SathishKumar_Rajendiran_HW1_NLP

October 25, 2020

1 NLP Homework 1 - Comparing Corpora with Corpus Statistics

- Name: Sathish Kumar Rajendiran
- Homework: 1| debate 2020 Trump vs Biden
- Date: 10/18/2020
- Class: 2020-0930 IST 664- Natural Language Processing

2 Documents Compared

1) 2020- Presidential Debate 1- Complete Transcript

2) 2016- Presidential Debate 1- Complete Transcript

3 Analysis Questions and Sources

1) What is the major topic discussed in 2020 1st Presidential Debate?

2) What is the major topic discussed in 2016 1st Presidential Debate?

3) What is inferred from last two elections major topics?

4) Topics that almost decided the campaign success?

5) Who are the candidates?

4 Sources

4.0.1 1. 2020- Presidential Debate 1- Full Transcript

Read the full transcript from the first presidential debate between Joe Biden and Donald Trump

By USA TODAY Staff 09/30/2020 01:10 PM EDT https://www.usatoday.com/story/news/politics/elections/2020/debate-read-full-transcript-first-debate/3587462001/

4.0.2 2. 2016 - Presidential Debate 1 - Full Transcript

Read the first presidential debate between Donald J Trump and Hillary Clinton

By POLITICO STAFF 09/27/2016 01:55 AM EDT https://www.politico.com/story/2016/09/full-transcript-first-2016-presidential-debate-228761

5 Loading and Cleaning the Data

- It's plain text so there is no markup to parse.
- There's punctuation like commas, apostrophes, quotes, question marks, and more.
- There's hyphenated descriptions like "armour-like".
- There are names

6 Import necessary libraries

[1]:
```
#import libraries

# standard library
import os
import sys
from datetime import datetime
import time

# csv, xls, pdf, pandas & json
import pandas as pd
import json
import csv
import xlrd

# Language Processing
import nltk
from nltk import FreqDist
from nltk.corpus import stopwords
from nltk.tokenize import word_tokenize
from nltk.tokenize import regexp_tokenize

# setup to process bigrams and ngrams
from nltk.collocations import *

##  Regular Expression to match non-alphabetic characters
import re
import string

#visualization
from wordcloud import WordCloud, STOPWORDS, ImageColorGenerator
import matplotlib.pyplot as plt
```

```
os.getcwd()
```

[1]: '/Users/sathishrajendiran/ist664-nlp'

6.1 Define re-usable function for text processing using regular expression

- Pattern to match word of non-alphabetical characters
- Words with internal hyphens or apostrophes
- look for special characters

[2]:
```
#defining filters using regular expression

def alpha_filter(w):
  # pattern to match word of non-alphabetical characters
    pattern = re.compile('^[^a-z]+$')
    if(pattern.match(w)):
        return True
    else:
        return False
```

[3]:
```
#defining filters using regular expression

def words_filter(w):
    # words with internal hyphens or apostrophes
    pattern = re.compile(' \w+(?:-\w+)*')
    if(pattern.match(w)):
        return True
    else:
        return False
```

[4]:
```
def special_filter(w):
    # look for special characters
    pattern = re.compile('[''\".?!,:;/]+')
    if(pattern.match(w)):
        return True
    else:
        return False
```

6.2 Tokenization with NLTK

- Import text files into rawText
- Tokenization using word_tokenize function from NLTK library
- Tokens to word corpus
- Sample search to test tokens

6.3 2020 - 1st Presidential Debate | Process and Tokenization of Raw Text

[5]:
```
# Working with 2020- Presidential Debate 1- Full Transcript
try:
    debatefile_2020 = open('/Users/sathishrajendiran/ist664-nlp/
 ↪presidential_debate_2020.txt', 'r')
    rawText_2020 = debatefile_2020.read()
    print('length of raw text is:',len(rawText_2020))

except:
    print("Is the file in correct directory?")

debateTokens_2020 = nltk.word_tokenize(rawText_2020)
debateText_2020 = nltk.Text(debateTokens_2020)
debateText_2020.concordance('president')
#When we are done, we close the file.
debatefile_2020.close()
```

```
length of raw text is: 97372
Displaying 25 of 153 matches:
 of this transcript misstated what President Donald Trump said about the Democr
idential debate between Republican President Donald Trump and Democrat Joe Bide
f the presidential debates between President Donald J. Trump and former Vice Pr
nt Donald J. Trump and former Vice President Joe Biden . This debate is sponsor
e welcome the Republican nominee , President Trump , and the Democratic nominee
 and the Democratic nominee , Vice President Biden . əWALLACE Gentlemen , a lot
rst subject is the Supreme Court . President Trump you nominated Amy Coney Barr
onsider a nominee the court , Vice President Biden , you say that this is an ef
 say that this is an effort by the president and Republicans to jam through and
ice Barrett would take the court . President Trump , in this first segment you
gment you go first . Two minutes . PRESIDENT DONALD TRUMP Thank you very much ,
ave the right to do it .  WALLACE President Trump , Thank you . Same question
k you . Same question to your Vice President Biden you havetwominutes .  :
 and looking forward to this , Mr. President . I -- the American people have a
enators and when they vote for the President of the United States . They 're no
eir view , is by who they elect as president who they elect as vice president .
s president who they elect as vice president . Now , what 's at stake here is ,
w , what 's at stake here is , the President ‘ s made it clear , he wants to ge
t , ə years ago or so , she said a president and the Senate is elected for a pe
ected for a period of time , but a president 's elected for four years . We ‘ r
 So we have the Senate , we have a president -- BIDEN Who ‘ s elected at the ne
 discussion . Yes , I agree . Vice President .  : BIDEN Number one . He knows
're gon na jump in right now . Mr. President . Mr. President , there ‘ s a mode
in right now . Mr. President . Mr. President , there ‘ s a moderator . We are g
 me finish . The point is that the President also is opposed to Roe v Wade . Th
```

