User Complaints Mining

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Preparing data

Load and clean the customer complaints data

The data should be downloaded from Kaggle's Consumer Complaints Database.

Loading and removing rows with no complaint narrative and unnecessary colimns:

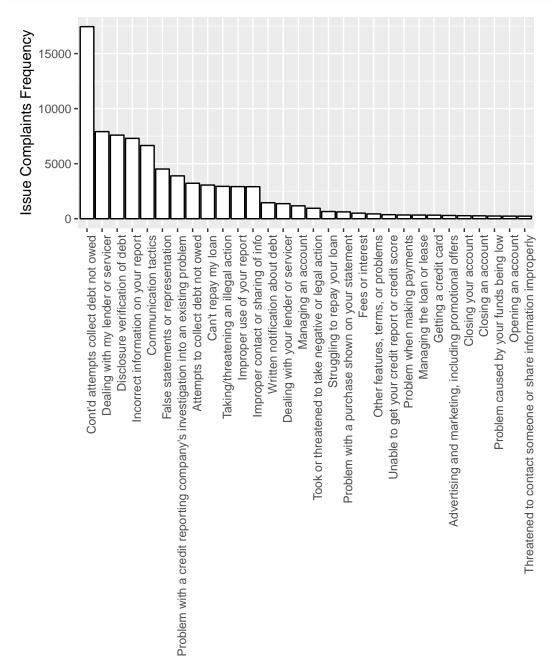
```
if(!file.exists("./user-complaints-mining/df.Rds")) {
  df <- read_csv(file="../data/Consumer_Complaints.csv.zip",col_names = TRUE)</pre>
  df \leftarrow df[,-c(1,7,9:18)]
  df <- df[!is.na(df[,"Consumer complaint narrative"]),] #199,970</pre>
  df <- df[!is.na(df[,"Company"]),] # no NA's</pre>
  df <- df[!is.na(df[,"Product"]),] # no NA's</pre>
  df <- df[!is.na(df[,"Issue"]),] # no NA's</pre>
  df <- df[!is.na(df[,"Sub-product"]),] # 147,788 total left</pre>
  df <- df[!is.na(df[,"Sub-issue"]),] # 81,940 total left</pre>
  # Converting all but narrative columns to factors
  df$Product <- as.factor(df$Product)</pre>
  df$`Sub-product` <- as.factor(df$`Sub-product`)</pre>
  df$Issue <- as.factor(df$Issue)</pre>
  df$`Sub-issue` <- as.factor(df$`Sub-issue`)</pre>
  df$Company <- as.factor(df$Company)</pre>
  saveRDS(df, file = "./user-complaints-mining/df.Rds")
  gc()
} else {
  df <- readRDS("./user-complaints-mining/df.Rds")</pre>
}
df
```

```
## # A tibble: 81,940 x 6
##
     Product `Sub-product`
                               Issue `Sub-issue`
                                                   `Consumer complai~ Company
##
      <fct>
               <fct>
                               <fct> <fct>
                                                   <chr>>
                                                                      <fct>
## 1 Debt co~ Other (i.e. ph~ Discl~ Not given e~ This company refu~ The CBE~
## 2 Debt co~ Credit card
                              Impro~ Talked to a~ "This complaint i~ SQUARET~
## 3 Debt co~ Credit card
                              Takin~ Sued w/o pr~ "I am writing to ~ Selip &~
## 4 Debt co~ Other (i.e. ph~ Cont'~ Debt result~ My identity was s~ Southwe~
## 5 Student~ Federal studen~ Can't~ Can't get f~ "I was dropped fr~ AES/PHE~
                              Discl~ Not given e~ The first communi~ Blatt, ~
## 6 Debt co~ Credit card
## 7 Debt co~ Other (i.e. ph~ Commu~ Frequent or~ "My complaint is ~ AR Reso~
## 8 Debt co~ I do not know
                              False~ Attempted t~ In a clearance in~ SANTAND~
## 9 Student~ Non-federal st~ Can't~ Can't tempo~ XXXX University, ~ Navient~
## 10 Student~ Non-federal st~ Deali~ Received ba~ I had attended XX~ CITIZEN~
## # ... with 81,930 more rows
```

