lab6.R

sathvik

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```
# 171EC146
# Sathvik S Prabhu
# Dataset: Twitter Airline Sentiment
library(wordcloud)
## Loading required package: RColorBrewer
library(tm)
## Loading required package: NLP
library(e1071)
library(gmodels)
tweets_raw<-read.csv("/home/sathvik/EC8/ML/Lab/Lab6/Tweets.csv")</pre>
tweets<-data.frame("type"=tweets_raw$airline_sentiment, "text"=tweets_raw$text)</pre>
str(tweets)
                    14640 obs. of 2 variables:
## 'data.frame':
## $ type: Factor w/ 3 levels "negative", "neutral",..: 2 3 2 1 1 1 3 2 3 3 ...
## $ text: Factor w/ 14427 levels ",@USAirways 2nd time this occurred in 3 weeks. I'm not patient. I h
tweets[1,]
                                             text
## 1 neutral @VirginAmerica What @dhepburn said.
table(tweets$type)
##
## negative neutral positive
       9178
                3099
                         2363
tweets[1:3,]
##
         type
## 1 neutral
## 2 positive
## 3 neutral
##
                                                                           text
## 1
                                           @VirginAmerica What @dhepburn said.
## 2 @VirginAmerica plus you've added commercials to the experience... tacky.
## 3 @VirginAmerica I didn't today... Must mean I need to take another trip!
```

```
tweets_corpus <- Corpus(VectorSource(tweets$text))</pre>
print(tweets_corpus)
## <<SimpleCorpus>>
## Metadata: corpus specific: 1, document level (indexed): 0
## Content: documents: 14640
inspect(tweets_corpus[1:3])
## <<SimpleCorpus>>
## Metadata: corpus specific: 1, document level (indexed): 0
## Content: documents: 3
## [1] @VirginAmerica What @dhepburn said.
## [2] @VirginAmerica plus you've added commercials to the experience... tacky.
## [3] @VirginAmerica I didn't today... Must mean I need to take another trip!
tweets[1:3,]
##
         type
## 1 neutral
## 2 positive
## 3 neutral
##
                                                                           t.ext.
## 1
                                           @VirginAmerica What @dhepburn said.
## 2 @VirginAmerica plus you've added commercials to the experience... tacky.
## 3 @VirginAmerica I didn't today... Must mean I need to take another trip!
corpus_clean <- tm_map(tweets_corpus, tolower)</pre>
## Warning in tm_map.SimpleCorpus(tweets_corpus, tolower): transformation drops
## documents
corpus_clean <- tm_map(corpus_clean, removeNumbers)</pre>
## Warning in tm_map.SimpleCorpus(corpus_clean, removeNumbers): transformation
## drops documents
inspect(corpus_clean[1:3])
## <<SimpleCorpus>>
## Metadata: corpus specific: 1, document level (indexed): 0
## Content: documents: 3
##
## [1] @virginamerica what @dhepburn said.
## [2] Ovirginamerica plus you've added commercials to the experience... tacky.
## [3] @virginamerica i didn't today... must mean i need to take another trip!
corpus_clean <- tm_map(corpus_clean, removeWords, stopwords())</pre>
## Warning in tm_map.SimpleCorpus(corpus_clean, removeWords, stopwords()):
## transformation drops documents
corpus_clean <- tm_map(corpus_clean, removePunctuation)</pre>
## Warning in tm_map.SimpleCorpus(corpus_clean, removePunctuation): transformation
## drops documents
```

