Report for 02935 Introduction to applied statistics and R for PhD students, Winter 2025

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Summary

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Introduction

Description of data

The data process in the following report was collected in Kangerluasunnguaq (Kobbefjord, Nuuk) in Southeast Greenland in 2024. The data was collected in 100 plots placed in an area of interest of aproxemately 12 km^2 by randomised stratified sampling. Stratification was based on elevation (5 bins) and NDVI (4 bins).

Within each circular plot of 1 m^2 the abundance and maximum height of all vascular plant species was recorded. Abundance was assessed by means of the well known Braun-Blanquet scale (8 step version).

In all plots soil temperature, soil moisture, and general vegetation height, was measured as well. Soil temperature was measured with a generic thermometer (°C, 4 measurements, mean calculated). Soil moisture was measured with a ThetaProbe (% water content, 4 measurements, mean calculated). General vegetation height was measured with a generic ruler (cm, 4 measurements, mean calculated)

The final processed data contains data from 100 plots and 72 species of vascular plants.

```
stat_mappingplants <- readRDS("~/Library/CloudStorage/OneDrive-Aarhusuniversitet/MappingPlants/admin

stat_mappingplants$taxon <- as.factor(stat_mappingplants$taxon)

str(stat_mappingplants)
```

```
'data.frame':   631 obs. of  14 variables:
 $ plot_name                : chr  "MP002" "MP003" "MP004" "MP005" ...
 $ taxon                    : Factor w/ 74 levels "Agrostis mertensii",..: 65 61 24 5 61 5 5 24 61
 $ height                   : int  15 14 7 6 23 37 23 9 35 2 ...
 $ bb                       : Factor w/ 8 levels "0.5","2.5","12.5",..: 3 4 3 4 3 5 3 4 6 3 ...
 $ bb_num                   : num  12.5 37.5 12.5 37.5 12.5 62.5 12.5 37.5 87.5 12.5 ...
 $ mean_soil_moisture       : num  95.42 3.22 25.23 35.2 28.3 ...
 $ mean_soil_temp           : num  7.05 6.5 4 6.9 4.58 ...
 $ mean_veg_height          : num  9.25 2.25 10.75 3 6.25 ...
 $ rowid                    : int  1 2 3 4 5 6 7 9 10 11 ...
 $ position                 : chr  "taxon_1" "taxon_1" "taxon_1" "taxon_1" ...
 $ bryophyte_braun_blanquet_1: Factor w/ 8 levels "+ (<5 %; few individuals)",..: 7 4 7 7 5 4 6 8 3
 $ lichen_braun_blanquet    : Factor w/ 9 levels "+ (<5 %; few individuals)",..: 2 6 4 7 4 3 2 4 2
 $ bare_ground_braun_blanquet: Factor w/ 9 levels "+ (<5 %; few individuals)",..: 2 5 8 9 2 2 2 4 4
 $ other_vegetation_type    : logi  NA NA NA NA NA NA ...
```

Scientific question

- Does the most common species have different preferences (= abundance) for soil moisture and/or temperature?

    - *

- What model can describe the relationship between the abundance of the most common species ($>$ 10 observations in plots) and soil moisture?

- Can PCA reveal any kind of structure in the collected data based the abundance of different species?

    - If so, what do these structures indicate?

Statistical analyses

The relationship between soil moisture and abundance of a given species cannot be assumed to be linear. Any given species of plants will have a preference for soil moisture (a wide or narrow interval) where frequency is highest. Abundance of said species will decrease with higher or lower soil moisture than this optimum. Hence, the relation could be considered to have somewhat a bell shape, but uncertain whether this would be symmetrical.

Thus, for the purpose of the analysis a generalised additive model (GAM) have been chosen. Thise choise was made with emphasis on the fact that this model does not make any assumptions about the relationship of the explanatory and response variable.

- Estimation: Which parameter values t the observations best? How certain are we of our estimates?

- Model check : Are the assumptions on the underlying model fullled? Logically this should come rst, but for practical reasons it comes after estimation.

- Simplifying the model (te

Model choise (expexted relation ship, data types)