6.4 2016 - 1st Presidential Debate | Process and Tokenization of Raw Text

[6]:
```
# Working with 2016- Presidential Debate 1- Full Transcript
try:
    debatefile_2016 = open('/Users/sathishrajendiran/ist664-nlp/
 ↪presidential_debate_2016.txt', 'r')
    rawText_2016 = debatefile_2016.read()
    print('length of raw text is:',len(rawText_2016))

except:
    print("Is the file in correct directory?")

debateTokens_2016 = nltk.word_tokenize(rawText_2016)
debateText_2016 = nltk.Text(debateTokens_2016)
debateText_2016.concordance('president')
#When we are done, we close the file.
debatefile_2016.close()
```

```
length of raw text is: 92599
Displaying 25 of 27 matches:
andidates : Democratic nominee for president of the United States , Hillary Cli
inton , and Republican nominee for president of the United States , Donald J. T
at in my book … TRUMP : So is it President Obama 's fault ? [ Interruption ]
you even announced . TRUMP : Is it President Obama 's fault ? [ Interruption ]
nces … TRUMP : Secretary , is it President Obama 's fault ? [ Interruption ]
her . Because we have -- we have a president that ca n't sit them around a tabl
oters will know if their potential president owes money to -- who he owes it to
or 40 years , everyone running for president has released their tax returns . Y
f your -- if your main claim to be president of the United States is your busin
n killed since Barack Obama became president . Over 4 -- almost 4,000 people in
 I prepared for ? I prepared to be president . And I think that 's a good thing
claim of the nation 's first black president was not a natural born citizen . Y
cans have accepted for years , the president was born in the United States . Ca
he campaign , her campaign against President Obama , fought very hard , and you
to tell the story and question the president 's legitimacy in 2012 , '13 , '14
y for the country but even for the president in getting him to produce his birt
is racist lie that our first black president was not an American citizen . Ther
biggest challenges facing the next president , because clearly we 're facing at
now , because the truth is , under President Obama we 've lost control of thing
 -- we will take out ISIS . Well , President Obama and Secretary Clinton create
 And my successor , John Kerry and President Obama got a deal that put a lid on
 warming , like you think and your president thinks . Nuclear is the single gre
ing America . On nuclear weapons , President Obama reportedly considered changi
er . Words matter when you run for president , and they really matter when you
nd they really matter when you are president . And I want to reassure our allie
```

6.5 Cleaning with NLTK

- Convert to Lower case
- Apply Stop words from NLTK library
- Create custom stop words and apply those
- Remove Punctuations
- Retain tokens size greater than 2

6.6 2020 - 1st Presidential Debate | Cleaning data

[7]:
```
# convert to lower case
# debateTokens = [w.lower() for w in debateTokens]

#change to lower case
filewords_2020 = [w.lower() for w in debateTokens_2020]

#remove punctuations
table = str.maketrans('', '', string.punctuation)
stripped = [w.translate(table) for w in debateTokens_2020]

#store in filewords
filewords_2020 = [w for w in stripped if w.isalpha() and␣
 ↪len(debateTokens_2020)>2]

from nltk.corpus import stopwords

#Remove stop words from NLTK library
stop_words = set(stopwords.words('english'))
filewords_2020 = [w for w in debateTokens_2020 if not w in stop_words]

#prepare custom stop words
custom_stopwords␣
 ↪=['ɑ','ɑ','ɑ','ɑə','ɑəə','ɑə','ɑ','ɑ','əə','ɑ̃','ɑ̃','ve','gon','na','you'
                    ,'they','we','\'re','\'s','n\'t','\'ve','ɑə']

# Apply Custom stop words
filewords_2020 = [w for w in debateTokens_2020 if not w in custom_stopwords]
```

