Homework 2

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Libraries

```r
library(NLP) # Required for tm
library(tm) # Corpus
library(data.table) # rbindlist
library(quanteda) # tokenize
```

```
## quanteda version 0.9.9.22
```

```
## Use 3 of 4 cores in parallel computing
```

```
##
## Attaching package: 'quanteda'
```

```
## The following objects are masked from 'package:tm':
##
##     as.DocumentTermMatrix, stopwords
```

```
## The following object is masked from 'package:NLP':
##
##     ngrams
```

```
## The following object is masked from 'package:utils':
##
##     View
```

```
## The following object is masked from 'package:base':
##
##     sample
```

```r
library(plyr) # join
library(readtext) # reading text files
```

Parse Files

```r
# function takes DirSource for files and a string for speakerName
parseCorpus <- function(files, speakerName) {
  # Parse into R structures
  docs <- Corpus(files) # I didn't realize I was using the wrong Corpus until far too late, it works...
  if(length(files) > 1) {
    docFrames <- lapply(docs, function(doc) data.frame(doc$content))
    docFrame <- rbindlist(docFrames)
  } else {
    docFrame <- docs$content
  }
  # Clean up
  findString <- paste(char_toupper(speakerName), ': ')
  docFrame <- lapply(docFrame, function(text) gsub(findString, '', text))
  docFrame <- lapply(docFrame, function(text) gsub('\\([A-Z ]+\\)', '', text))
  # Tokenize
```

```
    # Seperate words and remove punctuation
  unigramTokens <- tokenize(paste(docFrame, collapse=''), removePunct=TRUE, removeNumbers=TRUE, removeSy
  bigramTokens <- tokenize(paste(docFrame, collapse=''), removePunct=TRUE, removeNumbers=TRUE, removeSym
    # Without stopwords
  unigramTokensNoStopwords <- removeFeatures(unigramTokens, stopwords('english'))
  bigramTokensNoStopwords <- removeFeatures(bigramTokens, stopwords('english'))
    # Put lower case versions in data.table
  unigrams <- data.table(token=tolower(unlist(unigramTokens)))
  bigrams <- data.table(token=tolower(unlist(bigramTokens)))
    # Without stopwords
  unigramsNoStopwords <- data.table(token=tolower(unlist(unigramTokensNoStopwords)))
  bigramsNoStopwords <- data.table(token=tolower(unlist(bigramTokensNoStopwords)))
    # Count instances
  unigramCount <- unigrams[, .N, by=token][order(N, decreasing=TRUE)]
  bigramCount <- bigrams[, .N, by=token][order(N, decreasing=TRUE)]
    # Without stopwords
  unigramCountNoStopwords <- unigramsNoStopwords[, .N, by=token][order(N, decreasing=TRUE)]
  bigramCountNoStopwords <- bigramsNoStopwords[, .N, by=token][order(N, decreasing=TRUE)]
    # Add canidate names
  unigramCount$canidate <- speakerName
  bigramCount$canidate <- speakerName
    # Without stopwords
  unigramCountNoStopwords$canidate <- speakerName
  bigramCountNoStopwords$canidate <- speakerName
  # Return all four sets of tokens
  return(list('unigramCount'=unigramCount, 'bigramCount'=bigramCount, 'unigramCountNoStopwords'=unigram
}
```

Chi^2 calculation

```
chiSquared <- function(input) {
  DT <- data.table(join(input[canidate == "Clinton"][, list(token, clintonCount = as.numeric(N))], inpu
  DT[is.na(clintonCount)]$clintonCount <- 0
  DT[is.na(trumpCount)]$trumpCount <- 0
  DT[, `:=`(totalCount, clintonCount + trumpCount)]
  DT <- DT[order(totalCount, decreasing=TRUE)][totalCount > 5]
  DT[, `:=`(totalClinton, sum(clintonCount))]
  DT[, `:=`(totalTrump, sum(trumpCount))]
  DT[, `:=`(chi2, (totalClinton + totalTrump) * (trumpCount * (totalClinton - clintonCount) - clintonCo

  return(DT[order(chi2, decreasing=TRUE)])
}
```

Apply functions

```
clintonList <- parseCorpus(DirSource('CampaignSpeeches',pattern='clinton'), 'Clinton')
trumpList <- parseCorpus(DirSource('CampaignSpeeches',pattern='trump'), 'Trump')
# Combine data.tables
unigramCount <- rbind(clintonList$unigramCount, trumpList$unigramCount)[order(N, decreasing=TRUE)]
bigramCount <- rbind(clintonList$bigramCount, trumpList$bigramCount)[order(N, decreasing=TRUE)]
# Without stopwords
```

```
unigramCountNoStopwords <- rbind(clintonList$unigramCountNoStopwords, trumpList$unigramCountNoStopwords
bigramCountNoStopwords <- rbind(clintonList$bigramCountNoStopwords, trumpList$bigramCountNoStopwords)[o
```