Feature engineering

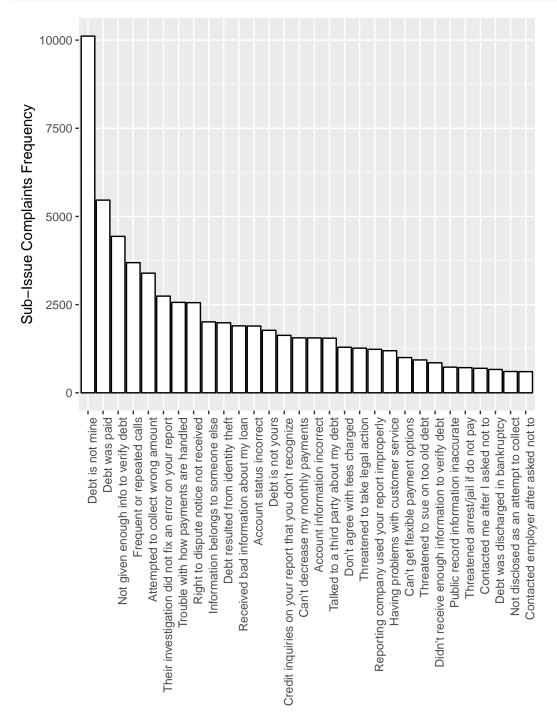
Distribution of the most frequent "Issue" complaints

```
most_freq_issues_list <- levels(fct_infreq(df$Issue))[1:30]
ggplot() + aes(fct_infreq(df[df$Issue %in% most_freq_issues_list,]$Issue))+
   geom_histogram(colour="black", fill="white", stat = "count")+
   ylab("Issue Complaints Frequency") + xlab("")+
   theme(axis.text.x = element_text(angle =90, hjust = 1))</pre>
```



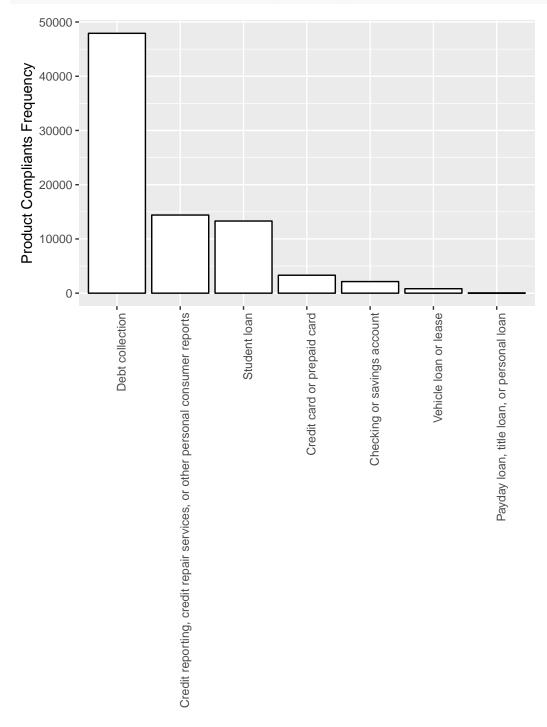
Distribution of the most frequent "Sub-issue" complaints

```
most_freq_subissues_list <- levels(fct_infreq(df$`Sub-issue`))[1:30]
ggplot() + aes(fct_infreq(df[df$`Sub-issue` %in% most_freq_subissues_list,]$`Sub-issue`))+
geom_histogram(colour="black", fill="white", stat = "count")+
ylab("Sub-Issue Complaints Frequency") + xlab("")+
theme(axis.text.x = element_text(angle =90, hjust = 1))</pre>
```



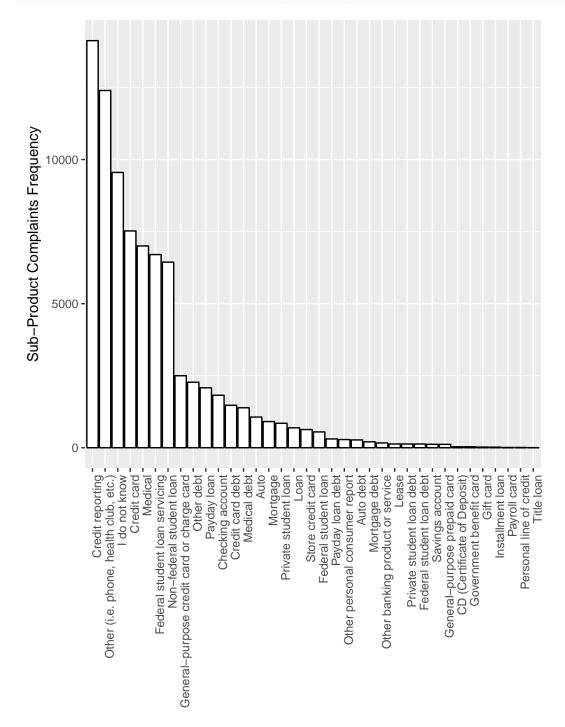
Distribution of the most frequent "Product" complaints

```
most_freq_product_list <- levels(fct_infreq(df$Product))[1:30]
ggplot() + aes(fct_infreq(df[df$Product %in% most_freq_product_list,]$Product))+
   geom_histogram(colour="black", fill="white", stat = "count")+
   ylab("Product Compliants Frequency") + xlab("")+
   theme(axis.text.x = element_text(angle =90, hjust = 1))</pre>
```