6.7 2016 - 1st Presidential Debate | Cleaning data

[8]:
```
# convert to lower case
# debateTokens = [w.lower() for w in debateTokens]

#change to lower case
filewords_2016 = [w.lower() for w in debateTokens_2016]

#remove punctuations
```

```
table = str.maketrans('', '', string.punctuation)
stripped = [w.translate(table) for w in debateTokens_2016]

#store in filewords
filewords_2016 = [w for w in stripped if w.isalpha() and␣
 ↪len(debateTokens_2016)>2]

from nltk.corpus import stopwords
#Remove stop words from NLTK library
stop_words = set(stopwords.words('english'))
filewords_2016 = [w for w in debateTokens_2016 if not w in stop_words]

#prepare custom stop words
custom_stopwords␣
 ↪=['ɑ','ɑ','ɑ','ɑə','ɑəə','ɑə','ɑ','ɑ','əə','ɑ̈','ɑ̈','ve','gon','na','you'
                    ,'they','we','\'re','\'s','n\'t','\'ve','ɑə']
# Apply Custom stop words

filewords_2016 = [w for w in debateTokens_2016 if not w in custom_stopwords]
```

6.7.1 Preview first 100 words from each file

[9]:
```
# display the first words
print ("Display first 100 words from 2020 Presidential debate file:")
print (filewords_2020[:50])

print ("\nDisplay first 100 words from 2016 Presidential debate file:")
print (filewords_2016[:50])
```

```
Display first 100 words from 2020 Presidential debate file:
['Correction', 'and', 'clarification', ':', 'A', 'prior', 'version', 'of',
'this', 'transcript', 'misstated', 'what', 'President', 'Donald', 'Trump',
'said', 'about', 'the', 'Democratic', 'Party', 'and', 'socialism', '.', 'This',
'is', 'the', 'full', 'transcript', 'from', 'Tuesday', 'night', 'first',
'presidential', 'debate', 'between', 'Republican', 'President', 'Donald',
'Trump', 'and', 'Democrat', 'Joe', 'Biden', '.', 'The', 'debate', 'was',
'moderated', 'by', 'Fox']

Display first 100 words from 2016 Presidential debate file:
['Full', 'transcript', ':', 'First', '2016', 'presidential', 'debate', 'By',
'POLITICO', 'STAFF', '09/27/2016', '01:55', 'AM', 'EDT', 'HOLT', ':', 'Good',
'evening', 'from', 'Hofstra', 'University', 'in', 'Hempstead', ',', 'New',
'York', '.', 'I', "'m", 'Lester', 'Holt', ',', 'anchor', 'of', '``', 'NBC',
'Nightly', 'News', '.', "''", 'I', 'want', 'to', 'welcome', 'to', 'the',
'first', 'presidential', 'debate', '.']
```

6.7.2 2020 - 1st Presidential Debate | Top 50 Words by frequency

[10]:
```
# Creating a frequency distribution of words
ndist_2020 = FreqDist(filewords_2020)
# print the top 50 tokens by frequency
nitems_2020 = ndist_2020.most_common(50)
print ("2020 - 1st Presidential Debate | Top 50 Words by frequency:")
for item in nitems_2020:
    print (item[0], '\t', item[1])
```

```
2020 - 1st Presidential Debate | Top 50 Words by frequency:
.        1202
,        1180
the      679
to       479
:        425
I        323
of       308
a        308
and      291
that     282
it       262
in       255
--       239
is       196
have     193
‘        167
TRUMP    154
        149
he       143
do       137
people   133
BIDEN    122
WALLACE          121
what     118
And      116
?        116
be       112
        109
President        108
You      104
going    99
on       98
are      96
not      96
about    95
this     93
He       92
```

```
        91
with     83
ə        83
for      81
was      77
We       74
said     72
want     70
at       69
your     68
know     67
They     65
because          65
```

6.7.3 2016 - 1st Presidential Debate | Top 50 Words by frequency

[11]:
```
# Creating a frequency distribution of words
ndist_2016 = FreqDist(filewords_2016)
# print the top 50 tokens by frequency
nitems_2016 = ndist_2016.most_common(50)
print ("2016 - 1st Presidential Debate | Top 50 Words by frequency:")
for item in nitems_2016:
    print (item[0], '\t', item[1])
```

```
2016 - 1st Presidential Debate | Top 50 Words by frequency:
,        1148
.        1116
the      588
to       569
I        458
and      347
that     338
of       337
a        313
:        307
have     263
it       242
in       224
And      178
is       161
do       149
TRUMP    121
are      117
was      115
be       114
--       109
our      103
We       101
```

```
this     101
for      100
not      99
on       95
CLINTON          94
with     91
what     90
going    88
?        87
very     83
HOLT     82
at       82
about    77
think    76
country          72
people   71
But      69
because          66
he       66
them     64
would    64
as       60
will     59
been     56
has      56
You      56
said     55
```

6.8 Setup to process bigrams

[12]:
```
# setup to process bigrams
from nltk.collocations import *
# setup to process bigrams
bigram_measures = nltk.collocations.BigramAssocMeasures()
```

6.9 2020 - 1st Presidential Debate | BigramCollocationFinder

[13]:
```
# additional stop words from a stop word file
fstop = open('Smart.English.stop', 'r')
stoptext = fstop.read()
fstop.close()

stopwords = nltk.word_tokenize(stoptext)
print ("Display first 10 Stopwords:")
print (stopwords[:10])
```

```
Display first 10 Stopwords:
```

```
['', 's', 'a', "a's", 'able', 'about', 'above', 'according', 'accordingly',
'across']
```