results

discussion

Assumed model

assumption

evaluation

- Statistical analyses
- results
- discussion

PCA

```
select_cols_list <- function(df) {
  column_list <- colnames(df)
  column_string <- paste(column_list, collapse = ",\n")
  cat(column_string, "\n")
  invisible(column_string)
}
```

```
library(tidyverse)
```

```
-- Attaching core tidyverse packages ---------------------- tidyverse 2.0.0 --
v dplyr     1.1.4     v readr     2.1.5
v forcats   1.0.0     v stringr   1.5.1
v ggplot2   3.5.1     v tibble    3.2.1
v lubridate 1.9.3     v tidyr     1.3.1
v purrr     1.0.2
-- Conflicts ----------------------------------------- tidyverse_conflicts() --
x dplyr::filter() masks stats::filter()
x dplyr::lag()    masks stats::lag()
i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become error
```

```
library(janitor)
```

```
Attaching package: 'janitor'

The following objects are masked from 'package:stats':

    chisq.test, fisher.test
```

```
stat_mappingplants <- readRDS("~/Library/CloudStorage/OneDrive-Aarhusuniversitet/MappingPlants/admin
```

```
wide_data <- stat_mappingplants[-c(590, 288), ] |>
  filter(rowid < 102) |>
  pivot_wider(id_cols = plot_name, names_from = taxon, values_from = bb_num) |>
  clean_names()
```

```
Warning: Values from `bb_num` are not uniquely identified; output will contain
list-cols.
* Use `values_fn = list` to suppress this warning.
* Use `values_fn = {summary_fun}` to summarise duplicates.
* Use the following dplyr code to identify duplicates.
  {data} |>
  dplyr::summarise(n = dplyr::n(), .by = c(plot_name, taxon)) |>
  dplyr::filter(n > 1L)
```

```
wide_data2 <- wide_data |>
  mutate(across(-1, ~ as.numeric(as.character(.)))) |>
  mutate(across(-1, ~ replace_na(., 0)))
```

```
Warning: There were 74 warnings in `mutate()`.
The first warning was:
i In argument: `across(-1, ~as.numeric(as.character(.)))`.
Caused by warning:
! NAs introduced by coercion
i Run `dplyr::last_dplyr_warnings()` to see the 73 remaining warnings.
```

```
sum(is.na(wide_data2))
```

```
[1] 0
```

```
#pca_stat <- wide_data2[,-1 ]

pca_stat <- wide_data2[, !(names(wide_data2) %in% c("plot_name", "phleum_commutatum"))]

wide_data2
```

```
# A tibble: 100 x 75
   plot_name scirpus_caespitosus salix_glauca empetrum_nigrum betula_nana
   <chr>                   <dbl>        <dbl>           <dbl>       <dbl>
 1 MP002                    12.5          0               0.5         0
 2 MP003                     0           37.5            37.5         0
 3 MP004                     0            0              12.5        37.5
 4 MP005                     0            0               0.5        37.5
 5 MP006                     0           12.5            62.5         0
 6 MP007                     0            0              87.5        62.5
 7 MP001                     0            0              87.5        12.5
 8 MP008                     0            0              37.5         0.1
 9 MP009                     0           87.5            62.5         0
10 MP010                     0            0               0           0
# i 90 more rows
# i 70 more variables: salix_herbacea <dbl>, carex_bigelowii <dbl>,
#   vaccinium_uliginosum <dbl>, oxyria_digyna <dbl>, huperzia_selago <dbl>,
#   gnaphalium_supinum <dbl>, poa_alpina <dbl>, poa_glauca <dbl>,
#   saxifraga_oppositifolia <dbl>, juncus_trifidus <dbl>,
#   angelica_archangelica <dbl>, luzula_spicata <dbl>, carex_glareosa <dbl>,
#   deschampsia_flexuosa <dbl>, polygonum_viviparum <dbl>, ...
```

```
select_cols_list(wide_data)
```

```
plot_name,
scirpus_caespitosus,
salix_glauca,
empetrum_nigrum,
betula_nana,
salix_herbacea,
carex_bigelowii,
vaccinium_uliginosum,
oxyria_digyna,
huperzia_selago,
gnaphalium_supinum,
poa_alpina,
poa_glauca,
saxifraga_oppositifolia,
juncus_trifidus,
angelica_archangelica,
luzula_spicata,
carex_glareosa,
deschampsia_flexuosa,
polygonum_viviparum,
phyllodoce_coerulea,
luzula_multiflora,
luzula_confusa,
silene_acaulis,
carex_rariflora,
loiseleuria_procumbens,
salix_arctophila,
festuca_brachyphylla,
```

