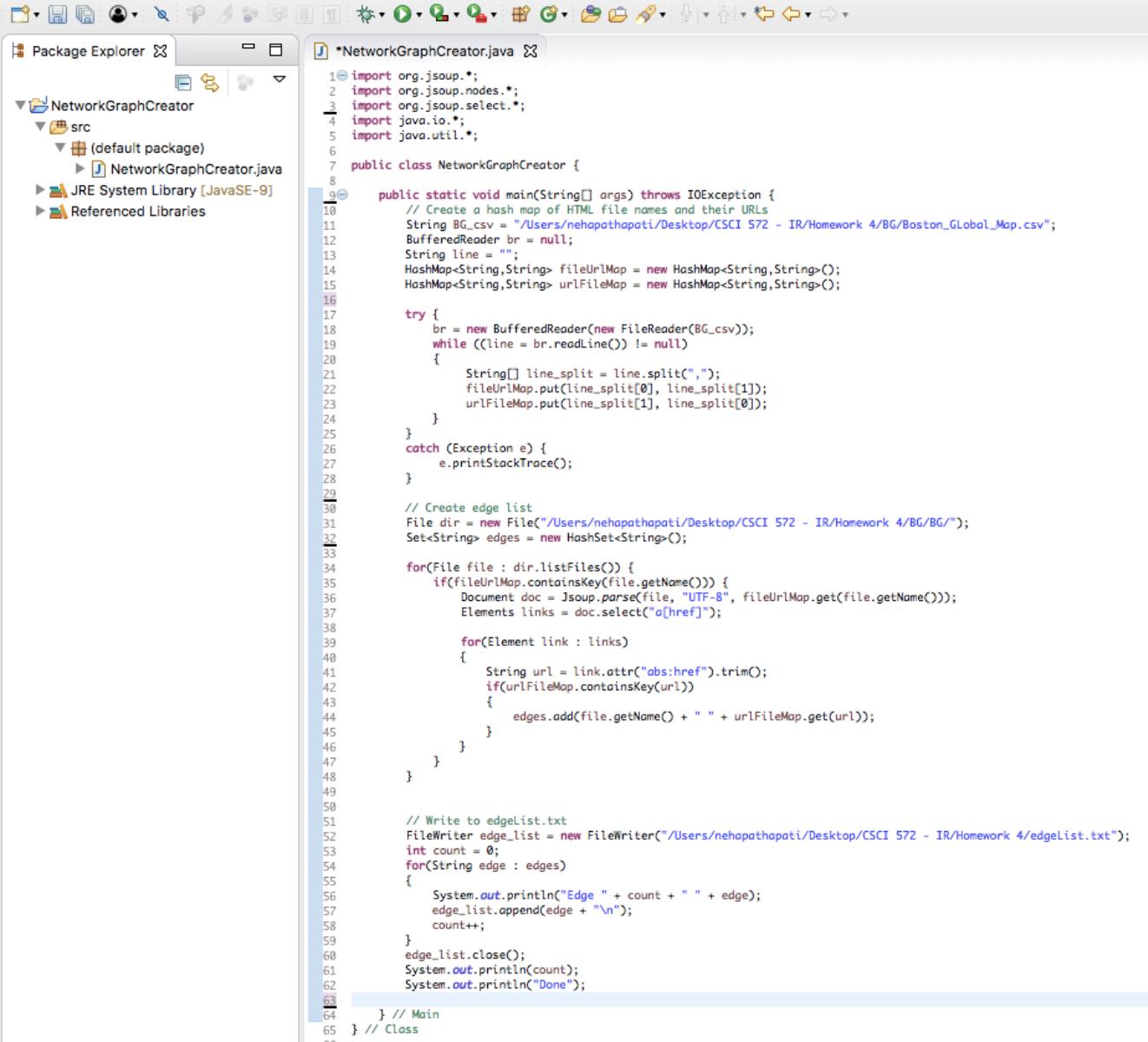
Test the functioning of this PHP client at <http://localhost/index.php>.

The screenshot shows a browser window with the URL <http://localhost/index.php?q=Star+Wars>. The search term 'Star Wars' is entered in the search bar. The results are displayed in a table:

1.	<b>TITLE</b>	The Force is with 'Star Wars: The Force Awakens' - The Boston Globe
	<b>URL</b>	<a href="https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVDnclrp5M/story.html">https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVDnclrp5M/story.html</a>
	<b>ID</b>	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/Sed705742cac8cc2468ec81d68592a1d5d56b71ddb506fc54cc593551bd7afaa.html
	<b>DESCRIPTION</b>	"Star Wars: The Force Awakens" resumes the celebrated sci-fi series.
2.	<b>TITLE</b>	The Force is with 'Star Wars: The Force Awakens' - The Boston Globe
	<b>URL</b>	<a href="https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVDnclrp5M/story.html">https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVDnclrp5M/story.html</a>
	<b>ID</b>	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/7570c4f53e01b8f31a9343ead9e8b1d10035d133c88795f1920db2019caddd1.html
	<b>DESCRIPTION</b>	"Star Wars: The Force Awakens" resumes the celebrated sci-fi series.
3.	<b>TITLE</b>	First fan stakes out a spot for latest Star Wars film - The Boston Globe
	<b>URL</b>	<a href="https://www.bostonglobe.com/metro/2015/12/17/first-line-for-the-force-fan-stakes-out-spot-for-latest-star-wars-film/QBYM4R1QwbCoA7c7cBs8w0/story.html">https://www.bostonglobe.com/metro/2015/12/17/first-line-for-the-force-fan-stakes-out-spot-for-latest-star-wars-film/QBYM4R1QwbCoA7c7cBs8w0/story.html</a>
	<b>ID</b>	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/54bf5c91b911458cc7916beb9aae9fedc330c0fd979eacc5e99ceb352644de02.html
	<b>DESCRIPTION</b>	Kyle Babbitt staked out a spot at the Loews Theater on the Common.
4.	<b>TITLE</b>	For 'Star Wars' die-hards, 18-hour marathon a daunting but enjoyable task - The Boston Globe
	<b>URL</b>	<a href="https://www.bostonglobe.com/lifestyle/style/2015/12/18/for-star-wars-die-hards-hour-marathon-daunting-but-enjoyable-task/W08Q3d2TeXWCQzDaZsI/story.html">https://www.bostonglobe.com/lifestyle/style/2015/12/18/for-star-wars-die-hards-hour-marathon-daunting-but-enjoyable-task/W08Q3d2TeXWCQzDaZsI/story.html</a>
	<b>ID</b>	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/fcc8acd81fb07ea9cf77d09759dfbba3f617220e71d04f5c349daef63bddb6a.html
	<b>DESCRIPTION</b>	It was just before 3 a.m. Thursday morning at the Showcase Cinema de Lux in Revere, and a collection of dedicated "Star Wars" fans would soon settle in for what figured to be a very long day.
5.	<b>TITLE</b>	'Star Wars' is different for different generations - The Boston Globe
	<b>URL</b>	<a href="https://www.bostonglobe.com/arts/2015/12/12/starwarsgenerations/PLDMidc6USG536AfUaPA7N/story.html">https://www.bostonglobe.com/arts/2015/12/12/starwarsgenerations/PLDMidc6USG536AfUaPA7N/story.html</a>
	<b>ID</b>	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/5ecd2a68ae536575c680280d2a746bc52130dfb77d170423a47a50d6f6435bf8.html
	<b>DESCRIPTION</b>	A parade near Tokyo proves "Star Wars" fans come in a wide range of ages. AP Photo/Shizuo Kambayashi A parade near Tokyo proves "Star Wars" fans come in a wide range of ages.
6.	<b>TITLE</b>	'Star Wars' sneakers not just for kids - The Boston Globe
	<b>URL</b>	<a href="https://www.bostonglobe.com/lifestyle/style/2015/12/12/star-wars-sneakers-not-just-for-kids/XnHidQOeCIVNY94HfpJQ/story.html">https://www.bostonglobe.com/lifestyle/style/2015/12/12/star-wars-sneakers-not-just-for-kids/XnHidQOeCIVNY94HfpJQ/story.html</a>
	<b>ID</b>	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/2beec3d8cfa8ca4d1175d12d525ef7e768c84cedf1078c2f288306e2b36c1a47.html
	<b>DESCRIPTION</b>	Matt Morand doesn't carry a lunchbox or three-ring binder any more, but the Hopkinton dad can still wear a pair of Darth Vader sneakers on a trip to the mall.
7.	<b>TITLE</b>	Governor Baker not a fan of new 'Star Wars' flicks - The Boston Globe
	<b>URL</b>	<a href="https://www.bostonglobe.com/metro/2015/12/17/charlie-baker-not-fan-new-star-wars-flicks/UX6q3i6wY5F6AiuydtuTI/story.html">https://www.bostonglobe.com/metro/2015/12/17/charlie-baker-not-fan-new-star-wars-flicks/UX6q3i6wY5F6AiuydtuTI/story.html</a>
	<b>ID</b>	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/0a452f523a6da0cf69e592b58082d32f96f3208da16cf087e52d1cc6b6c7ce35.html
	<b>DESCRIPTION</b>	The Force, which will soon awaken, is not with Governor Charlie Baker.