Question 1 Results

```
unigramChi <- chiSquared(unigramCount)
```

```
## Joining by: token
```

```
unigramChi[1:10]
```

```
##        token clintonCount trumpCount totalCount totalClinton totalTrump
##  1:    going           40        233        273        18897      22149
##  2:     very           18        127        145        18897      22149
##  3:    women           70         10         80        18897      22149
##  4: families           46          2         48        18897      22149
##  5:    let’s           48          3         51        18897      22149
##  6:  economy           46          4         50        18897      22149
##  7:  hillary            9         73         82        18897      22149
##  8:      i’m           31        119        150        18897      22149
##  9:    don’t           24        103        127        18897      22149
## 10:       as          132         63        195        18897      22149
##           chi2
##  1: 108.97915
##  2:  66.22454
##  3:  55.46514
##  4:  47.96352
##  5:  47.51346
##  6:  42.56775
##  7:  40.66069
##  8:  39.01061
##  9:  37.77413
## 10:  36.97961
```

```
bigramChi <- chiSquared(bigramCount)
```

```
## Joining by: token
```

```
bigramChi[1:10]
```

```
##               token clintonCount trumpCount totalCount totalClinton
##  1:        going to           31        208        239         5949
##  2:      each other           18          0         18         5949
##  3:    young people           19          1         20         5949
##  4:       i believe           19          1         20         5949
##  5:         look at            4         42         46         5949
##  6: hillary clinton            6         47         53         5949
##  7:       we should           20          2         22         5949
##  8:          i mean            1         29         30         5949
##  9:           do it            2         32         34         5949
## 10:         the top           14          0         14         5949
##     totalTrump     chi2
##  1:       7941 88.54452
##  2:       7941 24.05841
##  3:       7941 22.26349
##  4:       7941 22.26349
##  5:       7941 21.96095
##  6:       7941 21.57149
##  7:       7941 20.80273
##  8:       7941 19.15370
##  9:       7941 19.00148
## 10:       7941 18.70670
```

```
# Without stopwords
unigramChiNoStopwords <- chiSquared(unigramCountNoStopwords)
```

```
## Joining by: token
```

```
unigramChiNoStopwords[1:10]
```

```
##        token clintonCount trumpCount totalCount totalClinton totalTrump
##  1:    going           40        233        273         8444      10279
##  2:    women           70         10         80         8444      10279
##  3: families           46          2         48         8444      10279
##  4:    let’s           48          3         51         8444      10279
##  5:  economy           46          4         50         8444      10279
##  6: together           65         17         82         8444      10279
##  7:  hillary            9         73         82         8444      10279
##  8:      i’m           31        119        150         8444      10279
##  9:    don’t           24        103        127         8444      10279
## 10:     work           83         32        115         8444      10279
##          chi2
##  1: 103.72883
##  2:  58.33660
##  3:  50.02664
##  4:  49.62704
##  5:  44.53855
##  6:  38.83545
##  7:  38.73395
##  8:  36.45759
##  9:  35.45515
## 10:  34.25626
```

```
bigramChiNoStopwords <- chiSquared(bigramCountNoStopwords)
```

```
## Joining by: token
```

```
bigramChiNoStopwords[1:10]
```

```
##               token clintonCount trumpCount totalCount totalClinton
##  1:        going to           31        208        239         5949
##  2:      each other           18          0         18         5949
##  3:    young people           19          1         20         5949
##  4:       i believe           19          1         20         5949
##  5:         look at            4         42         46         5949
##  6: hillary clinton            6         47         53         5949
##  7:       we should           20          2         22         5949
##  8:          i mean            1         29         30         5949
##  9:           do it            2         32         34         5949
## 10:         the top           14          0         14         5949
##     totalTrump     chi2
##  1:       7941 88.54452
##  2:       7941 24.05841
##  3:       7941 22.26349
##  4:       7941 22.26349
##  5:       7941 21.96095
##  6:       7941 21.57149
##  7:       7941 20.80273
##  8:       7941 19.15370
##  9:       7941 19.00148
## 10:       7941 18.70670
```