ledum_groenlandicum,
lycopodium_annotinum,
eriophorum_angustifolium,
chamaenerion_latifolium,
rhodiola_rosea,
calamagrostis_langsdorfii,
festuca_rubra,
juniperus_communis,
diphasiastrum_complanatum,
campanula_gieseckiana,
luzula_parviflora,
gymnocarpium_dryopteris,
taraxacum_croceum,
plantago_maritima,
linnaea_borealis_ssp_americana,
deschampsia_alpina,
cerastium_alpinum,
sibbaldia_procumbens,
listera_cordata,
potentilla_tridentata,
carex_brunnescens,
tofieldia_pusilla,
dryopteris_assimilis,
diphasiastrum_alpinum,
pyrola_grandiflora,
potentilla_crantzii,
poa_pratensis,
carex_scirpoidea,
bartsia_alpina,
coptis_trifolia,
veronica_wormskjoldii,
agrostis_mertensii,
veronica_alpina,
harrimanella_hypnoides,
diapensia_lapponica,
stellaria_calycantha,
scirpis_caespitosus,
chamaenerion_angustifolium,
alchemilla_alpina,
pedicularis_lapponica,
viscaria_alpina,
pedicularis_flammea,
equisetum_silvaticum,
hieracium_hyparcticum,
poa_nemoralis,
carex_canescens,
phleum_commutatum

```r
str(wide_data2)
```

```
tibble [100 x 75] (S3: tbl_df/tbl/data.frame)
 $ plot_name                 : chr [1:100] "MP002" "MP003" "MP004" "MP005" ...
 $ scirpus_caespitosus       : num [1:100] 12.5 0 0 0 0 0 0 0 0 0 ...
 $ salix_glauca              : num [1:100] 0 37.5 0 0 12.5 0 0 0 87.5 0 ...
 $ empetrum_nigrum           : num [1:100] 0.5 37.5 12.5 0.5 62.5 87.5 87.5 37.5 62.5 0 ...
 $ betula_nana               : num [1:100] 0 0 37.5 37.5 0 62.5 12.5 0.1 0 0 ...
 $ salix_herbacea            : num [1:100] 0 0 0 0 0 0 0 0.5 0 12.5 ...
 $ carex_bigelowii           : num [1:100] 12.5 0 2.5 0.1 0 0.1 2.5 2.5 0.5 0.1 ...
```

```
$ vaccinium_uliginosum        : num [1:100] 37.5 0 0 12.5 37.5 0 37.5 2.5 12.5 0 ...
$ oxyria_digyna               : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ huperzia_selago             : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ gnaphalium_supinum          : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ poa_alpina                  : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ poa_glauca                  : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ saxifraga_oppositifolia     : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ juncus_trifidus             : num [1:100] 0 0.5 0 0 0 0 0 0 12.5 ...
$ angelica_archangelica       : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ luzula_spicata              : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ carex_glareosa              : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ deschampsia_flexuosa        : num [1:100] 0.1 2.5 0 0 0 0 0.5 0.1 0 12.5 ...
$ polygonum_viviparum         : num [1:100] 0 0 0 0 0 0 0 0 0.01 0 ...
$ phyllodoce_coerulea         : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ luzula_multiflora           : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ luzula_confusa              : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ silene_acaulis              : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ carex_rariflora             : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ loiseleuria_procumbens      : num [1:100] 0 0 0 0.1 0 0 0 0.5 0 0 ...
$ salix_arctophila            : num [1:100] 0 0 0 0 0 0 0 0 0.1 0 ...
$ festuca_brachyphylla        : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ ledum_groenlandicum         : num [1:100] 0 0 0 0 0 2.5 0 0.1 0 ...
$ lycopodium_annotinum        : num [1:100] 0 0 0 0 12.5 12.5 0 0 0 ...
$ eriophorum_angustifolium    : num [1:100] 0.5 0 0 0 0 0 0 0 0 ...
$ chamaenerion_latifolium     : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ rhodiola_rosea              : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ calamagrostis_langsdorfii   : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ festuca_rubra               : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ juniperus_communis          : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ diphasiastrum_complanatum   : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ campanula_gieseckiana       : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ luzula_parviflora           : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ gymnocarpium_dryopteris     : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ taraxacum_croceum           : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ plantago_maritima           : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ linnaea_borealis_ssp_americana: num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ deschampsia_alpina          : num [1:100] 0 0 0 0 2.5 0 0 0 ...
$ cerastium_alpinum           : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ sibbaldia_procumbens        : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ listera_cordata             : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ potentilla_tridentata       : num [1:100] 0 0 0 0 0 0 0.1 0 0 ...
$ carex_brunnescens           : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ tofieldia_pusilla           : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ dryopteris_assimilis        : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ diphasiastrum_alpinum       : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ pyrola_grandiflora          : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ potentilla_crantzii         : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ poa_pratensis               : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ carex_scirpoidea            : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ bartsia_alpina              : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ coptis_trifolia             : num [1:100] 0.1 0 0 0 0 0 0 0 0 ...
$ veronica_wormskjoldii       : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ agrostis_mertensii          : num [1:100] 0 0 0 0 0 0 0.1 0 0 ...
$ veronica_alpina             : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ harrimanella_hypnoides      : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ diapensia_lapponica         : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ stellaria_calycantha        : num [1:100] 0 0 0 0 0 0 0 0 0 ...
$ scirpis_caespitosus         : num [1:100] 0 0 0 0 0 0 0 0 0 ...
```

```
$ chamaenerion_angustifolium  : num [1:100] 0 0 0 0 0 0 0 0 0 0 ...
$ alchemilla_alpina           : num [1:100] 0 0 0 0 0 0 0 0 0 0 ...
$ pedicularis_lapponica       : num [1:100] 0 0 0 0 0 0 0 0 0 0 ...
$ viscaria_alpina             : num [1:100] 0 0 0 0 0 0 0 0 0 0 ...
$ pedicularis_flammea         : num [1:100] 0 0 0 0 0 0 0 0 0 0 ...
$ equisetum_silvaticum        : num [1:100] 0 0 0 0 0 0 0 0 0 0 ...
$ hieracium_hyparcticum       : num [1:100] 0 0 0 0 0 0 0 0 0 0 ...
$ poa_nemoralis               : num [1:100] 0 0 0 0 0 0 0 0 0 0 ...
$ carex_canescens             : num [1:100] 0 0 0 0 0 0 0 0 0 0 ...
$ phleum_commutatum           : num [1:100] 0 0 0 0 0 0 0 0 0 0 ...
```

```r
library(remotes)
#install_github("rwehrens/ChemometricsWithR")
library(ChemometricsWithR)
```

```
Attaching package: 'ChemometricsWithR'

The following objects are masked from 'package:stats':

    loadings, screeplot
```

```r
mp.PC<- PCA(scale(pca_stat))
names(mp.PC)
```

```
[1] "scores"        "loadings"      "var"           "totalvar"
[5] "centered.data"
```

```r
summary(mp.PC)
```

```
PCA model of a mean-centered matrix of 100 by 73
Number of PCs to cover 90 percent of the variance: 36

        Var Cumul. var.
PC 1  6.990096     6.990096
PC 2  6.189466    13.179562
PC 3  5.185294    18.364856
PC 4  4.912269    23.277125
PC 5  4.147000    27.424125
PC 10 2.844822    44.163875
```

```r
head(mp.PC$loadings,n=3)
```

```
                          PC 1         PC 2        PC 3        PC 4        PC 5
scirpus_caespitosus 0.02100433 -0.006161716  0.04485609 -0.02040953 0.022014862
salix_glauca        0.13173551 -0.012393257 -0.29491885  0.06706374 0.003074665