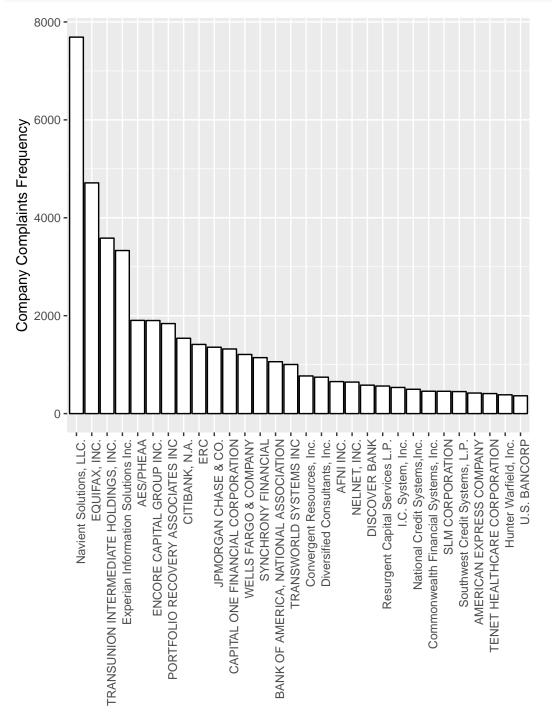
Distribution of the most frequent "Sub-product" complaints

```
most_freq_subproduct_list <- levels(fct_infreq(df$`Sub-product`))
ggplot() + aes(fct_infreq(df[df$`Sub-product` %in% most_freq_subproduct_list,]$`Sub-product`))+
geom_histogram(colour="black", fill="white", stat = "count")+
ylab("Sub-Product Complaints Frequency") + xlab("")+
theme(axis.text.x = element_text(angle =90, hjust = 1))</pre>
```



Distribution of the most frequent "Company" complaints

```
most_freq_company_list <- levels(fct_infreq(df$Company))[1:30]
ggplot() + aes(fct_infreq(df[df$Company %in% most_freq_company_list,]$Company))+
    geom_histogram(colour="black", fill="white", stat = "count")+
    ylab("Company Complaints Frequency") + xlab("")+
    theme(axis.text.x = element_text(angle =90, hjust = 1))</pre>
```



Text Minig

Split data into test and train sets

```
set.seed(123)
sample = sample.split(df$`Consumer complaint narrative`, SplitRatio = .5)
train = subset(df, sample == TRUE)
test = subset(df, sample == FALSE)
```

Word analysis

Building a corpus, which is a collection of text documents VectorSource specifies that the source is character vectors. After that, the corpus needs a couple of transformations, including changing letters to lower case, removing punctuations/numbers and removing stop words. The general English stop-word list is tailored by adding some words specific to the documents in question.

[1] " company refuses provide verification validation debt fdcpa debt mine" ## [2] " writing request assistance deceptive practices collection lawfirm appears tactics violating consumer protection law debt collection practices depriving consumers rights dispute received notice company day contacted offices instructed memo dated instruct contact plaintiff attorney court instructions provided contacted plaintiff attorney phone faxed letter disputing debt letter company responded letter dated sending bill due date requested bill showing balance back made payment back disputing amount owed disputing charges wrote back company faxed dispute letter continue dispute amount owed company response furnished information disputing owe disputing balance inaccurate needed proof charges activity account paragraph letter disputing amount send letter letter company disputing balance requesting documents company responded letter communication received letter copy default judgment filed court clerk office indicating failed respond judgment facts judgment firm served original judgment attaching dispute letters showing responded instructed office occasions plaintiff failed respond dispute furnish information provided and unable obtain proof original debt credible legal procedure settle debts utilized unfaithful dirty tactics violated rights court committed perjury law filing false documents court defaulted judgment failed respond fact responded failed furnish proof court house clerk office told company notify offices contact company told

court clerk office respond summons clerks office granted default judgement based false information respond summons filed false affirmation clerk office"

- ## [3] " communication received debt collector court summons delivered mother laws home received summons hand week summons stated alledgedly owed money debt collector advisement dispute debt days demand debt collector validate debt attempted demand validation debt online research certified letter days ago post office told today approximately certified letter attempted delivered days mailed accepted debt collector today withoyut knowledge information sufficient form opinion truth accuracy claim based deny generally specifically claim debt collector"
- ## [4] " attended forced loan attend school loan interest rate make payments attended school enrolled told classmates received reduction balance curious criteria receive reduction"
- ## [5] "years ago harassed issue asked send application form signed understood charged
 extra pet damages paid additional month pet covered damages wanted photos damages
 property manager told walk left apartment thing scam money contacted requested
 information"

