

# Testing species classifiers

```
## Linking to GEOS 3.6.1, GDAL 2.2.3, PROJ 4.9.3
## -- Attaching packages ----- tidyverse_
## v ggplot2 3.1.0      v purrr  0.2.5
## v tibble  1.4.2      v dplyr  0.7.8
## v tidyr   0.8.2      v stringr 1.3.1
## v readr   1.1.1      v forcats 0.3.0
## -- Conflicts ----- tidyverse_
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()     masks stats::lag()
## Loading required package: sp
##
## Attaching package: 'raster'
## The following object is masked from 'package:dplyr':
##
##     select
## The following object is masked from 'package:tidyr':
##
##     extract
## here() starts at H:/dev/local-structure-wpb-severity
## Loading required package: lattice
##
## Attaching package: 'caret'
## The following object is masked from 'package:purrr':
##
##     lift
```

## Introduction

We want to classify tree species using our aerial imagery, so we will test a few different classifiers using data that has been hand-classified to a known species. That is, the crown segments for these trees have already been delineated, then we overlaid them on top of the ortho-index for the given plot, added the known ground trees (with their species ID) to the plot (all in QGIS), and marked crowns as their appropriate species.

We will implement a bunch of classification methods using the `caret` package, and pick one that performs well.

```
## Parsed with column specification:
## cols(
##   treeID = col_character(),
##   height = col_double(),
##   ch_area = col_double(),
##   live = col_integer(),
##   species = col_character(),
##   x = col_double(),
##   y = col_double(),
##   b_mean = col_double(),
```

```
## g_mean = col_double(),
## r_mean = col_double(),
## re_mean = col_double(),
## nir_mean = col_double(),
## ndvi_mean = col_double(),
## rgi_mean = col_double(),
## gbi_mean = col_double(),
## ndre_mean = col_double(),
## crs = col_character()
## )
```

## First classify live versus dead

We first want to classify which trees are alive and which are dead. I've had success doing this with logistic regression in the past, so we will start there. To prepare to do this in `caret`, we partition the data into a training and a testing subset.

```
## Boosted Logistic Regression
##
## 452 samples
## 9 predictor
## 2 classes: '0', '1'
##
## No pre-processing
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 452, 452, 452, 452, 452, 452, ...
## Resampling results across tuning parameters:
##
## nIter Accuracy Kappa
## 11 0.9607938 0.9143618
## 21 0.9610800 0.9147792
## 31 0.9581724 0.9085008
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was nIter = 21.
```

That works pretty well!

## Data prep for species classification

Next, we subset our data to just the live crowns, so that we can classify species. We partition the data representing just the live crowns as we did for the data that included all the crowns.

How many classified samples are there per species?

```
## # A tibble: 5 x 2
## species      n
##   <chr>   <int>
## 1 abco      27
## 2 cade      61
## 3 pila      22
## 4 pipo      66
## 5 quke      26
```

In case it becomes useful later, we'll collapse PILA and PIPO into a single group "Pinus"

## Different classification approaches

```
## Regularized Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
##   lambda Accuracy   Kappa
##   0.2      0.6444072 0.5253953
##   0.3      0.6502176 0.5328492
##   0.4      0.6562389 0.5404601
##   0.5      0.6560116 0.5393407
##   0.6      0.6585771 0.5422513
##   0.7      0.6593460 0.5423541
##   0.8      0.6493030 0.5283286
##   0.9      0.6325461 0.5055233
##   1.0      0.6070308 0.4720402
##
## Tuning parameter 'gamma' was held constant at a value of 0
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were gamma = 0 and lambda = 0.7.

##           abco      cade      pila      pipo      quke
## 1 0.003521779 0.30506224 1.429712e-04 0.67521915 1.605386e-02
## 2 0.174316648 0.14797178 7.429201e-02 0.60002296 3.396614e-03
## 3 0.000424329 0.02568109 1.127811e-03 0.29849236 6.742744e-01
## 4 0.005337266 0.02136598 1.274560e-02 0.51357063 4.469805e-01
## 5 0.050869861 0.29842993 1.557322e-03 0.64842062 7.222742e-04
## 6 0.001006080 0.97774175 3.151049e-06 0.02124602 3.003231e-06

## # A tibble: 39 x 18
##   treeID height ch_area live species      x      y b_mean g_mean r_mean
##   <chr>   <dbl>   <dbl> <int> <chr>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~  11.6    20.6     1 pipo    7.16e5 4.27e6 0.0247 0.0598 0.0325
## 2 eldo_~  32.9    24.8     1 pipo    7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~  17.7    20.2     1 pipo    7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~  16.0   111.     1 pipo    7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~  53.8    53.5     1 pipo    7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~  17.5    26.6     1 cade    7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~  39.8     9.26     1 cade    7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~  15.6    27.2     1 cade    7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~   9.69   21.5     1 abco    7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~  6.83    7.83     1 abco    7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,
## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>

## Penalized Discriminant Analysis
##
## 163 samples
```

```

## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
##  lambda  Accuracy  Kappa
##  0.15    0.6058192  0.4781037
##  0.16    0.6058192  0.4781037
##  0.17    0.6065089  0.4792032
##  0.18    0.6077396  0.4808956
##  0.19    0.6064760  0.4793525
##  0.20    0.6064760  0.4794235
##  0.21    0.6070913  0.4802129
##  0.22    0.6077263  0.4809990
##  0.23    0.6083416  0.4818079
##  0.24    0.6097962  0.4836279
##  0.25    0.6091295  0.4827674
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was lambda = 0.24.

##          abco      cade      pila      pipo      quke
## 1 0.003521779 0.30506224 1.429712e-04 0.67521915 1.605386e-02
## 2 0.174316648 0.14797178 7.429201e-02 0.60002296 3.396614e-03
## 3 0.000424329 0.02568109 1.127811e-03 0.29849236 6.742744e-01
## 4 0.005337266 0.02136598 1.274560e-02 0.51357063 4.469805e-01
## 5 0.050869861 0.29842993 1.557322e-03 0.64842062 7.222742e-04
## 6 0.001006080 0.97774175 3.151049e-06 0.02124602 3.003231e-06

## # A tibble: 39 x 18
##   treeID height ch_area live species      x      y b_mean g_mean r_mean
##   <chr>   <dbl>   <dbl> <int> <chr>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~  11.6    20.6     1 pipo    7.16e5 4.27e6 0.0247 0.0598 0.0325
## 2 eldo_~  32.9    24.8     1 pipo    7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~  17.7    20.2     1 pipo    7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~  16.0   111.     1 pipo    7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~  53.8    53.5     1 pipo    7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~  17.5    26.6     1 cade    7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~  39.8     9.26     1 cade    7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~  15.6    27.2     1 cade    7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~   9.69   21.5     1 abco    7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~  6.83    7.83     1 abco    7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,
## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>

## Localized Linear Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##

```

```

## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
##   k   Accuracy   Kappa
##   17  0.4321549  0.2445248
##   44  0.6335570  0.5141702
##   71  0.6403723  0.5216603
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was k = 71.

##           abco       cade       pila       pipo       quke
## 1 4.559498e-04 0.23617539 5.494974e-07 0.680904691 8.246342e-02
## 2 9.474192e-02 0.33616398 1.386753e-02 0.555226568 0.000000e+00
## 3 8.825635e-07 0.02192083 6.617874e-07 0.171527363 8.065503e-01
## 4 1.492915e-02 0.04022921 1.216603e-04 0.922086430 2.263355e-02
## 5 7.488957e-03 0.39326784 1.516587e-05 0.599188599 3.943556e-05
## 6 4.196165e-04 0.99167105 1.209606e-09 0.007908666 6.639781e-07

## # A tibble: 39 x 18
##   treeID height ch_area live species      x      y b_mean g_mean r_mean
##   <chr>   <dbl>   <dbl> <int> <chr>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~  11.6    20.6     1 pipo    7.16e5 4.27e6 0.0247 0.0598 0.0325
## 2 eldo_~  32.9    24.8     1 pipo    7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~  17.7    20.2     1 pipo    7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~  16.0   111.     1 pipo    7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~  53.8    53.5     1 pipo    7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~  17.5    26.6     1 cade    7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~  39.8     9.26     1 cade    7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~  15.6    27.2     1 cade    7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~   9.69    21.5     1 abco    7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~  6.83     7.83     1 abco    7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,
## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>

## Penalized Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
##   df  Accuracy   Kappa
##   4   0.6001257  0.4577045
##   5   0.6185527  0.4863536
##   6   0.6352188  0.5106391
##   7   0.6388658  0.5178264
##   8   0.6367024  0.5152303

```

```

## 9 0.6235804 0.4973921
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was df = 7.

##          abco      cade      pila      pipo      quke
## 1 0.023481705 0.49123615 3.105131e-03 0.47841555 3.761468e-03
## 2 0.245890147 0.15754581 1.085685e-01 0.48106850 6.927085e-03
## 3 0.004210622 0.12667771 1.569250e-02 0.63563615 2.177830e-01
## 4 0.009028858 0.07514375 2.393821e-02 0.53329557 3.585936e-01
## 5 0.078807851 0.48351359 1.958520e-03 0.43443846 1.281574e-03
## 6 0.010470411 0.91831887 3.503916e-05 0.07116049 1.518447e-05

## # A tibble: 39 x 18
##   treeID height ch_area live species      x      y b_mean g_mean r_mean
##   <chr>   <dbl>   <dbl> <int> <chr>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~ 11.6    20.6     1 pipo    7.16e5 4.27e6 0.0247 0.0598 0.0325
## 2 eldo_~ 32.9    24.8     1 pipo    7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~ 17.7    20.2     1 pipo    7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~ 16.0   111.     1 pipo    7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~ 53.8    53.5     1 pipo    7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~ 17.5    26.6     1 cade    7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~ 39.8     9.26     1 cade    7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~ 15.6    27.2     1 cade    7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~  9.69   21.5     1 abco    7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~  6.83    7.83     1 abco    7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,
## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>

## Linear Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results:
##
##   Accuracy   Kappa
## 0.6181074 0.4883564

##          abco      cade      pila      pipo      quke
## 1 0.005164655 0.40762697 4.188914e-04 0.58498867 1.800813e-03
## 2 0.167866058 0.19240952 6.262842e-02 0.57098869 6.107315e-03
## 3 0.001002644 0.13906449 3.802394e-03 0.74749740 1.086331e-01
## 4 0.003670521 0.08826156 9.533512e-03 0.60937834 2.891561e-01
## 5 0.048989958 0.49690732 8.358460e-04 0.45197805 1.288828e-03
## 6 0.008950924 0.93328836 2.398846e-05 0.05772911 7.615519e-06

## # A tibble: 39 x 18
##   treeID height ch_area live species      x      y b_mean g_mean r_mean
##   <chr>   <dbl>   <dbl> <int> <chr>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~ 11.6    20.6     1 pipo    7.16e5 4.27e6 0.0247 0.0598 0.0325

