

Stabilization Analyses for Characters

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Description

This file enables stabilization analyses for the feature value estimations. In other words, feature values are not estimated for a single, pre-defined number of characters, but are estimated for discrete steps (defined with “stepsize”), and for a given maximum number of characters (defined as “n”).

Load libraries

If the libraries are not installed yet, you need to install them using, for example, the command: `install.packages(“ggplot2”)`. For the Hrate package this is different, since it comes from github. The devtools library needs to be installed, and then the `install_github()` function is used.

```
library(stringr)
library(ggplot2)
library(plyr)
library(entropy)
library(ggExtra)
library(gsubfn)
```

```
## Loading required package: proto
```

```
# library(devtools)
# install_github("dimalik/Hrate")
library(Hrate)
```

List files

Create list with all the files in the directory “corpus”.

```
# give file paths to the files to be processed
file.list <- list.files(path = "~/Github/NaLaFi/data/",
                       recursive = T, full.names = T)
head(file.list)
```

```
## [1] "/home/chris/Github/NaLaFi/data//non-writing/animal/animal_bhg_0001.txt"
## [2] "/home/chris/Github/NaLaFi/data//non-writing/animal/animal_bhg_0002.txt"
## [3] "/home/chris/Github/NaLaFi/data//non-writing/animal/animal_bhg_0003.txt"
## [4] "/home/chris/Github/NaLaFi/data//non-writing/animal/animal_bhg_0004.txt"
## [5] "/home/chris/Github/NaLaFi/data//non-writing/animal/animal_bhg_0005.txt"
## [6] "/home/chris/Github/NaLaFi/data//non-writing/animal/animal_bhg_0006.txt"
```

```
#file = "/home/chris/Github/NaLaFi/data//non-writing/animal/animal_cad_0002.txt"
length(file.list)
```

```
## [1] 277
```

Stabilization analysis per file

```
# set counter
counter = 0
# set the maximal number of units (n), and the stepsize for stabilization analysis
# (i.e. in steps of how many units are values calculated?)
n = 100
stepsize = 10
# initialize dataframe to append results to
stabilization.df <- data.frame(filename = character(0), subcorpus = character(0),
                               code = character(0), huni.chars = numeric(0),
                               hrte.chars = numeric(0), ttr.chars = numeric(0),
                               rm.chars = numeric(0), units = numeric(0))

# start time
start_time <- Sys.time()
for (file in file.list)
{
  try({ # if the processing failes for a certain file, there will be no output for this file,
    # but the try() function allows the loop to keep running

    # basic processing
    # loading textfile
    textfile <- scan(file, what = "char", quote = "",
                     comment.char = "", encoding = "UTF-8", sep = "\n" , skip = 7, nmax = 20)
    # skip 7 first lines, nmax gives the maximum number of lines to be read,
    # note that reading more lines will considerably increase processing time.
    # remove annotations marked by '<>'