```
corpus_clean <- tm_map(corpus_clean, stripWhitespace)</pre>
## Warning in tm_map.SimpleCorpus(corpus_clean, stripWhitespace): transformation
## drops documents
inspect(corpus_clean[1:3])
## <<SimpleCorpus>>
## Metadata: corpus specific: 1, document level (indexed): 0
## Content: documents: 3
## [1] virginamerica dhepburn said
## [2] virginamerica plus added commercials experience tacky
## [3] virginamerica today must mean need take another trip
tweets dtm <- DocumentTermMatrix(corpus clean)</pre>
tweets_dtm
## <<DocumentTermMatrix (documents: 14640, terms: 14147)>>
## Non-/sparse entries: 138074/206974006
## Sparsity
## Maximal term length: 46
## Weighting
                      : term frequency (tf)
# Data preparation: Training and testing sets
# size=14640
# about 80:20 ratio
tweets_raw_train <- tweets[1:12000, ]</pre>
tweets_raw_test<- tweets[12001:14640, ]</pre>
tweets_dtm_train <- tweets_dtm[1:12000, ]</pre>
tweets_dtm_test<- tweets_dtm[12001:14640, ]</pre>
tweets_corpus_train <- corpus_clean[1:12000]</pre>
tweets_corpus_test<- corpus_clean[12001:14640]
prop.table(table(tweets_raw_train$type))
##
              neutral positive
## negative
## 0.6070833 0.2220000 0.1709167
prop.table(table(tweets_raw_test$type))
##
## negative
              neutral positive
## 0.7170455 0.1647727 0.1181818
# Visualizing text data - word clouds
wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE)
## Warning in strwidth(words[i], cex = size[i], ...): conversion failure on
## '"jetblue' in 'mbcsToSbcs': dot substituted for <e2>
## Warning in strwidth(words[i], cex = size[i], ...): conversion failure on
## '"jetblue' in 'mbcsToSbcs': dot substituted for <80>
## Warning in strwidth(words[i], cex = size[i], ...): conversion failure on
## '"jetblue' in 'mbcsToSbcs': dot substituted for <9c>
## Warning in text.default(x1, y1, words[i], cex = size[i], offset = 0, srt =
```

```
## rotWord * : conversion failure on '"jetblue' in 'mbcsToSbcs': dot substituted
## for <e2>
## Warning in text.default(x1, y1, words[i], cex = size[i], offset = 0, srt =
## rotWord * : conversion failure on '"jetblue' in 'mbcsToSbcs': dot substituted
## for <80>
## Warning in text.default(x1, y1, words[i], cex = size[i], offset = 0, srt =
## rotWord * : conversion failure on '"jetblue' in 'mbcsToSbcs': dot substituted
## for <9c>
## Warning in text.default(x1, y1, words[i], cex = size[i], offset = 0, srt =
## rotWord * : font metrics unknown for Unicode character U+201c
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## changed could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## talk could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## point could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## around could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## destination could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## makes could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## message could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## soon could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## option could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## houston could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## philly could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets corpus train, min.freq = 40, random.order = FALSE):
## hey could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## longer could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## given could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## asked could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## together could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## row could not be fit on page. It will not be plotted.
```

```
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## traveling could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## landing could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## swa could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## waited could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## calling could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## possible could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## minute could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## hear could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## terminal could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets corpus train, min.freq = 40, random.order = FALSE):
## arrived could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## points could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## scheduled could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## seems could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## carry could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## awful could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## real could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## idea could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## mean could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## forward could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
```

Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):

guess could not be fit on page. It will not be plotted.

things could not be fit on page. It will not be plotted.

```
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## everything could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## sucks could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## international could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## attendants could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## unitedairlines could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## maintenance could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## imaginedragons could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## happened could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## glad could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets corpus train, min.freq = 40, random.order = FALSE):
## reservations could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## hard could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## years could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## hoping could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## loyal could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## else could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## frustrating could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets corpus train, min.freq = 40, random.order = FALSE):
## reflight could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## deal could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
```

Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):

Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):

pilots could not be fit on page. It will not be plotted.

saying could not be fit on page. It will not be plotted.

telling could not be fit on page. It will not be plotted.

```
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## monday could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## error could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## group could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## arrive could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## counting could not be fit on page. It will not be plotted.
## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## counting in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## counting in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## counting in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## counting in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## counting in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## counting in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## counting in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
## currently could not be fit on page. It will not be plotted.
```

- ## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
- ## request could not be fit on page. It will not be plotted.
- ## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
 ## thought could not be fit on page. It will not be plotted.
- ## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
 ## believe could not be fit on page. It will not be plotted.
- ## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
 ## information could not be fit on page. It will not be plotted.
- ## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
 ## companion could not be fit on page. It will not be plotted.
- ## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
 ## wanted could not be fit on page. It will not be plotted.
- ## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
 ## standby could not be fit on page. It will not be plotted.
- ## Warning in wordcloud(tweets_corpus_train, min.freq = 40, random.order = FALSE):
 ## boarded could not be fit on page. It will not be plotted.