Steming

```
dictCorpus <- myCorpus
myCorpus <- tm_map(myCorpus, stemDocument)
print(myCorpus[1:5]$content)</pre>
```

- ## [1] "compani refus provid verif valid debt fdcpa debt mine"
- ## [2] "write request assist decept practic collect lawfirm appear tactic violat consum protect law debt collect practic depriv consum right disput receiv notic compani day contact offic instruct memo date instruct contact plaintiff attorney court instruct provid contact plaintiff attorney phone fax letter disput debt letter compani respond letter date send bill due date request bill show balanc back made payment back disput amount owe disput charg wrote back compani fax disput letter continu disput amount owe compani respons furnish inform disput owe disput balanc inaccur need proof charg activ account paragraph letter disput amount send letter letter compani disput balanc request document compani respond letter communic receiv letter copi default judgment file court clerk offic indic fail respond judgment fact judgment firm serv origin judgment attach disput letter show respond instruct offic occas plaintiff fail respond disput furnish inform provided and unabl obtain proof origin debt credibl legal procedur settl debt util unfaith dirti tactic violat right court commit perjuri law file fals document court default judgment fail respond fact respond fail furnish proof court hous clerk offic told compani notifi offic contact compani told court clerk offic respond summon clerk offic grant default judgement base fals inform respond summon file fals affirm clerk offic" ## [3] "communic receiv debt collector court summon deliv mother law home receiv summon hand week summon state alledg owe money debt collector advis disput debt day demand debt collector valid debt attempt demand valid debt onlin research certifi letter day ago post offic told today approxim certifi letter attempt deliv day mail accept debt collector today withoyut knowledg inform suffici form opinion truth accuraci claim base deni general specif claim debt collector"
- ## [4] "attend forc loan attend school loan interest rate make payment attend school enrol told classmat receiv reduct balanc curious criteria receiv reduct"
- ## [5] "year ago harass issu ask send applic form sign understood charg extra pet damag paid addit month pet cover damag want photo damag properti manag told walk left apart thing scam money contact request inform"

Building a Document-Term Matrix

This operation requiers 64GB of RAM. To avoid calculation, the pre-build myDtm object will be loaded from the file system. To recalculate it needs to be removed from the file system first.

```
if(!file.exists("./user-complaints-mining/myDtm.Rds")) {
  myDtm <- TermDocumentMatrix(myCorpus, control = list(minWordLength = 1))</pre>
  rowTotals <- apply(myDtm , 1, sum) #Find the sum of words in each Document
  myDtm <- myDtm[rowTotals > 0, ] #remove all docs without words
  saveRDS(myDtm, file = "./user-complaints-mining/myDtm.Rds")
  gc()
} else {
  myDtm <- readRDS("./user-complaints-mining/myDtm.Rds")</pre>
inspect(myDtm)
## <<TermDocumentMatrix (terms: 27440, documents: 40970)>>
## Non-/sparse entries: 1585496/1122631304
## Sparsity
                      : 100%
## Maximal term length: 124
## Weighting
                   : term frequency (tf)
## Sample
##
            Docs
             11425 11904 31399 31930 33039 34137 35502 35599 36932 9698
## Terms
##
     account
                26
                      21
                             60
                                   62
                                         18
                                               64
                                                       5
                                                             8
                                                                   0
                                                                         6
##
     call
                 3
                      10
                              2
                                    0
                                         18
                                                 0
                                                       3
                                                             0
                                                                   2
                                                                        7
                       0
##
     collect
                 0
                              5
                                    0
                                          0
                                                 4
                                                       0
                                                             6
                                                                   0
                                                                        21
                              0
                                                 2
                                                                   2
##
     credit
                 3
                       1
                                    0
                                          0
                                                      13
                                                             2
                                                                        0
     debt
                       0
                              1
                                                                   3
                                                                        68
##
                 0
                                    1
                                                 1
                                                       0
                                                             0
##
     inform
                       5
                              8
                                    8
                                          6
                                                8
                                                      10
                                                            73
                                                                   5
                                                                        9
                11
     loan
                 5
                              2
                                                                   3
##
                       0
                                    0
                                         11
                                                0
                                                       2
                                                             0
                                                                        0
##
                 2
                      12
                             27
                                   27
                                         24
                                               27
                                                       7
                                                             0
                                                                   0
                                                                        1
    payment
##
    receiv
                       2
                             0
                                    0
                                         25
                                                0
                                                       1
                                                                   8
                                                                       10
##
     report
                 1
                       0
                             25
                                   27
                                          1
                                                28
                                                      26
                                                             8
                                                                   0
                                                                        0
```