    textfile <- gsub("<.*>", "", textfile)
    # print(head(textfile))
    # get filename
    filename <- basename(file)
    #print(filename) # for visual inspection
    # get subcorpus category
    subcorpus <- sub("_.*", "", filename)
    # print(subcorpus) # for visual inspection
    # get the three letter identification code + the running number
    code <- substring(substring(filename, regexpr("_", filename) + 1), 1, 8)

    # Split into individual characters/signs
    # remove tabs and parentheses, as well as star signs '*' and plus signs '+'
    # note that this might have to be tuned according to the text files included
    textfile <- str_replace_all(textfile, c("\\t" = "", "\\(" = "", "\\)" = "",
                                             "\\]" = "", "\\[" = "", "\\}" = "",
                                             "\\{" = "", "\\*" = "", "\\+" = ""))
    # split the textfile into individual utf-8 characters. Note that white spaces are
    # counted as utf-8 characters here.
    chars <- unlist(strsplit(textfile, ""))
    chars <- chars[1:n] # use only maximally n units
```

```

chars <- chars[!is.na(chars)] # remove NAs for vectors which are already shorter
# than n
# chars <- chars[chars != " "] # remove white spaces from character vector
# use "next" statement to exclude files with less than x characters
if (length(chars) < 100) {
  next
}
# run loop with stepsizes
# define the number of units (i.e. characters) used for analyses (note that k is
# always either equal to or smaller than n)
k = length(chars)
for (i in 1:(k/stepsize))
{
  # unigram entropy estimation
  # define substring of chars vector by stepsize
  sub.chars <- chars[1:(i*stepsize)]
  # calculate unigram entropy for characters
  chars.df <- as.data.frame(table(sub.chars))
  # print(chars.df)
  huni.chars <- entropy(chars.df$Freq, method = "ML", unit = "log2")
  # entropy rate estimation
  # note: the values chosen for max.length and every.word will crucially
  # impact processing time. max.length = NULL means all units in the file are
  # considered.
  hrate.chars <- get.estimate(text = sub.chars, every.word = 1,
                             max.length = NULL)
  # calculate type-token ratio (ttr)
  ttr.chars <- nrow(chars.df)/sum(chars.df$Freq)

  # calculate repetition measure according to Sproat (2014)
  # the overall number of repetitions is the sum of frequency counts minus 1.
  R <- sum(chars.df$Freq)-1
  # calculate the number of adjacent repetitions
  r = 0
  if (length(sub.chars) > 1){
    for (j in 1:(length(sub.chars)-1)){
      if (sub.chars[j] == sub.chars[j+1]){
        r = r + 1
      } else {
        r = r + 0
      }
    }
    # calculate the repetition measure
    rm.chars <- r/R
  } else {
    rm.chars <- "NA"
  }

  # append results to dataframe
  local.df <- data.frame(filename, subcorpus, code, huni.chars, hrate.chars,
                        ttr.chars, rm.chars, units = i*stepsize)
  stabilization.df <- rbind(stabilization.df, local.df)
}