```

```

## 2 eldo_~ 32.9 24.8 1 pipo 7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~ 17.7 20.2 1 pipo 7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~ 16.0 111. 1 pipo 7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~ 53.8 53.5 1 pipo 7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~ 17.5 26.6 1 cade 7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~ 39.8 9.26 1 cade 7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~ 15.6 27.2 1 cade 7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~ 9.69 21.5 1 abco 7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~ 6.83 7.83 1 abco 7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,
## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>

## Mixture Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
## subclasses Accuracy Kappa
## 1 0.5934279 0.4575848
## 2 0.5990773 0.4678745
## 3 0.6068364 0.4773618
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was subclasses = 3.

## abco cade pila pipo quke
## 1 8.533749e-05 0.0846227819 5.424148e-06 0.70904567 2.062408e-01
## 2 2.462329e-01 0.0284020564 9.432227e-02 0.63091252 1.302712e-04
## 3 5.411676e-08 0.0000386950 9.348948e-06 0.05917986 9.407720e-01
## 4 9.367273e-05 0.0005198699 1.155416e-02 0.91057041 7.726189e-02
## 5 1.219917e-01 0.0720835032 2.827976e-03 0.80297303 1.237598e-04
## 6 6.646119e-05 0.9856749118 7.600338e-08 0.01424850 1.004923e-05

## # A tibble: 39 x 18
## treeID height ch_area live species x y b_mean g_mean r_mean
## <chr> <dbl> <dbl> <int> <chr> <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~ 11.6 20.6 1 pipo 7.16e5 4.27e6 0.0247 0.0598 0.0325
## 2 eldo_~ 32.9 24.8 1 pipo 7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~ 17.7 20.2 1 pipo 7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~ 16.0 111. 1 pipo 7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~ 53.8 53.5 1 pipo 7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~ 17.5 26.6 1 cade 7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~ 39.8 9.26 1 cade 7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~ 15.6 27.2 1 cade 7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~ 9.69 21.5 1 abco 7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~ 6.83 7.83 1 abco 7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,

```

```

## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>

## Linear Discriminant Analysis
##
## 163 samples
##   9 predictor
##   5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
##   dimen  Accuracy  Kappa
##   3      0.5958188  0.4635799
##   4      0.5942789  0.4612765
##   5      0.5942789  0.4612765
##   6      0.5942789  0.4612765
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was dimen = 3.

##           abco      cade      pila      pipo      quke
## 1 0.005164655 0.40762697 4.188914e-04 0.58498867 1.800813e-03
## 2 0.167866058 0.19240952 6.262842e-02 0.57098869 6.107315e-03
## 3 0.001002644 0.13906449 3.802394e-03 0.74749740 1.086331e-01
## 4 0.003670521 0.08826156 9.533512e-03 0.60937834 2.891561e-01
## 5 0.048989958 0.49690732 8.358460e-04 0.45197805 1.288828e-03
## 6 0.008950924 0.93328836 2.398846e-05 0.05772911 7.615519e-06

## # A tibble: 39 x 18
##   treeID height ch_area live species      x      y b_mean g_mean r_mean
##   <chr>   <dbl>   <dbl> <int> <chr>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~  11.6    20.6     1 pipo    7.16e5 4.27e6 0.0247 0.0598 0.0325
## 2 eldo_~  32.9    24.8     1 pipo    7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~  17.7    20.2     1 pipo    7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~  16.0   111.     1 pipo    7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~  53.8    53.5     1 pipo    7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~  17.5    26.6     1 cade    7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~  39.8     9.26     1 cade    7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~  15.6    27.2     1 cade    7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~   9.69   21.5     1 abco    7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~  6.83    7.83     1 abco    7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,
## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>

## Random Forest
##
## 163 samples
##   9 predictor
##   5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...