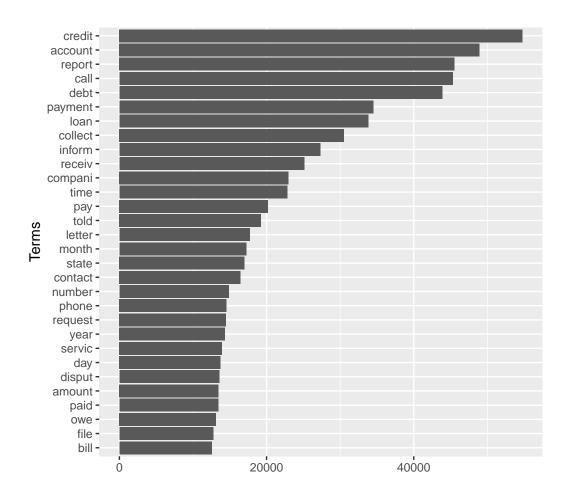


Figure 1: 30 Most Frequent Terms

Frequent Terms and Association

```
freq.terms <- findFreqTerms(myDtm, lowfreq=5)
term.freq <- rowSums(as.matrix(myDtm))
term.freq <- subset(term.freq, term.freq >= 5)

dfTerms <- data.frame(term = names(term.freq), freq = term.freq)
ggplot(dfTerms[order(-dfTerms$freq),][1:30,], aes(x = reorder(term, freq), y = freq)) +
    geom_bar(stat = "identity") + xlab("Terms") + ylab("") + coord_flip()</pre>
```

Which words are associated with term "loan"?

```
findAssocs(myDtm, c('loan'), 0.35)

## $loan

## student payment privat navient interest consolid
## 0.60 0.40 0.39 0.39 0.38 0.36
```



Figure 2: Words Cloud of Complaints

Building word cloud:

```
library(wordcloud)
m <- as.matrix(myDtm)
v <- sort(rowSums(m), decreasing=TRUE)
myNames <- names(v)
d <- data.frame(word=myNames, freq=v)
wordcloud(d$word, d$freq, min.freq=20, scale=c(4,.2), max.words = 200)</pre>
```