## VI. GENERATION OF EDGES LIST (GRAPH)

In order to create a graph that the Page Rank function of the NetworkX library will take as input, a Java code is written using the Eclipse IDE. The Java Code used to generate the list of edges of the graph is as follows:



The screenshot shows the Eclipse IDE interface with the 'Package Explorer' view on the left and the 'NetworkGraphCreator.java' file in the center editor. The code is a Java program that reads a CSV file containing URLs and their names, and then generates a list of edges by parsing HTML files and extracting href links. The generated edges are then written to a file named 'edgeList.txt'.

```
1 import org.jsoup.*;
2 import org.jsoup.nodes.*;
3 import org.jsoup.select.*;
4 import java.io.*;
5 import java.util.*;
6
7 public class NetworkGraphCreator {
8
9     public static void main(String[] args) throws IOException {
10         // Create a hash map of HTML file names and their URLs
11         String BG_csv = "/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/BG/Boston_Global_Map.csv";
12         BufferedReader br = null;
13         String line = "";
14         HashMap<String, String> fileUrlMap = new HashMap<String, String>();
15         HashMap<String, String> urlFileMap = new HashMap<String, String>();
16
17         try {
18             br = new BufferedReader(new FileReader(BG_csv));
19             while ((line = br.readLine()) != null)
20             {
21                 String[] line_split = line.split(",");
22                 fileUrlMap.put(line_split[0], line_split[1]);
23                 urlFileMap.put(line_split[1], line_split[0]);
24             }
25         } catch (Exception e) {
26             e.printStackTrace();
27         }
28
29         // Create edge list
30         File dir = new File("/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/BG/BG/");
31         Set<String> edges = new HashSet<String>();
32
33         for(File file : dir.listFiles()) {
34             if(fileUrlMap.containsKey(file.getName())) {
35                 Document doc = Jsoup.parse(file, "UTF-8", fileUrlMap.get(file.getName()));
36                 Elements links = doc.select("a[href]");
37
38                 for(Element link : links)
39                 {
40                     String url = link.attr("abs:href").trim();
41                     if(urlFileMap.containsKey(url))
42                     {
43                         edges.add(file.getName() + " " + urlFileMap.get(url));
44                     }
45                 }
46             }
47         }
48
49
50         // Write to edgeList.txt
51         FileWriter edge_list = new FileWriter("/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/edgeList.txt");
52         int count = 0;
53         for(String edge : edges)
54         {
55             System.out.println("Edge " + count + " " + edge);
56             edge_list.append(edge + "\n");
57             count++;
58         }
59         edge_list.close();
60         System.out.println(count);
61         System.out.println("Done");
62
63     } // Main
64 } // Class
65
66
```

The list of graph edges generated by this code is saved in a file titled 'edgesList.txt'. A preview of the 'edgesList.txt' file is shown below:

```

c843524d1e1c5c54d42ce80048805a020209bf6fc5175547f5b07b3aa7d0c.html
013c8fb3c2049338006210237da898555772c29014dd614b7f9741cb94d9f.html
915b33cae3c530ae9ae522599efb80721708a5e42c7ddff80dc572b0f1a4a34e.html
14d1d5b514dca5c773952dcb458cab83592dfe75473f5b4ad5a4c91b63fcda5.html
e31ffffd10d88c8336524f139f514f04480522b8161ddf5bd0f0169194286f43.html
60a255e3e9fd58692c9e0360711c539b9c4318c0ed0fffa591fe1dfdf496bf.html
249ec5bc7d7c69390ba796972335e348b878d555d0fseedf8e4ca65a7f64fc0.html
909f84d4bce289217947e1527ef2527cf6a797ce2f8fb448f55bd4b3d0de274.html
36bc60a0eb1e64c76fd901cb94fae8af44eeeb6c52373afe877af2f36a391.html
230a4e5efc5f9d671f00cfa3c7c1e3174236db8fa1be338ea4e3bede6a4286ca.html
a43c9362e877b7a462d256dc6b7c5d2a93440a41a7a84bdcbe2f17981b8.html
00b16263d3a9f9d6f671aef9e84b5b09d50043d309e4b8270407c3947b89.html
f4468c9f5044c91113562b1a6a97a5b75faa0b297cc21a648fa0e6b1c8c602.html
20f37a9c2cb180294935e4ae23e5085d10c067031d91d66582da7d44acf016b.html
e27fb3c6be506e1e1462b8a7074c8174e90579a21a5727a1c61a5b5d2841c.html
569d0ab61b23a4dadce2273c9fb5f0fc4b1205f1e66044c955e2fd45476.html
c934592fc93816852e737491e60987edd2c0d4574a0e9a040b10b676b3817c.html
857823774923e704b7e721237784923e20ec420ec586c4.html
c9c034848a5360f57716ab0c916dadcd2c5c9e31b5f4304db601a7fbab5.html
ff5e665686d4ce3c50487a50a6b53e6578127ff0b145e27c30a4b0f6a186162.html
699c3933a797fe69a3f592e2fdbb2f1fce7c2482b7610a7fab19c1d6016.html
c5c61ba69bbd2f5c5841c7a2179b721bab56df6302e9fea3d9417c38a61514.html
f12c2143a8d636f7d9ff64b4a78d4e105c146c1855cfbb092e5a38d1e1f936.html
38020fb9a8a76d1e43d8799c6b336a804b7e1e2485b7440d13edabab83.html
230a4e5efc5f9d671f00cfa3c7e13174236db8fa1be338ea4e3bede6a4286ca.html
a6677f4478ab7bce390b77c9f533ed8d2be61b1238a2444986186547f8e5d.html
f12c2143a8d636f7d9ff64b4a78d4e105c146c1855cfbb092e5a38d1e1f936.html
eb88eac64a9fa763c671bcfd4e16e5abf139d3c3fd0d705aea887eb2b.html
e1c76131b255175642074b3568c940a772f38eabd7c4475767f70265360662.html
6c7a98488fcb30a11d6617733c1fe7ed6d77555ea494725b918d0ff7de4946.html
c1a48d00303173aaec12ae87768d7ed7d9b397011d9c5abceba387cf4a960.html
d66ef842c481761027eaa4c38c7525bc3dea58a57e041ad27a4f5d77f6ad906.html
be854d61c25f54d161e910f8784c3c1aa0ace3ec2bbe5511ce8485bb99fdb58.html

```

## VII. PAGE RANK CALCULATION

NetworkX library is used to calculate page rank values for all web pages. The graph generated in Step VI is used as input for the PageRank function. The PageRank function outputs the page rank values for web pages in the format: <document\_ID>=page\_rank\_value.

The NetworkX library is imported as follows:

```

import networkx as nx

```

The PageRank function of the NetworkX library returns a dictionary of nodes with Page Rank as values. It is called as follows:

```

# Find page rank
pr = nx.pagerank(G, alpha = 0.85, personalization = None, max_iter = 30, tol = 1e-06, nstart = None, weight = 'weight', dangling = None)

```

The parameters set for the NetworkX Page Rank function are as follows (The information for these parameters was got from [1]):

1. G = graph (which refers to a directed NetworkX graph)
2. alpha = 0.85 (which is the damping parameter and it's value by default is 0.85)
3. personalization = None (this vector consists of a dictionary with key for graph node and non-zero value for each node)
4. max\_iter = 30 (maximum number of iterations for power method)
5. tol = 1e-06 (error tolerance for checking convergence in power method)
6. nstart = None (starting value of PageRank)
7. weight = 'weight' (indicates that the edge data key needs to be used as weights)
8. dangling = None

The complete python script to calculate page ranks using NetworkX library is as follows:

```

import networkx as nx

print 'Creating NetworkX graph from edge list and calculating page rank'

edgeList = open('/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/edgeList.txt', 'rb')
G = nx.read_edgelist(edgeList, create_using = nx.DiGraph())

# Find page rank
pr = nx.pagerank(G, alpha = 0.85, personalization = None, max_iter = 30, tol = 1e-06, nstart = None, weight = 'weight', dangling = None)

# Write to Page Rank file
f = open('/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/external_pageRankFile.txt', 'w')

dir = '/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/'
for key, val in pr.items():
    f.write(str(dir+key) + "=" + str(val) + "\n")

```

The page ranks calculated is stored in a text file titled `external_PageRank.txt`. A preview of this file is shown below:

## VIII. ADD THE external PageRank.txt FILE TO CORE

Copy the external\_PageRank.txt file generated by the Python script in Step VII to the data folder of the irhw4 core (/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/data).

## **IX. ADDING PAGE RANK FILE TO CONFIGURATION**

Modify the configuration files to include the Page Rank and change the Solr ranking strategy to Page Rank.

Add the following two lines to the schema.xml file:

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

Modify the solrconfig.xml file to include the following:

```
<listener event="newSearcher" class="org.apache.solr.schema.ExternalFileFieldReloadListener"/>
<listener event="firstSearcher" class="org.apache.solr.schema.ExternalFileFieldReloadListener"/>
```

Save the changes made to these files.

## X. RELOAD THE CORE IN SOLR UI

Since the data and the conf folders of the irhw4 core were modified, the core has to be reloaded. Hence, navigate to the Solr UI at <http://localhost:8983/solr/>, select ‘Core Admin’ on the left panel, and click ‘Reload’.

## XI. MODIFY PHP CODE

Edit the PHP code written in Step V to read in the external\_PageRank.txt file generated in Step VII. Also, the HTML form is changed to include options for choosing the type of ranking – Lucene or Page Rank.