```



```

## Resampling results across tuning parameters:
##
##   mtry Accuracy   Kappa
##   2     0.5302035 0.3660913
##   5     0.5424081 0.3849851
##   9     0.5540786 0.4009981
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was mtry = 9.

##   abco  cade  pila  pipo  quke
## 1 0.002 0.978 0.000 0.018 0.002
## 2 0.204 0.272 0.156 0.364 0.004
## 3 0.012 0.404 0.010 0.404 0.170
## 4 0.010 0.060 0.016 0.902 0.012
## 5 0.098 0.146 0.028 0.724 0.004
## 6 0.000 1.000 0.000 0.000 0.000

## # A tibble: 39 x 18
##   treeID height ch_area live species      x      y b_mean g_mean r_mean
##   <chr>   <dbl>  <dbl> <int> <chr>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~  11.6   20.6     1 pipo  7.16e5 4.27e6 0.0247 0.0598 0.0325
## 2 eldo_~  32.9   24.8     1 pipo  7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~  17.7   20.2     1 pipo  7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~  16.0  111.     1 pipo  7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~  53.8   53.5     1 pipo  7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~  17.5   26.6     1 cade  7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~  39.8    9.26     1 cade  7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~  15.6   27.2     1 cade  7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~   9.69   21.5     1 abco  7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~  6.83    7.83     1 abco  7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,
## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>

## Conditional Inference Random Forest
##
## 163 samples
##   9 predictor
##   5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
##   mtry Accuracy   Kappa
##   2     0.4907439 0.3073892
##   5     0.5059904 0.3310428
##   9     0.5185669 0.3499542
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was mtry = 9.

##           abco      cade      pila      pipo      quke
## 1 0.012941058 0.8399929 0.01146860 0.07684591 0.058751528

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## 2 0.176584945 0.1942477 0.17494279 0.44493508 0.009289512
## 3 0.038042980 0.2223705 0.04589333 0.50205749 0.191635699
## 4 0.027492408 0.1649577 0.03843704 0.73021764 0.038895248
## 5 0.126367190 0.2288755 0.02519989 0.61227166 0.007285758
## 6 0.008518208 0.8559671 0.01281870 0.06508062 0.057615329

## # A tibble: 39 x 18
##   treeID height ch_area live species      x      y b_mean g_mean r_mean
##   <chr>   <dbl>   <dbl> <int> <chr>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~ 11.6    20.6     1 pipo  7.16e5 4.27e6 0.0247 0.0598 0.0325
## 2 eldo_~ 32.9    24.8     1 pipo  7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~ 17.7    20.2     1 pipo  7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~ 16.0   111.     1 pipo  7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~ 53.8    53.5     1 pipo  7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~ 17.5    26.6     1 cade  7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~ 39.8     9.26     1 cade  7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~ 15.6    27.2     1 cade  7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~  9.69   21.5     1 abco  7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~  6.83    7.83     1 abco  7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,
## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>

## Boosted Tree
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
##   maxdepth  mstop  Accuracy  Kappa
## 1          50    0.3048177 -0.003359694
## 1         100    0.3042274 -0.002234239
## 1         150    0.3096910  0.008704657
## 2          50    0.3108847  0.014853769
## 2         100    0.3134551  0.019776468
## 2         150    0.3182723  0.028474801
## 3          50    0.3106600  0.017402630
## 3         100    0.3148396  0.025996642
## 3         150    0.3148586  0.027540103
##
## Tuning parameter 'nu' was held constant at a value of 0.1
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were mstop = 150, maxdepth = 2 and
## nu = 0.1.

## Initialization by the identity.
## Iteration 1 Log Likelihood: -1978.46240440834
## Iteration 2 Log Likelihood: -1968.66660962836
## Iteration 3 Log Likelihood: -1968.66660962836
## Iteration 4 Log Likelihood: -1968.66660962836

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## Iteration 5 Log Likelihood: -1968.66660962836
## Iteration 6 Log Likelihood: -1968.66660962836
## Iteration 7 Log Likelihood: -1968.66660962836
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1977.37875696161
## Iteration 2 Log Likelihood: -1735.11570003764
## Iteration 3 Log Likelihood: -1735.11570003764
## Iteration 4 Log Likelihood: -1735.11570003764
## Iteration 5 Log Likelihood: -1735.11570003764
## Iteration 6 Log Likelihood: -1735.11570003764
## Iteration 7 Log Likelihood: -1735.11570003764
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1974.80789741169
## Iteration 2 Log Likelihood: -82.0340954559247
## Iteration 3 Log Likelihood: -82.0340954559257
## Iteration 4 Log Likelihood: -82.0340954559286
## Iteration 5 Log Likelihood: -82.0340954559238
## Iteration 6 Log Likelihood: -82.0340954559221
## Iteration 7 Log Likelihood: -82.0340954559272
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1986.16647647306
## Iteration 2 Log Likelihood: -1976.35934977617
## Iteration 3 Log Likelihood: -1976.35919536462
## Iteration 4 Log Likelihood: -1976.3590407203
## Iteration 5 Log Likelihood: -1976.35888583526
## Iteration 6 Log Likelihood: -1976.35873070129
## Iteration 7 Log Likelihood: -1976.35857530998
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1985.18253062512
## Iteration 2 Log Likelihood: -1742.53344935936
## Iteration 3 Log Likelihood: -1742.53278631184
## Iteration 4 Log Likelihood: -1742.53212089724
## Iteration 5 Log Likelihood: -1742.53145220739
## Iteration 6 Log Likelihood: -1742.53077929936
## Iteration 7 Log Likelihood: -1742.53010117912
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1982.73841976462
## Iteration 2 Log Likelihood: -78.4048574237185
## Iteration 3 Log Likelihood: -78.1904025505889
## Iteration 4 Log Likelihood: -77.9538306861561
## Iteration 5 Log Likelihood: -77.687756828779
## Iteration 6 Log Likelihood: -77.3736767451008
## Iteration 7 Log Likelihood: -76.9918108672873
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1963.75091830159
## Iteration 2 Log Likelihood: -1953.92670480236
## Iteration 3 Log Likelihood: -1953.77677064324
## Iteration 4 Log Likelihood: -1953.60832506498
## Iteration 5 Log Likelihood: -1953.42551202479
## Iteration 6 Log Likelihood: -1953.23755580451
## Iteration 7 Log Likelihood: -1953.05698919398
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1959.68650840683
## Iteration 2 Log Likelihood: -1718.29135320842

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## Iteration 3 Log Likelihood: -1713.87543697103
## Iteration 4 Log Likelihood: -1710.198168743
## Iteration 5 Log Likelihood: -1709.4244472011
## Iteration 6 Log Likelihood: -1709.13511213382
## Iteration 7 Log Likelihood: -1708.86425252176
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1950.20049537947
## Iteration 2 Log Likelihood: 31.8497446802178
## Iteration 3 Log Likelihood: 68.7193555595413
## Iteration 4 Log Likelihood: 73.0016992830556
## Iteration 5 Log Likelihood: 75.5187416715122
## Iteration 6 Log Likelihood: 77.7601342326191
## Iteration 7 Log Likelihood: 79.4651229758349
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1978.46240440834
## Iteration 2 Log Likelihood: -1968.66660962836
## Iteration 3 Log Likelihood: -1968.66660962836
## Iteration 4 Log Likelihood: -1968.66660962836
## Iteration 5 Log Likelihood: -1968.66660962836
## Iteration 6 Log Likelihood: -1968.66660962836
## Iteration 7 Log Likelihood: -1968.66660962836
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1977.37875696161
## Iteration 2 Log Likelihood: -1735.11570003764
## Iteration 3 Log Likelihood: -1735.11570003764
## Iteration 4 Log Likelihood: -1735.11570003764
## Iteration 5 Log Likelihood: -1735.11570003764
## Iteration 6 Log Likelihood: -1735.11570003764
## Iteration 7 Log Likelihood: -1735.11570003764
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1974.80789741169
## Iteration 2 Log Likelihood: -82.0340954559259
## Iteration 3 Log Likelihood: -82.0340954559235
## Iteration 4 Log Likelihood: -82.0340954559289
## Iteration 5 Log Likelihood: -82.0340954559252
## Iteration 6 Log Likelihood: -82.0340954559243
## Iteration 7 Log Likelihood: -82.0340954559248
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1986.05307432568
## Iteration 2 Log Likelihood: -1976.24704508095
## Iteration 3 Log Likelihood: -1976.24675424746
## Iteration 4 Log Likelihood: -1976.24646172363
## Iteration 5 Log Likelihood: -1976.24616750595
## Iteration 6 Log Likelihood: -1976.24587159128
## Iteration 7 Log Likelihood: -1976.24557397675
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1985.05301006107
## Iteration 2 Log Likelihood: -1742.41960904177
## Iteration 3 Log Likelihood: -1742.41828291875
## Iteration 4 Log Likelihood: -1742.4169282602
## Iteration 5 Log Likelihood: -1742.41554247775
## Iteration 6 Log Likelihood: -1742.41412286778
## Iteration 7 Log Likelihood: -1742.41266657749
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1982.57312985694
## Iteration 2 Log Likelihood: -78.3604862632041
## Iteration 3 Log Likelihood: -78.150004772813
## Iteration 4 Log Likelihood: -77.9219548273334
## Iteration 5 Log Likelihood: -77.6683168037869
## Iteration 6 Log Likelihood: -77.3702805719189
## Iteration 7 Log Likelihood: -77.0032751552988
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1957.55202595494
## Iteration 2 Log Likelihood: -1947.76543020029
## Iteration 3 Log Likelihood: -1947.60695822226
## Iteration 4 Log Likelihood: -1947.44817171799
## Iteration 5 Log Likelihood: -1947.29665138279
## Iteration 6 Log Likelihood: -1947.15983245534
## Iteration 7 Log Likelihood: -1947.0429345132
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1951.2758522332
## Iteration 2 Log Likelihood: -1710.57460448925
## Iteration 3 Log Likelihood: -1707.16793505622
## Iteration 4 Log Likelihood: -1705.30423032651
## Iteration 5 Log Likelihood: -1704.30126404424
## Iteration 6 Log Likelihood: -1703.60935560476
## Iteration 7 Log Likelihood: -1703.23232838824
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1937.74561972088
## Iteration 2 Log Likelihood: 63.198592207166
## Iteration 3 Log Likelihood: 113.622847912107
## Iteration 4 Log Likelihood: 134.663122274621
## Iteration 5 Log Likelihood: 139.051289865244
## Iteration 6 Log Likelihood: 139.600061894439
## Iteration 7 Log Likelihood: 139.718714256554
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1952.67669790036
## Iteration 2 Log Likelihood: -1942.67285803057
## Iteration 3 Log Likelihood: -1942.67285803057
## Iteration 4 Log Likelihood: -1942.67285803057
## Iteration 5 Log Likelihood: -1942.67285803057
## Iteration 6 Log Likelihood: -1942.67285803057
## Iteration 7 Log Likelihood: -1942.67285803057
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1951.32025393296
## Iteration 2 Log Likelihood: -1706.77489294874
## Iteration 3 Log Likelihood: -1706.77489294874
## Iteration 4 Log Likelihood: -1706.77489294874
## Iteration 5 Log Likelihood: -1706.77489294874
## Iteration 6 Log Likelihood: -1706.77489294874
## Iteration 7 Log Likelihood: -1706.77489294874
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1948.06550620113
## Iteration 2 Log Likelihood: -73.5193849620114
## Iteration 3 Log Likelihood: -73.5193849620137
## Iteration 4 Log Likelihood: -73.519384962012
## Iteration 5 Log Likelihood: -73.5193849620153
## Iteration 6 Log Likelihood: -73.5193849620105

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## Iteration 7 Log Likelihood: -73.5193849620099
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1965.14377961435