empetrum_nigrum     0.11195949 -0.059020372  0.09955936 -0.04524340 0.102951999
                          PC 6         PC 7         PC 8        PC 9
scirpus_caespitosus -0.01070334  0.001886381 -0.015790608  0.04184768
salix_glauca         0.04213159 -0.072217579  0.005581509 -0.05499974
empetrum_nigrum     -0.01152914 -0.005923966 -0.124505825 -0.12162005
                          PC 10        PC 11       PC 12        PC 13
scirpus_caespitosus -0.08350966  0.13572460 -0.19619460 0.1178451925
salix_glauca         0.08794629 -0.04977709 -0.03169407 0.0009000675
```

```
empetrum_nigrum       -0.04417072  0.09561448  0.14110835 0.2260979780
                            PC 14        PC 15        PC 16        PC 17        PC 18
scirpus_caespitosus -0.29606471  0.32195472 -0.30584119  0.27844279 -0.1556819
salix_glauca         0.06779358 -0.02434254 -0.06957532 -0.09870617 -0.2161373
empetrum_nigrum     -0.04026837 -0.06911963  0.03481842 -0.26378600 -0.1418917
                            PC 19        PC 20        PC 21        PC 22
scirpus_caespitosus -0.03688733  0.08219921 -0.02632309 -0.08107269
salix_glauca         0.28763692 -0.11624040  0.01881937 -0.11304595
empetrum_nigrum     -0.12053869  0.23190783 -0.23672678  0.11942825
                            PC 23        PC 24        PC 25        PC 26
scirpus_caespitosus  0.005920323 0.02583533 -0.002706221 -0.0063841258
salix_glauca        -0.020034131 0.21090617  0.020712473  0.0552562673
empetrum_nigrum     -0.076376525 0.02149509  0.076337547 -0.0008759939
                            PC 27        PC 28        PC 29        PC 30
scirpus_caespitosus -0.01235032 -0.006351271 -0.0004508112 -0.001880637
salix_glauca        -0.03007107 -0.053747183  0.0122150141  0.010486240
empetrum_nigrum     -0.05943550 -0.092907882 -0.0021266281 -0.009089968
                            PC 31        PC 32        PC 33        PC 34
scirpus_caespitosus -0.0005294618 -4.330027e-03 -0.003942000 -0.01164820
salix_glauca        -0.0028367987  3.883299e-05  0.005483626 -0.03200222
empetrum_nigrum      0.0053178113  6.635357e-03 -0.046141632 -0.03728587
                            PC 35        PC 36        PC 37        PC 38
scirpus_caespitosus  0.007279788 0.003247243 -0.07964226 0.05519231
salix_glauca        -0.005448427 0.085712291 -0.08231795 0.12146807
empetrum_nigrum      0.012422508 0.218943192  0.07421728 0.09526953
                            PC 39        PC 40        PC 41        PC 42
scirpus_caespitosus  0.046732112 -0.087891029 -0.03257312  0.01665405
salix_glauca        -0.007933976  0.001354495  0.03853936  0.34630640
empetrum_nigrum     -0.020675514  0.236217477  0.37853238 -0.20433026
                            PC 43        PC 44        PC 45        PC 46        PC 47
scirpus_caespitosus  0.2340775 -0.03691249 -0.1473914  0.02242724  0.42219471
salix_glauca         0.1098232  0.04922985  0.3103832  0.20366095 -0.25615454
empetrum_nigrum     -0.1423107  0.18213910  0.0983950 -0.28829884  0.01112796
                            PC 48        PC 49        PC 50        PC 51        PC 52
scirpus_caespitosus -0.05972950 -0.4185310 0.07174345  0.02288217 0.195073547
salix_glauca         0.07482800 -0.3007001 0.25197182 -0.05194691 0.004794277
empetrum_nigrum     -0.03764784 -0.2017732 0.14733233  0.13252190 0.064539043
                            PC 53        PC 54        PC 55        PC 56        PC 57
scirpus_caespitosus -0.09526304  0.05258177  0.01273185 -0.01375436 -0.01620886
salix_glauca        -0.05734825 -0.12130225 -0.29276822 -0.05469051 -0.01009490
empetrum_nigrum     -0.14677339 -0.12737275  0.02905490 -0.05343519 -0.02251625
                            PC 58        PC 59        PC 60        PC 61
scirpus_caespitosus -0.001681217  0.027565765 0.003203019  0.021551603
salix_glauca         0.041905006  0.009803703 0.013197221  0.024706333
empetrum_nigrum     -0.053199793 -0.022391653 0.030225234 -0.001334788
                            PC 62        PC 63        PC 64        PC 65
scirpus_caespitosus  0.004406572 -0.00189968 -0.005781142 -0.001845269
salix_glauca         0.011636786  0.01156668  0.002059197 -0.007948177
empetrum_nigrum     -0.018924221 -0.02008754 -0.032947698  0.010248391
                            PC 66        PC 67        PC 68        PC 69
scirpus_caespitosus -0.007530096 -2.438259e-04 -5.888249e-05 -2.001200e-06
salix_glauca        -0.009066001 -5.959708e-05  2.601688e-04  4.458434e-08
empetrum_nigrum      0.030096197 -5.657010e-04 -1.963269e-04  2.791209e-05
                            PC 70        PC 71        PC 72        PC 73
scirpus_caespitosus -1.925745e-16  0.000000e+00  0.000000e+00  0.000000e+00
salix_glauca         3.036567e-18 -2.053227e-16 -1.121419e-16 -9.066401e-17
empetrum_nigrum     -1.504270e-17  1.651743e-16  1.780040e-16 -1.314775e-17
```

```r
X<-var(scale(pca_stat))
T<-eigen(X)$vectors
sum(is.na(X))
```

```
[1] 0
```

```r
head(T,n=3)
```

```
              [,1]         [,2]        [,3]        [,4]        [,5]        [,6]
[1,] -0.02100433 -0.006161716 -0.04485609 -0.02040953 0.022014862 -0.01070334
[2,] -0.13173551 -0.012393257  0.29491885  0.06706374 0.003074665  0.04213159
[3,] -0.11195949 -0.059020372 -0.09955936 -0.04524340 0.102951999 -0.01152914
               [,7]         [,8]        [,9]        [,10]       [,11]       [,12]
[1,] -0.001886381  0.015790608 -0.04184768  0.08350966 -0.13572460  0.19619460
[2,]  0.072217579 -0.005581509  0.05499974 -0.08794629  0.04977709  0.03169407
[3,]  0.005923966  0.124505825  0.12162005  0.04417072 -0.09561448 -0.14110835
              [,13]        [,14]       [,15]       [,16]       [,17]      [,18]
[1,] 0.1178451925 -0.29606471  0.32195472  0.30584119 -0.27844279 0.1556819
[2,] 0.0009000675  0.06779358 -0.02434254  0.06957532  0.09870617 0.2161373
[3,] 0.2260979780 -0.04026837 -0.06911963 -0.03481842  0.26378600 0.1418917
              [,19]       [,20]       [,21]       [,22]        [,23]        [,24]
[1,] -0.03688733  0.08219921 -0.02632309 -0.08107269 -0.005920323 -0.02583533
[2,]  0.28763692 -0.11624040  0.01881937 -0.11304595  0.020034131 -0.21090617
[3,] -0.12053869  0.23190783 -0.23672678  0.11942825  0.076376525 -0.02149509
              [,25]         [,26]        [,27]       [,28]        [,29]
[1,] -0.002706221 -0.0063841258 0.01235032 0.006351271  0.0004508112
[2,]  0.020712473  0.0552562673 0.03007107 0.053747183 -0.0122150141
[3,]  0.076337547 -0.0008759939 0.05943550 0.092907882  0.0021266281
              [,30]         [,31]        [,32]       [,33]      [,34]
[1,] -0.001880637 -0.0005294618  4.330027e-03  0.003942000 0.01164820
[2,]  0.010486240 -0.0028367987 -3.883299e-05 -0.005483626 0.03200222
[3,] -0.009089968  0.0053178113 -6.635357e-03  0.046141632 0.03728587
              [,35]       [,36]       [,37]       [,38]        [,39]        [,40]
[1,] -0.007279788 0.003247243 -0.07964226 0.05519231  0.046732112  0.087891029
[2,]  0.005448427 0.085712291 -0.08231795 0.12146807 -0.007933976 -0.001354495
[3,] -0.012422508 0.218943192  0.07421728 0.09526953 -0.020675514 -0.236217477
              [,41]       [,42]       [,43]       [,44]       [,45]       [,46]
[1,]  0.03257312  0.01665405 -0.2340775 -0.03691249 -0.1473914 -0.02242724
[2,] -0.03853936  0.34630640 -0.1098232  0.04922985  0.3103832 -0.20366095
[3,] -0.37853238 -0.20433026  0.1423107  0.18213910  0.0983950  0.28829884
              [,47]       [,48]       [,49]       [,50]       [,51]       [,52]
[1,] -0.42219471  0.05972950 0.4185310 -0.07174345 -0.02288217 0.195073547
[2,]  0.25615454 -0.07482800 0.3007001 -0.25197182  0.05194691 0.004794277
[3,] -0.01112796  0.03764784 0.2017732 -0.14733233 -0.13252190 0.064539043
              [,53]       [,54]       [,55]       [,56]       [,57]        [,58]
[1,] 0.09526304 -0.05258177  0.01273185 0.01375436 -0.01620886  0.001681217