Building LDA model for the 'train' set of complaints

```
library(topicmodels)
dtm <- as.DocumentTermMatrix(myDtm)</pre>
numTopics <- 30 # 7, 10 or 30
topicsFileName <- paste("./user-complaints-mining/lda",numTopics,".Rds", sep = "")</pre>
ui = unique(dtm$i) #array of unique row ids in 'train' set
if(!file.exists(topicsFileName)) {
  dtm.new = dtm[ui,]
  train.lda <- LDA(dtm.new, k = numTopics) # identify topics
  saveRDS(train.lda, file = topicsFileName)
  gc()
} else {
  train.lda <- readRDS(topicsFileName)</pre>
}
(train.terms <- terms(train.lda, 10)) # first terms of every topic
##
         Topic 1
                      Topic 2
                                  Topic 3
                                             Topic 4
                                                           Topic 5
                                                                       Topic 6
    [1,] "debt"
                                  "told"
                                             "court"
                                                           "inform"
                                                                       "loan"
##
                      "return"
##
    [2,] "collector"
                      "advis"
                                  "ask"
                                             "file"
                                                           "person"
                                                                       "student"
##
    [3,] "alleg"
                      "cancel"
                                  "contact"
                                             "bankruptci"
                                                           "secur"
                                                                       "navient"
   [4,] "valid"
                                  "inform"
                                             "recoveri"
                                                           "number"
                                                                       "repay"
##
                      "purchas"
##
   [5,] "communic"
                      "offer"
                                  "back"
                                             "attorney"
                                                           "social"
                                                                       "forbear"
                      "charg"
##
   [6,] "llc"
                                  "email"
                                             "garnish"
                                                           "equifax"
                                                                       "program"
    [7,] "ceas"
                                  "spoke"
                                                           "data"
##
                      "citi"
                                             "law"
                                                                       "privat"
                      "receiv"
                                             "case"
                                                           "individu" "defer"
##
    [8,] "midland"
                                  "repres"
   [9,] "attempt"
                      "american" "refus"
                                             "judgment"
                                                           "breach"
                                                                       "consolid"
## [10,] "limit"
                      "express"
                                  "speak"
                                             "portfolio"
                                                           "access"
                                                                       "default"
                                             Topic 10
                                                                    Topic 12
##
         Topic 7
                    Topic 8
                                Topic 9
                                                       Topic 11
                                "report"
                                             "letter"
                                                                     "complaint"
##
   [1,] "account"
                    "disput"
                                                        "servic"
   [2,] "close"
                    "verifi"
                                "credit"
                                             "show"
                                                                     "attach"
                                                        "process"
                                             "certifi"
##
   [3,] "open"
                    "inform"
                                "remov"
                                                       "submit"
                                                                     "file"
                                             "apart"
                                                        "custom"
##
    [4,] "number"
                    "delet"
                                "bureaus"
                                                                     "record"
##
   [5,] "activ"
                    "item"
                                "show"
                                             "manag"
                                                        "form"
                                                                     "state"
##
   [6,] "mine"
                    "file"
                                "negat"
                                             "leas"
                                                        "applic"
                                                                     "cfpb"
    [7,] "current" "investig"
                                             "send"
                                                        "chase"
                                                                     "note"
##
                                "bureau"
##
    [8,] "respons" "day"
                                "updat"
                                             "day"
                                                        "request"
                                                                     "document"
                                                        "time"
##
    [9,] "maci"
                    "inaccur"
                                "incorrect" "move"
                                                                     "action"
  [10,] "onlin"
                    "fcra"
                                "list"
                                             "detail"
                                                       "paperwork" "claim"
##
##
         Topic 13
                    Topic 14
                               Topic 15
                                           Topic 16
                                                     Topic 17
                                                                 Topic 18
##
   [1,] "call"
                    "pay"
                               "work"
                                           "violat"
                                                      "address"
                                                                  "compani"
##
   [2,] "phone"
                    "work"
                               "harass"
                                           "act"
                                                      "inquiri"
                                                                  "request"
##
   [3,] "number"
                    "time"
                               "compani"
                                           "consum"
                                                      "author"
                                                                  "provid"
##
    [4,] "time"
                    "money"
                               "contact"
                                           "fair"
                                                      "pull"
                                                                  "document"
                                                                  "valid"
##
   [5,] "day"
                    "job"
                               "messag"
                                           "ident"
                                                      "file"
    [6,] "told"
                               "threaten"
                                           "theft"
                                                      "inquir"
                                                                  "proof"
                    "make"
    [7,] "compani"
                               "stop"
                                           "law"
                                                      "contact"
                                                                  "contract"
##
                    "school"
##
    [8,] "back"
                    "back"
                               "left"
                                           "feder"
                                                      "compani"
                                                                  "copi"
   [9,] "answer"
                               "employ"
                                           "inform"
                                                     "knowledg"
                                                                 "send"
##
                    "year"
                               "leav"
## [10,] "person"
                    "financi"
                                           "practic"
                                                     "type"
                                                                  "sign"
##
         Topic 19 Topic 20
                                Topic 21
                                           Topic 22
                                                         Topic 23
                                                                    Topic 24
##
    [1,] "credit"
                  "collect"
                                "bill"
                                           "receiv"
                                                         "charg"
                                                                     "year"
##
   [2,] "card"
                   "agenc"
                                "due"
                                           "owe"
                                                         "fraud"
                                                                     "home"
    [3,] "score"
                                "issu"
                                           "state"
                                                         "money"
                                                                     "ago"
##
                   "contact"
```

```
[4,] "discov" "attempt"
                                "past"
                                           "mail"
                                                         "fraudul"
                                                                     "mortgag"
    [5,] "appli"
                                "time"
                                                         "claim"
                                                                     "live"
##
                   "debt"
                                           "notic"
                                                         "fund"
    [6,] "affect" "consult"
                                "correct"
                                                                     "husband"
##
                                           "system"
                                                         "polic"
##
    [7,] "drop"
                   "diversifi"
                                "wrong"
                                           "notif"
                                                                     "hous"
                                                                    "sold"
    [8,] "limit"
                                "problem" "send"
##
                   "erc"
                                                         "investig"
##
    [9,] "point"
                   "notic"
                                "resolv"
                                           "notifi"
                                                         "file"
                                                                     "tax"
                                "error"
                                           "correspond" "acct"
                                                                     "wife"
##
   [10,] "xxx"
                   "turn"
                    Topic 26
                               Topic 27
                                           Topic 28
                                                                    Topic 30
##
         Topic 25
                                                      Topic 29
                               "bank"
##
    [1,] "payment"
                    "insur"
                                           "interest"
                                                      "paid"
                                                                     "date"
                    "medic"
                                           "month"
##
    [2,] "make"
                               "check"
                                                       "amount"
                                                                     "origin"
                               "fee"
                                                      "balanc"
##
    [3,] "month"
                    "car"
                                           "payment"
                                                                     "creditor"
##
    [4,] "late"
                    "financi" "charg"
                                           "rate"
                                                      "full"
                                                                     "delinqu"
##
    [5,] "made"
                    "hospit"
                               "deposit"
                                           "pay"
                                                      "pay"
                                                                     "status"
                                                                     "well"
    [6,] "pay"
                    "financ"
                               "debit"
                                           "amount"
##
                                                      "statement"
                               "transact"
                                                       "agreement"
##
    [7,] "day"
                    "vehicl"
                                           "year"
                                                                     "fargo"
    [8,] "time"
                                                      "settl"
                                                                     "amount"
##
                    "compani"
                               "cash"
                                           "appli"
##
    [9,] "told"
                    "doctor"
                               "america"
                                           "increas"
                                                      "agre"
                                                                     "unpaid"
## [10,] "due"
                    "claim"
                               "day"
                                           "lower"
                                                      "settlement" "number"
```