Test the PHP Client on <http://localhost/index.php>. A screenshot of the PHP client is as follows:

<input type="text" value="localhost/index.php?q=Hurricane+Harvey&amp;rankingtype=lucene"/>	
Search: Hurricane Harvey	
Ranking Strategy: <input checked="" type="radio"/> Lucene Results <input type="radio"/> Page Rank Results	
<input type="button" value="Submit"/>	
1.	
Title	House seals deal on hurricane relief - The Boston Globe
URL	<a href="https://www.bostonglobe.com/news/nation/2017/09/08/house-seals-deal-hurricane-relief/mgMI2SyD8kUlB4ewoFSBII/story.html">https://www.bostonglobe.com/news/nation/2017/09/08/house-seals-deal-hurricane-relief/mgMI2SyD8kUlB4ewoFSBII/story.html</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/69edceb1875e253e850bc9334351b9bc00062edaf753865e2b3ae99fbb531316.html
DESCRIPTION	The House gave final approval to a fiscal deal that keeps the government funded until December, while also providing \$15 billion in hurricane relief, despite opposition from Republicans.
2.	
Title	Hurricane Harvey devastates southeast Texas - The Boston Globe
URL	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffQOqpglzfYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffQOqpglzfYxL/story.html</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/37357c44f83403c08fc709c157a25ff54c18d5b65134a6551c59a812df45b120.html
DESCRIPTION	Hurricane Harvey made landfall as a Category 4 storm along the southeast coastline of Texas over the weekend, the most powerful storm to hit the United States since 2004. As the storm lingers in the region, rainfall has caused major flooding in the Houston area and south Texas, leading to thousands of people needing rescue and evacuation.
3.	
Title	Hurricane Harvey devastates southeast Texas - The Boston Globe
URL	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffQOqpglzfYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffQOqpglzfYxL/story.html</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/0fb45fb661871b3d0a9b54f38bed83e511a0d75f79dc645465ee406d6ddc67c.html
DESCRIPTION	Hurricane Harvey made landfall as a Category 4 storm along the southeast coastline of Texas over the weekend, the most powerful storm to hit the United States since 2004. As the storm lingers in the region, rainfall has caused major flooding in the Houston area and south Texas, leading to thousands of people needing rescue and evacuation.
4.	
Title	Hurricane Harvey devastates southeast Texas - The Boston Globe
URL	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffQOqpglzfYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffQOqpglzfYxL/story.html</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/152a157770812d172bc9fe2bd815ae18c3ab3c045b7883a8723db383c03f28be.html
DESCRIPTION	Hurricane Harvey made landfall as a Category 4 storm along the southeast coastline of Texas over the weekend, the most powerful storm to hit the United States since 2004. As the storm lingers in the region, rainfall has caused major flooding in the Houston area and south Texas, leading to thousands of people needing rescue and evacuation.
5.	
Title	Hurricane Harvey devastates southeast Texas - The Boston Globe
URL	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffQOqpglzfYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffQOqpglzfYxL/story.html</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/648a95158ds93dc3409abf58c40d8f3b1f5309bb84f73c82333394015f40d3e.html
DESCRIPTION	Hurricane Harvey made landfall as a Category 4 storm along the southeast coastline of Texas over the weekend, the most powerful storm to hit the United States since 2004. As the storm lingers in the region, rainfall has caused major flooding in the Houston area and south Texas, leading to thousands of people needing rescue and evacuation.
6.	
Title	Hurricane Harvey devastates southeast Texas - The Boston Globe
URL	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffQOqpglzfYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffQOqpglzfYxL/story.html</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/f0551c7fb663a8242446cc1ab4aedee87fc88c108a30bf6b1a679d7f827b6.html
DESCRIPTION	Hurricane Harvey made landfall as a Category 4 storm along the southeast coastline of Texas over the weekend, the most powerful storm to hit the United States since 2004. As the storm lingers in the region, rainfall has caused major flooding in the Houston area and south Texas, leading to thousands of people needing rescue and evacuation.

The results were collected for all the queries given in the Homework from this UI and documented.

## PART B: PAGE RANK EXPLANATION

Page Rank is basically an algorithm used by Google to rank web pages in search results. This algorithm ranks pages based on the number of other webpages that are pointing to it and also based on the quality of the pages pointing to it [2]. So, page rank essentially determines how important a page is [2]. It assumes that if a page is being pointed to by several other pages, then it is likely to be considerably significant. [2]

Some pages have high page rank as they have a larger number of incoming links to the website and also due to the good quality of pages that point to it. So naturally the pages which have fewer incoming links or are being pointed to by low quality pages tend to have a lower page rank.

## PART C: FLOW SCREENSHOTS

The query chosen in: Star Wars

### 1. Initial Page with Query Box

A screen shot of the initial page with query box is shown below. Here, the query entered is 'Star Wars'. And, the ranking strategy chosen is 'Lucene'.

<input type="text" value="Star Wars"/>	
Ranking Strategy: <input checked="" type="radio"/> Lucene Results <input type="radio"/> Page Rank Results	
<input type="button" value="Submit"/>	

## 2. Lucene Results for Query (Default)

The top 10 results returned by Lucene for the selected query are shown below. Each result comprises of the fields – Title, URL, ID and Description.

localhost/index.php?q=Star+Wars&rankingtype=ucene			
Search: Star Wars			
Ranking Strategy: <input checked="" type="radio"/> Lucene Results <input type="radio"/> Page Rank Results			
<input type="button" value="Submit"/>			
1.	Title	The Force is with 'Star Wars: The Force Awakens' - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVdnclrp5M/story.html">https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVdnclrp5M/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/5ed705742cac8cc2468ec81d68592a1d5d56b71ddb506fc54cc593551bd7afaa.html	
	DESCRIPTION	"Star Wars: The Force Awakens" resumes the celebrated sci-fi series.	
2.	Title	The Force is with 'Star Wars: The Force Awakens' - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVdnclrp5M/story.html">https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVdnclrp5M/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/7570c4f53e01b8f31a9343eadc9e8b1d10035d133c88795f1920db2019caddd1.html	
	DESCRIPTION	"Star Wars: The Force Awakens" resumes the celebrated sci-fi series.	
3.	Title	First fan stakes out a spot for latest Star Wars film - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/metro/2015/12/17/first-line-for-the-force-fan-stakes-out-spot-for-latest-star-wars-film/QBY4M4R1QwbCoA7c7b8wO/story.html">https://www.bostonglobe.com/metro/2015/12/17/first-line-for-the-force-fan-stakes-out-spot-for-latest-star-wars-film/QBY4M4R1QwbCoA7c7b8wO/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/54bf5c91b911458cc7916beb9aaefedc330c0fd979eacc5e99eb352644de02.html	
	DESCRIPTION	Kyle Babbitt staked out a spot at the Loews Theater on the Common.	
4.	Title	For 'Star Wars' die-hards, 18-hour marathon a daunting but enjoyable task - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/lifestyle/style/2015/12/18/for-star-wars-die-hards-hour-marathon-daunting-but-enjoyable-task/W08Q3d2TeXWCQzDaZsI/story.html">https://www.bostonglobe.com/lifestyle/style/2015/12/18/for-star-wars-die-hards-hour-marathon-daunting-but-enjoyable-task/W08Q3d2TeXWCQzDaZsI/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/8fcc8acd81fb07ea9ef77d09759dfbba3f617220e71d04f5c3439daef63bdb6a.html	
	DESCRIPTION	It was just before 3 a.m. Thursday morning at the Showcase Cinema de Lux in Revere, and a collection of dedicated "Star Wars" fans would soon settle in for what figured to be a very long day.	
5.	Title	'Star Wars' is different for different generations - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/arts/2015/12/12/starwarsgenerations/PLDMidc6USG536AfUaPA7N/story.html">https://www.bostonglobe.com/arts/2015/12/12/starwarsgenerations/PLDMidc6USG536AfUaPA7N/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/sedc2a68ae536575c680280d2a746bc52130dfb77d170423a47a50d6f6435bf8.html	
	DESCRIPTION	A parade near Tokyo proves "Star Wars" fans come in a wide range of ages. AP Photo/Shizuo Kambayashi A parade near Tokyo proves "Star Wars" fans come in a wide range of ages.	
6.	Title	'Star Wars' sneakers not just for kids - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/lifestyle/style/2015/12/12/star-wars-sneakers-not-just-for-kids/XnHidQoEClvVNY94HfpJQ/story.html">https://www.bostonglobe.com/lifestyle/style/2015/12/12/star-wars-sneakers-not-just-for-kids/XnHidQoEClvVNY94HfpJQ/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/2bec3d8cfa8ca4d1175d12d525ef7e768c84cedf1078c2f288306e2b36c1a47.html	
	DESCRIPTION	Matt Morand doesn't carry a lunchbox or three-ring binder any more, but the Hopkinton dad can still wear a pair of Darth Vader sneakers on a trip to the mall.	
7.	Title	Governor Baker not a fan of new 'Star Wars' flicks - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/metro/2015/12/17/charlie-baker-not-fan-new-star-wars-flicks/UX6q3i6wY5F6AiuydfuTI/story.html">https://www.bostonglobe.com/metro/2015/12/17/charlie-baker-not-fan-new-star-wars-flicks/UX6q3i6wY5F6AiuydfuTI/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/0a452f523a6da0cf69e592b58082d32f96f3208da16cf087e52d1cc6b6c7ce35.html	

