Name: Matthias Bartolo Id: 0436103L

Web Intelligence Individual Assignment (Information Retrieval Task)

Packages

In [1]:

```
import nltk #For tokenisation
import os   #For file retrieval
import xml.etree.cElementTree as et #For extracting xml data from a file
from nltk.tokenize import RegexpTokenizer #For tokenising and removing punctuation
from nltk.stem import PorterStemmer #For text Stemming
from nltk.corpus import stopwords #For stop word removal
nltk.download('stopwords')#Downloading stop words from nltk library
import math #For log
import numpy as np #For Document Matrix
from numpy.linalg import norm #For normalising cosine similarity
import pandas as pd #For the creation of a dataframe
from numpy import dot #For calculation of dot product
```

```
[nltk_data] Downloading package stopwords to
[nltk_data]     C:\Users\User\AppData\Roaming\nltk_data...
[nltk_data]   Package stopwords is already up-to-date!
```

Indexing Component

1. Parse the document to extract the data in the XML's < raw > tag (10 marks);

In [2]:

```
#Function which retrieves,a list of files in the doc directory
def RetrievingFiles(directoryName):
    #Retrieves all the file names int he given directory
    FileList= os.listdir(directoryName)
    #Dictionary which holds the full path of the files
    Filepaths={}
    #Looping through all the file names in the file list
    for filename in FileList:
        #Attaching directoryName at the beginning of the file name to achieve full file path
        fullpath=os.path.join(directoryName, filename)
        #If full path is a directory, then we will opt to add all the files inside the directory to the
        #Filepaths list, this is achieved by recursively, calling the same function
        if os.path.isdir(fullpath):
            Filepaths.update(RetrievingFiles(fullpath))
        else:
            #Appending full path to list
            Filepaths[filename]=fullpath
    #Retuning List of full file paths
    return Filepaths
```

In [3]:

```
#Function which extracts the data in XML raw tag
def ExtractRawData(filepath):
    #Importing data by reading through file
    tree=et.parse(filepath)
    root=tree.getroot()
    #Variable which will hold the extractedData
    extractedData=[]
    #Extracts information which have the raw tag
    for rawData in root.iter("raw"):
        #Retrieving text and saving text in variable
        extractedData=rawData.text
    #Returning text
    return extractedData
```

In [ ]:

2. Tokenise the documents' content (5 marks);

In [4]:

```
#Function which tokenises the document's content and removes punctuation
def Tokenise(data):
    #Creating reference variable for class RegexpTokenizer, which is found in the nltk class
    tk=RegexpTokenizer(r'\w+')#\w+ is used to match any word character and thus punctuation would be ignored
    #Using tokenise method
    tokenisedDocument=tk.tokenize(data)
    #Returning tokenised document text
    return tokenisedDocument
```

In [ ]:

3. Perform case-folding, stop-word removal and stemming (20 marks);

In [5]:

```python
#Function, which handles case folding, i.e., returns string in list in lowercase
def CaseFolding(textList):
    #Creating and returning new list, whereby, every word is in lowercase
    filteredList=[word.casefold() for word in textList]
    return filteredList
```

In [6]:

```python
#Function which removes stop words (common words) from the english language
def StopWordRemoval(textList):
    #List to hold text without stop words
    filteredList=[]
    #Retrieving stopwords
    stopWords=set(stopwords.words('english'))
    #Looping through all the words in the inputted list, and if they are not stop words, then
    #words are appended to the filtered list
    for word in textList:
        if word not in stopWords:
            filteredList.append(word)
    #Returning filtered List
    return filteredList
```

In [7]:

```python
#Function which handles Stemming, i.e., removes suffixes and prefixes, from strings in list
def Stemming(textList):
    #Creating reference variable for class PorterStemmer
    stemmer=PorterStemmer()
    #Creating and returning new list, whereby, every word is stemmed
    filteredList =[stemmer.stem(word) for word in textList]
    #Returning filtered List
    return filteredList
```

In [8]:

```python
#Function that handles Case-folding, Stop-word removal and Stemming
#by calling all previous functions in the correct order
def DocumentCleaning(text):
    tokenisedList=Tokenise(text)
    casefoldedList=CaseFolding(tokenisedList)
    stopwordRemovedList=StopWordRemoval(casefoldedList)
    stemmedList=Stemming(stopwordRemovedList)
    return stemmedList
```

In [9]:

```python
#Function, which calls all previous functions, and returns a filtered list of all the documents
def DocumentIndexing(directoryName):
    #Document list to hold all the text in all documents
    documentList={}
    #Retrieving all files from specified directory
    allFiles = RetrievingFiles(directoryName)
    #Loooping through every file
    for file in allFiles.keys():
        #Extracting data from the file
        data=ExtractRawData(allFiles[file])
        #Cleaning extractedData
        cleanedData=DocumentCleaning(data)
        #Appending cleaned data to document list
        documentList[file]=cleanedData
    #Returning documentList
    return documentList
```

In [ ]:

4. Build the term by document matrix containing the T F.IDF weight for each term within each document (25 marks).

In [10]:

```python
#Function which returns all the unique words in all of the documents
def GetUniqueWords(documentList):
    #Dictionary to hold the frequency of every word (utilised for fast indexing)
    wordFrequency={}

    #Looping through the text in the list, and if word is not present in wordFrequency dictionary,
    #then word will be added to dictionary with frequency of 1, else if word is present
    #frequency will be incremented
    for text in documentList.keys():
        for word in documentList[text]:
            if word not in wordFrequency.keys():
                wordFrequency[word]=1
            else:
                wordFrequency[word]+=1

    #Returning list
    return wordFrequency
```