```
used employees departure contact old earlier something confirmation newark worse room twice may leaving snow working ...jetblue business destination dragons plus worse photocharlotte hungdenver anything say morning tickets awesome helpful away company thing awesome helpful away company thing awesome helpful away company thing includes a wesome helpful away company thing awesome helpful away company thing away to may company thing away company thing away to may company thing away the work of excitation the cover feel allowed far away company thing away to may company thing away to may company thing away company thing away to may company the destroined far allowed far al
                                                                                                                                                                                                                                              E guys nitting a gradual case case flightled wifi send
  startlaxticket
        pass seats
                                                                                                                                                                                                                                                      waiting give every bwi
     experience.
 direct stuck called long bos making miss
                                                                                                                                                                                                                                                       great saidleave car sit problems
                                                                                                                                                                                                                                                      people book open g
  stop info san stried
                                                                           hours thanks now will one never best of the hough
hours thanks now will one never best stathough late service hold the needgood work phile that stranded the website two airline cancelled the normagent since love fix even made also terrible another jfk delayed please phone trip response name different service another jfk delayed please phone trip response name different service and the service and 
 negative <- subset(tweets_raw_train, type == "negative")</pre>
 neutral <- subset(tweets_raw_train, type == "neutral")</pre>
 positive <- subset(tweets_raw_train, type == "positive")</pre>
 wordcloud(negative$text, max.words = 40,scale = c(3, 0.5))
 ## Warning in tm_map.SimpleCorpus(corpus, tm::removePunctuation): transformation
 ## drops documents
 ## Warning in tm_map.SimpleCorpus(corpus, function(x) tm::removeWords(x,
 ## tm::stopwords())): transformation drops documents
                                        usairways
                      cant help service just will flightled thanks waiting cancelled
             Southwestair podelay get please polate hour planed ont back one hours planed jetblue one hours planed jetblue still to call us of lights amp call us of lights amp
 wordcloud(neutral$text, max.words = 40, scale = c(3, 0.5))
 ## Warning in tm map.SimpleCorpus(corpus, tm::removePunctuation): transformation
```

drops documents

```
## Warning in tm_map.SimpleCorpus(corpus, tm::removePunctuation): transformation
## drops documents
## Warning in strwidth(words[i], cex = size[i], ...): conversion failure on
## '"jetblue' in 'mbcsToSbcs': dot substituted for <e2>
## Warning in strwidth(words[i], cex = size[i], ...): conversion failure on
## '"jetblue' in 'mbcsToSbcs': dot substituted for <80>
## Warning in strwidth(words[i], cex = size[i], ...): conversion failure on
## '"jetblue' in 'mbcsToSbcs': dot substituted for <9c>
## Warning in text.default(x1, y1, words[i], cex = size[i], offset = 0, srt =
## rotWord * : conversion failure on '"jetblue' in 'mbcsToSbcs': dot substituted
## for <e2>
## Warning in text.default(x1, y1, words[i], cex = size[i], offset = 0, srt =
## rotWord * : conversion failure on '"jetblue' in 'mbcsToSbcs': dot substituted
## for <80>
## Warning in text.default(x1, y1, words[i], cex = size[i], offset = 0, srt =
## rotWord * : conversion failure on '"jetblue' in 'mbcsToSbcs': dot substituted
## for <9c>
## Warning in text.default(x1, y1, words[i], cex = size[i], offset = 0, srt =
## rotWord * : font metrics unknown for Unicode character U+201c
                                               can
                                 got angle an
                                 ្ឌី fleets ទីpleasenew
                     our will today get
amp likefly travel
see just need flying flights
back likefly travel
heek email
                                virginamerica know
                                                    ...jetblue now
                                                  Lone thanks
                       usairways
wordcloud(positive$text, max.words = 40, scale = c(3, 0.5))
## Warning in tm_map.SimpleCorpus(corpus, tm::removePunctuation): transformation
## drops documents
## Warning in tm_map.SimpleCorpus(corpus, function(x) tm::removeWords(x,
## tm::stopwords())): transformation drops documents
```