localhost/index.php?q=Star+Wars&rankingtype=ucene			
ID /Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/54bf5c91b911458cc7916beb9aaefedc330c0fd979eacc5e99eb352644de02.html			
DESCRIPTION Kyle Babbitt staked out a spot at the Loews Theater on the Common.			
4.	Title	For 'Star Wars' die-hards, 18-hour marathon a daunting but enjoyable task - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/lifestyle/style/2015/12/18/for-star-wars-die-hards-hour-marathon-daunting-but-enjoyable-task/W08Q3d2TeXWCQzDaZsI/story.html">https://www.bostonglobe.com/lifestyle/style/2015/12/18/for-star-wars-die-hards-hour-marathon-daunting-but-enjoyable-task/W08Q3d2TeXWCQzDaZsI/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/8fcc8acd81fb07ea9ef77d09759dfbba3f617220e71d04f5c3439daef63bdb6a.html	
	DESCRIPTION	It was just before 3 a.m. Thursday morning at the Showcase Cinema de Lux in Revere, and a collection of dedicated "Star Wars" fans would soon settle in for what figured to be a very long day.	
5.	Title	'Star Wars' is different for different generations - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/arts/2015/12/12/starwarsgenerations/PLDMidc6USG536AfUaPA7N/story.html">https://www.bostonglobe.com/arts/2015/12/12/starwarsgenerations/PLDMidc6USG536AfUaPA7N/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/sedc2a68ae536575c680280d2a746bc52130dfb77d170423a47a50d6f6435bf8.html	
	DESCRIPTION	A parade near Tokyo proves "Star Wars" fans come in a wide range of ages. AP Photo/Shizuo Kambayashi A parade near Tokyo proves "Star Wars" fans come in a wide range of ages.	
6.	Title	'Star Wars' sneakers not just for kids - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/lifestyle/style/2015/12/12/star-wars-sneakers-not-just-for-kids/XnHidQoEClvVNY94HfpJQ/story.html">https://www.bostonglobe.com/lifestyle/style/2015/12/12/star-wars-sneakers-not-just-for-kids/XnHidQoEClvVNY94HfpJQ/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/2bec3d8cfa8ca4d1175d12d525ef7e768c84cedf1078c2f288306e2b36c1a47.html	
	DESCRIPTION	Matt Morand doesn't carry a lunchbox or three-ring binder any more, but the Hopkinton dad can still wear a pair of Darth Vader sneakers on a trip to the mall.	
7.	Title	Governor Baker not a fan of new 'Star Wars' flicks - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/metro/2015/12/17/charlie-baker-not-fan-new-star-wars-flicks/UX6q3i6wY5F6AiuydfuTI/story.html">https://www.bostonglobe.com/metro/2015/12/17/charlie-baker-not-fan-new-star-wars-flicks/UX6q3i6wY5F6AiuydfuTI/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/0a452f523a6da0cf69e592b58082d32f96f3208da16cf087e52d1cc6b6c7ce35.html	
	DESCRIPTION	The Force, which will soon awaken, is not with Governor Charlie Baker.	
8.	Title	Getting the latest scoop, or scoops, on 'Star Wars' - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/arts/movies/2015/12/12/getting-latest-scoop-scoops-star-wars/1CDNVgBUSzNeG9FPW50yJP/story.html">https://www.bostonglobe.com/arts/movies/2015/12/12/getting-latest-scoop-scoops-star-wars/1CDNVgBUSzNeG9FPW50yJP/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/364c51c8798811e25298b0872dafd4e594edd4b22c39e81c87c839b17e3aa22d.html	
	DESCRIPTION	"Star Wars: The Force Awakens" had its media days in Los Angeles on Sunday.	
9.	Title	Getting the latest scoop, or scoops, on 'Star Wars' - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/arts/movies/2015/12/12/getting-latest-scoop-scoops-star-wars/1CDNVgBUSzNeG9FPW50yJP/story.html">https://www.bostonglobe.com/arts/movies/2015/12/12/getting-latest-scoop-scoops-star-wars/1CDNVgBUSzNeG9FPW50yJP/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/a3a3dbf760ed94455483759993c9f2e3c3ee9c67991e9ca83a00823d31ac2485.html	
	DESCRIPTION	"Star Wars: The Force Awakens" had its media days in Los Angeles on Sunday.	
10.	Title	'Star Wars' fan, meet Poe Dameron - The Boston Globe	
	URL	<a href="https://www.bostonglobe.com/arts/movies/2015/12/12/oscar-isaac-talks-about-acting-new-star-wars-movie/Z85lkTpnnFbJz9wT7PoygM/story.html">https://www.bostonglobe.com/arts/movies/2015/12/12/oscar-isaac-talks-about-acting-new-star-wars-movie/Z85lkTpnnFbJz9wT7PoygM/story.html</a>	
	ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/b4401ade0f12b5d2b2487223650d67393099be8ab3b02781250999241432aa88.html	
	DESCRIPTION	Oscar Isaac talks about acting in "Star Wars: The Force Awakens."	

### 3. Page Rank Results for Query

The top 10 results returned by the Page Rank algorithm are shown below. Each result comprises of the fields – Title, URL, ID and Description.

1.			
Title	The Boston Globe	URL	<a href="https://www.bostonglobe.com">https://www.bostonglobe.com</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/186da41d1b69770b26a97c42199eca3096036d460c848b0e027e0f1b356059b.html	DESCRIPTION	A leading news source for Massachusetts, breaking news, business, sports, health, arts & entertainment, politics, education, cars, jobs, real estate & more.
2.			
Title	The Boston Globe	URL	<a href="https://www.bostonglobe.com">https://www.bostonglobe.com</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/5838a85d461ff37807d188b584d96b357017ebdc3b911481fe782842fbe14b1.html	DESCRIPTION	A leading news source for Massachusetts, breaking news, business, sports, health, arts & entertainment, politics, education, cars, jobs, real estate & more.
3.			
Title	Sports - The Boston Globe	URL	<a href="https://www.bostonglobe.com/sports">https://www.bostonglobe.com/sports</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/5f249b436c6959484324a8970c95e7ef50fd59234d47a34e0f76a9b55dd0888a.html	DESCRIPTION	Find breaking sports news on baseball, football, basketball, hockey, soccer, college and high school sports, the Olympics and more.
4.			
Title	Obituaries - The Boston Globe	URL	<a href="https://www.bostonglobe.com">https://www.bostonglobe.com</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/6a93f3ba9af9777796399189411af293cc82686cec012574140f845b6ad78220.html	DESCRIPTION	NA
5.			
Title	Arts - The Boston Globe	URL	<a href="https://www.bostonglobe.com/arts">https://www.bostonglobe.com/arts</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/909f84d4bce2892f7947e1527ef2527cf6a797ce2f8fb4e48f55bd4b3d0de2f4.html	DESCRIPTION	NA
6.			
Title	Business - The Boston Globe	URL	<a href="https://www.bostonglobe.com/business">https://www.bostonglobe.com/business</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/e536e3f42045a6b83ee69e5ef7453b367a72ac22e47c900a13c33742b132f38f.html	DESCRIPTION	NA
7.			
Title	Sports - The Boston Globe	URL	<a href="https://www.bostonglobe.com/sports">https://www.bostonglobe.com/sports</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/920239361490f269624f97c17a3763b0ef1718b3f87fa0791c189e82ec0d2fcc.html	DESCRIPTION	

1.			
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/5f249b436c6959484324a8970c95e7ef50fd59234d47a34e0f76a9b55dd0888a.html	DESCRIPTION	Find breaking sports news on baseball, football, basketball, hockey, soccer, college and high school sports, the Olympics and more.
4.			
Title	Obituaries - The Boston Globe	URL	<a href="https://www.bostonglobe.com">https://www.bostonglobe.com</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/6a93f3ba9af9777796399189411af293cc82686cec012574140f845b6ad78220.html	DESCRIPTION	NA
5.			
Title	Arts - The Boston Globe	URL	<a href="https://www.bostonglobe.com/arts">https://www.bostonglobe.com/arts</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/909f84d4bce2892f7947e1527ef2527cf6a797ce2f8fb4e48f55bd4b3d0de2f4.html	DESCRIPTION	NA
6.			
Title	Business - The Boston Globe	URL	<a href="https://www.bostonglobe.com/business">https://www.bostonglobe.com/business</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/e536e3f42045a6b83ee69e5ef7453b367a72ac22e47c900a13c33742b132f38f.html	DESCRIPTION	NA
7.			
Title	Sports - The Boston Globe	URL	<a href="https://www.bostonglobe.com/sports">https://www.bostonglobe.com/sports</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/920239361490f269624f97c17a3763b0ef1718b3f87fa0791c189e82ec0d2fcc.html	DESCRIPTION	Find breaking sports news on baseball, football, basketball, hockey, soccer, college and high school sports, the Olympics and more.
8.			
Title	Business - The Boston Globe	URL	<a href="https://www.bostonglobe.com/business">https://www.bostonglobe.com/business</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/9f5b33cae3c530e9ae522599ebf80721708a5e42c7ddf80dc572b0af1a4a34e.html	DESCRIPTION	NA
9.			
Title	Arts - The Boston Globe	URL	<a href="https://www.bostonglobe.com/arts">https://www.bostonglobe.com/arts</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/c934592fc93816852e737491c60987edd2c00d457a4ea9b40b10b676bb3817cf.html	DESCRIPTION	NA
10.			
Title	The Boston Globe	URL	<a href="https://www.bostonglobe.com">https://www.bostonglobe.com</a>
ID	/Users/nehapathapati/Desktop/CSCI 572 - IR/Homework 4/solr-7.1.0/server/solr/irhw4/BG/BG/d4f81ffbaf93bcf9eb4fd6246d9ae95872324f36b381d9d4ef8e617874a6f40.html	DESCRIPTION	A leading news source for Massachusetts, breaking news, business, sports, health, arts & entertainment, politics, education, cars, jobs, real estate & more.

#### 4. Actual Webpages

A screenshot of the webpage got after clicking the first Lucene Result in Step 2 is as follows:

The screenshot shows a news article from the Boston Globe's 'Movies' section. The headline is "Launch of 'Star Wars: The Force Awakens' takes the faithful full circle". Below the headline is a large image of a Star Wars ship. A sidebar on the right lists "Top 10 Trending Articles" with links to various stories. At the bottom, there is a call-to-action for readers to subscribe to the site.

**Launch of 'Star Wars: The Force Awakens' takes the faithful full circle**

We hope you've enjoyed your free articles  
Continue reading by subscribing to Globe.com for just 99¢.  
[Subscribe now](#) [Already a member?](#) [Log in](#) [Home](#)

A screenshot of the webpage got after clicking the first Page Rank Result in Step 3 is as follows:

The screenshot shows the main homepage of the Boston Globe. The top navigation bar includes links for "SUBSCRIBE TODAY" and "Ethical. Trustworthy. Real.". The main banner features an advertisement for L.L.Bean with a 25% off offer. Below the banner, there is a large image of a baby and a headline about sexual harassment at Berklee College of Music. On the right side, there is a sidebar for newsletters and breaking news alerts.