Calculating Term Frequency (TF) =

(the normalised frequency of the term in the document) / (the frequency of the most frequently occurring term in the document)

In [11]:

```
#Function which calculates the term frequency values of TF.IDF weight
def GetTermFrequency(WordFreqList,documentList):
    #Dictionary to hold the term frequency
    termfrequency={}

    #Looping through all the words in the WordFreqList.keys()
    for word in WordFreqList.keys():
        #Vector which holds, the WordTF for every document
        WordTFVector={}
        #Looping through all the documents in the documentList
        for document in documentList.keys():
            #Variable to act as a counter, to count the number of times, word appears in the document
            documentFrequency=0
            #Looping through all the document words in the document
            for documentWord in documentList[document]:
                #Incrementing documentFrequency since, word == documentWord
                if word == documentWord:
                    documentFrequency+=1
            #Appending documentFrequency to vector
            WordTFVector[document]=documentFrequency
        #Updating term frequency
        termfrequency[word]=WordTFVector

    #Normalising term frequency
    #Looping through all the documents in the documentList
    for index in documentList.keys():
        #Getting the max Term Frequency for each document
        maxTf=0
        for word in termfrequency.keys():
            if(maxTf<termfrequency[word][index]):
                 maxTf= termfrequency[word][index]
        divisor=maxTf
        #Normalising by dividing by element with max term frequency
        for word in termfrequency.keys():
            termfrequency[word][index] = termfrequency[word][index]/divisor

    #Returning term frequency
    return termfrequency
```

Calculating Inverse Document Frequency (IDF) =

log((the total number of documents) / (the number of documents containing the word))

In [12]:

```
#Function which calculates the inverse document frequency values of TF.IDF weight
def GetInverseDocumentFrequency(WordFreqList,documentList):
    #Dictionary to hold the inverse document frequency
    inverseDocumentfrequency={}

    #Looping through all the words in the WordFreqList.keys()
    for word in WordFreqList.keys():
        #Variable to act as a counter, to count the number of documents, word appears in
        documentAppearsCounter=0
        #Looping through all the documents in the documentList
        for document in documentList.keys():
            #If word is in document, then incrementing the counter
            if word in documentList[document]:
                documentAppearsCounter+=1
        #Calculating inverse document frequency by taking the log((no of documents)/(no of documents containing the word)
        inverseDocumentfrequency[word]= math.log((len(documentList.keys())/(documentAppearsCounter)),10)
    #Returning inverse document frequency
    return inverseDocumentfrequency
```

Calculating TF.IDF

by multiplying TF X IDF

In [13]:

```
#Function which calculates the TF.IDF weight
def GetTFIDF(TFValues,IDFValues):
    #List which will hold the column names
    columnKeys=[]
    #Dictionary which will hold the TFIDFRows values
    TFIDFList={}
    #Looping through the keys in the TFValues dictionary
    for word in TFValues.keys():
        #Dictionary which will hold the TFIDFScore values of every row
        TFIDFRows={}
        #Looping through the elements in TFValues dictionary
        for wordTF in TFValues[word].keys():
            #Multiplying TF WITH IDF
            TFIDFScore= TFValues[word][wordTF]*IDFValues[word]
            #Appending TFIDF score to TFIDFRows
            TFIDFRows[wordTF]=TFIDFScore
            columnKeys=TFValues[word].keys()
        #Appending TFIDFRows to the TFIDFList
        TFIDFList[word]=TFIDFRows

    #Converting TFIDFList into a dataframe
    TFIDFMatrix=pd.DataFrame(TFIDFList,index=columnKeys, columns=TFIDFList.keys())
    #Returning TFIDFMatrix
    return TFIDFMatrix
```

Method which Calculates the Vector Space Model of a given list of documents

In [14]:

```
#Function that utilises all previously built methods to build the term by document matrix
def CalculateVectorSpaceModel(documentList):
    sortedWordFreqList=GetUniqueWords(documentList)
    TFValues=GetTermFrequency(sortedWordFreqList,documentList)
    IDFValues=GetInverseDocumentFrequency(sortedWordFreqList,documentList)
    documentMatrix=GetTFIDF(TFValues,IDFValues)
    return documentMatrix
```

In [ ]:

In [15]:

```
directoryName1 = 'docs/'; #Directory which contains, all the doc files
documentList1=DocumentIndexing(directoryName1)
documentVectorSpaceModel1=CalculateVectorSpaceModel(documentList1)
```

In [16]:

```
#Printing Document Vector Space
documentVectorSpaceModel1
```

Out[16]:

	william	beaumont	human	digest	physiolog	imag	sourc	novemb	21	1785	...	monterey	approv
wes2015.d001.naf	0.342024	2.519828	0.123613	1.596537	0.480216	0.058357	0.080294	0.066985	0.099801	0.130465	...	0.000000	0.000000
wes2015.d002.naf	0.000000	0.000000	0.067425	0.000000	0.000000	0.000000	0.000000	0.073075	0.000000	0.000000	...	0.000000	0.000000
wes2015.d003.naf	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.080382	0.000000	0.000000	...	0.000000	0.000000
wes2015.d004.naf	0.000000	0.000000	0.000000	0.000000	0.000000	0.053868	0.000000	0.123665	0.000000	0.000000	...	0.000000	0.000000
wes2015.d005.naf	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.036537	0.000000	0.000000	...	0.000000	0.000000
...	...	...	...	...	...	...	...	...	...	...	...	...	...
wes2015.d327.naf	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000
wes2015.d328.naf	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.074851	0.000000	...	0.000000	0.000000
wes2015.d329.naf	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000
wes2015.d330.naf	0.273619	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.000000	0.000000
wes2015.d331.naf	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	...	0.387666	0.193833