[2,] 0.05734825  0.12130225 -0.29276822 0.05469051 -0.01009490 -0.041905006
[3,] 0.14677339  0.12737275  0.02905490 0.05343519 -0.02251625  0.053199793
              [,59]       [,60]       [,61]       [,62]       [,63]
[1,]  0.027565765 0.003203019  0.021551603  0.004406572  0.00189968
[2,]  0.009803703 0.013197221  0.024706333  0.011636786 -0.01156668
[3,] -0.022391653 0.030225234 -0.001334788 -0.018924221  0.02008754
              [,64]         [,65]        [,66]       [,67]        [,68]
[1,] -0.005781142 -0.001845269 -0.007530096 2.438259e-04 -5.888249e-05
[2,]  0.002059197 -0.007948177 -0.009066001 5.959708e-05  2.601688e-04
[3,] -0.032947698  0.010248391  0.030096197 5.657010e-04 -1.963269e-04
              [,69]        [,70]       [,71]       [,72]       [,73]
```

```
[1,]  2.001200e-06  0.000000e+00  0.000000e+00  0.000000e+00  0.000000e+00
[2,] -4.458386e-08  1.771736e-13  1.386098e-14  9.456768e-15  6.592533e-15
[3,] -2.791209e-05 -8.039151e-13 -7.233469e-14 -4.887652e-14 -8.010915e-14
```

```
Lambda<-t(T)%*%X%*%T
round(Lambda, digits=2)
```

```
       [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9] [,10] [,11] [,12] [,13]
 [1,]  5.1 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
 [2,]  0.0 4.52 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
 [3,]  0.0 0.00 3.79 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
 [4,]  0.0 0.00 0.00 3.59 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
 [5,]  0.0 0.00 0.00 0.00 3.03 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
 [6,]  0.0 0.00 0.00 0.00 0.00 2.76 0.00 0.00 0.00  0.00  0.00  0.00  0.00
 [7,]  0.0 0.00 0.00 0.00 0.00 0.00 2.69 0.00 0.00  0.00  0.00  0.00  0.00
 [8,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 2.52 0.00  0.00  0.00  0.00  0.00
 [9,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 2.18  0.00  0.00  0.00  0.00
[10,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  2.08  0.00  0.00  0.00
[11,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  2.02  0.00  0.00
[12,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  1.92  0.00
[13,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  1.88
[14,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[15,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[16,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[17,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[18,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[19,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[20,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[21,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[22,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[23,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[24,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[25,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[26,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[27,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[28,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[29,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[30,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[31,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[32,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[33,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[34,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[35,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[36,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[37,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[38,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[39,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[40,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[41,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[42,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[43,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[44,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[45,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[46,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[47,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[48,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[49,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
[50,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00  0.00  0.00  0.00  0.00
```

```
[51,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[52,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[53,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[54,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[55,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[56,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[57,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[58,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[59,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[60,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[61,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[62,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[63,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[64,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[65,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[66,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[67,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[68,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[69,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[70,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[71,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[72,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
[73,]  0.0 0.00 0.00 0.00 0.00 0.00 0.00 0.00 0.00   0.00   0.00   0.00   0.00
       [,14] [,15] [,16] [,17] [,18] [,19] [,20] [,21] [,22] [,23] [,24] [,25]
 [1,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
 [2,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
 [3,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
 [4,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
 [5,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
 [6,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
 [7,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
 [8,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
 [9,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[10,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[11,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[12,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[13,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[14,]  1.83  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[15,]  0.00  1.78  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[16,]  0.00  0.00  1.65  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[17,]  0.00  0.00  0.00  1.58  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[18,]  0.00  0.00  0.00  0.00  1.53  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[19,]  0.00  0.00  0.00  0.00  0.00  1.47  0.00  0.00  0.00  0.00  0.00  0.00
[20,]  0.00  0.00  0.00  0.00  0.00  0.00  1.33  0.00  0.00  0.00  0.00  0.00
[21,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  1.28  0.00  0.00  0.00  0.00
[22,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  1.22  0.00  0.00  0.00
[23,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  1.19  0.00  0.00
[24,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  1.13  0.00
[25,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  1.08
[26,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[27,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[28,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[29,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[30,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[31,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[32,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[33,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
[34,]  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00  0.00
```