Show complaints correlation to topics in 'train' set

```
train.topics <- topics(train.lda, 5, threshold=.1)</pre>
for (i in c(1,55,500,333)) {
  print (paste(" "))
 print (paste("Complaint# ", i))
 print(paste("Topics found: ", train.topics[i]))
 print (train$`Consumer complaint narrative`[ui[i]])
}
## [1] " "
## [1] "Complaint# 1"
## [1] "Topics found: c(1, 18)"
## [1] "This company refuses to provide me verification and validation of debt per my
right under the FDCPA. I do not believe this debt is mine."
## [1] " "
## [1] "Complaint# 55"
## [1] "Topics found: 13"
## [1] "I have received calls from Midland Credit company since XX/XX/2015. They do not
ask for me by name but say they are trying to collect a debt. The same number of this
company has called me every day for the last several weeks. The number they used before
in XX/XX/XXXX was XXXX. They are now calling from XXXX. I spoke to a manager XXXX XXXX
and requested that they remove my number from their call list. This is the third time I
have ask them to quit calling my number. They have never complied. I HAVE NEVER GIVEN
THEM MY NAME AS THEY DONT ADDRESS ME BY NAME! All these people have is my phone number to
continue to harass me. They all sound like they are from XXXX."
## [1] " "
## [1] "Complaint# 500"
## [1] "Topics found: c(6, 14)"
## [1] "I am seeking information about my Genesis loans through XXXX in XXXX, PA. I have
heard about all of the loan forgiveness because of the XXXX XXXX settlement. I was one of
the many students who were talked into the lending scheme brought on by these schools and
Genesis lending company. I was charged horrible interest payments that I could n't
afford, while still in school. As well as, pulled out of class because I could not afford
payments. Horrible interest rates still haunt me, along with unreasonable monthly
payments. I am already on deferment, on which they still require me to make minimum
payments. I have a loan balance of {$21000.00} and have no idea how I will be able to
keep up with this. I feel as though I was a victim as well as other students who have
already had their loans forgiven. The way the company went about handing these loans out
to young students who know nothing about them, was wrong. My loan servicer XXXX told me
that Genesis has already handled the persons eligible for forgiveness and passed me along
to their company. So my question is, why was I considered not eligible? I attended school
in XX/XX/XXXX-XX/XXXXX and suffered just like everyone else who attended these scheming
schools. Please help!"
## [1] " "
## [1] "Complaint# 333"
## [1] "Topics found: c(1, 12, 14, 26)"
## [1] "Talked to someone not related to me about debt and left information about debt
with my name on front door where everyone could see it and read it. They are also listing
someone else in the document I do n't know, does n't exist and/Or has nothing to do with
this debt. The documents were so cigarette smoke infiltrated they made me sick."
```

Topics related to most frequent issues

Function definitions

```
prepareCorpus <- function(textArr) {</pre>
  myCorpus <- Corpus(VectorSource(textArr))</pre>
  myCorpus <- tm_map(myCorpus, removePunctuation)</pre>
  myCorpus <- tm_map(myCorpus, removeNumbers)</pre>
  myCorpus <- tm_map(myCorpus, tolower)</pre>
  myStopwords <- c(stopwords(language="en", source="smart"),</pre>
                    "xx", "xxxx", "xxxxxxxxxxx", "xxxxxxxxx")
  myCorpus <- tm_map(myCorpus, removeWords, myStopwords)</pre>
  myCorpus <- tm_map(myCorpus, stripWhitespace)</pre>
  return (myCorpus)
# Steming and reverse - long operation!
doSteming <- function(myCorpus) {</pre>
  #dictCorpus <- myCorpus</pre>
  myCorpus <- tm_map(myCorpus, stemDocument)</pre>
  #myCorpus <- tm_map(myCorpus, stemCompletion, dictionary=dictCorpus)</pre>
  return (myCorpus)
}
getBestTopicNums <- function(arr, threshold) {</pre>
  topNums <- sort(arr, index.return=TRUE, decreasing = TRUE)$ix</pre>
  arr <- arr[arr>threshold]
  return (topNums[1:length(arr)])
```