**The Boston Globe**

**L.L.Bean** **25% OFF**  
ENDS TUESDAY, 11/14

**An extraordinary day at Berklee puts focus on sexual harassment**

**Chelsea police make terminally ill toddler's dream come true**

**A fifth woman comes forward against Roy Moore**

**Varsity News**

**Breaking News Alerts**

## PART D: URLs OF TOP TEN RESULTS (LUCENE AND PAGE RANK)

QUERY 1: Elon Musk		
#	LUCENE RESULTS	PAGE RANK RESULTS
1	<a href="https://www.bostonglobe.com/sports/bruins/2017/10/05/youngsters-lift-bruins-victory/fsKD9FFTnXE1LQQXAS6kBm/story.html">https://www.bostonglobe.com/sports/bruins/2017/10/05/youngsters-lift-bruins-victory/fsKD9FFTnXE1LQQXAS6kBm/story.html</a>	<a href="https://www.bostonglobe.com/2014/05/04/tracking-dorm-shortfall/umq1VQjQWYrbDCH7hcOFIN/story.html">https://www.bostonglobe.com/2014/05/04/tracking-dorm-shortfall/umq1VQjQWYrbDCH7hcOFIN/story.html</a>
2	<a href="https://www.bostonglobe.com/sports/bruins/2017/10/05/youngsters-lift-bruins-victory/fsKD9FFTnXE1LQQXAS6kBm/story.html">https://www.bostonglobe.com/sports/bruins/2017/10/05/youngsters-lift-bruins-victory/fsKD9FFTnXE1LQQXAS6kBm/story.html</a>	<a href="https://www.bostonglobe.com/business/2017/09/27/jeff-bezos-has-never-lived-worked-here-but-knows-lot-about-boston/yKb9pR9zfb1SMd1MnTTDj/story.html">https://www.bostonglobe.com/business/2017/09/27/jeff-bezos-has-never-lived-worked-here-but-knows-lot-about-boston/yKb9pR9zfb1SMd1MnTTDj/story.html</a>
3	<a href="https://www.bostonglobe.com/2016/09/16/freightfarm/MVvdKOWwrMSAof8cmHOliN/story.html">https://www.bostonglobe.com/2016/09/16/freightfarm/MVvdKOWwrMSAof8cmHOliN/story.html</a>	<a href="https://www.bostonglobe.com/sports/bruins/2017/10/05/youngsters-lift-bruins-victory/fsKD9FFTnXE1LQQXAS6kBm/story.html">https://www.bostonglobe.com/sports/bruins/2017/10/05/youngsters-lift-bruins-victory/fsKD9FFTnXE1LQQXAS6kBm/story.html</a>
4	<a href="https://www.bostonglobe.com/news/nation/2017/09/08/commerce-secretary-ceos-were-wrong-quit-trump-councils-after-charlottesville/0tBTfkswTtE7nfInfVNapl/story.html">https://www.bostonglobe.com/news/nation/2017/09/08/commerce-secretary-ceos-were-wrong-quit-trump-councils-after-charlottesville/0tBTfkswTtE7nfInfVNapl/story.html</a>	<a href="https://www.bostonglobe.com/sports/2015/06/27/boston-globe-baseball-all-scholastics/EGDePA2zBCfkT7R6kxEWAP/story.html">https://www.bostonglobe.com/sports/2015/06/27/boston-globe-baseball-all-scholastics/EGDePA2zBCfkT7R6kxEWAP/story.html</a>
5	<a href="https://www.bostonglobe.com/lifestyle/2017/10/05/for-electric-car-owners-range-anxiety-gives-way-charging-time-trauma/BbVjlWtQjSk0hl9nDOK8NI/story.html">https://www.bostonglobe.com/lifestyle/2017/10/05/for-electric-car-owners-range-anxiety-gives-way-charging-time-trauma/BbVjlWtQjSk0hl9nDOK8NI/story.html</a>	<a href="https://www.bostonglobe.com/2016/09/16/freightfarm/MVvdKOWwrMSAof8cmHOliN/story.html">https://www.bostonglobe.com/2016/09/16/freightfarm/MVvdKOWwrMSAof8cmHOliN/story.html</a>
6	<a href="https://www.bostonglobe.com/lifestyle/2017/10/05/for-electric-car-owners-range-anxiety-gives-way-charging-time-trauma/BbVjlWtQjSk0hl9nDOK8NI/story.html">https://www.bostonglobe.com/lifestyle/2017/10/05/for-electric-car-owners-range-anxiety-gives-way-charging-time-trauma/BbVjlWtQjSk0hl9nDOK8NI/story.html</a>	<a href="https://www.bostonglobe.com/sports/high-schools/2017/06/30/boston-globe-preps-all-scholastics/mfVPQtq2ey9fTHuPHQec9L/story.html">https://www.bostonglobe.com/sports/high-schools/2017/06/30/boston-globe-preps-all-scholastics/mfVPQtq2ey9fTHuPHQec9L/story.html</a>
7	<a href="https://www.bostonglobe.com/news/nation/2017/08/15/some-corporations-have-had-enough-trump/o2JljN2DbdkuaQYSx6HRjl/story.html">https://www.bostonglobe.com/news/nation/2017/08/15/some-corporations-have-had-enough-trump/o2JljN2DbdkuaQYSx6HRjl/story.html</a>	<a href="https://www.bostonglobe.com/sports/high-schools/2017/06/30/boston-globe-girls-tennis-all-scholastics/GTzxcWey1r9d0Rskjt0N5L/story.html">https://www.bostonglobe.com/sports/high-schools/2017/06/30/boston-globe-girls-tennis-all-scholastics/GTzxcWey1r9d0Rskjt0N5L/story.html</a>
8	<a href="https://www.bostonglobe.com/news/nation/2017/08/15/some-corporations-have-had-enough-trump/o2JljN2DbdkuaQYSx6HRjl/story.html">https://www.bostonglobe.com/news/nation/2017/08/15/some-corporations-have-had-enough-trump/o2JljN2DbdkuaQYSx6HRjl/story.html</a>	<a href="https://www.bostonglobe.com/lifestyle/2017/10/05/for-electric-car-owners-range-anxiety-gives-way-charging-time-trauma/BbVjlWtQjSk0hl9nDOK8NI/story.html">https://www.bostonglobe.com/lifestyle/2017/10/05/for-electric-car-owners-range-anxiety-gives-way-charging-time-trauma/BbVjlWtQjSk0hl9nDOK8NI/story.html</a>
9	<a href="https://www.bostonglobe.com/business/2017/09/27/jeff-bezos-has-never-lived-worked-here-but-knows-lot-about-boston/yKb9pR9zfb1SMd1MnTTDj/story.html">https://www.bostonglobe.com/business/2017/09/27/jeff-bezos-has-never-lived-worked-here-but-knows-lot-about-boston/yKb9pR9zfb1SMd1MnTTDj/story.html</a>	<a href="https://www.bostonglobe.com/news/nation/2017/08/15/some-corporations-have-had-enough-trump/o2JljN2DbdkuaQYSx6HRjl/story.html">https://www.bostonglobe.com/news/nation/2017/08/15/some-corporations-have-had-enough-trump/o2JljN2DbdkuaQYSx6HRjl/story.html</a>
10	<a href="https://www.bostonglobe.com/business/2017/09/27/jeff-bezos-has-never-lived-worked-here-but-knows-lot-about-boston/yKb9pR9zfb1SMd1MnTTDj/story.html">https://www.bostonglobe.com/business/2017/09/27/jeff-bezos-has-never-lived-worked-here-but-knows-lot-about-boston/yKb9pR9zfb1SMd1MnTTDj/story.html</a>	<a href="https://www.bostonglobe.com/sports/high-schools/2017/06/30/boston-globe-preps-all-scholastics/mfVPQtq2ey9fTHuPHQec9L/story.html">https://www.bostonglobe.com/sports/high-schools/2017/06/30/boston-globe-preps-all-scholastics/mfVPQtq2ey9fTHuPHQec9L/story.html</a>

QUERY 2: Star Wars		
#	LUCENE RESULTS	PAGE RANK RESULTS
1	<a href="https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVDnclirp5M/story.html">https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVDnclirp5M/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
2	<a href="https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVDnclirp5M/story.html">https://www.bostonglobe.com/arts/movies/2015/12/15/the-force-with-star-wars-the-force-awakens/KyOQ1W4zeMyVDnclirp5M/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
3	<a href="https://www.bostonglobe.com/metro/2015/12/17/first-line-for-the-force-fan-stakes-out-spot-for-latest-star-wars-film/QBYM4R1QwbCoA7c7cBs8wO/story.html">https://www.bostonglobe.com/metro/2015/12/17/first-line-for-the-force-fan-stakes-out-spot-for-latest-star-wars-film/QBYM4R1QwbCoA7c7cBs8wO/story.html</a>	<a href="https://www.bostonglobe.com/sports">https://www.bostonglobe.com/sports</a>
4	<a href="https://www.bostonglobe.com/lifestyle/style/2015/12/18/for-star-wars-die-hards-hour-marathon-daunting-but-enjoyable-task/W08Q3d2TeXWCQzDalZaZsl/story.html">https://www.bostonglobe.com/lifestyle/style/2015/12/18/for-star-wars-die-hards-hour-marathon-daunting-but-enjoyable-task/W08Q3d2TeXWCQzDalZaZsl/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
5	<a href="https://www.bostonglobe.com/arts/2015/12/12/starwarsgenerations/PLDMidc6USG536AfUaPA7N/story.html">https://www.bostonglobe.com/arts/2015/12/12/starwarsgenerations/PLDMidc6USG536AfUaPA7N/story.html</a>	<a href="https://www.bostonglobe.com/arts">https://www.bostonglobe.com/arts</a>
6	<a href="https://www.bostonglobe.com/lifestyle/style/2015/12/12/star-wars-sneakers-not-just-for-kids/XnHidQOeClvVNY94HfptQJ/story.html">https://www.bostonglobe.com/lifestyle/style/2015/12/12/star-wars-sneakers-not-just-for-kids/XnHidQOeClvVNY94HfptQJ/story.html</a>	<a href="https://www.bostonglobe.com/business">https://www.bostonglobe.com/business</a>
7	<a href="https://www.bostonglobe.com/metro/2015/12/17/charlie-baker-not-fan-new-star-wars-flicks/UX6q3i6wY5F6AluydftuTl/story.html">https://www.bostonglobe.com/metro/2015/12/17/charlie-baker-not-fan-new-star-wars-flicks/UX6q3i6wY5F6AluydftuTl/story.html</a>	<a href="https://www.bostonglobe.com/sports">https://www.bostonglobe.com/sports</a>
8	<a href="https://www.bostonglobe.com/arts/movies/2015/12/12/getting-latest-scoop-scoops-star-wars/1CDNVgBUSzNeG9FPW50yJP/story.html">https://www.bostonglobe.com/arts/movies/2015/12/12/getting-latest-scoop-scoops-star-wars/1CDNVgBUSzNeG9FPW50yJP/story.html</a>	<a href="https://www.bostonglobe.com/business">https://www.bostonglobe.com/business</a>
9	<a href="https://www.bostonglobe.com/arts/movies/2015/12/12/getting-latest-scoop-scoops-star-wars/1CDNVgBUSzNeG9FPW50yJP/story.html">https://www.bostonglobe.com/arts/movies/2015/12/12/getting-latest-scoop-scoops-star-wars/1CDNVgBUSzNeG9FPW50yJP/story.html</a>	<a href="https://www.bostonglobe.com/arts">https://www.bostonglobe.com/arts</a>
10	<a href="https://www.bostonglobe.com/arts/movies/2015/12/12/oscar-isaac-talks-about-acting-new-star-wars-movie/Z85IkTprnFbjz9wT7PoygM/story.html">https://www.bostonglobe.com/arts/movies/2015/12/12/oscar-isaac-talks-about-acting-new-star-wars-movie/Z85IkTprnFbjz9wT7PoygM/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>