[14]:
```
finder_2020 = BigramCollocationFinder.from_words(filewords_2020)

# choose to use both the non-alpha word filter and a stopwords filter
finder_2020.apply_word_filter(alpha_filter)
finder_2020.apply_word_filter(lambda w: w in stopwords)
finder_2020.apply_word_filter(words_filter)
finder_2020.apply_word_filter(special_filter)
```

6.10 2016 - 1st Presidential Debate | BigramCollocationFinder

[15]:
```
finder_2016 = BigramCollocationFinder.from_words(filewords_2016)

# choose to use both the non-alpha word filter and a stopwords filter
finder_2016.apply_word_filter(alpha_filter)
finder_2016.apply_word_filter(lambda w: w in stopwords)
finder_2016.apply_word_filter(words_filter)
```

6.11 2020 - 1st Presidential Debate | Display the top 50 bigrams by Frequency

[16]:
```
# score by frequency and display the top 50 bigrams
scored_2020 = finder_2020.score_ngrams(bigram_measures.raw_freq)
print ()
print ("Bigrams from file with top 50 frequencies")
for item in scored_2020[:50]:
        print (item)
```

```
Bigrams from file with top 50 frequencies
(('Vice', 'President'), 0.001657727937591419)
(('Mr.', 'President'), 0.0014139444173573866)
(('President', 'Trump'), 0.0013651877133105802)
(('President', 'Biden'), 0.0008288639687957094)
(('American', 'people'), 0.0006338371526084836)
(('Mr.', 'Vice'), 0.0004388103364212579)
(('United', 'States'), 0.0004388103364212579)
(('health', 'care'), 0.0004388103364212579)
(('million', 'people'), 0.0004388103364212579)
(('Green', 'New'), 0.0003900536323744515)
(('New', 'Deal'), 0.0003900536323744515)
(('Supreme', 'Court'), 0.0003900536323744515)
(('vice', 'president'), 0.0003900536323744515)
(('mail-in', 'ballots'), 0.00034129692832764505)
(('The', 'fact'), 0.0002925402242808386)
(('climate', 'change'), 0.0002925402242808386)
```

```
(('law', 'enforcement'), 0.0002925402242808386)
(('radical', 'left'), 0.0002925402242808386)
(('Affordable', 'Care'), 0.00024378352023403217)
(('Care', 'Act'), 0.00024378352023403217)
(('My', 'son'), 0.00024378352023403217)
(('Democratic', 'Party'), 0.00019502681618722574)
(('Go', 'ahead'), 0.00019502681618722574)
(('New', 'York'), 0.00019502681618722574)
(('Paris', 'accord'), 0.00019502681618722574)
(('brought', 'back'), 0.00019502681618722574)
(('final', 'question'), 0.00019502681618722574)
(('held', 'accountable'), 0.00019502681618722574)
(('individual', 'mandate'), 0.00019502681618722574)
(('open', 'discussion'), 0.00019502681618722574)
(('people', 'died'), 0.00019502681618722574)
(('pre-existing', 'conditions'), 0.00019502681618722574)
(('Bernie', 'Sanders'), 0.0001462701121404193)
(('Dr.', 'Fauci'), 0.0001462701121404193)
(('Election', 'Day'), 0.0001462701121404193)
(('He', 'knew'), 0.0001462701121404193)
(('He', 'made'), 0.0001462701121404193)
(('In', 'fact'), 0.0001462701121404193)
(('Nancy', 'Pelosi'), 0.0001462701121404193)
(('Not', 'true'), 0.0001462701121404193)
(('President', 'Donald'), 0.0001462701121404193)
(('That', 'isnot'), 0.0001462701121404193)
(('The', 'Green'), 0.0001462701121404193)
(('This', 'man'), 0.0001462701121404193)
(('White', 'House'), 0.0001462701121404193)
(('big', 'difference'), 0.0001462701121404193)
(('electric', 'cars'), 0.0001462701121404193)
(('fair', 'election'), 0.0001462701121404193)
(('forest', 'management'), 0.0001462701121404193)
(('greatest', 'economy'), 0.0001462701121404193)
```

6.12 2016 - 1st Presidential Debate | Display the top 100 bigrams from by Frequency

[17]:
```
# score by frequency and display the top 50 bigrams
scored_2016 = finder_2016.score_ngrams(bigram_measures.raw_freq)
print ()
print ("Bigrams from file with top 50 frequencies")
for item in scored_2016[:50]:
        print (item)
```

```
Bigrams from file with top 50 frequencies
(('Secretary', 'Clinton'), 0.002034110467845408)
```