## Iteration 2 Log Likelihood: -1955.12471304907
## Iteration 3 Log Likelihood: -1955.12407302729
## Iteration 4 Log Likelihood: -1955.12343086533
## Iteration 5 Log Likelihood: -1955.12278657178
## Iteration 6 Log Likelihood: -1955.12214015303
## Iteration 7 Log Likelihood: -1955.12149161291
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1963.97283125133
## Iteration 2 Log Likelihood: -1718.84217936043
## Iteration 3 Log Likelihood: -1718.83907452765
## Iteration 4 Log Likelihood: -1718.83596690161
## Iteration 5 Log Likelihood: -1718.83284990366
## Iteration 6 Log Likelihood: -1718.82971671671
## Iteration 7 Log Likelihood: -1718.82655974424
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1960.87244523387
## Iteration 2 Log Likelihood: -77.9214733508978
## Iteration 3 Log Likelihood: -77.5234439499665
## Iteration 4 Log Likelihood: -76.9889817899385
## Iteration 5 Log Likelihood: -76.4176627757086
## Iteration 6 Log Likelihood: -75.9282620457888
## Iteration 7 Log Likelihood: -75.5453582281078
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1924.06533106563
## Iteration 2 Log Likelihood: -1913.36763457505
## Iteration 3 Log Likelihood: -1912.87325080238
## Iteration 4 Log Likelihood: -1912.26315030995
## Iteration 5 Log Likelihood: -1911.6023808543
## Iteration 6 Log Likelihood: -1911.03811593962
## Iteration 7 Log Likelihood: -1910.66417505369
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1925.06351069994
## Iteration 2 Log Likelihood: -1674.23813978205
## Iteration 3 Log Likelihood: -1665.29939726351
## Iteration 4 Log Likelihood: -1662.93259058931
## Iteration 5 Log Likelihood: -1661.97067078229
## Iteration 6 Log Likelihood: -1660.3542224222
## Iteration 7 Log Likelihood: -1658.90432410874
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1922.77169890235
## Iteration 2 Log Likelihood: 66.0732638324483
## Iteration 3 Log Likelihood: 99.3265921332883
## Iteration 4 Log Likelihood: 109.971052558399
## Iteration 5 Log Likelihood: 111.975816249422
## Iteration 6 Log Likelihood: 112.871317071294
## Iteration 7 Log Likelihood: 113.366621200367
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1952.67669790036
## Iteration 2 Log Likelihood: -1942.67285803057
## Iteration 3 Log Likelihood: -1942.67285803057
## Iteration 4 Log Likelihood: -1942.67285803057

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## Iteration 5 Log Likelihood: -1942.67285803057
## Iteration 6 Log Likelihood: -1942.67285803057
## Iteration 7 Log Likelihood: -1942.67285803057
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1951.32025393296
## Iteration 2 Log Likelihood: -1706.77489294874
## Iteration 3 Log Likelihood: -1706.77489294874
## Iteration 4 Log Likelihood: -1706.77489294874
## Iteration 5 Log Likelihood: -1706.77489294874
## Iteration 6 Log Likelihood: -1706.77489294874
## Iteration 7 Log Likelihood: -1706.77489294874
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1948.06550620113
## Iteration 2 Log Likelihood: -73.5193849620109
## Iteration 3 Log Likelihood: -73.5193849620124
## Iteration 4 Log Likelihood: -73.5193849620088
## Iteration 5 Log Likelihood: -73.5193849620124
## Iteration 6 Log Likelihood: -73.5193849620127
## Iteration 7 Log Likelihood: -73.5193849620086
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1964.89023685045
## Iteration 2 Log Likelihood: -1954.87185825913
## Iteration 3 Log Likelihood: -1954.87072445544
## Iteration 4 Log Likelihood: -1954.86957823782
## Iteration 5 Log Likelihood: -1954.86841982358
## Iteration 6 Log Likelihood: -1954.86724944806
## Iteration 7 Log Likelihood: -1954.86606736333
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1963.69945250983
## Iteration 2 Log Likelihood: -1718.56952590961
## Iteration 3 Log Likelihood: -1718.56232084837
## Iteration 4 Log Likelihood: -1718.55497725947
## Iteration 5 Log Likelihood: -1718.54749036713
## Iteration 6 Log Likelihood: -1718.53985573896
## Iteration 7 Log Likelihood: -1718.53206885295
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1960.54123168819
## Iteration 2 Log Likelihood: -77.017378138859
## Iteration 3 Log Likelihood: -76.6089370753314
## Iteration 4 Log Likelihood: -76.1513485057004
## Iteration 5 Log Likelihood: -75.6484790541429
## Iteration 6 Log Likelihood: -75.1218175516636
## Iteration 7 Log Likelihood: -74.6052706246018
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1910.92487613572
## Iteration 2 Log Likelihood: -1899.95383191864
## Iteration 3 Log Likelihood: -1899.20860308699
## Iteration 4 Log Likelihood: -1898.529426764
## Iteration 5 Log Likelihood: -1898.029809409
## Iteration 6 Log Likelihood: -1897.72120215623
## Iteration 7 Log Likelihood: -1897.55011175833
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1910.20681475942
## Iteration 2 Log Likelihood: -1655.21962576019

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## Iteration 3 Log Likelihood: -1650.42611843124
## Iteration 4 Log Likelihood: -1649.56873176074
## Iteration 5 Log Likelihood: -1648.65118523296
## Iteration 6 Log Likelihood: -1647.02357098737
## Iteration 7 Log Likelihood: -1645.60148412267
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1902.53779150951
## Iteration 2 Log Likelihood: 135.712981839515
## Iteration 3 Log Likelihood: 167.391721188334
## Iteration 4 Log Likelihood: 178.365914024775
## Iteration 5 Log Likelihood: 184.021463909831
## Iteration 6 Log Likelihood: 185.279329796088
## Iteration 7 Log Likelihood: 185.718614015445
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1993.46001221336
## Iteration 2 Log Likelihood: -1983.4490191617
## Iteration 3 Log Likelihood: -1983.4490191617
## Iteration 4 Log Likelihood: -1983.4490191617
## Iteration 5 Log Likelihood: -1983.4490191617
## Iteration 6 Log Likelihood: -1983.4490191617
## Iteration 7 Log Likelihood: -1983.4490191617
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1992.77896677236
## Iteration 2 Log Likelihood: -1744.23363599176
## Iteration 3 Log Likelihood: -1744.23363599176
## Iteration 4 Log Likelihood: -1744.23363599176
## Iteration 5 Log Likelihood: -1744.23363599176
## Iteration 6 Log Likelihood: -1744.23363599176
## Iteration 7 Log Likelihood: -1744.23363599176
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1991.15641059796
## Iteration 2 Log Likelihood: -36.4687593601275
## Iteration 3 Log Likelihood: -36.4687593601245
## Iteration 4 Log Likelihood: -36.4687593601278
## Iteration 5 Log Likelihood: -36.46875936013
## Iteration 6 Log Likelihood: -36.4687593601243
## Iteration 7 Log Likelihood: -36.4687593601308
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2001.90045380471
## Iteration 2 Log Likelihood: -1991.85589677676
## Iteration 3 Log Likelihood: -1991.855010305
## Iteration 4 Log Likelihood: -1991.85412648756
## Iteration 5 Log Likelihood: -1991.85324557545
## Iteration 6 Log Likelihood: -1991.85236782104
## Iteration 7 Log Likelihood: -1991.85149346631
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2001.40520038986
## Iteration 2 Log Likelihood: -1752.42204373815
## Iteration 3 Log Likelihood: -1752.41878518822
## Iteration 4 Log Likelihood: -1752.4156415859
## Iteration 5 Log Likelihood: -1752.41260868117
## Iteration 6 Log Likelihood: -1752.40968296085
## Iteration 7 Log Likelihood: -1752.40685979934
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1999.72791797387
## Iteration 2 Log Likelihood: -34.8750456209833
## Iteration 3 Log Likelihood: -34.7867821741944
## Iteration 4 Log Likelihood: -34.6889564778476
## Iteration 5 Log Likelihood: -34.5711987870109
## Iteration 6 Log Likelihood: -34.4151354460837
## Iteration 7 Log Likelihood: -34.1931527677556
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1979.09916846018
## Iteration 2 Log Likelihood: -1968.14624756556
## Iteration 3 Log Likelihood: -1967.69744298642
## Iteration 4 Log Likelihood: -1967.18397271258
## Iteration 5 Log Likelihood: -1966.51641975064
## Iteration 6 Log Likelihood: -1965.72802957674
## Iteration 7 Log Likelihood: -1965.02156009435
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1982.53544387995
## Iteration 2 Log Likelihood: -1729.08195808252
## Iteration 3 Log Likelihood: -1725.61222586078
## Iteration 4 Log Likelihood: -1718.67154211929
## Iteration 5 Log Likelihood: -1716.28222661775
## Iteration 6 Log Likelihood: -1715.73891655302
## Iteration 7 Log Likelihood: -1715.58604783208
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1980.24427910048
## Iteration 2 Log Likelihood: 22.9239053938956
## Iteration 3 Log Likelihood: 45.6190155746055
## Iteration 4 Log Likelihood: 55.8270274750994
## Iteration 5 Log Likelihood: 63.4430350199398
## Iteration 6 Log Likelihood: 63.8093812973606
## Iteration 7 Log Likelihood: 63.832453610337
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1993.46001221336
## Iteration 2 Log Likelihood: -1983.4490191617
## Iteration 3 Log Likelihood: -1983.4490191617
## Iteration 4 Log Likelihood: -1983.4490191617
## Iteration 5 Log Likelihood: -1983.4490191617
## Iteration 6 Log Likelihood: -1983.4490191617
## Iteration 7 Log Likelihood: -1983.4490191617
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1992.77896677236
## Iteration 2 Log Likelihood: -1744.23363599176
## Iteration 3 Log Likelihood: -1744.23363599176
## Iteration 4 Log Likelihood: -1744.23363599176
## Iteration 5 Log Likelihood: -1744.23363599176
## Iteration 6 Log Likelihood: -1744.23363599176
## Iteration 7 Log Likelihood: -1744.23363599176
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1991.15641059796
## Iteration 2 Log Likelihood: -36.4687593601269
## Iteration 3 Log Likelihood: -36.4687593601296
## Iteration 4 Log Likelihood: -36.468759360129
## Iteration 5 Log Likelihood: -36.4687593601262
## Iteration 6 Log Likelihood: -36.4687593601269

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## Iteration 7 Log Likelihood: -36.4687593601275
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2001.75700254467
## Iteration 2 Log Likelihood: -1991.70892857822
## Iteration 3 Log Likelihood: -1991.70779901108
## Iteration 4 Log Likelihood: -1991.70666025761
## Iteration 5 Log Likelihood: -1991.70551254605
## Iteration 6 Log Likelihood: -1991.7043561194
## Iteration 7 Log Likelihood: -1991.70319122317
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2001.32676397939
## Iteration 2 Log Likelihood: -1752.27668775866
## Iteration 3 Log Likelihood: -1752.2719052859
## Iteration 4 Log Likelihood: -1752.26724212451
## Iteration 5 Log Likelihood: -1752.26269733704
## Iteration 6 Log Likelihood: -1752.25827257637
## Iteration 7 Log Likelihood: -1752.25396772144
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1999.66781539795
## Iteration 2 Log Likelihood: -34.6087006645953
## Iteration 3 Log Likelihood: -34.4932989702597
## Iteration 4 Log Likelihood: -34.3617772566526
## Iteration 5 Log Likelihood: -34.2029337583892
## Iteration 6 Log Likelihood: -33.9982275197386
## Iteration 7 Log Likelihood: -33.7207050494824
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1972.85928421706
## Iteration 2 Log Likelihood: -1961.62975565697
## Iteration 3 Log Likelihood: -1960.8196385514
## Iteration 4 Log Likelihood: -1959.96770117229
## Iteration 5 Log Likelihood: -1959.18652718448
## Iteration 6 Log Likelihood: -1958.61714129847
## Iteration 7 Log Likelihood: -1958.28588060346
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1975.88532003904
## Iteration 2 Log Likelihood: -1721.21345286209
## Iteration 3 Log Likelihood: -1715.40759666945
## Iteration 4 Log Likelihood: -1711.04551269978
## Iteration 5 Log Likelihood: -1709.74279167381
## Iteration 6 Log Likelihood: -1709.16561995475
## Iteration 7 Log Likelihood: -1708.91482051016
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1970.91286758103
## Iteration 2 Log Likelihood: 51.5053525168819
## Iteration 3 Log Likelihood: 84.6457794636351
## Iteration 4 Log Likelihood: 92.0344199957906
## Iteration 5 Log Likelihood: 102.52952572112
## Iteration 6 Log Likelihood: 114.197452195548
## Iteration 7 Log Likelihood: 120.667429412675
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1963.88093349006
## Iteration 2 Log Likelihood: -1953.74301797469
## Iteration 3 Log Likelihood: -1953.74301797469
## Iteration 4 Log Likelihood: -1953.74301797469

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## Iteration 5 Log Likelihood: -1953.74301797469