```

```

# counter
counter <- counter + 1
# print(counter)
})
}
end_time <- Sys.time()
end_time - start_time

```

```
## Time difference of 14.10105 secs
```

```
head(stabilization.df)
```

```
##          filename subcorpus      code huni.chars hrate.chars ttr.chars
## 1 animal_bhg_0001.txt    animal bhg_0001  2.846439   1.812114 0.8000000
## 2 animal_bhg_0001.txt    animal bhg_0001  3.046439   2.193634 0.5500000
## 3 animal_bhg_0001.txt    animal bhg_0001  3.199581   2.389334 0.4333333
## 4 animal_bhg_0001.txt    animal bhg_0001  3.431541   2.608716 0.4000000
## 5 animal_bhg_0001.txt    animal bhg_0001  3.493661   2.674294 0.3400000
## 6 animal_bhg_0001.txt    animal bhg_0001  3.493506   2.727356 0.3000000
##   rm.chars units
## 1         0    10
## 2         0    20
## 3         0    30
## 4         0    40
## 5         0    50
## 6         0    60

```

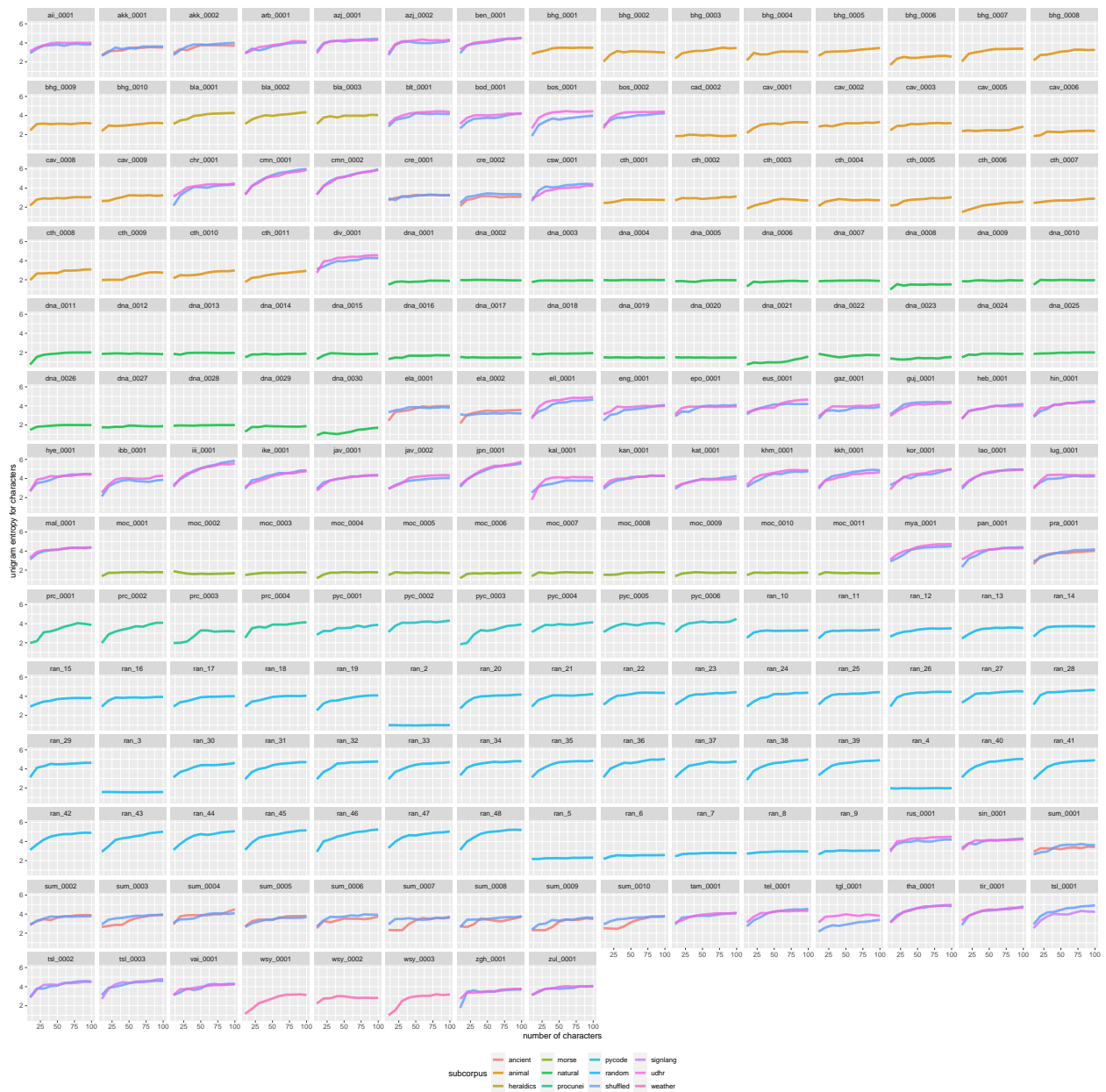
Stabilization plots

Unigram entropy characters

```

huni.chars.plot <- ggplot(stabilization.df, aes(x = units, y = huni.chars,
                                                colour = subcorpus)) +
  geom_line(alpha = 0.8, size = 1.5) +
  theme(legend.position = "bottom") +
  labs(x = "number of characters", y = "unigram entropy for characters") +
  facet_wrap(~code)
huni.chars.plot