(('Mr.', 'Trump'), 0.0011996036092421635)
(('United', 'States'), 0.0006258801439524331)
(('New', 'York'), 0.0005215667866270276)
(('tax', 'returns'), 0.0005215667866270276)
(('trade', 'deals'), 0.0005215667866270276)
(('bring', 'back'), 0.00046941010796432484)
(('Middle', 'East'), 0.00041725342930162205)
(('President', 'Obama'), 0.00041725342930162205)
(('Barack', 'Obama'), 0.0003650967506389193)
(('Sean', 'Hannity'), 0.0003650967506389193)
(('long', 'time'), 0.0003650967506389193)
(('middle', 'class'), 0.00031294007197621654)
(('North', 'Korea'), 0.0002607833933135138)
(('birth', 'certificate'), 0.0002607833933135138)
(('ca', 'bring'), 0.0002607833933135138)
(('criminal', 'justice'), 0.0002607833933135138)
(('nuclear', 'weapons'), 0.0002607833933135138)
(('American', 'people'), 0.00020862671465081103)
(('Donald', 'Trump'), 0.00020862671465081103)
(('In', 'fact'), 0.00020862671465081103)
(('Iran', 'deal'), 0.00020862671465081103)
(('Our', 'country'), 0.00020862671465081103)
(('Saudi', 'Arabia'), 0.00020862671465081103)
(('back', 'jobs'), 0.00020862671465081103)
(('bad', 'experience'), 0.00020862671465081103)
(('campaign', 'manager'), 0.00020862671465081103)
(('fair', 'share'), 0.00020862671465081103)
(('final', 'question'), 0.00020862671465081103)
(('justice', 'system'), 0.00020862671465081103)
(('million', 'jobs'), 0.00020862671465081103)
(('money', 'back'), 0.00020862671465081103)
(('tax', 'cuts'), 0.00020862671465081103)
(('African-American', 'community'), 0.00015647003598810827)
(('Obama', 'fault'), 0.00015647003598810827)
(('South', 'Korea'), 0.00015647003598810827)
(('That', 'means'), 0.00015647003598810827)
(('Wall', 'Street'), 0.00015647003598810827)
(('We', "'ll"), 0.00015647003598810827)
(('We', 'defend'), 0.00015647003598810827)
(('When', 'sell'), 0.00015647003598810827)
(('bad', 'things'), 0.00015647003598810827)
(('biggest', 'tax'), 0.00015647003598810827)
(('good', 'job'), 0.00015647003598810827)
(('great', 'thing'), 0.00015647003598810827)
(('implicit', 'bias'), 0.00015647003598810827)
(('interest', 'rates'), 0.00015647003598810827)
(('million', 'people'), 0.00015647003598810827)
(('police', 'officers'), 0.00015647003598810827)

```
(('rising', 'incomes'), 0.00015647003598810827)
```

6.13 2020 - 1st Presidential debate | Score by PMI and display the top bigrams

6.13.1 Apply filter value as 6

[18]:
```
# score by PMI and display the top 50 bigrams
# only use frequently occurring words in mutual information
finder_2020.apply_freq_filter(6)
scored_2020 = finder_2020.score_ngrams(bigram_measures.pmi)
print(scored_2020)
```

```
[(('Supreme', 'Court'), 11.324039871367212), (('climate', 'change'),
11.324039871367212), (('United', 'States'), 11.002111776479854), (('Green',
'New'), 10.516684949309608), (('New', 'Deal'), 10.516684949309608), (('law',
'enforcement'), 9.779719355143403), (('health', 'care'), 9.587074277201008),
(('radical', 'left'), 9.362107912200733), (('mail-in', 'ballots'),
8.971523456646432), (('vice', 'president'), 8.694683251287602), (('Vice',
'President'), 7.527332193509119), (('Mr.', 'President'), 7.141731145469068),
(('President', 'Trump'), 7.128579777817762), (('Mr.', 'Vice'),
7.079279637002312), (('President', 'Biden'), 6.956175492312994), (('American',
'people'), 6.647269059119754), (('million', 'people'), 5.794826247533614),
(('The', 'fact'), 5.604080702506696)]
```

[19]:
```
## 2016 - 1st Presidential debate  | Score by PMI and display the top bigrams
### Apply filter value as 6
```

[20]:
```
# score by PMI and display the top 50 bigrams
# only use frequently occurring words in mutual information
finder_2016.apply_freq_filter(6)
scored_2016 = finder_2016.score_ngrams(bigram_measures.pmi)
print(scored_2016)
```

```
[(('middle', 'class'), 11.641825972041826), (('Sean', 'Hannity'),
11.226788472762983), (('Middle', 'East'), 11.056863471320671), (('United',
'States'), 10.641825972041826), (('New', 'York'), 10.419433550705378),
(('Barack', 'Obama'), 10.056863471320671), (('President', 'Obama'),
10.056863471320671), (('trade', 'deals'), 9.963754066929189), (('Mr.', 'Trump'),
9.211191617711965), (('tax', 'returns'), 8.834471049984222), (('long', 'time'),
8.667821180574773), (('Secretary', 'Clinton'), 8.594072840593459), (('bring',
'back'), 8.01517052302071)]
```

6.14 2020 - 1st Presidential debate | Bigrams with top 15 mutual Information Scores