331 rows × 13538 columns

In [ ]:

Querying Component

1. Preprocess the user query (tokenisation, case-folding, stop-word removal and stemming) (5 marks);

In [17]:

```
#User input of query
query=input("Enter user query:\n")
#Utilising above Methods
filteredquery=DocumentCleaning(query)
print(filteredquery)
```

```
Enter user query:
william beaumont
['william', 'beaumont']
```

In [18]:

```
#Queries already present in queriesfolder
directoryName2 = 'queries/'; #Directory which contains, all the query files
documentList2=DocumentIndexing(directoryName2)
print(documentList2)
```

```
{'wes2015.q01.naf': ['fabric', 'music', 'instrument'], 'wes2015.q02.naf': ['famou', 'german', 'poetri'], 'wes2015.q03.na
f': ['romantic'], 'wes2015.q04.naf': ['univers', 'edinburgh', 'research'], 'wes2015.q06.naf': ['bridg', 'construct'], 'we
s2015.q07.naf': ['walk', 'fame', 'star'], 'wes2015.q08.naf': ['scientist', 'work', 'atom', 'bomb'], 'wes2015.q09.naf':
['invent', 'internet'], 'wes2015.q10.naf': ['earli', 'telecommun', 'method'], 'wes2015.q12.naf': ['explor', 'south', 'pol
e'], 'wes2015.q13.naf': ['famou', 'member', 'royal', 'navi'], 'wes2015.q14.naf': ['nobel', 'prize', 'win', 'invent'], 'we
s2015.q16.naf': ['south', 'america'], 'wes2015.q17.naf': ['edward', 'teller', 'mari', 'curi'], 'wes2015.q18.naf': ['compu
t', 'languag', 'program', 'artifici', 'intellig'], 'wes2015.q19.naf': ['william', 'hearst', 'movi'], 'wes2015.q22.naf':
['captain', 'jame', 'cook', 'becom', 'explor'], 'wes2015.q23.naf': ['grace', 'hopper', 'get', 'famou'], 'wes2015.q24.na
f': ['comput', 'astronomi'], 'wes2015.q25.naf': ['wwii', 'aircraft'], 'wes2015.q26.naf': ['literari', 'critic', 'thoma',
'moor'], 'wes2015.q27.naf': ['nazi', 'confisc', 'destroy', 'art', 'literatur'], 'wes2015.q28.naf': ['modern', 'age', 'eng
lish', 'literatur'], 'wes2015.q29.naf': ['modern', 'physiolog'], 'wes2015.q32.naf': ['roman', 'empir'], 'wes2015.q34.na
f': ['scientist', 'contribut', 'photosynthesi'], 'wes2015.q36.naf': ['aviat', 'pioneer', 'public'], 'wes2015.q37.naf':
['gutenberg', 'bibl'], 'wes2015.q38.naf': ['religi', 'belief', 'scientist', 'explor'], 'wes2015.q40.naf': ['carl', 'fried
rich', 'gauss', 'influenc', 'colleagu'], 'wes2015.q41.naf': ['person', 'hannov'], 'wes2015.q42.naf': ['skinner', 'exper
i', 'oper', 'condit', 'chamber'], 'wes2015.q44.naf': ['napoleon', 'russian', 'campaign'], 'wes2015.q45.naf': ['friend',
'enemi', 'napoleon', 'bonapart'], 'wes2015.q46.naf': ['first', 'woman', 'nobel', 'prize']}
```

In [ ]:

2. Use cosine similarity to calculate the similarity between the query and each document (25 marks);

Calculating Query Term Frequency (TF)

Utilising similar method to one above

In [19]:

```
#Function which calculates the query term frequency values of TF.IDF weight
def GetQueryTermFrequency(WordFreqList,queryList):
    #Dictionary to hold the query term frequency
    querytermfrequency={}
    #Looping through all the words in the WordFreqList.keys()
    for word in WordFreqList.keys():
        #Variable to act as a counter, to count the number of times, word appears in the query
        queryWordFrequency=0
        #Looping through all the words in the query list
        for queryWord in queryList:
            #If word is in query, then incrementing the counter
            if word == queryWord:
                queryWordFrequency+=1
        #Storing Frequency in dictionary
        querytermfrequency[word]= queryWordFrequency
    #Normalising:
    maxTfIndex = max(querytermfrequency, key=querytermfrequency.get)
    divisor=querytermfrequency[maxTfIndex]
    for index in querytermfrequency.keys():
        querytermfrequency[index]=querytermfrequency[index]/divisor

    #Returning query term frequency
    return querytermfrequency
```

Calculating Query TF.IDF

Utilising similar method to one above

In [20]:

```
#Function which calculates the Query TF.IDF weight
def GetQueryTFIDF(TFValues,IDFValues):
    #List which will hold the TFIDFListvalues
    TFIDFList={}

    #Looping through the keys in the TFValues dictionary
    for word in TFValues.keys():
        TFIDFScore= TFValues[word]*IDFValues[word]
        #Appending TFIDFScore score to TFIDFList
        TFIDFList[word]=TFIDFScore

    return TFIDFList
```