## Iteration 6 Log Likelihood: -1953.74301797469
## Iteration 7 Log Likelihood: -1953.74301797469
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1962.18112393349
## Iteration 2 Log Likelihood: -1713.58668952994
## Iteration 3 Log Likelihood: -1713.58668952994
## Iteration 4 Log Likelihood: -1713.58668952994
## Iteration 5 Log Likelihood: -1713.58668952994
## Iteration 6 Log Likelihood: -1713.58668952994
## Iteration 7 Log Likelihood: -1713.58668952994
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1958.06778562199
## Iteration 2 Log Likelihood: 7.35161470397493
## Iteration 3 Log Likelihood: 7.35161470397702
## Iteration 4 Log Likelihood: 7.35161470397649
## Iteration 5 Log Likelihood: 7.35161470397895
## Iteration 6 Log Likelihood: 7.3516147039756
## Iteration 7 Log Likelihood: 7.35161470397492
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1978.88365529292
## Iteration 2 Log Likelihood: -1968.69179405985
## Iteration 3 Log Likelihood: -1968.69074004678
## Iteration 4 Log Likelihood: -1968.68969562633
## Iteration 5 Log Likelihood: -1968.68866119335
## Iteration 6 Log Likelihood: -1968.68763711975
## Iteration 7 Log Likelihood: -1968.6866237555
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1977.28144516177
## Iteration 2 Log Likelihood: -1728.1819386727
## Iteration 3 Log Likelihood: -1728.17795193013
## Iteration 4 Log Likelihood: -1728.17410445777
## Iteration 5 Log Likelihood: -1728.17038758984
## Iteration 6 Log Likelihood: -1728.16679260566
## Iteration 7 Log Likelihood: -1728.16330974071
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1972.84591965877
## Iteration 2 Log Likelihood: 1.4391108785803
## Iteration 3 Log Likelihood: 1.58383972033737
## Iteration 4 Log Likelihood: 1.76830137048393
## Iteration 5 Log Likelihood: 2.02309709253942
## Iteration 6 Log Likelihood: 2.38518914320714
## Iteration 7 Log Likelihood: 2.83390947658434
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1941.05668628335
## Iteration 2 Log Likelihood: -1930.2249213151
## Iteration 3 Log Likelihood: -1929.91176886138
## Iteration 4 Log Likelihood: -1929.54929183257
## Iteration 5 Log Likelihood: -1929.06777060796
## Iteration 6 Log Likelihood: -1928.45855818863
## Iteration 7 Log Likelihood: -1927.82552283861
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1942.20232143035
## Iteration 2 Log Likelihood: -1689.78902086823

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## Iteration 3 Log Likelihood: -1686.20821758507
## Iteration 4 Log Likelihood: -1680.66160566325
## Iteration 5 Log Likelihood: -1678.99954828832
## Iteration 6 Log Likelihood: -1678.5046406366
## Iteration 7 Log Likelihood: -1678.201907633
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1937.22381675586
## Iteration 2 Log Likelihood: 86.7389404735094
## Iteration 3 Log Likelihood: 120.574904073187
## Iteration 4 Log Likelihood: 139.599749720969
## Iteration 5 Log Likelihood: 146.862386575381
## Iteration 6 Log Likelihood: 147.488066389933
## Iteration 7 Log Likelihood: 147.71649426469
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1963.88093349006
## Iteration 2 Log Likelihood: -1953.74301797469
## Iteration 3 Log Likelihood: -1953.74301797469
## Iteration 4 Log Likelihood: -1953.74301797469
## Iteration 5 Log Likelihood: -1953.74301797469
## Iteration 6 Log Likelihood: -1953.74301797469
## Iteration 7 Log Likelihood: -1953.74301797469
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1962.18112393349
## Iteration 2 Log Likelihood: -1713.58668952994
## Iteration 3 Log Likelihood: -1713.58668952994
## Iteration 4 Log Likelihood: -1713.58668952994
## Iteration 5 Log Likelihood: -1713.58668952994
## Iteration 6 Log Likelihood: -1713.58668952994
## Iteration 7 Log Likelihood: -1713.58668952994
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1958.06778562199
## Iteration 2 Log Likelihood: 7.35161470397324
## Iteration 3 Log Likelihood: 7.35161470397594
## Iteration 4 Log Likelihood: 7.35161470397562
## Iteration 5 Log Likelihood: 7.35161470397445
## Iteration 6 Log Likelihood: 7.35161470397884
## Iteration 7 Log Likelihood: 7.35161470398053
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1978.58329435208
## Iteration 2 Log Likelihood: -1968.38972215233
## Iteration 3 Log Likelihood: -1968.3883251395
## Iteration 4 Log Likelihood: -1968.38691854562
## Iteration 5 Log Likelihood: -1968.3855028079
## Iteration 6 Log Likelihood: -1968.38407836161
## Iteration 7 Log Likelihood: -1968.38264564073
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1977.06864354132
## Iteration 2 Log Likelihood: -1727.90688706384
## Iteration 3 Log Likelihood: -1727.90129284677
## Iteration 4 Log Likelihood: -1727.89585424743
## Iteration 5 Log Likelihood: -1727.89056924687
## Iteration 6 Log Likelihood: -1727.88543669589
## Iteration 7 Log Likelihood: -1727.88045353044
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1972.69461023059
## Iteration 2 Log Likelihood: 1.47420496488359
## Iteration 3 Log Likelihood: 1.62496325330906
## Iteration 4 Log Likelihood: 1.81177774716696
## Iteration 5 Log Likelihood: 2.06428951870762
## Iteration 6 Log Likelihood: 2.41772368249253
## Iteration 7 Log Likelihood: 2.85623324420334
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1931.17179210205
## Iteration 2 Log Likelihood: -1920.07476652916
## Iteration 3 Log Likelihood: -1919.36113443064
## Iteration 4 Log Likelihood: -1918.61265671877
## Iteration 5 Log Likelihood: -1917.94055034486
## Iteration 6 Log Likelihood: -1917.45319259971
## Iteration 7 Log Likelihood: -1917.16139787193
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1931.38191845843
## Iteration 2 Log Likelihood: -1677.49782060904
## Iteration 3 Log Likelihood: -1671.3874936979
## Iteration 4 Log Likelihood: -1669.06472014015
## Iteration 5 Log Likelihood: -1668.46096551949
## Iteration 6 Log Likelihood: -1668.17194961818
## Iteration 7 Log Likelihood: -1667.99166255037
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1923.01675003771
## Iteration 2 Log Likelihood: 131.467146761307
## Iteration 3 Log Likelihood: 174.841767013785
## Iteration 4 Log Likelihood: 200.649094705413
## Iteration 5 Log Likelihood: 212.51407477153
## Iteration 6 Log Likelihood: 214.651724082584
## Iteration 7 Log Likelihood: 215.205765765368
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1945.26985067589
## Iteration 2 Log Likelihood: -1935.22580957317
## Iteration 3 Log Likelihood: -1935.22580957317
## Iteration 4 Log Likelihood: -1935.22580957317
## Iteration 5 Log Likelihood: -1935.22580957317
## Iteration 6 Log Likelihood: -1935.22580957317
## Iteration 7 Log Likelihood: -1935.22580957317
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1943.08548154828
## Iteration 2 Log Likelihood: -1697.71015002112
## Iteration 3 Log Likelihood: -1697.71015002112
## Iteration 4 Log Likelihood: -1697.71015002112
## Iteration 5 Log Likelihood: -1697.71015002112
## Iteration 6 Log Likelihood: -1697.71015002112
## Iteration 7 Log Likelihood: -1697.71015002112
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1937.81364491293
## Iteration 2 Log Likelihood: -30.9556440349579
## Iteration 3 Log Likelihood: -30.9556440349572
## Iteration 4 Log Likelihood: -30.9556440349551
## Iteration 5 Log Likelihood: -30.9556440349599
## Iteration 6 Log Likelihood: -30.9556440349585

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## Iteration 7 Log Likelihood: -30.955644034959
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1953.8359519311
## Iteration 2 Log Likelihood: -1943.75954188549
## Iteration 3 Log Likelihood: -1943.75922834128
## Iteration 4 Log Likelihood: -1943.75891521658
## Iteration 5 Log Likelihood: -1943.75860249858
## Iteration 6 Log Likelihood: -1943.75829017406
## Iteration 7 Log Likelihood: -1943.75797822885
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1951.62958827802
## Iteration 2 Log Likelihood: -1705.93544152149
## Iteration 3 Log Likelihood: -1705.93402268435
## Iteration 4 Log Likelihood: -1705.93260422086
## Iteration 5 Log Likelihood: -1705.93118307603
## Iteration 6 Log Likelihood: -1705.92975614777
## Iteration 7 Log Likelihood: -1705.92832021203
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1946.1247869373
## Iteration 2 Log Likelihood: -28.8255329429964
## Iteration 3 Log Likelihood: -28.63976210776
## Iteration 4 Log Likelihood: -28.4359550301009
## Iteration 5 Log Likelihood: -28.2311875353114
## Iteration 6 Log Likelihood: -28.0464148958405
## Iteration 7 Log Likelihood: -27.8949770263661
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1926.83253929225
## Iteration 2 Log Likelihood: -1916.49395351962
## Iteration 3 Log Likelihood: -1916.28547768844
## Iteration 4 Log Likelihood: -1916.03223045441
## Iteration 5 Log Likelihood: -1915.72881935105
## Iteration 6 Log Likelihood: -1915.38992421649
## Iteration 7 Log Likelihood: -1915.05335281167
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1925.22873427941
## Iteration 2 Log Likelihood: -1677.6056305432
## Iteration 3 Log Likelihood: -1673.37655209316
## Iteration 4 Log Likelihood: -1668.44971240368
## Iteration 5 Log Likelihood: -1667.42579175454
## Iteration 6 Log Likelihood: -1667.11292093039
## Iteration 7 Log Likelihood: -1666.79862212782
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1919.09251236809
## Iteration 2 Log Likelihood: 91.8976967867015
## Iteration 3 Log Likelihood: 103.998385378681
## Iteration 4 Log Likelihood: 114.115373637619
## Iteration 5 Log Likelihood: 117.063469327592
## Iteration 6 Log Likelihood: 117.555669793132
## Iteration 7 Log Likelihood: 117.776150464946
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1945.26985067589
## Iteration 2 Log Likelihood: -1935.22580957317
## Iteration 3 Log Likelihood: -1935.22580957317
## Iteration 4 Log Likelihood: -1935.22580957317

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## Iteration 5 Log Likelihood: -1935.22580957317
## Iteration 6 Log Likelihood: -1935.22580957317
## Iteration 7 Log Likelihood: -1935.22580957317
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1943.08548154828
## Iteration 2 Log Likelihood: -1697.71015002112
## Iteration 3 Log Likelihood: -1697.71015002112
## Iteration 4 Log Likelihood: -1697.71015002112
## Iteration 5 Log Likelihood: -1697.71015002112
## Iteration 6 Log Likelihood: -1697.71015002112
## Iteration 7 Log Likelihood: -1697.71015002112
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1937.81364491293
## Iteration 2 Log Likelihood: -30.9556440349573
## Iteration 3 Log Likelihood: -30.9556440349596
## Iteration 4 Log Likelihood: -30.9556440349587
## Iteration 5 Log Likelihood: -30.9556440349602
## Iteration 6 Log Likelihood: -30.9556440349582
## Iteration 7 Log Likelihood: -30.9556440349554
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1953.64031646305
## Iteration 2 Log Likelihood: -1943.56517749294
## Iteration 3 Log Likelihood: -1943.56463714094
## Iteration 4 Log Likelihood: -1943.56409383166
## Iteration 5 Log Likelihood: -1943.56354759108
## Iteration 6 Log Likelihood: -1943.56299844661
## Iteration 7 Log Likelihood: -1943.56244642643
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1951.44653030165
## Iteration 2 Log Likelihood: -1705.75336763846
## Iteration 3 Log Likelihood: -1705.75046799678
## Iteration 4 Log Likelihood: -1705.74755465542
## Iteration 5 Log Likelihood: -1705.74462379561
## Iteration 6 Log Likelihood: -1705.74167153854
## Iteration 7 Log Likelihood: -1705.73869374618
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1945.9335757133
## Iteration 2 Log Likelihood: -28.6362162942697
## Iteration 3 Log Likelihood: -28.4515828947352
## Iteration 4 Log Likelihood: -28.251038148875
## Iteration 5 Log Likelihood: -28.0493268772571
## Iteration 6 Log Likelihood: -27.864862726649
## Iteration 7 Log Likelihood: -27.7078687815918
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1918.42917858799