Define topics of first 3 'test' complaints

```
numOfTests <- 3
testThreshold = .2
set.seed(15)
randomIds <- sample(nrow(test),numOfTests)</pre>
test.corpus <- prepareCorpus(test$`Consumer complaint narrative`[randomIds])</pre>
test.corpus <- doSteming(test.corpus)</pre>
test.dtm <- DocumentTermMatrix(test.corpus, control = list(minWordLength = 1))</pre>
test.topics <- posterior(train.lda,test.dtm)</pre>
for (i in 1:numOfTests) {
  tops <- getBestTopicNums(test.topics$topics[i,], testThreshold)</pre>
  print("----")
  print("Topics identified:")
  print(train.terms[,tops])
  print (paste("Original Issue: ", test[[randomIds[i],"Issue"]]))
 print(paste("Complaint narrative:",test[[randomIds[i],"Consumer complaint narrative"]]))
## [1] "----"
## [1] "Topics identified:"
## [1] "loan" "student" "navient" "repay" "forbear" "program"
## [7] "privat" "defer" "consolid" "default"
## [1] "Original Issue: Dealing with my lender or servicer"
## [1] "Complaint narrative: I received a student loan from \" Discover Student Loans ''
in XXXX 2015. I had a XXXX credit score at the time, and my Federal aid would not cover
Out of State Tuition. I accepted the loan for 6-12 % fixed rate interest, sure that I
would receive close to the lowest. Half way through the semester, I receive notice (
through the loan servicer, mind you ) that my interest rate would be the full 12 %, and I
was forced to drop out, so that the XXXX half of the tuition bill would be refunded.
Discover Bank used the most predatory loan terms possible."
## [1] "----"
## [1] "Topics identified:"
## [1] "debt" "collector" "alleg" "valid" "communic"
## [6] "llc" "ceas" "midland" "attempt" "limit"
## [1] "Original Issue: Cont'd attempts collect debt not owed"
## [1] "Complaint narrative: An acct was opened in my name with XXXX XXXX. Once I
discovered this, I informed XXXX XXXX that it was not my debt. The account was charged
off at some point and removed from my credit file XX/XX/XXXX. I received a notice from
Portfolio Recovery Services on XX/XX/XXXX questioning the debt. i informed them in
writing to stop calling me constantly about this debt. I also asked them to verify this
debt in 30 days. They added the debt to my XXXX credit files XX/XX/XXXX without providing
proof that the debt is mine. The credit bureaus continue to report this debt and state
that is valid. Portfolio Recovery Associates only sent me a collection letter and a XXXX
XXXX statement from XX/XX/XXXX as verification on XX/XX/XXXX. Which is not validation of
this debt. I responded to their letter on XX/XX/XXXX asking them to remove this debt from
their records and my credit files because they did not validate this debt with me. They
just added it on my credit file as they saw fit."
## [1] "----"
## [1] "Topics identified:"
## [1] "pay" "work" "time" "money" "job" "make" "school"
```

- ## [8] "back" "year" "financi"
- ## [1] "Original Issue: Struggling to repay your loan"
- ## [1] "Complaint narrative: I first got this loan in XX/XX/XXXX when I first attended XXXX University. XX/XX/XXXX I could not afford to attend the school any longer for how expensive it was. I got the loan through XXXX XXXX who is Navient and could only get approved if I had a co-signer. I had to put the account in forbearance because of payment to high. I had to do a deferment because of the payment to high. Once I was able to finally make a payment that fit into our budget each month and came out of our account directly they went and up the amount AGAIN without any notice and no negotiation whatsoever. They would always say, 'well can your co-signed pay it. ' My co-signer being my father is unable to pay anything because he was force to quit his job to an injury that made it impossible for him to work indefinitely. They do n't care about that. So they put a lean on his house. Then my mother passed away and that made matters even worse. They still do n't care about that. Low and behold they canceled my repayment plan I had going for a couple years and upped my amount once again without notice that is literally almost impossible to pay. They said there is no way out of this one and I have to pay it or they will start garnishing wages and start to take personal belongings from my father as collateral. So I have literally not paid other bills so I can make sure this one is paid each month. Not to mention that I am married with XXXX children under the age of XXXX on one income. Again, they do n't care. This loan is literally the thorn in our flesh everyday."