Method which Calculates the QueryVector of a given query

In [21]:

```
#Function that utilises all previously built methods to build the query vector
def CalculateQueryVector(documentList,queryList):
    sortedWordFreqList=GetUniqueWords(documentList)
    TFValues=GetQueryTermFrequency(sortedWordFreqList,queryList)
    IDFValues=GetInverseDocumentFrequency(sortedWordFreqList,documentList)
    documentMatrix=GetQueryTFIDF(TFValues,IDFValues)
    return documentMatrix
```

Calculating Cosine Similarity =

dotproduct(document *query) / (norm(document)*norm(query)

In [22]:

```
#Function which calculates, the similarity between the query and each document
def CosineSimilarity(documentVectorSpace,queryVector):
    #Dictionary to hold Cosine Similarity
    cosineSimilarity={}
    filenames=documentVectorSpace.index
    #Looping through document VectorSpace
    for i in filenames:
        #Calculating dot product
        dotproduct=dot(documentVectorSpace.loc[i],list( queryVector.values()))
        #Calculating Cosine Similarity
        cosSimilarity = dotproduct / (norm(documentVectorSpace.loc[i]) * norm(list(queryVector.values())))
        #Storing cosine Similarity in dictionary
        cosineSimilarity[i]=cosSimilarity
    #Returning dictionary
    return cosineSimilarity
```

Calculating Cosine Similarity upon user inputted query

In [23]:

```
userQueryVectorModel1=CalculateQueryVector(documentList1,filteredquery)
cosineSimilarity1=CosineSimilarity(documentVectorSpaceModel1,userQueryVectorModel1)
```

In [ ]:

Calculating Cosine Similarity upon query present in queries folder

In [24]:

```
userQueryVectorModel2=CalculateQueryVector(documentList1,documentList2["wes2015.q01.naf"])
cosineSimilarity2=CosineSimilarity(documentVectorSpaceModel1,userQueryVectorModel2)
```

In [ ]:

3.Output the list of documents as a ranked list (10 marks).