## Iteration 2 Log Likelihood: -1908.03417024454
## Iteration 3 Log Likelihood: -1907.70390365342
## Iteration 4 Log Likelihood: -1907.35995850757
## Iteration 5 Log Likelihood: -1907.03415140641
## Iteration 6 Log Likelihood: -1906.75805458601
## Iteration 7 Log Likelihood: -1906.5478820333
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1915.06618465516
## Iteration 2 Log Likelihood: -1666.98006186454

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## Iteration 3 Log Likelihood: -1662.30199292856
## Iteration 4 Log Likelihood: -1660.09261289542
## Iteration 5 Log Likelihood: -1659.35236870193
## Iteration 6 Log Likelihood: -1658.88277848723
## Iteration 7 Log Likelihood: -1658.40113736982
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1903.92398861084
## Iteration 2 Log Likelihood: 138.200431935345
## Iteration 3 Log Likelihood: 171.127147802611
## Iteration 4 Log Likelihood: 180.821771204711
## Iteration 5 Log Likelihood: 182.056956732153
## Iteration 6 Log Likelihood: 182.470884359621
## Iteration 7 Log Likelihood: 182.691740406587
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1994.52819890253
## Iteration 2 Log Likelihood: -1984.62373265593
## Iteration 3 Log Likelihood: -1984.62373265593
## Iteration 4 Log Likelihood: -1984.62373265593
## Iteration 5 Log Likelihood: -1984.62373265593
## Iteration 6 Log Likelihood: -1984.62373265593
## Iteration 7 Log Likelihood: -1984.62373265593
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1993.69059882066
## Iteration 2 Log Likelihood: -1748.86311549546
## Iteration 3 Log Likelihood: -1748.86311549546
## Iteration 4 Log Likelihood: -1748.86311549546
## Iteration 5 Log Likelihood: -1748.86311549546
## Iteration 6 Log Likelihood: -1748.86311549546
## Iteration 7 Log Likelihood: -1748.86311549546
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1991.69061829731
## Iteration 2 Log Likelihood: -59.6976862933027
## Iteration 3 Log Likelihood: -59.6976862933067
## Iteration 4 Log Likelihood: -59.6976862933014
## Iteration 5 Log Likelihood: -59.697686293302
## Iteration 6 Log Likelihood: -59.6976862932999
## Iteration 7 Log Likelihood: -59.6976862932975
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2010.58288948185
## Iteration 2 Log Likelihood: -2000.63885800262
## Iteration 3 Log Likelihood: -2000.63679026631
## Iteration 4 Log Likelihood: -2000.63471161974
## Iteration 5 Log Likelihood: -2000.63262224677
## Iteration 6 Log Likelihood: -2000.63052236485
## Iteration 7 Log Likelihood: -2000.62841222762
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2009.69223304377
## Iteration 2 Log Likelihood: -1764.30286581907
## Iteration 3 Log Likelihood: -1764.29356854797
## Iteration 4 Log Likelihood: -1764.28368250812
## Iteration 5 Log Likelihood: -1764.27312783423
## Iteration 6 Log Likelihood: -1764.26182381741
## Iteration 7 Log Likelihood: -1764.24969047748
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -2007.65622225352
## Iteration 2 Log Likelihood: -64.1696509592318
## Iteration 3 Log Likelihood: -63.5170658669915
## Iteration 4 Log Likelihood: -62.8208424041685
## Iteration 5 Log Likelihood: -62.2776098275999
## Iteration 6 Log Likelihood: -61.9322463566497
## Iteration 7 Log Likelihood: -61.723609294984
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1972.31860429816
## Iteration 2 Log Likelihood: -1961.27369730564
## Iteration 3 Log Likelihood: -1959.93992787052
## Iteration 4 Log Likelihood: -1959.00910299688
## Iteration 5 Log Likelihood: -1958.55897040585
## Iteration 6 Log Likelihood: -1958.37339944912
## Iteration 7 Log Likelihood: -1958.28972155043
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1968.81738543708
## Iteration 2 Log Likelihood: -1712.70568625691
## Iteration 3 Log Likelihood: -1706.27258106442
## Iteration 4 Log Likelihood: -1705.58548289931
## Iteration 5 Log Likelihood: -1705.0708600423
## Iteration 6 Log Likelihood: -1704.52051132805
## Iteration 7 Log Likelihood: -1704.03764838009
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1962.72810028672
## Iteration 2 Log Likelihood: 82.5185800463978
## Iteration 3 Log Likelihood: 113.456771848291
## Iteration 4 Log Likelihood: 122.269070161605
## Iteration 5 Log Likelihood: 124.081756347156
## Iteration 6 Log Likelihood: 124.426364053799
## Iteration 7 Log Likelihood: 124.530997816716
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1994.52819890253
## Iteration 2 Log Likelihood: -1984.62373265593
## Iteration 3 Log Likelihood: -1984.62373265593
## Iteration 4 Log Likelihood: -1984.62373265593
## Iteration 5 Log Likelihood: -1984.62373265593
## Iteration 6 Log Likelihood: -1984.62373265593
## Iteration 7 Log Likelihood: -1984.62373265593
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1993.69059882066
## Iteration 2 Log Likelihood: -1748.86311549546
## Iteration 3 Log Likelihood: -1748.86311549546
## Iteration 4 Log Likelihood: -1748.86311549546
## Iteration 5 Log Likelihood: -1748.86311549546
## Iteration 6 Log Likelihood: -1748.86311549546
## Iteration 7 Log Likelihood: -1748.86311549546
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1991.69061829731
## Iteration 2 Log Likelihood: -59.6976862933029
## Iteration 3 Log Likelihood: -59.6976862933039
## Iteration 4 Log Likelihood: -59.6976862933076
## Iteration 5 Log Likelihood: -59.6976862933029
## Iteration 6 Log Likelihood: -59.6976862933035

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## Iteration 7 Log Likelihood: -59.6976862933038
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2010.18736824069
## Iteration 2 Log Likelihood: -2000.25477200169
## Iteration 3 Log Likelihood: -2000.25168973928
## Iteration 4 Log Likelihood: -2000.2486354874
## Iteration 5 Log Likelihood: -2000.24561181829
## Iteration 6 Log Likelihood: -2000.24262120297
## Iteration 7 Log Likelihood: -2000.23966599532
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2009.07556396499
## Iteration 2 Log Likelihood: -1763.85169882088
## Iteration 3 Log Likelihood: -1763.83275629418
## Iteration 4 Log Likelihood: -1763.81343540229
## Iteration 5 Log Likelihood: -1763.79377275412
## Iteration 6 Log Likelihood: -1763.77382579446
## Iteration 7 Log Likelihood: -1763.75366912154
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2006.76308831212
## Iteration 2 Log Likelihood: -63.6030761886551
## Iteration 3 Log Likelihood: -62.9020848541472
## Iteration 4 Log Likelihood: -62.029102894794
## Iteration 5 Log Likelihood: -61.0946057034545
## Iteration 6 Log Likelihood: -60.2891516104494
## Iteration 7 Log Likelihood: -59.7521437362174
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1962.32129916025
## Iteration 2 Log Likelihood: -1951.29615119057
## Iteration 3 Log Likelihood: -1950.35726235865
## Iteration 4 Log Likelihood: -1949.94000381315
## Iteration 5 Log Likelihood: -1949.777048415
## Iteration 6 Log Likelihood: -1949.71263588786
## Iteration 7 Log Likelihood: -1949.68311200946
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1952.68651385718
## Iteration 2 Log Likelihood: -1702.08344330016
## Iteration 3 Log Likelihood: -1698.32051674883
## Iteration 4 Log Likelihood: -1696.89740265558
## Iteration 5 Log Likelihood: -1696.26571354698
## Iteration 6 Log Likelihood: -1695.62411206976
## Iteration 7 Log Likelihood: -1695.05619049543
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1937.23530457274
## Iteration 2 Log Likelihood: 163.781520811011
## Iteration 3 Log Likelihood: 195.814627394688
## Iteration 4 Log Likelihood: 196.305142571109
## Iteration 5 Log Likelihood: 196.4723643538
## Iteration 6 Log Likelihood: 196.591391461134
## Iteration 7 Log Likelihood: 196.674792667278
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1901.82205980436
## Iteration 2 Log Likelihood: -1891.61365086929
## Iteration 3 Log Likelihood: -1891.61365086929
## Iteration 4 Log Likelihood: -1891.61365086929

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## Iteration 5 Log Likelihood: -1891.61365086929
## Iteration 6 Log Likelihood: -1891.61365086929
## Iteration 7 Log Likelihood: -1891.61365086929
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1898.92059554392
## Iteration 2 Log Likelihood: -1653.44459725198
## Iteration 3 Log Likelihood: -1653.44459725198
## Iteration 4 Log Likelihood: -1653.44459725198
## Iteration 5 Log Likelihood: -1653.44459725198
## Iteration 6 Log Likelihood: -1653.44459725198
## Iteration 7 Log Likelihood: -1653.44459725198
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1891.91176436204
## Iteration 2 Log Likelihood: 7.00669509757297
## Iteration 3 Log Likelihood: 7.00669509757473
## Iteration 4 Log Likelihood: 7.00669509757205
## Iteration 5 Log Likelihood: 7.0066950975772
## Iteration 6 Log Likelihood: 7.00669509757409
## Iteration 7 Log Likelihood: 7.00669509757525
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1915.60391412654
## Iteration 2 Log Likelihood: -1905.33450458202
## Iteration 3 Log Likelihood: -1905.33356110622
## Iteration 4 Log Likelihood: -1905.33261879693
## Iteration 5 Log Likelihood: -1905.33167792532
## Iteration 6 Log Likelihood: -1905.33073875406
## Iteration 7 Log Likelihood: -1905.32980153774
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1912.67272194722
## Iteration 2 Log Likelihood: -1666.68276047533
## Iteration 3 Log Likelihood: -1666.67785656056
## Iteration 4 Log Likelihood: -1666.67312178198
## Iteration 5 Log Likelihood: -1666.66855970172
## Iteration 6 Log Likelihood: -1666.66417353047
## Iteration 7 Log Likelihood: -1666.65996495401
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1905.05338604839
## Iteration 2 Log Likelihood: 2.85926788862463
## Iteration 3 Log Likelihood: 3.01374737505459
## Iteration 4 Log Likelihood: 3.19584490222308
## Iteration 5 Log Likelihood: 3.39222412984387
## Iteration 6 Log Likelihood: 3.58139967903523
## Iteration 7 Log Likelihood: 3.74577757118622
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1870.46433947695
## Iteration 2 Log Likelihood: -1858.53380279118
## Iteration 3 Log Likelihood: -1857.44128382147
## Iteration 4 Log Likelihood: -1855.99183235401
## Iteration 5 Log Likelihood: -1854.51848427074
## Iteration 6 Log Likelihood: -1853.69413330412
## Iteration 7 Log Likelihood: -1853.41141884042
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1874.56309868617
## Iteration 2 Log Likelihood: -1618.90441802283

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## Iteration 3 Log Likelihood: -1610.08133452495
## Iteration 4 Log Likelihood: -1602.04998857873
## Iteration 5 Log Likelihood: -1600.37109415999
## Iteration 6 Log Likelihood: -1599.97229951638
## Iteration 7 Log Likelihood: -1599.76349784551
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1871.46544434205
## Iteration 2 Log Likelihood: 145.928615697127
## Iteration 3 Log Likelihood: 166.085224107903
## Iteration 4 Log Likelihood: 169.026507541784
## Iteration 5 Log Likelihood: 169.581166871331
## Iteration 6 Log Likelihood: 169.732857423084
## Iteration 7 Log Likelihood: 169.776551903453
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1901.82205980436
## Iteration 2 Log Likelihood: -1891.61365086929
## Iteration 3 Log Likelihood: -1891.61365086929
## Iteration 4 Log Likelihood: -1891.61365086929
## Iteration 5 Log Likelihood: -1891.61365086929
## Iteration 6 Log Likelihood: -1891.61365086929
## Iteration 7 Log Likelihood: -1891.61365086929
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1898.92059554392
## Iteration 2 Log Likelihood: -1653.44459725198
## Iteration 3 Log Likelihood: -1653.44459725198
## Iteration 4 Log Likelihood: -1653.44459725198
## Iteration 5 Log Likelihood: -1653.44459725198
## Iteration 6 Log Likelihood: -1653.44459725198
## Iteration 7 Log Likelihood: -1653.44459725198
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1891.91176436204
## Iteration 2 Log Likelihood: 7.0066950975753
## Iteration 3 Log Likelihood: 7.00669509757175
## Iteration 4 Log Likelihood: 7.00669509757377
## Iteration 5 Log Likelihood: 7.0066950975748
## Iteration 6 Log Likelihood: 7.00669509757446
## Iteration 7 Log Likelihood: 7.00669509757445
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1915.24608072133