[35,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[36,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[37,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[38,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[39,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[40,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[41,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[42,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[43,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[44,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[45,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[46,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[47,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[48,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[49,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[50,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[51,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[52,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[53,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[54,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[55,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[56,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[57,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[58,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[59,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[60,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[61,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[62,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[63,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[64,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[65,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[66,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[67,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[68,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[69,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[70,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[71,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[72,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[73,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

	[,26]	[,27]	[,28]	[,29]	[,30]	[,31]	[,32]	[,33]	[,34]	[,35]	[,36]	[,37]
[1,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[2,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[3,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[4,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[5,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[6,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[7,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[8,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[9,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[10,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[11,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[12,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[13,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[14,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[15,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[16,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[17,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[18,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00

[19,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[20,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[21,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[22,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[23,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[24,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[25,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[26,]	1.07	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[27,]	0.00	1.06	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[28,]	0.00	0.00	1.05	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[29,]	0.00	0.00	0.00	1.03	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[30,]	0.00	0.00	0.00	0.00	1.02	0.00	0.00	0	0.00	0.00	0.00	0.00
[31,]	0.00	0.00	0.00	0.00	0.00	1.01	0.00	0	0.00	0.00	0.00	0.00
[32,]	0.00	0.00	0.00	0.00	0.00	0.00	1.01	0	0.00	0.00	0.00	0.00
[33,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1	0.00	0.00	0.00	0.00
[34,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.98	0.00	0.00	0.00
[35,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.88	0.00	0.00
[36,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.78	0.00
[37,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.74
[38,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[39,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[40,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[41,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[42,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[43,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[44,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[45,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[46,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[47,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[48,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[49,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[50,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[51,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[52,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[53,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[54,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[55,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[56,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[57,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[58,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[59,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[60,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[61,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[62,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[63,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[64,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[65,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[66,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[67,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[68,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[69,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[70,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[71,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[72,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00
[73,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0	0.00	0.00	0.00	0.00

	[,38]	[,39]	[,40]	[,41]	[,42]	[,43]	[,44]	[,45]	[,46]	[,47]	[,48]	[,49]
[1,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[2,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00

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 [3,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
 [4,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
 [5,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
 [6,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
 [7,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
 [8,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
 [9,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[10,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[11,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[12,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[13,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[14,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[15,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[16,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[17,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[18,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[19,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[20,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[21,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[22,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[23,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[24,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[25,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[26,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[27,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[28,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[29,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[30,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[31,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[32,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[33,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[34,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[35,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[36,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[37,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[38,]   0.66   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[39,]   0.00   0.64   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[40,]   0.00   0.00   0.55   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[41,]   0.00   0.00   0.00   0.53   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[42,]   0.00   0.00   0.00   0.00   0.46   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[43,]   0.00   0.00   0.00   0.00   0.00   0.39   0.00   0.00    0.0    0.0   0.00   0.00
[44,]   0.00   0.00   0.00   0.00   0.00   0.00   0.37   0.00    0.0    0.0   0.00   0.00
[45,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.36    0.0    0.0   0.00   0.00
[46,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.3    0.0   0.00   0.00
[47,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.3   0.00   0.00
[48,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.26   0.00
[49,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.25
[50,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[51,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[52,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[53,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[54,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[55,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[56,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[57,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[58,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[59,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
[60,]   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00    0.0    0.0   0.00   0.00
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	[,50]	[,51]	[,52]	[,53]	[,54]	[,55]	[,56]	[,57]	[,58]	[,59]	[,60]	[,61]
[61,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[62,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[63,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[64,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[65,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[66,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[67,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[68,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[69,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[70,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[71,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[72,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
[73,]	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.0	0.0	0.00	0.00
	[,50]	[,51]	[,52]	[,53]	[,54]	[,55]	[,56]	[,57]	[,58]	[,59]	[,60]	[,61]
[1,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[2,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[3,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[4,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[5,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[6,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[7,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[8,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[9,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[10,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[11,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[12,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[13,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[14,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[15,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[16,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[17,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[18,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[19,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[20,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[21,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[22,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[23,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[24,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[25,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[26,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[27,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[28,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[29,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[30,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[31,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[32,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[33,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[34,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[35,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[36,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[37,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[38,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[39,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[40,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[41,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[42,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[43,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
[44,]	0.00	0.0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