```
much jetblue flight united love appreciate best a awesome will you well you well you well you will appreciate best a wesome will awesome room in the can virginamerica you will you will you will you will you will awe some will you will yo
```

##

|

Cell Contents

N

N / Row Total |

```
#Data preparation - creating indicator features for frequent words
# findFreqTerms(tweets_dtm_train, 5)
Dictionary <- function(x) {</pre>
  if( is.character(x) ) {
    return (x)
  }
  stop('x is not a character vector')
tweets_dict <- Dictionary(findFreqTerms(tweets_dtm_train, 5))</pre>
# 2449 fequent words
tweets train <- DocumentTermMatrix(tweets corpus train, list(dictionary = tweets dict))</pre>
tweets_test<- DocumentTermMatrix(tweets_corpus_test,list(dictionary = tweets_dict))</pre>
convert_counts <- function(x) {</pre>
  x \leftarrow ifelse(x > 0, 1, 0)
  x \leftarrow factor(x, levels = c(0, 1), labels = c("No", "Yes"))
  return(x)
}
tweets_train <- apply(tweets_train, MARGIN = 2, convert_counts)</pre>
tweets_test<- apply(tweets_test, MARGIN = 2, convert_counts)</pre>
# Step 3 - training a model on the data
tweets_classifier <- naiveBayes(tweets_train, tweets_raw_train$type)</pre>
# Step 4 - evaluating model performance
tweets_test_pred <- predict(tweets_classifier, tweets_test)</pre>
CrossTable(tweets_test_pred, tweets_raw_test$type,
           prop.chisq = FALSE, prop.t = FALSE,
           dnn = c('predicted', 'actual'))
##
```

```
N / Col Total |
##
##
## Total Observations in Table: 2640
##
##
##
          | actual
##
    predicted | negative | neutral | positive | Row Total |
##
   -----|----|-----|
                       130 | 43 |
##
    negative |
               1618 |
                                        1791 |
             0.903 | 0.073 | 0.024 |
0.855 | 0.299 | 0.138 |
##
      |
                                        0.678 |
          1
##
  -----|-----|-----|
     ##
                                        0.180 |
##
    ##
##
## -----|----|-----|
## Column Total | 1893 | 435 | 312 |
               0.717 | 0.165 | 0.118 |
    1
                                        |
## -----|----|-----|
##
# Accuracy: 79.89%
# Step 5 - improving model performance
# Using the laplace smoothing parameter.
tweets_classifier2 <- naiveBayes(tweets_train, tweets_raw_train$type, laplace = 1)</pre>
tweets_test_pred2 <- predict(tweets_classifier2, tweets_test)</pre>
CrossTable(tweets_test_pred2, tweets_raw_test$type,
       prop.chisq = FALSE, prop.t = FALSE,
       dnn = c('predicted', 'actual'))
##
##
##
    Cell Contents
## |-----|
             N I
         N / Row Total |
      N / Col Total |
## |-----|
##
## Total Observations in Table: 2640
##
##
##
           | actual
    predicted | negative | neutral | positive | Row Total |
 -----|-----|-----|
##
                        155 |
                                 53 |
##
    negative |
              1676 |
                                        1884 |
```

## ## ##		0.890 0.885	0.082 0.356	0.028 0.170	0.714
## ## ## ## ## ##	neutral	160 0.360 0.085		38 0.086 0.122	444 0.168
	positive	 57 0.183 0.030	 34 0.109 0.078	 221 0.708 0.708	312 0.118
	Column Total	 1893 0.717	 435 0.165	 312 0.118	2640
## ##					

Accuracy: 81.17%. Up by 1.3%