QUERY 3: North Korea		
#	LUCENE RESULTS	PAGE RANK RESULTS
1	<a href="https://www.bostonglobe.com/news/world/2017/09/08/korea-braces-for-another-possible-korea-missile-test/wrfYUFe7CEgGvKbcg41ZbN/story.html">https://www.bostonglobe.com/news/world/2017/09/08/korea-braces-for-another-possible-korea-missile-test/wrfYUFe7CEgGvKbcg41ZbN/story.html</a>	<a href="https://www.bostonglobe.com/login?p1=BGHeader_Login_Link">https://www.bostonglobe.com/login?p1=BGHeader_Login_Link</a>
2	<a href="https://www.bostonglobe.com/news/world/2017/08/09/trump-threatens-fire-and-fury-against-north-korea-endangers/sSaFxbsotVeQ3syE8glvgO/story.html">https://www.bostonglobe.com/news/world/2017/08/09/trump-threatens-fire-and-fury-against-north-korea-endangers/sSaFxbsotVeQ3syE8glvgO/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
3	<a href="https://www.bostonglobe.com/news/world/2017/08/09/trump-threatens-fire-and-fury-against-north-korea-endangers/sSaFxbsotVeQ3syE8glvgO/story.html">https://www.bostonglobe.com/news/world/2017/08/09/trump-threatens-fire-and-fury-against-north-korea-endangers/sSaFxbsotVeQ3syE8glvgO/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
4	<a href="https://www.bostonglobe.com/opinion/2017/08/09/plan-for-north-korea-before-this-spirals-out-control/Q23bbp1BbDPITxdvYxv3LK/story.html">https://www.bostonglobe.com/opinion/2017/08/09/plan-for-north-korea-before-this-spirals-out-control/Q23bbp1BbDPITxdvYxv3LK/story.html</a>	<a href="https://www.bostonglobe.com/sports">https://www.bostonglobe.com/sports</a>
5	<a href="https://www.bostonglobe.com/opinion/2017/08/09/plan-for-north-korea-before-this-spirals-out-control/Q23bbp1BbDPITxdvYxv3LK/story.html">https://www.bostonglobe.com/opinion/2017/08/09/plan-for-north-korea-before-this-spirals-out-control/Q23bbp1BbDPITxdvYxv3LK/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
6	<a href="https://www.bostonglobe.com/news/world/2017/09/25/north-korea-minister-says-can-shoot-down-bombers/8TtjEtXdimYcIXEArvHu5K/story.html">https://www.bostonglobe.com/news/world/2017/09/25/north-korea-minister-says-can-shoot-down-bombers/8TtjEtXdimYcIXEArvHu5K/story.html</a>	<a href="https://www.bostonglobe.com/lifestyle">https://www.bostonglobe.com/lifestyle</a>
7	<a href="https://www.bostonglobe.com/news/politics/2017/09/26/north-korea-seeks-help-from-republican-analysts-what-with-trump/Iro675CGFxHP3wqY4ZbzhK/story.html">https://www.bostonglobe.com/news/politics/2017/09/26/north-korea-seeks-help-from-republican-analysts-what-with-trump/Iro675CGFxHP3wqY4ZbzhK/story.html</a>	<a href="https://www.bostonglobe.com/opinion">https://www.bostonglobe.com/opinion</a>
8	<a href="https://www.bostonglobe.com/news/politics/2017/09/26/north-korea-seeks-help-from-republican-analysts-what-with-trump/Iro675CGFxHP3wqY4ZbzhK/story.html">https://www.bostonglobe.com/news/politics/2017/09/26/north-korea-seeks-help-from-republican-analysts-what-with-trump/Iro675CGFxHP3wqY4ZbzhK/story.html</a>	<a href="https://www.bostonglobe.com/metro">https://www.bostonglobe.com/metro</a>
9	<a href="https://www.bostonglobe.com/news/nation/2017/09/03/trump-says-north-korea-very-hostile-and-dangerous/SoR0T7tl6i3MdNpwHonu9M/story.html">https://www.bostonglobe.com/news/nation/2017/09/03/trump-says-north-korea-very-hostile-and-dangerous/SoR0T7tl6i3MdNpwHonu9M/story.html</a>	<a href="https://www.bostonglobe.com/lifestyle/crossword">https://www.bostonglobe.com/lifestyle/crossword</a>
10	<a href="https://www.bostonglobe.com/news/nation/2017/09/03/trump-says-north-korea-very-hostile-and-dangerous/SoR0T7tl6i3MdNpwHonu9M/story.html">https://www.bostonglobe.com/news/nation/2017/09/03/trump-says-north-korea-very-hostile-and-dangerous/SoR0T7tl6i3MdNpwHonu9M/story.html</a>	<a href="https://www.bostonglobe.com/opinion">https://www.bostonglobe.com/opinion</a>

QUERY 4: LA Dodgers		
#	LUCENE RESULTS	PAGE RANK RESULTS
1	<a href="https://www.bostonglobe.com/sports/2017/10/07/mlb-boxscore-dodgers-diamondbacks/TAdQkAqY6OqncGtjjZyG8O/story.html">https://www.bostonglobe.com/sports/2017/10/07/mlb-boxscore-dodgers-diamondbacks/TAdQkAqY6OqncGtjjZyG8O/story.html</a>	<a href="https://www.bostonglobe.com/arts">https://www.bostonglobe.com/arts</a>
2	<a href="https://www.bostonglobe.com/sports/2012/08/26/gonzo/Avzuwi4ZrRfOBdQKd1UFGP/story.html">https://www.bostonglobe.com/sports/2012/08/26/gonzo/Avzuwi4ZrRfOBdQKd1UFGP/story.html</a>	<a href="https://www.bostonglobe.com/arts">https://www.bostonglobe.com/arts</a>
3	<a href="https://www.bostonglobe.com/lifestyle/names/2017/09/28/carl-crawford-boston-carried-hate-for-that-city-for-long-time/SKvbZfN6QwarHEy24f965H/story.html">https://www.bostonglobe.com/lifestyle/names/2017/09/28/carl-crawford-boston-carried-hate-for-that-city-for-long-time/SKvbZfN6QwarHEy24f965H/story.html</a>	<a href="https://www.bostonglobe.com/lifestyle/names">https://www.bostonglobe.com/lifestyle/names</a>
4	<a href="https://www.bostonglobe.com/lifestyle/names/2017/09/28/carl-crawford-boston-carried-hate-for-that-city-for-long-time/SKvbZfN6QwarHEy24f965H/story.html">https://www.bostonglobe.com/lifestyle/names/2017/09/28/carl-crawford-boston-carried-hate-for-that-city-for-long-time/SKvbZfN6QwarHEy24f965H/story.html</a>	<a href="https://www.bostonglobe.com/lifestyle/names">https://www.bostonglobe.com/lifestyle/names</a>
5	<a href="https://www.bostonglobe.com/lifestyle/names/2017/09/28/carl-crawford-boston-carried-hate-for-that-city-for-long-time/SKvbZfN6QwarHEy24f965H/amp.html">https://www.bostonglobe.com/lifestyle/names/2017/09/28/carl-crawford-boston-carried-hate-for-that-city-for-long-time/SKvbZfN6QwarHEy24f965H/amp.html</a>	<a href="https://www.bostonglobe.com/arts/2017/10/06/seuss-controversy-illuminates-cultural-clash/9bg6jN1x3Dzsk5yT1dv8XP/story.html">https://www.bostonglobe.com/arts/2017/10/06/seuss-controversy-illuminates-cultural-clash/9bg6jN1x3Dzsk5yT1dv8XP/story.html</a>
6	<a href="https://www.bostonglobe.com/sports/redsox/2017/10/07/torey-luvullo-brought-love-yes-love-diamondbacks-clubhouse/HsIpMKRh4Hid1hXDCBwwyl/amp.html">https://www.bostonglobe.com/sports/redsox/2017/10/07/torey-luvullo-brought-love-yes-love-diamondbacks-clubhouse/HsIpMKRh4Hid1hXDCBwwyl/amp.html</a>	<a href="https://www.bostonglobe.com/arts/2017/10/06/seuss-controversy-illuminates-cultural-clash/9bg6jN1x3Dzsk5yT1dv8XP/story.html">https://www.bostonglobe.com/arts/2017/10/06/seuss-controversy-illuminates-cultural-clash/9bg6jN1x3Dzsk5yT1dv8XP/story.html</a>
7	<a href="https://www.bostonglobe.com/sports/redsox/2017/10/07/there-lot-like-about-baseball-except-all-pitching-changes/FXoONTz8M2oTYNyCMfJYAN/amp.html">https://www.bostonglobe.com/sports/redsox/2017/10/07/there-lot-like-about-baseball-except-all-pitching-changes/FXoONTz8M2oTYNyCMfJYAN/amp.html</a>	<a href="https://www.bostonglobe.com/arts">https://www.bostonglobe.com/arts</a>
8	<a href="https://www.bostonglobe.com/sports/2017/09/30/baseball-standings/G6K9mjYu6AokJmy36PkhcL/story.html">https://www.bostonglobe.com/sports/2017/09/30/baseball-standings/G6K9mjYu6AokJmy36PkhcL/story.html</a>	<a href="https://www.bostonglobe.com/news/bigpicture/2017/04/12/animal-expressions/jqzvgvqvk5GqncG2shUP1O/story.html">https://www.bostonglobe.com/news/bigpicture/2017/04/12/animal-expressions/jqzvgvqvk5GqncG2shUP1O/story.html</a>
9	<a href="https://www.bostonglobe.com/sports/redsox/2017/10/04/diamondbacks-advance-after-wild-one-over-rockies/ZXhz3EJeboHWpmrFA4UcRP/story.html">https://www.bostonglobe.com/sports/redsox/2017/10/04/diamondbacks-advance-after-wild-one-over-rockies/ZXhz3EJeboHWpmrFA4UcRP/story.html</a>	<a href="https://www.bostonglobe.com/arts">https://www.bostonglobe.com/arts</a>
10	<a href="https://www.bostonglobe.com/sports/redsox/2017/10/04/diamondbacks-advance-after-wild-one-over-rockies/ZXhz3EJeboHWpmrFA4UcRP/story.html">https://www.bostonglobe.com/sports/redsox/2017/10/04/diamondbacks-advance-after-wild-one-over-rockies/ZXhz3EJeboHWpmrFA4UcRP/story.html</a>	<a href="https://www.bostonglobe.com/news/bigpicture/2017/04/12/animal-expressions/jqzvgvqvk5GqncG2shUP1O/story.html">https://www.bostonglobe.com/news/bigpicture/2017/04/12/animal-expressions/jqzvgvqvk5GqncG2shUP1O/story.html</a>