In [25]:

```
sortedCosine1={Key: Value for Key, Value in sorted(cosineSimilarity1.items(), key=lambda item: item[1], reverse=True)}
print("User query: '",query,"'\n")
for index in sortedCosine1.keys():
    print("Document:", index , "\t - ", "Cosine Similarity:\t ", round(sortedCosine1[index],4))
```

```
User query: ' william beaumont '

Document: wes2015.d001.naf       -  Cosine Similarity:    0.659
Document: wes2015.d273.naf       -  Cosine Similarity:    0.0411
Document: wes2015.d310.naf       -  Cosine Similarity:    0.0287
Document: wes2015.d069.naf       -  Cosine Similarity:    0.0269
Document: wes2015.d102.naf       -  Cosine Similarity:    0.0269
Document: wes2015.d330.naf       -  Cosine Similarity:    0.026
Document: wes2015.d136.naf       -  Cosine Similarity:    0.0241
Document: wes2015.d320.naf       -  Cosine Similarity:    0.0241
Document: wes2015.d028.naf       -  Cosine Similarity:    0.024
Document: wes2015.d078.naf       -  Cosine Similarity:    0.0228
Document: wes2015.d056.naf       -  Cosine Similarity:    0.0204
Document: wes2015.d015.naf       -  Cosine Similarity:    0.0189
Document: wes2015.d088.naf       -  Cosine Similarity:    0.0174
Document: wes2015.d138.naf       -  Cosine Similarity:    0.0127
Document: wes2015.d035.naf       -  Cosine Similarity:    0.0125
Document: wes2015.d055.naf       -  Cosine Similarity:    0.0125
Document: wes2015.d266.naf       -  Cosine Similarity:    0.0109
Document: wes2015.d095.naf       -  Cosine Similarity:    0.0083
Document: wes2015.d009.naf       -  Cosine Similarity:    0.0081
Document: wes2015.d179.naf       -  Cosine Similarity:    0.0079
Document: wes2015.d289.naf       -  Cosine Similarity:    0.0077
Document: wes2015.d189.naf       -  Cosine Similarity:    0.0073
Document: wes2015.d241.naf       -  Cosine Similarity:    0.0072
Document: wes2015.d230.naf       -  Cosine Similarity:    0.0066
Document: wes2015.d291.naf       -  Cosine Similarity:    0.0065
Document: wes2015.d091.naf       -  Cosine Similarity:    0.0064
Document: wes2015.d299.naf       -  Cosine Similarity:    0.0064
Document: wes2015.d098.naf       -  Cosine Similarity:    0.0063
Document: wes2015.d106.naf       -  Cosine Similarity:    0.0063
```

```
Document: wes2015.d300.naf       -  Cosine Similarity:    0.0059
Document: wes2015.d272.naf       -  Cosine Similarity:    0.0057
Document: wes2015.d309.naf       -  Cosine Similarity:    0.0055
Document: wes2015.d274.naf       -  Cosine Similarity:    0.0054
Document: wes2015.d212.naf       -  Cosine Similarity:    0.0047
Document: wes2015.d180.naf       -  Cosine Similarity:    0.0047
Document: wes2015.d191.naf       -  Cosine Similarity:    0.0047
Document: wes2015.d323.naf       -  Cosine Similarity:    0.0046
Document: wes2015.d111.naf       -  Cosine Similarity:    0.0045
Document: wes2015.d254.naf       -  Cosine Similarity:    0.0045
Document: wes2015.d197.naf       -  Cosine Similarity:    0.0043
Document: wes2015.d129.naf       -  Cosine Similarity:    0.0043
Document: wes2015.d231.naf       -  Cosine Similarity:    0.0041
Document: wes2015.d147.naf       -  Cosine Similarity:    0.0041
Document: wes2015.d092.naf       -  Cosine Similarity:    0.0041
Document: wes2015.d257.naf       -  Cosine Similarity:    0.004
Document: wes2015.d109.naf       -  Cosine Similarity:    0.0036
Document: wes2015.d193.naf       -  Cosine Similarity:    0.0036
Document: wes2015.d294.naf       -  Cosine Similarity:    0.0032
Document: wes2015.d175.naf       -  Cosine Similarity:    0.0031
Document: wes2015.d190.naf       -  Cosine Similarity:    0.0025
Document: wes2015.d002.naf       -  Cosine Similarity:    0.0
Document: wes2015.d003.naf       -  Cosine Similarity:    0.0
Document: wes2015.d004.naf       -  Cosine Similarity:    0.0
Document: wes2015.d005.naf       -  Cosine Similarity:    0.0
Document: wes2015.d006.naf       -  Cosine Similarity:    0.0
Document: wes2015.d007.naf       -  Cosine Similarity:    0.0
Document: wes2015.d008.naf       -  Cosine Similarity:    0.0
Document: wes2015.d010.naf       -  Cosine Similarity:    0.0
Document: wes2015.d011.naf       -  Cosine Similarity:    0.0
Document: wes2015.d012.naf       -  Cosine Similarity:    0.0
Document: wes2015.d013.naf       -  Cosine Similarity:    0.0
Document: wes2015.d014.naf       -  Cosine Similarity:    0.0
Document: wes2015.d016.naf       -  Cosine Similarity:    0.0
Document: wes2015.d017.naf       -  Cosine Similarity:    0.0
Document: wes2015.d018.naf       -  Cosine Similarity:    0.0
Document: wes2015.d019.naf       -  Cosine Similarity:    0.0
Document: wes2015.d020.naf       -  Cosine Similarity:    0.0
Document: wes2015.d021.naf       -  Cosine Similarity:    0.0
Document: wes2015.d022.naf       -  Cosine Similarity:    0.0
Document: wes2015.d023.naf       -  Cosine Similarity:    0.0
Document: wes2015.d024.naf       -  Cosine Similarity:    0.0
Document: wes2015.d025.naf       -  Cosine Similarity:    0.0
Document: wes2015.d026.naf       -  Cosine Similarity:    0.0
Document: wes2015.d027.naf       -  Cosine Similarity:    0.0
Document: wes2015.d029.naf       -  Cosine Similarity:    0.0
Document: wes2015.d030.naf       -  Cosine Similarity:    0.0
Document: wes2015.d031.naf       -  Cosine Similarity:    0.0
Document: wes2015.d032.naf       -  Cosine Similarity:    0.0
Document: wes2015.d033.naf       -  Cosine Similarity:    0.0
Document: wes2015.d034.naf       -  Cosine Similarity:    0.0