## Iteration 2 Log Likelihood: -1904.97779975324
## Iteration 3 Log Likelihood: -1904.97644832985
## Iteration 4 Log Likelihood: -1904.97507824327
## Iteration 5 Log Likelihood: -1904.97368969036
## Iteration 6 Log Likelihood: -1904.97228288941
## Iteration 7 Log Likelihood: -1904.9708580796
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1912.37150231665
## Iteration 2 Log Likelihood: -1666.34842897207
## Iteration 3 Log Likelihood: -1666.34036242133
## Iteration 4 Log Likelihood: -1666.33237287353
## Iteration 5 Log Likelihood: -1666.32447585437
## Iteration 6 Log Likelihood: -1666.31668599788
## Iteration 7 Log Likelihood: -1666.30901555375
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1904.80745729912
## Iteration 2 Log Likelihood: 3.28274168926807
## Iteration 3 Log Likelihood: 3.51730904293883
## Iteration 4 Log Likelihood: 3.78035711674829
## Iteration 5 Log Likelihood: 4.05410463771377
## Iteration 6 Log Likelihood: 4.31104965362768
## Iteration 7 Log Likelihood: 4.53009694535083
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1855.80722351496
## Iteration 2 Log Likelihood: -1842.87718003901
## Iteration 3 Log Likelihood: -1840.84637962694
## Iteration 4 Log Likelihood: -1839.55417531799
## Iteration 5 Log Likelihood: -1838.99124343359
## Iteration 6 Log Likelihood: -1838.78721900423
## Iteration 7 Log Likelihood: -1838.70670499315
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1860.60718327117
## Iteration 2 Log Likelihood: -1597.4940304081
## Iteration 3 Log Likelihood: -1587.00944207237
## Iteration 4 Log Likelihood: -1585.77099227488
## Iteration 5 Log Likelihood: -1585.3934599249
## Iteration 6 Log Likelihood: -1585.09080740083
## Iteration 7 Log Likelihood: -1584.8561388807
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1858.03530314683
## Iteration 2 Log Likelihood: 194.594951452464
## Iteration 3 Log Likelihood: 246.83124192897
## Iteration 4 Log Likelihood: 251.230054785269
## Iteration 5 Log Likelihood: 252.011694524419
## Iteration 6 Log Likelihood: 252.449064680871
## Iteration 7 Log Likelihood: 252.814872095546
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1962.64963056054
## Iteration 2 Log Likelihood: -1952.82480080127
## Iteration 3 Log Likelihood: -1952.82480080127
## Iteration 4 Log Likelihood: -1952.82480080127
## Iteration 5 Log Likelihood: -1952.82480080127
## Iteration 6 Log Likelihood: -1952.82480080127
## Iteration 7 Log Likelihood: -1952.82480080127
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1961.05959882372
## Iteration 2 Log Likelihood: -1718.66266085731
## Iteration 3 Log Likelihood: -1718.66266085731
## Iteration 4 Log Likelihood: -1718.66266085731
## Iteration 5 Log Likelihood: -1718.66266085731
## Iteration 6 Log Likelihood: -1718.66266085731
## Iteration 7 Log Likelihood: -1718.66266085731
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1957.25212938308
## Iteration 2 Log Likelihood: -83.8289552779034
## Iteration 3 Log Likelihood: -83.828955277906
## Iteration 4 Log Likelihood: -83.828955277902
## Iteration 5 Log Likelihood: -83.8289552779064
## Iteration 6 Log Likelihood: -83.8289552779085

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## Iteration 7 Log Likelihood: -83.8289552779035
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1967.70772764014
## Iteration 2 Log Likelihood: -1957.86889591553
## Iteration 3 Log Likelihood: -1957.86849215579
## Iteration 4 Log Likelihood: -1957.86808901044
## Iteration 5 Log Likelihood: -1957.86768646914
## Iteration 6 Log Likelihood: -1957.86728452074
## Iteration 7 Log Likelihood: -1957.86688315218
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1966.3690642561
## Iteration 2 Log Likelihood: -1723.58867815096
## Iteration 3 Log Likelihood: -1723.58752358056
## Iteration 4 Log Likelihood: -1723.58638529738
## Iteration 5 Log Likelihood: -1723.58526086805
## Iteration 6 Log Likelihood: -1723.58414781926
## Iteration 7 Log Likelihood: -1723.58304360938
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1962.94714978792
## Iteration 2 Log Likelihood: -83.8859679875288
## Iteration 3 Log Likelihood: -83.5383053701903
## Iteration 4 Log Likelihood: -83.086553384058
## Iteration 5 Log Likelihood: -82.4864062464401
## Iteration 6 Log Likelihood: -81.8391298117374
## Iteration 7 Log Likelihood: -81.3409069718073
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1936.13931791077
## Iteration 2 Log Likelihood: -1926.00750910468
## Iteration 3 Log Likelihood: -1925.59838936215
## Iteration 4 Log Likelihood: -1925.16322883563
## Iteration 5 Log Likelihood: -1924.76323477062
## Iteration 6 Log Likelihood: -1924.44950903882
## Iteration 7 Log Likelihood: -1924.23490089002
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1930.56266833134
## Iteration 2 Log Likelihood: -1685.47981955912
## Iteration 3 Log Likelihood: -1680.54582300935
## Iteration 4 Log Likelihood: -1679.5483258181
## Iteration 5 Log Likelihood: -1679.20809104896
## Iteration 6 Log Likelihood: -1678.96808611628
## Iteration 7 Log Likelihood: -1678.77165880074
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1912.50189141599
## Iteration 2 Log Likelihood: 42.3898296214106
## Iteration 3 Log Likelihood: 107.458225763301
## Iteration 4 Log Likelihood: 117.349904835796
## Iteration 5 Log Likelihood: 120.658536195598
## Iteration 6 Log Likelihood: 121.763124292928
## Iteration 7 Log Likelihood: 122.094863971222
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1962.64963056054
## Iteration 2 Log Likelihood: -1952.82480080127
## Iteration 3 Log Likelihood: -1952.82480080127
## Iteration 4 Log Likelihood: -1952.82480080127

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## Iteration 5 Log Likelihood: -1952.82480080127
## Iteration 6 Log Likelihood: -1952.82480080127
## Iteration 7 Log Likelihood: -1952.82480080127
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1961.05959882372
## Iteration 2 Log Likelihood: -1718.66266085731
## Iteration 3 Log Likelihood: -1718.66266085731
## Iteration 4 Log Likelihood: -1718.66266085731
## Iteration 5 Log Likelihood: -1718.66266085731
## Iteration 6 Log Likelihood: -1718.66266085731
## Iteration 7 Log Likelihood: -1718.66266085731
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1957.25212938308
## Iteration 2 Log Likelihood: -83.8289552779054
## Iteration 3 Log Likelihood: -83.8289552779044
## Iteration 4 Log Likelihood: -83.8289552779051
## Iteration 5 Log Likelihood: -83.8289552779018
## Iteration 6 Log Likelihood: -83.8289552779046
## Iteration 7 Log Likelihood: -83.8289552779036
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1967.3991938777
## Iteration 2 Log Likelihood: -1957.5604820791
## Iteration 3 Log Likelihood: -1957.55973987381
## Iteration 4 Log Likelihood: -1957.55899349771
## Iteration 5 Log Likelihood: -1957.5582430219
## Iteration 6 Log Likelihood: -1957.55748852139
## Iteration 7 Log Likelihood: -1957.55673007306
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1966.0535930264
## Iteration 2 Log Likelihood: -1723.26511645535
## Iteration 3 Log Likelihood: -1723.26215066379
## Iteration 4 Log Likelihood: -1723.25916765195
## Iteration 5 Log Likelihood: -1723.25616107518
## Iteration 6 Log Likelihood: -1723.25312444449
## Iteration 7 Log Likelihood: -1723.25005105834
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1962.60063223808
## Iteration 2 Log Likelihood: -83.3277278014508
## Iteration 3 Log Likelihood: -83.0141747957661
## Iteration 4 Log Likelihood: -82.7027322245488
## Iteration 5 Log Likelihood: -82.3752796136429
## Iteration 6 Log Likelihood: -82.0234296167595
## Iteration 7 Log Likelihood: -81.6543975545992
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1923.83678106324
## Iteration 2 Log Likelihood: -1913.69891025085
## Iteration 3 Log Likelihood: -1913.27214044813
## Iteration 4 Log Likelihood: -1912.91420516573
## Iteration 5 Log Likelihood: -1912.64863081143
## Iteration 6 Log Likelihood: -1912.47049410019
## Iteration 7 Log Likelihood: -1912.35903038522
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1914.99657824916
## Iteration 2 Log Likelihood: -1672.60835219551

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## Iteration 3 Log Likelihood: -1669.67898759301
## Iteration 4 Log Likelihood: -1668.6991074932
## Iteration 5 Log Likelihood: -1667.77832032288
## Iteration 6 Log Likelihood: -1666.67426350893
## Iteration 7 Log Likelihood: -1665.57618934035
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1890.1597048161
## Iteration 2 Log Likelihood: 93.0771795751266
## Iteration 3 Log Likelihood: 159.452346686725
## Iteration 4 Log Likelihood: 168.886089471135
## Iteration 5 Log Likelihood: 179.448433509333
## Iteration 6 Log Likelihood: 184.37366861179
## Iteration 7 Log Likelihood: 185.333196040269
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1958.91339738673
## Iteration 2 Log Likelihood: -1948.8040571277
## Iteration 3 Log Likelihood: -1948.8040571277
## Iteration 4 Log Likelihood: -1948.8040571277
## Iteration 5 Log Likelihood: -1948.8040571277
## Iteration 6 Log Likelihood: -1948.8040571277
## Iteration 7 Log Likelihood: -1948.8040571277
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1957.4682234023
## Iteration 2 Log Likelihood: -1707.88956699797
## Iteration 3 Log Likelihood: -1707.88956699797
## Iteration 4 Log Likelihood: -1707.88956699797
## Iteration 5 Log Likelihood: -1707.88956699797
## Iteration 6 Log Likelihood: -1707.88956699797
## Iteration 7 Log Likelihood: -1707.88956699797
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1953.99490093974
## Iteration 2 Log Likelihood: 3.55549033465059
## Iteration 3 Log Likelihood: 3.55549033465302
## Iteration 4 Log Likelihood: 3.55549033465621
## Iteration 5 Log Likelihood: 3.55549033465539
## Iteration 6 Log Likelihood: 3.55549033465158
## Iteration 7 Log Likelihood: 3.5554903346528
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1968.72243650113
## Iteration 2 Log Likelihood: -1958.57514938206
## Iteration 3 Log Likelihood: -1958.57454253635
## Iteration 4 Log Likelihood: -1958.57393898036
## Iteration 5 Log Likelihood: -1958.57333872736
## Iteration 6 Log Likelihood: -1958.57274178301
## Iteration 7 Log Likelihood: -1958.57214814653
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1967.30957392019
## Iteration 2 Log Likelihood: -1717.44541130144
## Iteration 3 Log Likelihood: -1717.44235572858
## Iteration 4 Log Likelihood: -1717.43923561118
## Iteration 5 Log Likelihood: -1717.43603858828
## Iteration 6 Log Likelihood: -1717.43275176559
## Iteration 7 Log Likelihood: -1717.42936173169
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1963.59750224077
## Iteration 2 Log Likelihood: 1.15486734415759
## Iteration 3 Log Likelihood: 1.27346923898267
## Iteration 4 Log Likelihood: 1.38740653231368
## Iteration 5 Log Likelihood: 1.49612490023858
## Iteration 6 Log Likelihood: 1.60274899036825
## Iteration 7 Log Likelihood: 1.71515024415826
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1945.69871098171
## Iteration 2 Log Likelihood: -1934.86363021953
## Iteration 3 Log Likelihood: -1934.6124674534
## Iteration 4 Log Likelihood: -1934.36366960897
## Iteration 5 Log Likelihood: -1934.0477427715
## Iteration 6 Log Likelihood: -1933.61697350251
## Iteration 7 Log Likelihood: -1933.08818819541
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1947.85929814663
## Iteration 2 Log Likelihood: -1692.8286916387
## Iteration 3 Log Likelihood: -1688.72577560064
## Iteration 4 Log Likelihood: -1683.2313986953
## Iteration 5 Log Likelihood: -1681.85755910755
## Iteration 6 Log Likelihood: -1681.40966098895
## Iteration 7 Log Likelihood: -1681.04193258932
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1946.32123494805
## Iteration 2 Log Likelihood: 90.6315069003468
## Iteration 3 Log Likelihood: 105.59054434313
## Iteration 4 Log Likelihood: 108.666174641348
## Iteration 5 Log Likelihood: 112.949960246038
## Iteration 6 Log Likelihood: 118.979843793254
## Iteration 7 Log Likelihood: 128.605425096137
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1958.91339738673