QUERY 5: Puerto Rico		
#	LUCENE RESULTS	PAGE RANK RESULTS
1	<a href="https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html">https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
2	<a href="https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html">https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
3	<a href="https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html">https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html</a>	<a href="https://www.bostonglobe.com/business">https://www.bostonglobe.com/business</a>
4	<a href="https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html">https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html</a>	<a href="https://www.bostonglobe.com/business">https://www.bostonglobe.com/business</a>
5	<a href="https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html">https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
6	<a href="https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html">https://www.bostonglobe.com/news/politics/2017/10/03/six-things-trump-probably-shouldn-have-said-about-puerto-rico-while-puerto-rico/z2A6pU5IozLPkJdMzSY3HP/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
7	<a href="https://www.bostonglobe.com/opinion/editorials/2017/09/26/where-urgency-puerto-rico-response/oFxAJlj9duwxiaxVGK0LIL/story.html">https://www.bostonglobe.com/opinion/editorials/2017/09/26/where-urgency-puerto-rico-response/oFxAJlj9duwxiaxVGK0LIL/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
8	<a href="https://www.bostonglobe.com/opinion/editorials/2017/09/26/where-urgency-puerto-rico-response/oFxAJlj9duwxiaxVGK0LIL/story.html">https://www.bostonglobe.com/opinion/editorials/2017/09/26/where-urgency-puerto-rico-response/oFxAJlj9duwxiaxVGK0LIL/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
9	<a href="https://www.bostonglobe.com/opinion/editorials/2017/09/23/don-let-puerto-rico-languish/k7iPpkMGa54CDFd65lwh4H/story.html">https://www.bostonglobe.com/opinion/editorials/2017/09/23/don-let-puerto-rico-languish/k7iPpkMGa54CDFd65lwh4H/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
10	<a href="https://www.bostonglobe.com/opinion/editorials/2017/09/23/don-let-puerto-rico-languish/k7iPpkMGa54CDFd65lwh4H/story.html">https://www.bostonglobe.com/opinion/editorials/2017/09/23/don-let-puerto-rico-languish/k7iPpkMGa54CDFd65lwh4H/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>

QUERY 6: Hurricane Harvey		
#	LUCENE RESULTS	PAGE RANK RESULTS
1	<a href="https://www.bostonglobe.com/news/nation/2017/09/08/house-seals-deal-hurricane-relief/mgMI2SyD8kUlB4ewoFSBII/story.html">https://www.bostonglobe.com/news/nation/2017/09/08/house-seals-deal-hurricane-relief/mgMI2SyD8kUlB4ewoFSBII/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/05/term-purchase/RfO4zG3drUPKI8BRZNKIDP/story.html">https://www.bostonglobe.com/1970/01/05/term-purchase/RfO4zG3drUPKI8BRZNKIDP/story.html</a>
2	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/13/privacy-policy/LZx4MmGtzRGBg8CkDCIadI/story.html">https://www.bostonglobe.com/1970/01/13/privacy-policy/LZx4MmGtzRGBg8CkDCIadI/story.html</a>
3	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html</a>	<a href="https://www.bostonglobe.com/tools/help/staflist">https://www.bostonglobe.com/tools/help/staflist</a>
4	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/13/terms-service/XpUbEbX2aS9pkwUa7aOKTI/story.html">https://www.bostonglobe.com/1970/01/13/terms-service/XpUbEbX2aS9pkwUa7aOKTI/story.html</a>
5	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html</a>	<a href="https://www.bostonglobe.com/newsletters">https://www.bostonglobe.com/newsletters</a>
6	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/13/terms-service/XpUbEbX2aS9pkwUa7aOKTI/story.html">https://www.bostonglobe.com/1970/01/13/terms-service/XpUbEbX2aS9pkwUa7aOKTI/story.html</a>
7	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/05/term-purchase/RfO4zG3drUPKI8BRZNKIDP/story.html">https://www.bostonglobe.com/1970/01/05/term-purchase/RfO4zG3drUPKI8BRZNKIDP/story.html</a>
8	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html</a>	<a href="https://www.bostonglobe.com/tools/help/staflist">https://www.bostonglobe.com/tools/help/staflist</a>
9	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html</a>	<a href="https://www.bostonglobe.com/newsletters">https://www.bostonglobe.com/newsletters</a>
10	<a href="https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html">https://www.bostonglobe.com/news/bigpicture/2017/08/28/hurricane-harvey-devastates-southeast-texas/ZWm7Ln0xffqQqpglzffYxL/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/13/privacy-policy/LZx4MmGtzRGBg8CkDCIadI/story.html">https://www.bostonglobe.com/1970/01/13/privacy-policy/LZx4MmGtzRGBg8CkDCIadI/story.html</a>

QUERY 7: iPhone X		
#	LUCENE RESULTS	PAGE RANK RESULTS
1	<a href="https://www.bostonglobe.com/business/2017/09/21/should-you-queue-for-new-iphone-wait-for/MZLL85K3mhl2iGVYuy8ofN/story.html">https://www.bostonglobe.com/business/2017/09/21/should-you-queue-for-new-iphone-wait-for/MZLL85K3mhl2iGVYuy8ofN/story.html</a>	<a href="https://www.bostonglobe.com/login?p1=BGHeader_LogIn_Link">https://www.bostonglobe.com/login?p1=BGHeader_LogIn_Link</a>
2	<a href="https://www.bostonglobe.com/business/2017/09/21/should-you-queue-for-new-iphone-wait-for/MZLL85K3mhl2iGVYuy8ofN/story.html">https://www.bostonglobe.com/business/2017/09/21/should-you-queue-for-new-iphone-wait-for/MZLL85K3mhl2iGVYuy8ofN/story.html</a>	<a href="https://www.bostonglobe.com/login?p1=BGMenu_LogIn_Link">https://www.bostonglobe.com/login?p1=BGMenu_LogIn_Link</a>
3	<a href="https://www.bostonglobe.com/ideas/2017/09/12/apple-world-iphone-doesn-need-look-like-iphone/C8EFHm2BFe6eV9oeCudAKO/story.html">https://www.bostonglobe.com/ideas/2017/09/12/apple-world-iphone-doesn-need-look-like-iphone/C8EFHm2BFe6eV9oeCudAKO/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/05/term-purchase/RfO4zG3drUPKI8BRZNKIDP/story.html">https://www.bostonglobe.com/1970/01/05/term-purchase/RfO4zG3drUPKI8BRZNKIDP/story.html</a>
4	<a href="https://www.bostonglobe.com/business/2017/09/12/super-new-iphone-may-not-quite-super-enough-for-price/cVm5OkTOwWHIRtNtCORVDJ/story.html">https://www.bostonglobe.com/business/2017/09/12/super-new-iphone-may-not-quite-super-enough-for-price/cVm5OkTOwWHIRtNtCORVDJ/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/13/privacy-policy/LZx4MmGtzRGBg8CkDCladI/story.html">https://www.bostonglobe.com/1970/01/13/privacy-policy/LZx4MmGtzRGBg8CkDCladI/story.html</a>
5	<a href="https://www.bostonglobe.com/business/2017/09/12/super-new-iphone-may-not-quite-super-enough-for-price/cVm5OkTOwWHIRtNtCORVDJ/story.html">https://www.bostonglobe.com/business/2017/09/12/super-new-iphone-may-not-quite-super-enough-for-price/cVm5OkTOwWHIRtNtCORVDJ/story.html</a>	<a href="https://www.bostonglobe.com/tools/help/stafflist">https://www.bostonglobe.com/tools/help/stafflist</a>
6	<a href="https://www.bostonglobe.com/business/2017/09/12/super-new-iphone-may-not-quite-super-enough-for-price/cVm5OkTOwWHIRtNtCORVDJ/story.html">https://www.bostonglobe.com/business/2017/09/12/super-new-iphone-may-not-quite-super-enough-for-price/cVm5OkTOwWHIRtNtCORVDJ/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/13/terms-service/XpUbEbX2aS9pkwUa7aOKTI/story.html">https://www.bostonglobe.com/1970/01/13/terms-service/XpUbEbX2aS9pkwUa7aOKTI/story.html</a>
7	<a href="https://www.bostonglobe.com/business/2017/09/12/super-new-iphone-may-not-quite-super-enough-for-price/cVm5OkTOwWHIRtNtCORVDJ/story.html">https://www.bostonglobe.com/business/2017/09/12/super-new-iphone-may-not-quite-super-enough-for-price/cVm5OkTOwWHIRtNtCORVDJ/story.html</a>	<a href="https://www.bostonglobe.com/newsletters">https://www.bostonglobe.com/newsletters</a>
8	<a href="https://www.bostonglobe.com/ideas/2017/09/12/apple-world-iphone-doesn-need-look-like-iphone/C8EFHm2BFe6eV9oeCudAKO/story.html">https://www.bostonglobe.com/ideas/2017/09/12/apple-world-iphone-doesn-need-look-like-iphone/C8EFHm2BFe6eV9oeCudAKO/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/13/terms-service/XpUbEbX2aS9pkwUa7aOKTI/story.html">https://www.bostonglobe.com/1970/01/13/terms-service/XpUbEbX2aS9pkwUa7aOKTI/story.html</a>
9	<a href="https://www.bostonglobe.com/ideas/2017/09/12/apple-world-iphone-doesn-need-look-like-iphone/C8EFHm2BFe6eV9oeCudAKO/story.html">https://www.bostonglobe.com/ideas/2017/09/12/apple-world-iphone-doesn-need-look-like-iphone/C8EFHm2BFe6eV9oeCudAKO/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/05/term-purchase/RfO4zG3drUPKI8BRZNKIDP/story.html">https://www.bostonglobe.com/1970/01/05/term-purchase/RfO4zG3drUPKI8BRZNKIDP/story.html</a>
10	<a href="https://www.bostonglobe.com/business/2017/09/12/super-new-iphone-may-not-quite-super-enough-for-price/cVm5OkTOwWHIRtNtCORVDJ/amp.html">https://www.bostonglobe.com/business/2017/09/12/super-new-iphone-may-not-quite-super-enough-for-price/cVm5OkTOwWHIRtNtCORVDJ/amp.html</a>	<a href="https://www.bostonglobe.com/tools/help/stafflist">https://www.bostonglobe.com/tools/help/stafflist</a>