Document: wes2015.d036.naf       -  Cosine Similarity:    0.0
Document: wes2015.d037.naf       -  Cosine Similarity:    0.0
Document: wes2015.d038.naf       -  Cosine Similarity:    0.0
Document: wes2015.d039.naf       -  Cosine Similarity:    0.0
Document: wes2015.d040.naf       -  Cosine Similarity:    0.0
Document: wes2015.d041.naf       -  Cosine Similarity:    0.0
Document: wes2015.d042.naf       -  Cosine Similarity:    0.0
Document: wes2015.d043.naf       -  Cosine Similarity:    0.0
Document: wes2015.d044.naf       -  Cosine Similarity:    0.0
Document: wes2015.d045.naf       -  Cosine Similarity:    0.0
Document: wes2015.d046.naf       -  Cosine Similarity:    0.0
Document: wes2015.d047.naf       -  Cosine Similarity:    0.0
Document: wes2015.d048.naf       -  Cosine Similarity:    0.0
Document: wes2015.d049.naf       -  Cosine Similarity:    0.0
Document: wes2015.d050.naf       -  Cosine Similarity:    0.0
Document: wes2015.d051.naf       -  Cosine Similarity:    0.0
Document: wes2015.d052.naf       -  Cosine Similarity:    0.0
Document: wes2015.d053.naf       -  Cosine Similarity:    0.0
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Document: wes2015.d057.naf       -  Cosine Similarity:    0.0
Document: wes2015.d058.naf       -  Cosine Similarity:    0.0
Document: wes2015.d059.naf       -  Cosine Similarity:    0.0
Document: wes2015.d060.naf       -  Cosine Similarity:    0.0
Document: wes2015.d061.naf       -  Cosine Similarity:    0.0
Document: wes2015.d062.naf       -  Cosine Similarity:    0.0
Document: wes2015.d063.naf       -  Cosine Similarity:    0.0
Document: wes2015.d064.naf       -  Cosine Similarity:    0.0
Document: wes2015.d065.naf       -  Cosine Similarity:    0.0
Document: wes2015.d066.naf       -  Cosine Similarity:    0.0
Document: wes2015.d067.naf       -  Cosine Similarity:    0.0
Document: wes2015.d068.naf       -  Cosine Similarity:    0.0
Document: wes2015.d070.naf       -  Cosine Similarity:    0.0
Document: wes2015.d071.naf       -  Cosine Similarity:    0.0
Document: wes2015.d072.naf       -  Cosine Similarity:    0.0
Document: wes2015.d073.naf       -  Cosine Similarity:    0.0
Document: wes2015.d074.naf       -  Cosine Similarity:    0.0
Document: wes2015.d075.naf       -  Cosine Similarity:    0.0
Document: wes2015.d076.naf       -  Cosine Similarity:    0.0
Document: wes2015.d077.naf       -  Cosine Similarity:    0.0
Document: wes2015.d079.naf       -  Cosine Similarity:    0.0
Document: wes2015.d080.naf       -  Cosine Similarity:    0.0
Document: wes2015.d081.naf       -  Cosine Similarity:    0.0
Document: wes2015.d082.naf       -  Cosine Similarity:    0.0
Document: wes2015.d083.naf       -  Cosine Similarity:    0.0
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Document: wes2015.d087.naf       -  Cosine Similarity:    0.0
Document: wes2015.d089.naf       -  Cosine Similarity:    0.0
Document: wes2015.d090.naf       -  Cosine Similarity:    0.0
Document: wes2015.d093.naf       -  Cosine Similarity:    0.0
Document: wes2015.d094.naf       -  Cosine Similarity:    0.0
Document: wes2015.d096.naf       -  Cosine Similarity:    0.0
Document: wes2015.d097.naf       -  Cosine Similarity:    0.0
Document: wes2015.d099.naf       -  Cosine Similarity:    0.0
Document: wes2015.d100.naf       -  Cosine Similarity:    0.0
Document: wes2015.d101.naf       -  Cosine Similarity:    0.0
Document: wes2015.d103.naf       -  Cosine Similarity:    0.0
Document: wes2015.d104.naf       -  Cosine Similarity:    0.0
Document: wes2015.d105.naf       -  Cosine Similarity:    0.0
Document: wes2015.d107.naf       -  Cosine Similarity:    0.0
Document: wes2015.d108.naf       -  Cosine Similarity:    0.0
Document: wes2015.d110.naf       -  Cosine Similarity:    0.0
Document: wes2015.d112.naf       -  Cosine Similarity:    0.0
Document: wes2015.d113.naf       -  Cosine Similarity:    0.0
Document: wes2015.d114.naf       -  Cosine Similarity:    0.0
Document: wes2015.d115.naf       -  Cosine Similarity:    0.0
Document: wes2015.d116.naf       -  Cosine Similarity:    0.0
Document: wes2015.d117.naf       -  Cosine Similarity:    0.0
Document: wes2015.d118.naf       -  Cosine Similarity:    0.0
Document: wes2015.d119.naf       -  Cosine Similarity:    0.0
Document: wes2015.d120.naf       -  Cosine Similarity:    0.0
Document: wes2015.d121.naf       -  Cosine Similarity:    0.0
Document: wes2015.d122.naf       -  Cosine Similarity:    0.0
Document: wes2015.d123.naf       -  Cosine Similarity:    0.0
Document: wes2015.d124.naf       -  Cosine Similarity:    0.0
Document: wes2015.d125.naf       -  Cosine Similarity:    0.0
Document: wes2015.d126.naf       -  Cosine Similarity:    0.0
Document: wes2015.d127.naf       -  Cosine Similarity:    0.0
Document: wes2015.d128.naf       -  Cosine Similarity:    0.0
Document: wes2015.d130.naf       -  Cosine Similarity:    0.0
Document: wes2015.d131.naf       -  Cosine Similarity:    0.0
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Document: wes2015.d194.naf       -  Cosine Similarity:    0.0
Document: wes2015.d195.naf       -  Cosine Similarity:    0.0
Document: wes2015.d196.naf       -  Cosine Similarity:    0.0
Document: wes2015.d198.naf       -  Cosine Similarity:    0.0
Document: wes2015.d199.naf       -  Cosine Similarity:    0.0
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Document: wes2015.d202.naf       -  Cosine Similarity:    0.0
Document: wes2015.d203.naf       -  Cosine Similarity:    0.0