```



Safe figure to file

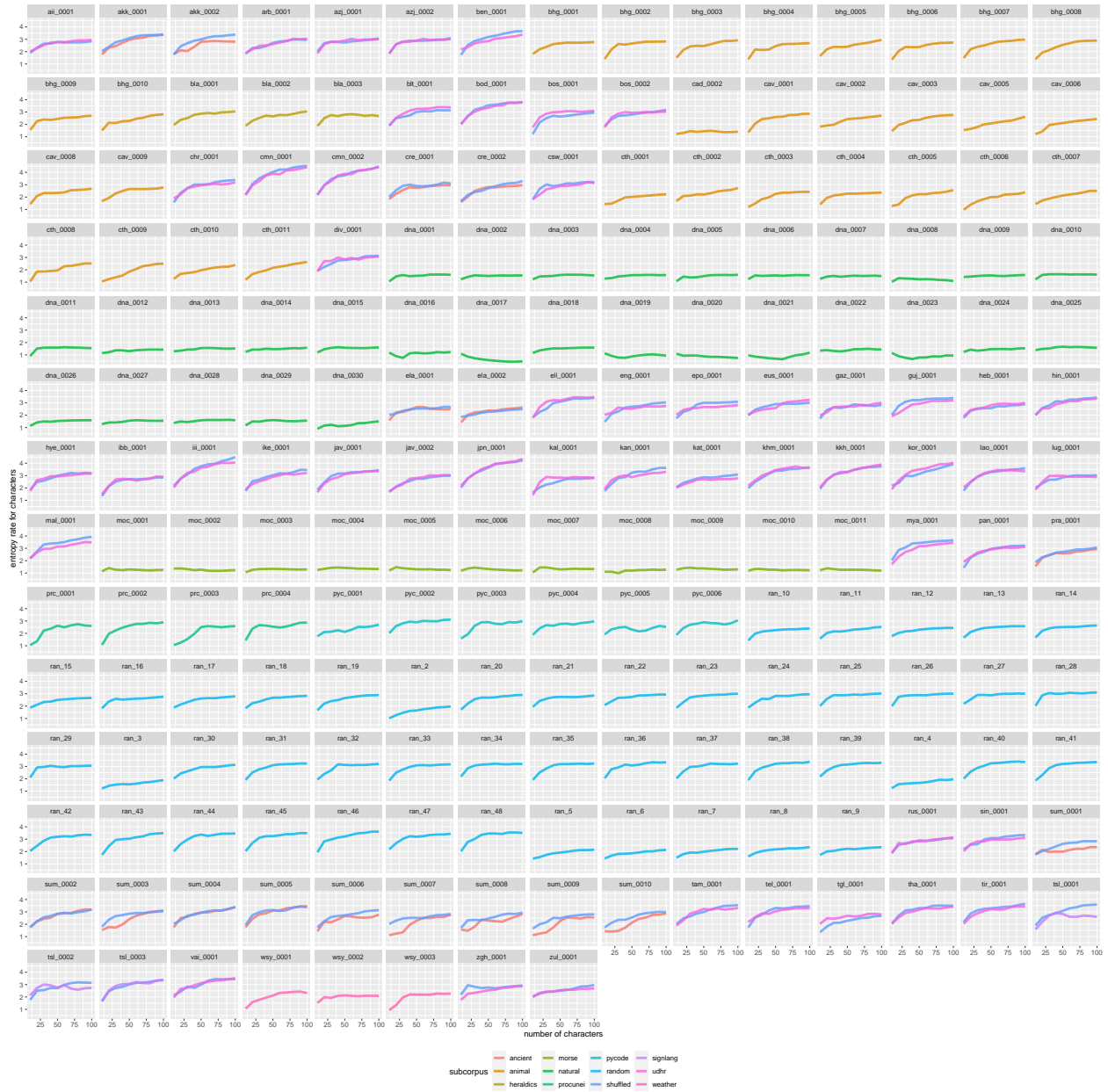
```
ggsave("~/Github/NaLaFi/figures/stabilization_huni_chars.pdf", huni.chars.plot, dpi = 300,
        scale = 1, device = cairo_pdf)
```

Saving 20 x 20 in image

Entropy rate characters

```
hrate.chars.plot <- ggplot(stabilization.df, aes(x = units, y = hrate.chars,
        colour = subcorpus)) +
```

```
geom_line(alpha = 0.8, size = 1.5) +
theme(legend.position = "bottom") +
labs(x = "number of characters", y = "entropy rate for characters") +
facet_wrap(~code)
hrate.chars.plot
```