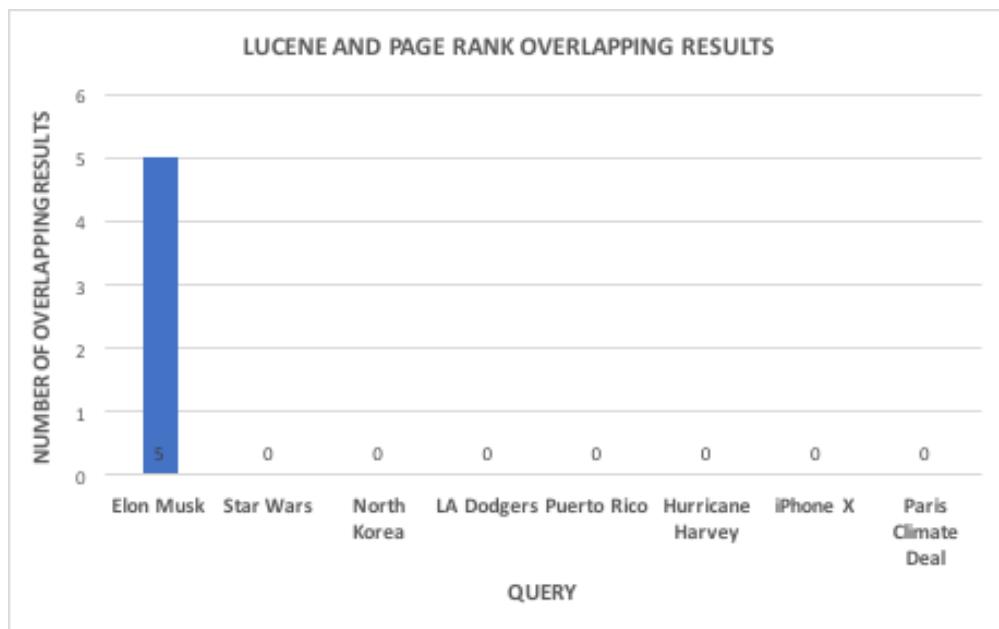
QUERY 8: Paris Climate Deal		
#	LUCENE RESULTS	PAGE RANK RESULTS
1	<a href="https://www.bostonglobe.com/news/politics/2017/06/02/john-kerry-calls-trump-climate-change-announcement-day-craven-ignorance-and-cynicism/GWBwSaQwm24lsxfX5jHmWM/amp.html">https://www.bostonglobe.com/news/politics/2017/06/02/john-kerry-calls-trump-climate-change-announcement-day-craven-ignorance-and-cynicism/GWBwSaQwm24lsxfX5jHmWM/amp.html</a>	<a href="https://www.bostonglobe.com/1970/01/13/privacy-policy/LZx4MmGtzRGBg8CkDCladI/story.html">https://www.bostonglobe.com/1970/01/13/privacy-policy/LZx4MmGtzRGBg8CkDCladI/story.html</a>
2	<a href="https://www.bostonglobe.com/news/politics/2017/06/02/john-kerry-calls-trump-climate-change-announcement-day-craven-ignorance-and-cynicism/GWBwSaQwm24lsxfX5jHmWM/story.html">https://www.bostonglobe.com/news/politics/2017/06/02/john-kerry-calls-trump-climate-change-announcement-day-craven-ignorance-and-cynicism/GWBwSaQwm24lsxfX5jHmWM/story.html</a>	<a href="https://www.bostonglobe.com/1970/01/13/privacy-policy/LZx4MmGtzRGBg8CkDCladI/story.html">https://www.bostonglobe.com/1970/01/13/privacy-policy/LZx4MmGtzRGBg8CkDCladI/story.html</a>
3	<a href="https://www.bostonglobe.com/news/politics/2017/06/02/john-kerry-calls-trump-climate-change-announcement-day-craven-ignorance-and-cynicism/GWBwSaQwm24lsxfX5jHmWM/story.html">https://www.bostonglobe.com/news/politics/2017/06/02/john-kerry-calls-trump-climate-change-announcement-day-craven-ignorance-and-cynicism/GWBwSaQwm24lsxfX5jHmWM/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
4	<a href="https://www.bostonglobe.com/magazine/2015/07/22/energy-secretary-ernie-moniz-cabinet-star-born/PsqmP1TairoTYQ1OSbt3uJ/story.html">https://www.bostonglobe.com/magazine/2015/07/22/energy-secretary-ernie-moniz-cabinet-star-born/PsqmP1TairoTYQ1OSbt3uJ/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
5	<a href="https://www.bostonglobe.com/business/2017/06/14/stata-slowing-down-hardly/xBhdDp7fFMfsxpjCzGunQJ/story.html">https://www.bostonglobe.com/business/2017/06/14/stata-slowing-down-hardly/xBhdDp7fFMfsxpjCzGunQJ/story.html</a>	<a href="https://www.bostonglobe.com/news/bigpicture">https://www.bostonglobe.com/news/bigpicture</a>
6	<a href="https://www.bostonglobe.com/metro/2017/06/02/climate/qELM7JPNpKnORMMqkzi2XJ/story.html">https://www.bostonglobe.com/metro/2017/06/02/climate/qELM7JPNpKnORMMqkzi2XJ/story.html</a>	<a href="https://www.bostonglobe.com/sports">https://www.bostonglobe.com/sports</a>
7	<a href="https://www.bostonglobe.com/metro/2017/06/02/climate/qELM7JPNpKnORMMqkzi2XJ/story.html">https://www.bostonglobe.com/metro/2017/06/02/climate/qELM7JPNpKnORMMqkzi2XJ/story.html</a>	<a href="https://www.bostonglobe.com/">https://www.bostonglobe.com/</a>
8	<a href="https://www.bostonglobe.com/metro/2017/06/02/climate/qELM7JPNpKnORMMqkzi2XJ/story.html">https://www.bostonglobe.com/metro/2017/06/02/climate/qELM7JPNpKnORMMqkzi2XJ/story.html</a>	<a href="https://www.bostonglobe.com/lifestyle">https://www.bostonglobe.com/lifestyle</a>
9	<a href="https://www.bostonglobe.com/metro/2017/07/04/united-church-christ-approves-emergency-resolution-climate-change/pgzKhYbm3UEyJcxA21GPAl/story.html">https://www.bostonglobe.com/metro/2017/07/04/united-church-christ-approves-emergency-resolution-climate-change/pgzKhYbm3UEyJcxA21GPAl/story.html</a>	<a href="https://www.bostonglobe.com/opinion">https://www.bostonglobe.com/opinion</a>
10	<a href="https://www.bostonglobe.com/metro/2017/07/04/united-church-christ-approves-emergency-resolution-climate-change/pgzKhYbm3UEyJcxA21GPAl/story.html">https://www.bostonglobe.com/metro/2017/07/04/united-church-christ-approves-emergency-resolution-climate-change/pgzKhYbm3UEyJcxA21GPAl/story.html</a>	<a href="https://www.bostonglobe.com/business">https://www.bostonglobe.com/business</a>

#### PART D: OVERLAPPING RESULTS

The table below shows the number of overlapping results between Lucene and Page Rank ranking strategies for the 8 queries:

QUERY #	1	2	3	4	5	6	7	8
QUERY	Elon Musk	Star Wars	North Korea	LA Dodgers	Puerto Rico	Hurricane Harvey	iPhone X	Paris Climate Deal
# OVERLAPPING RESULTS	5	0	0	0	0	0	0	0

The graph below depicts the overlapping results for the 8 queries, where in the X axis represents the query and the Y axis represents the overlapping number.



#### REFERENCES:

- [1] Website: [https://networkx.github.io/documentation/networkx-1.10/reference/generated/networkx.algorithms.link\\_analysis.page\\_rank\\_alg.page\\_rank.html](https://networkx.github.io/documentation/networkx-1.10/reference/generated/networkx.algorithms.link_analysis.page_rank_alg.page_rank.html)
- [2] Website: <https://en.wikipedia.org/wiki/PageRank>