Parse into R structures

```
# Get files into R
clintonListOrlando <- parseCorpus(DirSource('CampaignSpeeches',pattern='clinton-orlando'), 'Clinton')
trumpListOrlando <- parseCorpus(DirSource('CampaignSpeeches',pattern='trump-orlando'), 'Trump')
# Combine data.tables
unigramCountOrlando <- rbind(clintonListOrlando$unigramCount, trumpListOrlando$unigramCount)[order(N, de
bigramCountOrlando <- rbind(clintonListOrlando$bigramCount, trumpListOrlando$bigramCount)[order(N, decre
# Without stopwords
unigramCountNoStopwordsOrlando <- rbind(clintonListOrlando$unigramCountNoStopwords, trumpListOrlando$uni
bigramCountNoStopwordsOrlando <- rbind(clintonListOrlando$bigramCountNoStopwords, trumpListOrlando$bigra
```

Question 2 Results

```
unigramOrlandoChi <- chiSquared(unigramCountOrlando)
```

```
## Joining by: token
```

```
unigramOrlandoChi[1:10]
```

```
##           token clintonCount trumpCount totalCount totalClinton totalTrump
##  1: immigration            0         21         21         2113       2977
##  2:       don't            1         21         22         2113       2977
##  3:         and          164        159        323         2113       2977
##  4:        that           52         36         88         2113       2977
##  5:          as           28         14         42         2113       2977
##  6:         she            2         21         23         2113       2977
##  7:       those           11          2         13         2113       2977
##  8:    together           11          2         13         2113       2977
##  9:          up            7          0          7         2113       2977
## 10:        well            9          1         10         2113       2977
##          chi2
##  1: 14.967024
##  2: 12.436464
##  3: 12.183418
##  4: 11.396193
##  5: 11.036097
##  6: 10.248323
##  7:  9.972830
##  8:  9.972830
##  9:  9.875863
## 10:  9.702107
```

```
bigramOrlandoChi <- chiSquared(bigramCountOrlando)
```

```
## Joining by: token
```

```
bigramOrlandoChi[1:10]
```

```
##                token clintonCount trumpCount totalCount totalClinton
##  1: first responders            6          0          6          329
##  2:            a lot            6          0          6          329
##  3:          as well            6          0          6          329
##  4:       each other            6          0          6          329
##  5:          that we           10          3         13          329
##  6:           we are            7          1          8          329
##  7:           i have            7          1          8          329
##  8:         we don’t            0         12         12          329
##  9:          will be            0         11         11          329
## 10:           of the            2         17         19          329
##     totalTrump      chi2
##  1:        547 10.044482
##  2:        547 10.044482
##  3:        547 10.044482
##  4:        547 10.044482
##  5:        547  8.719754
##  6:        547  8.587115
##  7:        547  8.587115
##  8:        547  7.317794
##  9:        547  6.700223
## 10:        547  6.050879
```

```
# Without stopwords
unigramOrlandoChiNoStopwords <- chiSquared(unigramCountNoStopwordsOrlando)
```

```
## Joining by: token
```

```
unigramOrlandoChiNoStopwords[1:10]
```

```
##           token clintonCount trumpCount totalCount totalClinton totalTrump
##  1:    together           11          2         13          596       1027
##  2: immigration            0         21         21          596       1027
##  3:        well            9          1         10          596       1027
##  4:       first            8          1          9          596       1027
##  5:       learn            6          0          6          596       1027
##  6:  responders            6          0          6          596       1027
##  7:         lot            6          0          6          596       1027
##  8:       don’t            1         21         22          596       1027
##  9:        back            7          1          8          596       1027
## 10:     islamic            0         13         13          596       1027
##          chi2
##  1: 12.936155
##  2: 12.346706
##  3: 12.291316
##  4: 10.599020
##  5: 10.377290
##  6: 10.377290
##  7: 10.377290
##  8:  9.936931
##  9:  8.920834
## 10:  7.605221
```

```
bigramOrlandoChiNoStopwords <- chiSquared(bigramCountNoStopwordsOrlando)
```

```
## Joining by: token
```

```
bigramOrlandoChiNoStopwords[1:10]
```

```
##                token clintonCount trumpCount totalCount totalClinton
##  1: first responders            6          0          6          329
##  2:            a lot            6          0          6          329
##  3:          as well            6          0          6          329
##  4:       each other            6          0          6          329
##  5:          that we           10          3         13          329
##  6:           we are            7          1          8          329
##  7:           i have            7          1          8          329
##  8:         we don’t            0         12         12          329
##  9:          will be            0         11         11          329
## 10:           of the            2         17         19          329
##     totalTrump      chi2
##  1:        547 10.044482
##  2:        547 10.044482
##  3:        547 10.044482
##  4:        547 10.044482
##  5:        547  8.719754
##  6:        547  8.587115
##  7:        547  8.587115
##  8:        547  7.317794
##  9:        547  6.700223
## 10:        547  6.050879
```