[21]:
```
print ("\nBigrams from file with top 15 mutual information scores")
for item in scored_2020[:20]:
        print (item)
```

```
Bigrams from file with top 15 mutual information scores
(('Supreme', 'Court'), 11.324039871367212)
(('climate', 'change'), 11.324039871367212)
(('United', 'States'), 11.002111776479854)
(('Green', 'New'), 10.516684949309608)
(('New', 'Deal'), 10.516684949309608)
(('law', 'enforcement'), 9.779719355143403)
(('health', 'care'), 9.587074277201008)
(('radical', 'left'), 9.362107912200733)
(('mail-in', 'ballots'), 8.971523456646432)
(('vice', 'president'), 8.694683251287602)
(('Vice', 'President'), 7.527332193509119)
(('Mr.', 'President'), 7.141731145469068)
(('President', 'Trump'), 7.128579777817762)
(('Mr.', 'Vice'), 7.079279637002312)
(('President', 'Biden'), 6.956175492312994)
(('American', 'people'), 6.647269059119754)
(('million', 'people'), 5.794826247533614)
(('The', 'fact'), 5.604080702506696)
```

6.15 2016 - 1st Presidential debate | Bigrams with top 15 mutual Information Scores

[22]:
```
print ("\nBigrams from file with top 15 mutual information scores")
for item in scored_2016[:20]:
        print (item)
```

```
Bigrams from file with top 15 mutual information scores
(('middle', 'class'), 11.641825972041826)
(('Sean', 'Hannity'), 11.226788472762983)
(('Middle', 'East'), 11.056863471320671)
(('United', 'States'), 10.641825972041826)
(('New', 'York'), 10.419433550705378)
(('Barack', 'Obama'), 10.056863471320671)
(('President', 'Obama'), 10.056863471320671)
(('trade', 'deals'), 9.963754066929189)
(('Mr.', 'Trump'), 9.211191617711965)
(('tax', 'returns'), 8.834471049984222)
(('long', 'time'), 8.667821180574773)
```

```
(('Secretary', 'Clinton'), 8.594072840593459)
(('bring', 'back'), 8.01517052302071)
```

7 Data Questions

- Who are the candidates in 2020 and 2016 Elections? From the bigram analysis of 2020 1st debate file , the two names that appeared frequently are Mr. President (Donald Trump) and Mr. Vice President(Biden) are the candidates. From the bigram analysis of 2016 1st debate file , the two names that appeared frequently are Mr. Donald Trump and Secretary Hillary Clinton are the candidates. Even, though President Barack Obama's names appeared often.
- What is the major topic discussed in 2020 1st Presidential Debate? Based on the bigrams with top mutual information scores, question/topics that gained more attention are Supreme court Climate Change Law enforcement Health care Radical left and mail-in ballots.
- What is the major topic discussed in 2016 1st Presidential Debate? Based on the bigrams with top mutual information scores, question/topics that gained more attention are Middle Class Middel east (War) Trade deals Bring back jobs
- What is inferred from last two elections major topics? In 2016, the debate was centered around more jobs for american with more restrictions to outsourcing and tight control on the border for immigrations and trade deals. In 2020, it is more about law enforcement, health care, policies and emaployment around climate change.
- Topics that almost decided the campaign success? It is likely that the campaign on bringing jobs back to american made significant impact in 2016.However, from 2020 1st debate, its possible that having affordable health care for all may play a significant role in 2020 elections. Law enforcement may stand in favor of both parties. Might be a deal-breaker as well.

7.1 2020 - 1st Presidential Debate | Trigram

[23]:
```
# All trigrams from 2020 - 1st Presidential Debate
from nltk.collocations import ngrams
filewords_2020_3x = [w for w in filewords_2020 if len(w)>2]
trigram_2020 = ngrams(filewords_2020_3x,3) # n=3 trigram
print("Trigrams")
trigram_2020_list = []
for x in trigram_2020:
    trigram_2020_list.append(x)

print("2020 1st Presidential debate | Top 25 Trigrams:")
print(trigram_2020_list[:25])
```

```
Trigrams
2020 1st Presidential debate | Top 25 Trigrams:
[('Correction', 'and', 'clarification'), ('and', 'clarification', 'prior'),
('clarification', 'prior', 'version'), ('prior', 'version', 'this'), ('version',
'this', 'transcript'), ('this', 'transcript', 'misstated'), ('transcript',
'misstated', 'what'), ('misstated', 'what', 'President'), ('what', 'President',
```

```
'Donald'), ('President', 'Donald', 'Trump'), ('Donald', 'Trump', 'said'),
('Trump', 'said', 'about'), ('said', 'about', 'the'), ('about', 'the',
'Democratic'), ('the', 'Democratic', 'Party'), ('Democratic', 'Party', 'and'),
('Party', 'and', 'socialism'), ('and', 'socialism', 'This'), ('socialism',
'This', 'the'), ('This', 'the', 'full'), ('the', 'full', 'transcript'), ('full',
'transcript', 'from'), ('transcript', 'from', 'Tuesday'), ('from', 'Tuesday',
'night'), ('Tuesday', 'night', 'first')]
```