Document: wes2015.d204.naf       -  Cosine Similarity:    0.0
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Document: wes2015.d206.naf       -  Cosine Similarity:    0.0
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Document: wes2015.d209.naf       -  Cosine Similarity:    0.0
Document: wes2015.d210.naf       -  Cosine Similarity:    0.0
Document: wes2015.d211.naf       -  Cosine Similarity:    0.0
Document: wes2015.d213.naf       -  Cosine Similarity:    0.0
Document: wes2015.d214.naf       -  Cosine Similarity:    0.0
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Document: wes2015.d235.naf       -  Cosine Similarity:    0.0
Document: wes2015.d236.naf       -  Cosine Similarity:    0.0
Document: wes2015.d237.naf       -  Cosine Similarity:    0.0
Document: wes2015.d238.naf       -  Cosine Similarity:    0.0
Document: wes2015.d239.naf       -  Cosine Similarity:    0.0
Document: wes2015.d240.naf       -  Cosine Similarity:    0.0
Document: wes2015.d242.naf       -  Cosine Similarity:    0.0
Document: wes2015.d243.naf       -  Cosine Similarity:    0.0
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Document: wes2015.d246.naf       -  Cosine Similarity:    0.0
Document: wes2015.d247.naf       -  Cosine Similarity:    0.0
Document: wes2015.d248.naf       -  Cosine Similarity:    0.0
Document: wes2015.d249.naf       -  Cosine Similarity:    0.0
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Document: wes2015.d251.naf       -  Cosine Similarity:    0.0
Document: wes2015.d252.naf       -  Cosine Similarity:    0.0
Document: wes2015.d253.naf       -  Cosine Similarity:    0.0
Document: wes2015.d255.naf       -  Cosine Similarity:    0.0
Document: wes2015.d256.naf       -  Cosine Similarity:    0.0
Document: wes2015.d258.naf       -  Cosine Similarity:    0.0
Document: wes2015.d259.naf       -  Cosine Similarity:    0.0
Document: wes2015.d260.naf       -  Cosine Similarity:    0.0
Document: wes2015.d261.naf       -  Cosine Similarity:    0.0
Document: wes2015.d262.naf       -  Cosine Similarity:    0.0
Document: wes2015.d263.naf       -  Cosine Similarity:    0.0
Document: wes2015.d264.naf       -  Cosine Similarity:    0.0
Document: wes2015.d265.naf       -  Cosine Similarity:    0.0
Document: wes2015.d267.naf       -  Cosine Similarity:    0.0
Document: wes2015.d268.naf       -  Cosine Similarity:    0.0
Document: wes2015.d269.naf       -  Cosine Similarity:    0.0
Document: wes2015.d270.naf       -  Cosine Similarity:    0.0
Document: wes2015.d271.naf       -  Cosine Similarity:    0.0
Document: wes2015.d275.naf       -  Cosine Similarity:    0.0
Document: wes2015.d276.naf       -  Cosine Similarity:    0.0
Document: wes2015.d277.naf       -  Cosine Similarity:    0.0
Document: wes2015.d278.naf       -  Cosine Similarity:    0.0
Document: wes2015.d279.naf       -  Cosine Similarity:    0.0
Document: wes2015.d280.naf       -  Cosine Similarity:    0.0
Document: wes2015.d281.naf       -  Cosine Similarity:    0.0
Document: wes2015.d282.naf       -  Cosine Similarity:    0.0
Document: wes2015.d283.naf       -  Cosine Similarity:    0.0
Document: wes2015.d284.naf       -  Cosine Similarity:    0.0
Document: wes2015.d285.naf       -  Cosine Similarity:    0.0
Document: wes2015.d286.naf       -  Cosine Similarity:    0.0
Document: wes2015.d287.naf       -  Cosine Similarity:    0.0
Document: wes2015.d288.naf       -  Cosine Similarity:    0.0
Document: wes2015.d290.naf       -  Cosine Similarity:    0.0
Document: wes2015.d292.naf       -  Cosine Similarity:    0.0
Document: wes2015.d293.naf       -  Cosine Similarity:    0.0
Document: wes2015.d295.naf       -  Cosine Similarity:    0.0
Document: wes2015.d296.naf       -  Cosine Similarity:    0.0
Document: wes2015.d297.naf       -  Cosine Similarity:    0.0
Document: wes2015.d298.naf       -  Cosine Similarity:    0.0
Document: wes2015.d301.naf       -  Cosine Similarity:    0.0
Document: wes2015.d302.naf       -  Cosine Similarity:    0.0
Document: wes2015.d303.naf       -  Cosine Similarity:    0.0
Document: wes2015.d304.naf       -  Cosine Similarity:    0.0
Document: wes2015.d305.naf       -  Cosine Similarity:    0.0
Document: wes2015.d306.naf       -  Cosine Similarity:    0.0
Document: wes2015.d307.naf       -  Cosine Similarity:    0.0
Document: wes2015.d308.naf       -  Cosine Similarity:    0.0
Document: wes2015.d311.naf       -  Cosine Similarity:    0.0
```

```
Document: wes2015.d312.naf       -  Cosine Similarity:    0.0
Document: wes2015.d313.naf       -  Cosine Similarity:    0.0
Document: wes2015.d314.naf       -  Cosine Similarity:    0.0
Document: wes2015.d315.naf       -  Cosine Similarity:    0.0
Document: wes2015.d316.naf       -  Cosine Similarity:    0.0
Document: wes2015.d317.naf       -  Cosine Similarity:    0.0
Document: wes2015.d318.naf       -  Cosine Similarity:    0.0
Document: wes2015.d319.naf       -  Cosine Similarity:    0.0
Document: wes2015.d321.naf       -  Cosine Similarity:    0.0
Document: wes2015.d322.naf       -  Cosine Similarity:    0.0
Document: wes2015.d324.naf       -  Cosine Similarity:    0.0
Document: wes2015.d325.naf       -  Cosine Similarity:    0.0
Document: wes2015.d326.naf       -  Cosine Similarity:    0.0
Document: wes2015.d327.naf       -  Cosine Similarity:    0.0
Document: wes2015.d328.naf       -  Cosine Similarity:    0.0
Document: wes2015.d329.naf       -  Cosine Similarity:    0.0
Document: wes2015.d331.naf       -  Cosine Similarity:    0.0
```