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[45,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[46,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[47,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[48,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[49,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[50,]   0.22   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[51,]   0.00   0.2   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[52,]   0.00   0.0   0.15   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[53,]   0.00   0.0   0.00   0.14   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[54,]   0.00   0.0   0.00   0.00   0.12   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[55,]   0.00   0.0   0.00   0.00   0.00   0.08   0.00   0.00   0.00   0.00   0.00   0.00
[56,]   0.00   0.0   0.00   0.00   0.00   0.00   0.05   0.00   0.00   0.00   0.00   0.00
[57,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.04   0.00   0.00   0.00   0.00
[58,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.03   0.00   0.00   0.00
[59,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.02   0.00   0.00
[60,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.02   0.00
[61,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.01
[62,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[63,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[64,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[65,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[66,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[67,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[68,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[69,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[70,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[71,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[72,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
[73,]   0.00   0.0   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00   0.00
        [,62]  [,63] [,64]  [,65]  [,66]  [,67]  [,68]  [,69]  [,70]  [,71]  [,72]  [,73]
 [1,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
 [2,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
 [3,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
 [4,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
 [5,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
 [6,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
 [7,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
 [8,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
 [9,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[10,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[11,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[12,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[13,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[14,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[15,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[16,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[17,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[18,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[19,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[20,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[21,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[22,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[23,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[24,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[25,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[26,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[27,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
[28,]   0.00   0.00  0.00   0.00    0      0      0      0      0      0      0      0
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[29,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[30,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[31,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[32,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[33,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[34,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[35,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[36,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[37,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[38,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[39,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[40,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[41,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[42,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[43,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[44,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[45,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[46,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[47,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[48,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[49,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[50,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[51,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[52,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[53,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[54,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[55,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[56,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[57,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[58,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[59,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[60,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[61,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[62,]    0.01   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[63,]    0.00   0.01   0.00   0.00      0      0      0      0      0      0      0      0
[64,]    0.00   0.00   0.01   0.00      0      0      0      0      0      0      0      0
[65,]    0.00   0.00   0.00   0.01      0      0      0      0      0      0      0      0
[66,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[67,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[68,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[69,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[70,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[71,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[72,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
[73,]    0.00   0.00   0.00   0.00      0      0      0      0      0      0      0      0
```

`T[,1]`

```
 [1] -0.021004331 -0.131735509 -0.111959486 -0.056976378  0.202676292
 [6] -0.014694670 -0.072386727  0.247161852  0.229421437  0.199171478
[11]  0.251819925  0.313284131  0.034696574  0.007998462  0.115880504
[16]  0.272836747 -0.014638639 -0.081614239  0.073492611 -0.023138239
[21]  0.071193730  0.041788077 -0.007653613  0.004738740 -0.012700157
[26]  0.034850882  0.041174192 -0.040355572 -0.078673066 -0.024676040
[31]  0.042544727  0.246088636 -0.019151504 -0.014638639 -0.023047611
[36] -0.012884193 -0.069283461  0.049700002 -0.061304499  0.065189181
[41] -0.014638639 -0.083631731 -0.020692599  0.231255290  0.218233569
[46]  0.041995799 -0.026089629 -0.015797880 -0.011340840 -0.019545671
```

```
[51] -0.078849620  0.195632930 -0.019967238  0.196259069 -0.017824012
[56]  0.031106645  0.039854521 -0.039438934  0.004444741  0.304621489
[61]  0.063992000 -0.017528284 -0.052436775 -0.010596302 -0.081960925
[66] -0.019114722 -0.018871994  0.026575657 -0.009541663  0.035583343
[71] -0.095992771 -0.057609636  0.289437587
```
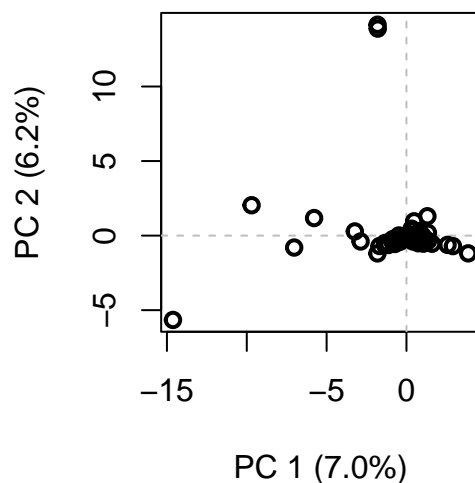
```
round(T[,1],digits=2)
```

```
 [1] -0.02 -0.13 -0.11 -0.06  0.20 -0.01 -0.07  0.25  0.23  0.20  0.25  0.31
[13]  0.03  0.01  0.12  0.27 -0.01 -0.08  0.07 -0.02  0.07  0.04 -0.01  0.00
[25] -0.01  0.03  0.04 -0.04 -0.08 -0.02  0.04  0.25 -0.02 -0.01 -0.02 -0.01
[37] -0.07  0.05 -0.06  0.07 -0.01 -0.08 -0.02  0.23  0.22  0.04 -0.03 -0.02
[49] -0.01 -0.02 -0.08  0.20 -0.02  0.20 -0.02  0.03  0.04 -0.04  0.00  0.30
[61]  0.06 -0.02 -0.05 -0.01 -0.08 -0.02 -0.02  0.03 -0.01  0.04 -0.10 -0.06
[73]  0.29
```

```
sum(diag(Lambda))
```

```
[1] 73
```

```
scoreplot(mp.PC, lwd=2)
```



```
plot_moisture <- stat_mappingplants |>
  group_by(plot_name) |>
  summarize(mean = mean(mean_soil_moisture))