7.2 2016 - 1st Presidential Debate | Trigram

[24]:
```
# All trigrams from 2016 - 1st Presidential Debate
from nltk.collocations import ngrams
filewords_2016_3x = [w for w in filewords_2016 if len(w)>2]
trigram_2016 = ngrams(filewords_2016_3x,3) # n=3 trigram
print("Trigrams")
trigram_2016_list = []
for x in trigram_2016:
    trigram_2016_list.append(x)

print("2016 1st Presidential debate | Top 25 Trigrams:")
print(trigram_2016_list[:25])
```

```
Trigrams
2016 1st Presidential debate | Top 25 Trigrams:
[('Full', 'transcript', 'First'), ('transcript', 'First', '2016'), ('First',
'2016', 'presidential'), ('2016', 'presidential', 'debate'), ('presidential',
'debate', 'POLITICO'), ('debate', 'POLITICO', 'STAFF'), ('POLITICO', 'STAFF',
'09/27/2016'), ('STAFF', '09/27/2016', '01:55'), ('09/27/2016', '01:55', 'EDT'),
('01:55', 'EDT', 'HOLT'), ('EDT', 'HOLT', 'Good'), ('HOLT', 'Good', 'evening'),
('Good', 'evening', 'from'), ('evening', 'from', 'Hofstra'), ('from', 'Hofstra',
'University'), ('Hofstra', 'University', 'Hempstead'), ('University',
'Hempstead', 'New'), ('Hempstead', 'New', 'York'), ('New', 'York', 'Lester'),
('York', 'Lester', 'Holt'), ('Lester', 'Holt', 'anchor'), ('Holt', 'anchor',
'NBC'), ('anchor', 'NBC', 'Nightly'), ('NBC', 'Nightly', 'News'), ('Nightly',
'News', 'want')]
```

7.3 2020 - 1st Presidential Debate | Word cloud

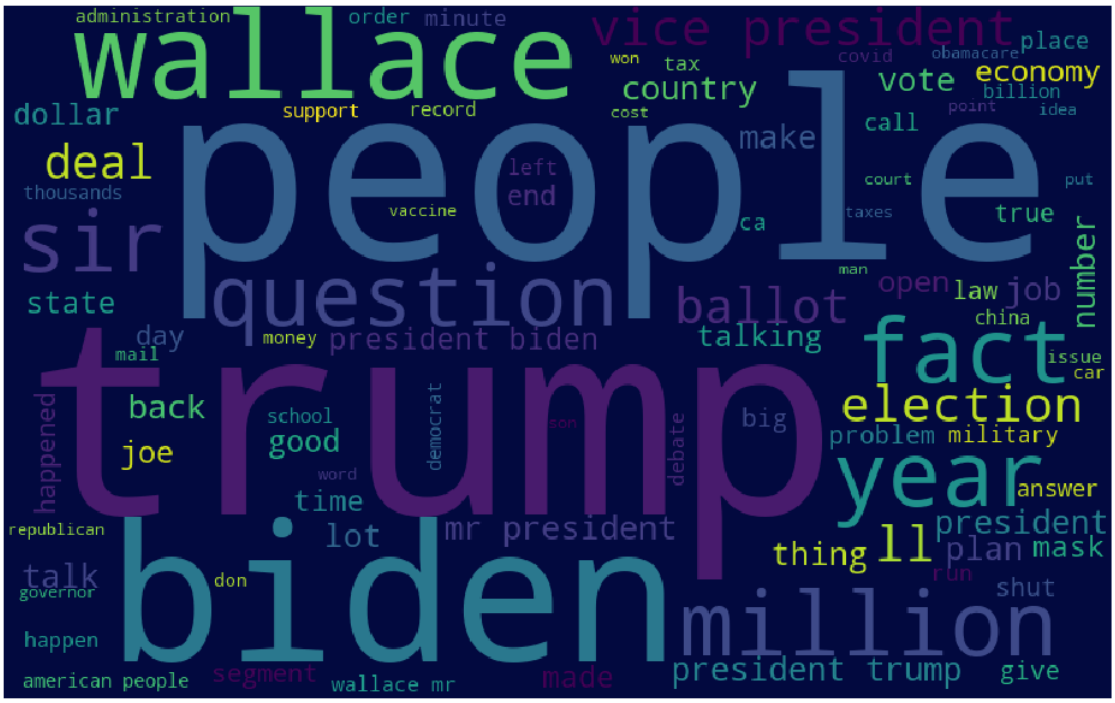
[25]:
```
from wordcloud import WordCloud, STOPWORDS, ImageColorGenerator
import matplotlib.pyplot as plt

# Converts each token into lowercase
comment_words_2020 = ''
for i in range(len(filewords_2020)):
    filewords_2020[i] = filewords_2020[i].lower()

comment_words_2020 += " ".join(filewords_2020)+" "
```

```
wordcloud_2020 = WordCloud(width = 800, height = 500,
                background_color ='#02093F',
                stopwords = stopwords,
                min_font_size = 12).generate(comment_words_2020)

# plot the WordCloud
plt.figure(figsize = (15, 8), facecolor = None)
plt.imshow(wordcloud_2020)
plt.axis("off")
plt.tight_layout(pad = 0)
plt.show()
```