In [ ]:

In [26]:

```
sortedCosine2={Key: Value for Key, Value in sorted(cosineSimilarity2.items(), key=lambda item: item[1], reverse=True)}
print("Query from queries folder: '",documentList2["wes2015.q01.naf"],"'\n")
for index in sortedCosine2.keys():
    print("Document:", index , "\t - ", "Cosine Similarity:\t ", round(sortedCosine2[index],4))
```

```
Query from queries folder: ' ['fabric', 'music', 'instrument'] '

Document: wes2015.d016.naf       -  Cosine Similarity:    0.1172
Document: wes2015.d085.naf       -  Cosine Similarity:    0.0702
Document: wes2015.d259.naf       -  Cosine Similarity:    0.0692
Document: wes2015.d254.naf       -  Cosine Similarity:    0.067
Document: wes2015.d186.naf       -  Cosine Similarity:    0.0512
Document: wes2015.d209.naf       -  Cosine Similarity:    0.0479
Document: wes2015.d153.naf       -  Cosine Similarity:    0.0353
Document: wes2015.d008.naf       -  Cosine Similarity:    0.0337
Document: wes2015.d170.naf       -  Cosine Similarity:    0.0311
Document: wes2015.d163.naf       -  Cosine Similarity:    0.0291
Document: wes2015.d185.naf       -  Cosine Similarity:    0.028
Document: wes2015.d215.naf       -  Cosine Similarity:    0.0279
Document: wes2015.d154.naf       -  Cosine Similarity:    0.0248
Document: wes2015.d315.naf       -  Cosine Similarity:    0.0243
Document: wes2015.d089.naf       -  Cosine Similarity:    0.0222
Document: wes2015.d296.naf       -  Cosine Similarity:    0.0219
Document: wes2015.d082.naf       -  Cosine Similarity:    0.0215
Document: wes2015.d060.naf       -  Cosine Similarity:    0.02
Document: wes2015.d004.naf       -  Cosine Similarity:    0.0189
Document: wes2015.d099.naf       -  Cosine Similarity:    0.0182
Document: wes2015.d006.naf       -  Cosine Similarity:    0.0179
Document: wes2015.d255.naf       -  Cosine Similarity:    0.0178
Document: wes2015.d162.naf       -  Cosine Similarity:    0.0176
Document: wes2015.d243.naf       -  Cosine Similarity:    0.0161
Document: wes2015.d100.naf       -  Cosine Similarity:    0.0157
Document: wes2015.d179.naf       -  Cosine Similarity:    0.0149
Document: wes2015.d094.naf       -  Cosine Similarity:    0.0149
Document: wes2015.d145.naf       -  Cosine Similarity:    0.0144
Document: wes2015.d039.naf       -  Cosine Similarity:    0.0142
Document: wes2015.d059.naf       -  Cosine Similarity:    0.0138
Document: wes2015.d312.naf       -  Cosine Similarity:    0.013
Document: wes2015.d311.naf       -  Cosine Similarity:    0.012
Document: wes2015.d329.naf       -  Cosine Similarity:    0.0112
Document: wes2015.d299.naf       -  Cosine Similarity:    0.011
Document: wes2015.d065.naf       -  Cosine Similarity:    0.011
Document: wes2015.d130.naf       -  Cosine Similarity:    0.0104
Document: wes2015.d028.naf       -  Cosine Similarity:    0.0104
Document: wes2015.d172.naf       -  Cosine Similarity:    0.0102
Document: wes2015.d273.naf       -  Cosine Similarity:    0.0102
Document: wes2015.d281.naf       -  Cosine Similarity:    0.0092
Document: wes2015.d317.naf       -  Cosine Similarity:    0.0089
Document: wes2015.d077.naf       -  Cosine Similarity:    0.0088
Document: wes2015.d152.naf       -  Cosine Similarity:    0.0087
Document: wes2015.d074.naf       -  Cosine Similarity:    0.0086
Document: wes2015.d195.naf       -  Cosine Similarity:    0.0083
Document: wes2015.d229.naf       -  Cosine Similarity:    0.0083
Document: wes2015.d212.naf       -  Cosine Similarity:    0.0081
Document: wes2015.d284.naf       -  Cosine Similarity:    0.0079
Document: wes2015.d265.naf       -  Cosine Similarity:    0.0079
Document: wes2015.d275.naf       -  Cosine Similarity:    0.0078
Document: wes2015.d032.naf       -  Cosine Similarity:    0.0077
Document: wes2015.d164.naf       -  Cosine Similarity:    0.0077
Document: wes2015.d052.naf       -  Cosine Similarity:    0.0076
Document: wes2015.d021.naf       -  Cosine Similarity:    0.0073
Document: wes2015.d316.naf       -  Cosine Similarity:    0.0071
Document: wes2015.d136.naf       -  Cosine Similarity:    0.007
Document: wes2015.d024.naf       -  Cosine Similarity:    0.0066
Document: wes2015.d038.naf       -  Cosine Similarity:    0.0063
Document: wes2015.d234.naf       -  Cosine Similarity:    0.0063
Document: wes2015.d116.naf       -  Cosine Similarity:    0.0062
Document: wes2015.d123.naf       -  Cosine Similarity:    0.006
Document: wes2015.d184.naf       -  Cosine Similarity:    0.0058
Document: wes2015.d001.naf       -  Cosine Similarity:    0.0
Document: wes2015.d002.naf       -  Cosine Similarity:    0.0
Document: wes2015.d003.naf       -  Cosine Similarity:    0.0
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