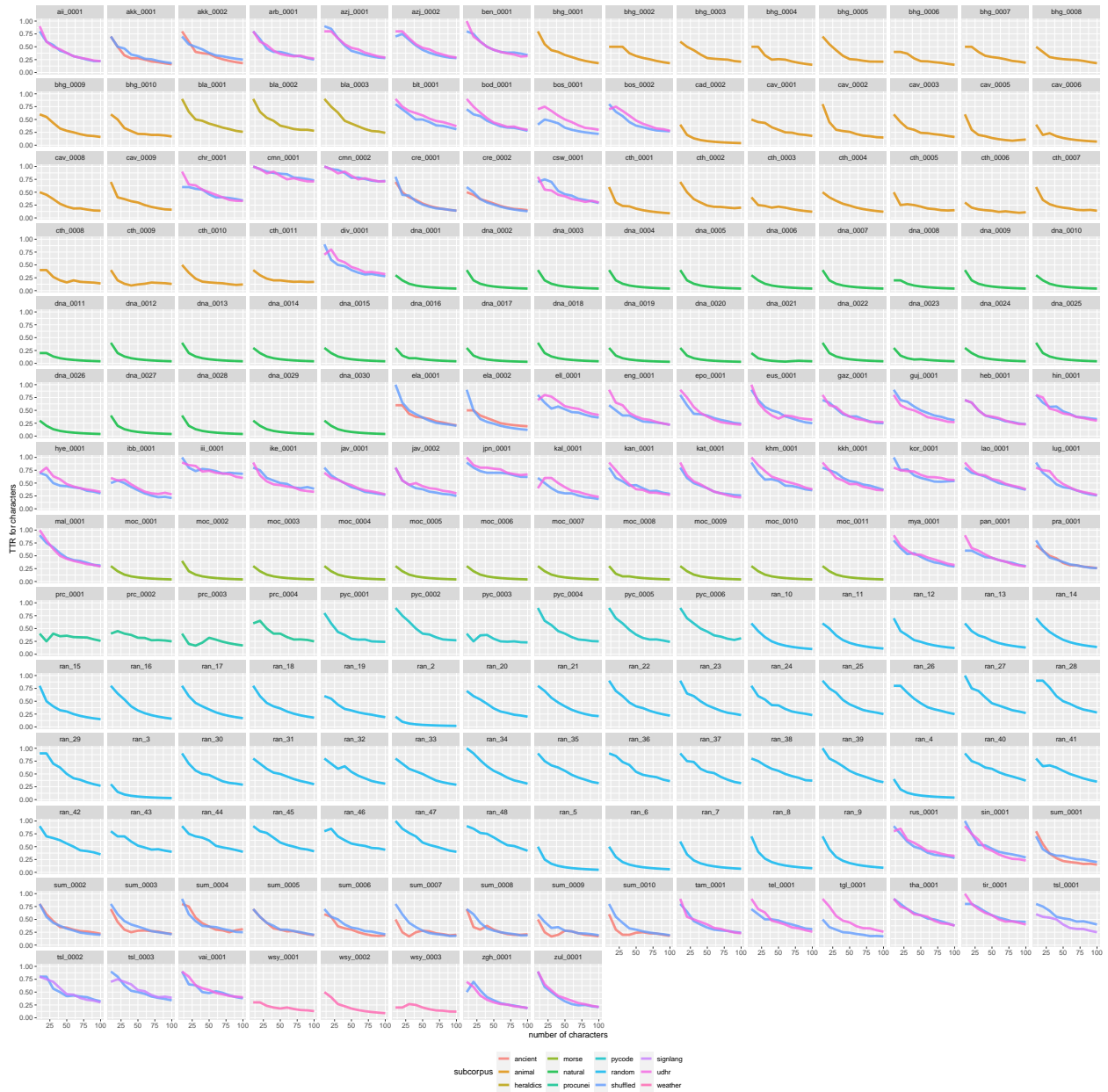
Safe figure to file

```
ggsave("~/Github/NaLaFi/figures/stabilization_hrate_chars.pdf", hrate.chars.plot, dpi = 300,
scale = 1, device = cairo_pdf)
```

Saving 20 x 20 in image

TTR characters

```
ttr.chars.plot <- ggplot(stabilization.df, aes(x = units, y = ttr.chars,
                                              colour = subcorpus)) +
  geom_line(alpha = 0.8, size = 1.5) +
  theme(legend.position = "bottom") +
  labs(x = "number of characters", y = "TTR for characters") +
  facet_wrap(~code)
ttr.chars.plot
```