7.4 2016 - 1st Presidential Debate | Word cloud

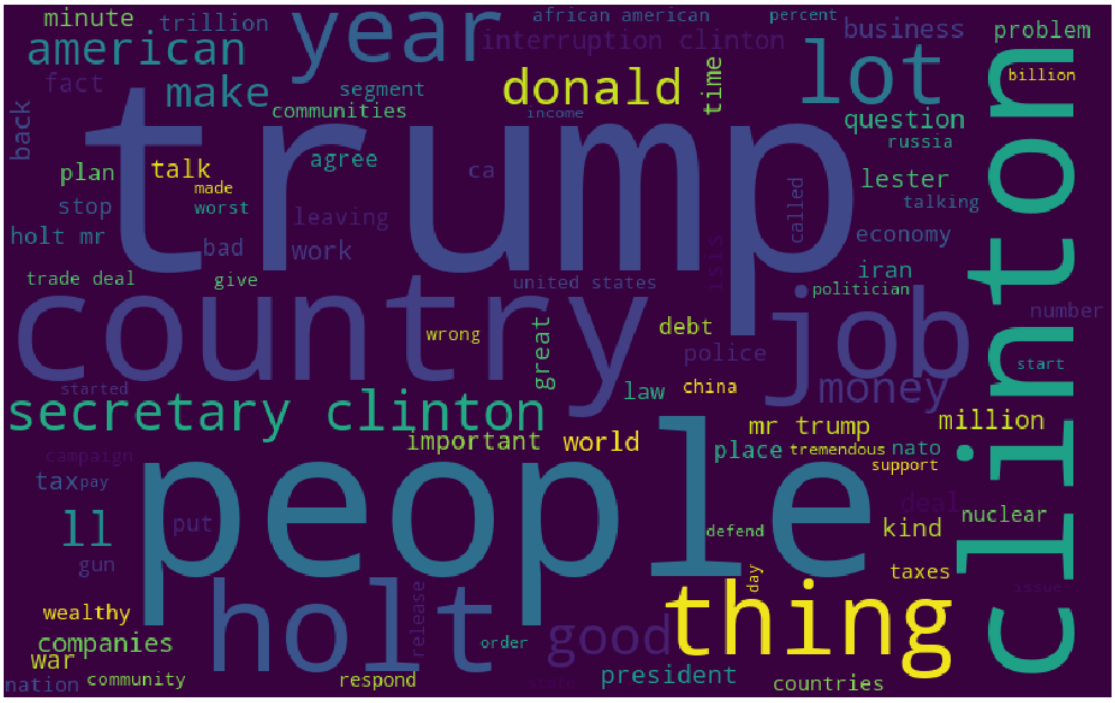
[26]:
```
from wordcloud import WordCloud, STOPWORDS, ImageColorGenerator
import matplotlib.pyplot as plt

# Converts each token into lowercase
comment_words_2016 = ''
for i in range(len(filewords_2016)):
    filewords_2016[i] = filewords_2016[i].lower()

comment_words_2016 += " ".join(filewords_2016)+" "
```

```
wordcloud_2016 = WordCloud(width = 800, height = 500,
                background_color ='#38023F',
                stopwords = stopwords,
                min_font_size = 12).generate(comment_words_2016)

# plot the WordCloud
plt.figure(figsize = (15, 8), facecolor = None)
plt.imshow(wordcloud_2016)
plt.axis("off")
plt.tight_layout(pad = 0)
plt.show()
```



7.5 Summary

- In this exercise, two complete transcripts from 2016 and 2020 US election's 1st presidential debates were analyzed. Both, files were extracted from Web sources.After extraction, each files were processed for NLTK tokenization. Pre-processing steps include, converting to lower case, removal of punctuations, words with internal hyphens or apostrophes, words with aplha-numeric characters etc. In addition,both custom stop words and stop words from NLTK libraries were applied to filter out unwanted texts.

- Later, the tokens were analyzed for top frequencies, and ngrams. With ngrams analysis, BigramCollocationFinder has been extensively used to analyze the two words that repeated more often.Intrestingly, both elections had differnt combination of bigrams topping the list

highlighting the central issues from both debates.Bigrams with mutual information scores support the same.

- Ex. In 2016 US elections Mr. Donald Trump's arguements on border control, jobs for american people were well received and resulted in favor.
- However, 2020 - Vice President Biden's arguements on climate change, economy, afortable health care plans for middle class and tax bills may favor him. However, law enforcement may still remain as challenge for both parties.
- Overall, NLTK library's word tokenizer, regexp tokenizer, stop words, ngrams & PMI scores helped analyzed the raw text from differnt sources. Wordcloud was presented as well on top of each data sets.Further, stemming , sentiment analysis and classifier models can be performed for better analysis for NLP.