Question 3

```
REFERENCE <- corpus(readtext("CampaignSpeeches/*.txt", docvarsfrom = "filenames"))
```

```
## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("possible
## glob pattern"): the condition has length > 1 and only the first element
## will be used
```

```
## possible glob pattern
```

```
## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used
```

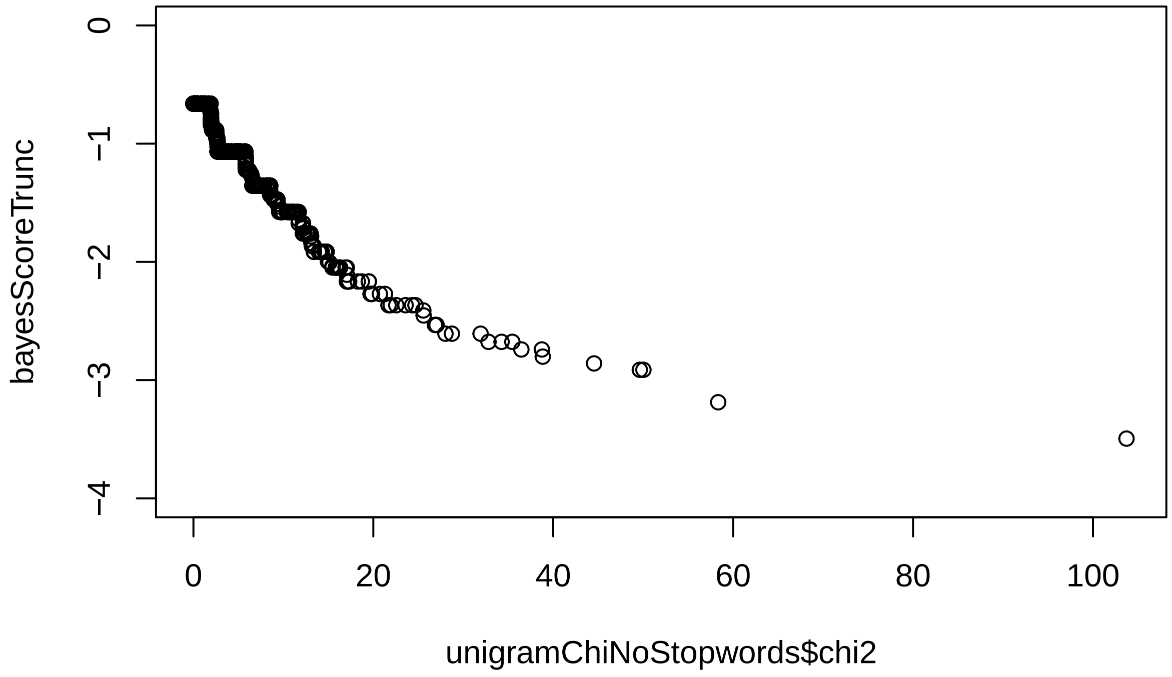
```
## regular file
```

```
## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used
```

```
## regular file
```

```
## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used

## regular file

## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used

## regular file

## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used

## regular file

## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used

## regular file

## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used

## regular file

## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used

## regular file

## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used

## regular file

## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used

## regular file

## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used

## regular file

## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used

## regular file

## Warning in if (options("readtext-verbosity")[[1]] >= 2) message("regular
## file"): the condition has length > 1 and only the first element will be
## used

## regular file
```

```
REFERENCE.dfm <- dfm(REFERENCE, tolower=TRUE, removeNumbers=TRUE, removePunct=TRUE, removeSeparators=TRU
refscores <- c(rep(-1,7), rep(1,6))
bs <- textmodel(REFERENCE.dfm, refscores, model="NB", smooth=1)
bayesScore <- sort(log(bs$PwGc[1, ]/bs$PwGc[2, ]), decreasing=FALSE) # Sort for Trump
# Plot Parameters
xMax <- ceiling(max(unigramChiNoStopwords$chi2))
xMin <- floor(min(unigramChiNoStopwords$chi2))
maxPoints <- length(unigramChiNoStopwords$chi2)
bayesScoreTrunc <- bayesScore[1:maxPoints] # Need to limit size of bayes score to match chi2
yMax <- ceiling(max(bayesScoreTrunc))
yMin <- floor(min(bayesScoreTrunc))
# Plot
plot(unigramChiNoStopwords$chi2, bayesScoreTrunc, xlim=c(xMin,xMax), ylim=c(yMin,yMax))
```



Question 4