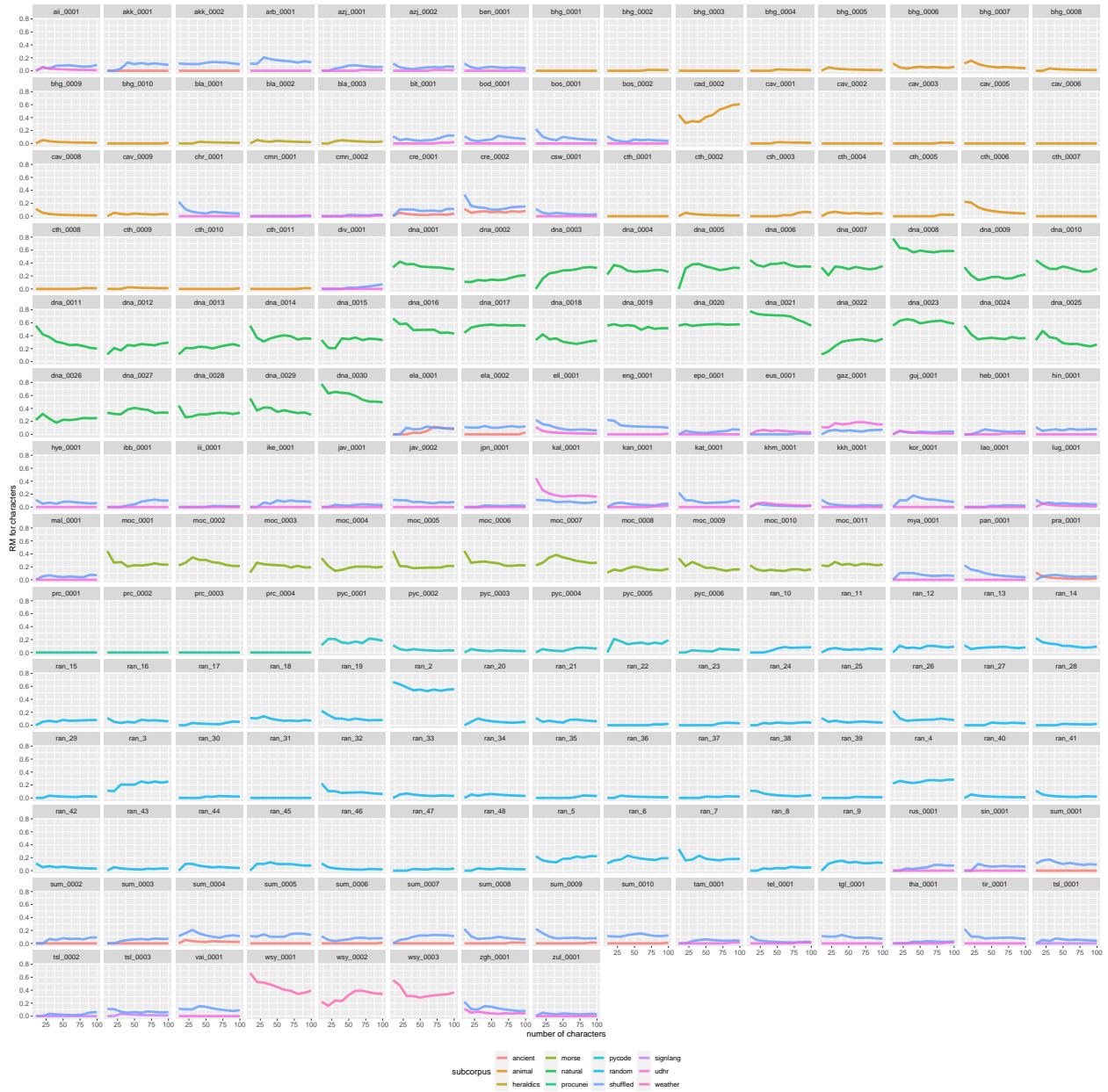
Save figure to file

```
ggsave("~/Github/NaLaFi/figures/stabilization_ttr_chars.pdf", ttr.chars.plot, dpi = 300,  
        scale = 1, device = cairo_pdf)
```

Saving 20 x 20 in image

Repetition rate characters

```
rm.chars.plot <- ggplot(stabilization.df, aes(x = units, y = rm.chars,  
                                              colour = subcorpus)) +  
  geom_line(alpha = 0.8, size = 1.5) +  
  theme(legend.position = "bottom") +  
  labs(x = "number of characters", y = "RM for characters") +  
  facet_wrap(~code)  
rm.chars.plot
```

Safe figure to file

```
ggsave("~/Github/NaLaFi/figures/stabilization_rm_chars.pdf", rm.chars.plot, dpi = 300,
        scale = 1, device = cairo_pdf)
```

Saving 20 x 20 in image