plot(x = plot_moisture$mean, y = plot_moisture$mean)
```

22
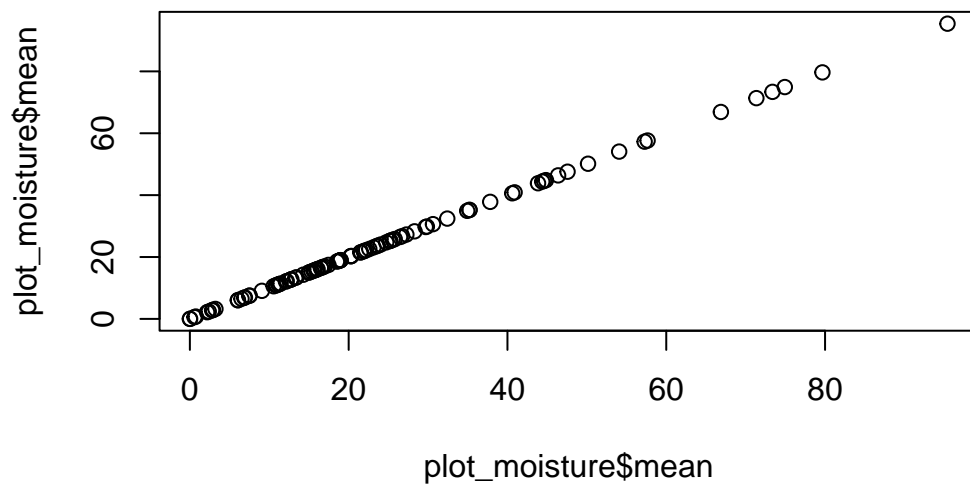
```r
hist(plot_moisture$mean)
```

Histogram of plot_moisture$mean
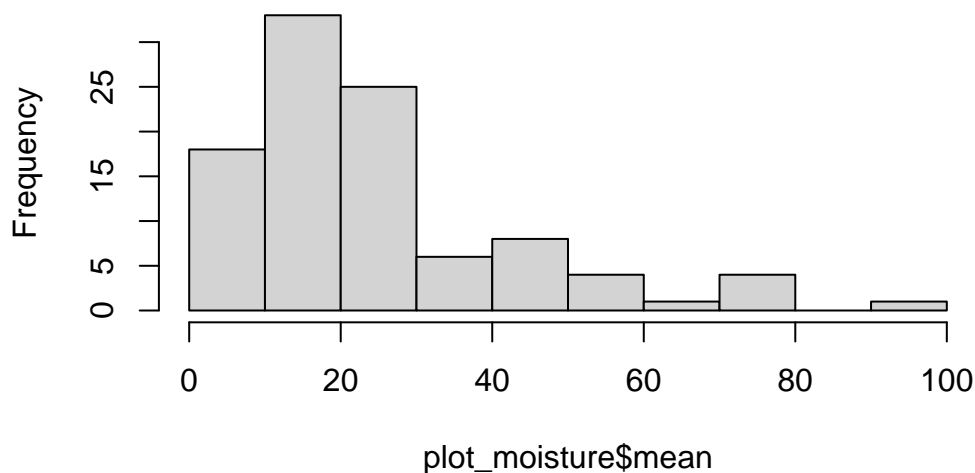

```r
# # Install and load vegan package
# install.packages("vegan")
# library(vegan)
#
# # Compute the Bray-Curtis dissimilarity matrix
# bray_curtis <- vegdist(pca_stat, method = "bray")
#
# # Convert to a matrix (since vegdist returns a dist object)
# bray_curtis_matrix <- as.matrix(bray_curtis)
#
# # Perform classical MDS (similar to PCA, but using dissimilarity matrix)
# mds <- cmdscale(bray_curtis_matrix, k = 2)  # k is the number of dimensions you want to keep (e.g.
#
# # Plot the MDS result
# plot(mds, main = "PCA-like plot using Bray-Curtis Dissimilarity")


# #| label: chunk-6
# # Perform k-means clustering (example: 3 clusters)
# set.seed(42)
# kmeans_result <- kmeans(wide_data2[, -1], centers = 32)  # Exclude first column (plot_name)
```

```
#
# # Add the cluster labels to the dataset
# wide_data2$cluster <- as.factor(kmeans_result$cluster)
#
# # Fit the tree model with k-means cluster labels as the response
# tree_model <- tree(cluster ~ ., data = wide_data2[, -1])  # Exclude non-numeric columns (plot_name
#
# plot(tree_model)
# text(tree_model, pretty = 0)
#
# # Print the tree model
# summary(tree_model)
```

Conclusion

Appendix

When you click the **Render** button a document will be generated that includes both content and the output of embedded code. You can embed code like this:

```
library(googlesheets4)
library(janitor)
library(tidyverse)
```

You can add options to executable code like this

```
# stat_mappingplants <- readRDS("~/Library/CloudStorage/OneDrive-Aarhusuniversitet/MappingPlants/adm
#
# taxa <- pivot |>
#   group_by(taxon) |>
#   count()
#
# soil_moi <- stat_mappingplants
#
# plot(x = stat_mappingplants$mean_soil_moisture, y = stat_mappingplants$mean_veg_height)
#
# hist(stat_mappingplants$mean_soil_moisture)
#
# empnig <- stat_mappingplants[stat_mappingplants$taxon=="Empetrum nigrum",]
#
# plot(x = empnig$mean_soil_moisture, y = empnig$bb_num)
#
#
# par(mfrow = c(2,2), mgp = c(2,0.7,0), mar = c(3,3,1,1))
# model <- gam(bb_num ~ s(mean_soil_moisture), data = stat_mappingplants[stat_mappingplants$taxon ==
# plot(model)
# par(mfrow = c(1,1))
#
# summary(model)
#
# library(tree)
# model<-tree(bb_num ~ ., data = empnig)
# plot(model)
# text(model)
```

```
taxon_counts <- table(stat_mappingplants$taxon)

# Convert to a data frame for easier manipulation
taxon_summary <- data.frame(
  Taxon = names(taxon_counts),
  Count = as.vector(taxon_counts)
)
```

```
taxon_summary <- taxon_summary[order(-taxon_summary$Count), ]


# Count the occurrences of each taxon
taxon_counts <- table(stat_mappingplants$taxon)

# Get the names of taxons with more than 10 observations
frequent_taxons <- names(taxon_counts[taxon_counts > 10])

# Filter the dataset
filtered_df <- stat_mappingplants[stat_mappingplants$taxon %in% frequent_taxons, ]


veg_height <- stat_mappingplants |>
  group_by(plot_name) |>
  summarize(mean_tax = mean(height),
            mean_plot = mean(mean_veg_height))

plot(y = veg_height$mean_tax, x = veg_height$mean_plot)
```