## Iteration 2 Log Likelihood: -1948.8040571277
## Iteration 3 Log Likelihood: -1948.8040571277
## Iteration 4 Log Likelihood: -1948.8040571277
## Iteration 5 Log Likelihood: -1948.8040571277
## Iteration 6 Log Likelihood: -1948.8040571277
## Iteration 7 Log Likelihood: -1948.8040571277
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1957.4682234023
## Iteration 2 Log Likelihood: -1707.88956699797
## Iteration 3 Log Likelihood: -1707.88956699797
## Iteration 4 Log Likelihood: -1707.88956699797
## Iteration 5 Log Likelihood: -1707.88956699797
## Iteration 6 Log Likelihood: -1707.88956699797
## Iteration 7 Log Likelihood: -1707.88956699797
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1953.99490093974
## Iteration 2 Log Likelihood: 3.55549033465335
## Iteration 3 Log Likelihood: 3.55549033465354
## Iteration 4 Log Likelihood: 3.55549033465529
## Iteration 5 Log Likelihood: 3.55549033465757
## Iteration 6 Log Likelihood: 3.55549033465764

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## Iteration 7 Log Likelihood: 3.55549033465372
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1968.51259125973
## Iteration 2 Log Likelihood: -1958.36208153086
## Iteration 3 Log Likelihood: -1958.36126961716
## Iteration 4 Log Likelihood: -1958.36045739173
## Iteration 5 Log Likelihood: -1958.35964498354
## Iteration 6 Log Likelihood: -1958.35883251614
## Iteration 7 Log Likelihood: -1958.35802010753
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1967.15668791575
## Iteration 2 Log Likelihood: -1717.22261279972
## Iteration 3 Log Likelihood: -1717.21841750355
## Iteration 4 Log Likelihood: -1717.21420823644
## Iteration 5 Log Likelihood: -1717.20997079682
## Iteration 6 Log Likelihood: -1717.20569077763
## Iteration 7 Log Likelihood: -1717.20135312482
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1963.47796397542
## Iteration 2 Log Likelihood: 1.27129199850681
## Iteration 3 Log Likelihood: 1.38983958675222
## Iteration 4 Log Likelihood: 1.50820688439737
## Iteration 5 Log Likelihood: 1.62751389201265
## Iteration 6 Log Likelihood: 1.74890593674294
## Iteration 7 Log Likelihood: 1.87686453152878
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1940.02156198032
## Iteration 2 Log Likelihood: -1928.91363374522
## Iteration 3 Log Likelihood: -1928.35432342101
## Iteration 4 Log Likelihood: -1927.75970499754
## Iteration 5 Log Likelihood: -1927.13587646226
## Iteration 6 Log Likelihood: -1926.57444938173
## Iteration 7 Log Likelihood: -1926.16528693772
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1942.19342830634
## Iteration 2 Log Likelihood: -1685.38418156592
## Iteration 3 Log Likelihood: -1679.1666749898
## Iteration 4 Log Likelihood: -1674.93846798765
## Iteration 5 Log Likelihood: -1673.72051691905
## Iteration 6 Log Likelihood: -1673.10774500507
## Iteration 7 Log Likelihood: -1672.85388245888
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1939.32181695114
## Iteration 2 Log Likelihood: 118.461106596983
## Iteration 3 Log Likelihood: 152.592097802987
## Iteration 4 Log Likelihood: 171.177366440504
## Iteration 5 Log Likelihood: 185.725975857771
## Iteration 6 Log Likelihood: 197.359645398027
## Iteration 7 Log Likelihood: 207.213560471625
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1956.09969167352
## Iteration 2 Log Likelihood: -1946.15063707028
## Iteration 3 Log Likelihood: -1946.15063707028
## Iteration 4 Log Likelihood: -1946.15063707028

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## Iteration 5 Log Likelihood: -1946.15063707028
## Iteration 6 Log Likelihood: -1946.15063707028
## Iteration 7 Log Likelihood: -1946.15063707028
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1954.6907677715
## Iteration 2 Log Likelihood: -1708.55293670221
## Iteration 3 Log Likelihood: -1708.55293670221
## Iteration 4 Log Likelihood: -1708.55293670221
## Iteration 5 Log Likelihood: -1708.55293670221
## Iteration 6 Log Likelihood: -1708.55293670221
## Iteration 7 Log Likelihood: -1708.55293670221
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1951.30038796286
## Iteration 2 Log Likelihood: -21.8483538909857
## Iteration 3 Log Likelihood: -21.8483538909852
## Iteration 4 Log Likelihood: -21.8483538909856
## Iteration 5 Log Likelihood: -21.8483538909847
## Iteration 6 Log Likelihood: -21.8483538909812
## Iteration 7 Log Likelihood: -21.8483538909836
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1959.0058669456
## Iteration 2 Log Likelihood: -1949.02866059997
## Iteration 3 Log Likelihood: -1949.02833479021
## Iteration 4 Log Likelihood: -1949.02800933645
## Iteration 5 Log Likelihood: -1949.02768423584
## Iteration 6 Log Likelihood: -1949.02735948462
## Iteration 7 Log Likelihood: -1949.02703507798
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1957.81935066435
## Iteration 2 Log Likelihood: -1710.94169812438
## Iteration 3 Log Likelihood: -1710.93980813785
## Iteration 4 Log Likelihood: -1710.9379474793
## Iteration 5 Log Likelihood: -1710.93611274371
## Iteration 6 Log Likelihood: -1710.93430037699
## Iteration 7 Log Likelihood: -1710.93250667951
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1954.78110091822
## Iteration 2 Log Likelihood: -10.0956995512791
## Iteration 3 Log Likelihood: -9.34545657518311
## Iteration 4 Log Likelihood: -8.63058700565773
## Iteration 5 Log Likelihood: -8.14656798770317
## Iteration 6 Log Likelihood: -7.87904538595311
## Iteration 7 Log Likelihood: -7.73621201719554
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1914.80084154753
## Iteration 2 Log Likelihood: -1904.85114377586
## Iteration 3 Log Likelihood: -1904.67905543598
## Iteration 4 Log Likelihood: -1904.48514978899
## Iteration 5 Log Likelihood: -1904.26781675654
## Iteration 6 Log Likelihood: -1904.03291827451
## Iteration 7 Log Likelihood: -1903.79311741943
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1910.47516882133
## Iteration 2 Log Likelihood: -1664.40214250618

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## Iteration 3 Log Likelihood: -1659.49251585717
## Iteration 4 Log Likelihood: -1655.91043507998
## Iteration 5 Log Likelihood: -1654.78884340134
## Iteration 6 Log Likelihood: -1654.47969954519
## Iteration 7 Log Likelihood: -1654.38350690318
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1900.97450761518
## Iteration 2 Log Likelihood: 82.5555239413424
## Iteration 3 Log Likelihood: 99.4959418585727
## Iteration 4 Log Likelihood: 117.800479704565
## Iteration 5 Log Likelihood: 122.452857203124
## Iteration 6 Log Likelihood: 124.683580669858
## Iteration 7 Log Likelihood: 125.440840519187
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1956.09969167352
## Iteration 2 Log Likelihood: -1946.15063707028
## Iteration 3 Log Likelihood: -1946.15063707028
## Iteration 4 Log Likelihood: -1946.15063707028
## Iteration 5 Log Likelihood: -1946.15063707028
## Iteration 6 Log Likelihood: -1946.15063707028
## Iteration 7 Log Likelihood: -1946.15063707028
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1954.6907677715
## Iteration 2 Log Likelihood: -1708.55293670221
## Iteration 3 Log Likelihood: -1708.55293670221
## Iteration 4 Log Likelihood: -1708.55293670221
## Iteration 5 Log Likelihood: -1708.55293670221
## Iteration 6 Log Likelihood: -1708.55293670221
## Iteration 7 Log Likelihood: -1708.55293670221
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1951.30038796286
## Iteration 2 Log Likelihood: -21.8483538909817
## Iteration 3 Log Likelihood: -21.8483538909819
## Iteration 4 Log Likelihood: -21.848353890988
## Iteration 5 Log Likelihood: -21.8483538909819
## Iteration 6 Log Likelihood: -21.8483538909859
## Iteration 7 Log Likelihood: -21.8483538909844
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1958.6094686778
## Iteration 2 Log Likelihood: -1948.63187829804
## Iteration 3 Log Likelihood: -1948.63134199904
## Iteration 4 Log Likelihood: -1948.63080328313
## Iteration 5 Log Likelihood: -1948.63026217422
## Iteration 6 Log Likelihood: -1948.6297186967
## Iteration 7 Log Likelihood: -1948.62917287526
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1957.41530178426
## Iteration 2 Log Likelihood: -1710.51140817097
## Iteration 3 Log Likelihood: -1710.50793959223
## Iteration 4 Log Likelihood: -1710.50445760107
## Iteration 5 Log Likelihood: -1710.50095594007
## Iteration 6 Log Likelihood: -1710.49742817586
## Iteration 7 Log Likelihood: -1710.49386772492
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1954.36402368776
## Iteration 2 Log Likelihood: -9.30007030301529
## Iteration 3 Log Likelihood: -8.65063598354978
## Iteration 4 Log Likelihood: -7.97307161425559
## Iteration 5 Log Likelihood: -7.38692789669464
## Iteration 6 Log Likelihood: -6.95637037705016
## Iteration 7 Log Likelihood: -6.66053455487799
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1895.03320397036
## Iteration 2 Log Likelihood: -1885.13507546109
## Iteration 3 Log Likelihood: -1884.93815214909
## Iteration 4 Log Likelihood: -1884.74647712247
## Iteration 5 Log Likelihood: -1884.56260823806
## Iteration 6 Log Likelihood: -1884.39123392502
## Iteration 7 Log Likelihood: -1884.2369150491
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1887.1624343538
## Iteration 2 Log Likelihood: -1641.49556123117
## Iteration 3 Log Likelihood: -1638.41499518726
## Iteration 4 Log Likelihood: -1637.06602514142
## Iteration 5 Log Likelihood: -1636.45012107227
## Iteration 6 Log Likelihood: -1636.06704871912
## Iteration 7 Log Likelihood: -1635.7631220084
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1870.85867351269
## Iteration 2 Log Likelihood: 159.305444179684
## Iteration 3 Log Likelihood: 174.472334669628
## Iteration 4 Log Likelihood: 218.501696074211
## Iteration 5 Log Likelihood: 230.748192372256
## Iteration 6 Log Likelihood: 231.86180434984
## Iteration 7 Log Likelihood: 232.845087863525
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1990.18699722603
## Iteration 2 Log Likelihood: -1980.2628163163
## Iteration 3 Log Likelihood: -1980.2628163163
## Iteration 4 Log Likelihood: -1980.2628163163
## Iteration 5 Log Likelihood: -1980.2628163163
## Iteration 6 Log Likelihood: -1980.2628163163
## Iteration 7 Log Likelihood: -1980.2628163163
## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1989.33543631746
## Iteration 2 Log Likelihood: -1746.02123170844
## Iteration 3 Log Likelihood: -1746.02123170844
## Iteration 4 Log Likelihood: -1746.02123170844
## Iteration 5 Log Likelihood: -1746.02123170844
## Iteration 6 Log Likelihood: -1746.02123170844
## Iteration 7 Log Likelihood: -1746.02123170844
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1987.2829120405
## Iteration 2 Log Likelihood: -72.7867796172875
## Iteration 3 Log Likelihood: -72.7867796172829
## Iteration 4 Log Likelihood: -72.7867796172837

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## Iteration 5 Log Likelihood: -72.7867796172816
## Iteration 6 Log Likelihood: -72.7867796172791
## Iteration 7 Log Likelihood: -72.786779617284
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1994.48811891121
## Iteration 2 Log Likelihood: -1984.5681210401
## Iteration 3 Log Likelihood: -1984.56732693634
## Iteration 4 Log Likelihood: -1984.56653177192
## Iteration 5 Log Likelihood: -1984.56573562561
## Iteration 6 Log Likelihood: -1984.56493856084
## Iteration 7 Log Likelihood: -1984.5641406341
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1993.75027812411
## Iteration 2 Log Likelihood: -1750.22190496427
## Iteration 3 Log Likelihood: -1750.2187125462
## Iteration 4 Log Likelihood: -1750.21553222209
## Iteration 5 Log Likelihood: -1750.21235640407
## Iteration 6 Log Likelihood: -1750.20917689905
## Iteration 7 Log Likelihood: -1750.20598427487
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1991.61896692704
## Iteration 2 Log Likelihood: -68.1351685714105
## Iteration 3 Log Likelihood: -67.8384776634412
## Iteration 4 Log Likelihood: -67.4915693743997
## Iteration 5 Log Likelihood: -67.1005512602478
## Iteration 6 Log Likelihood: -66.6854790726368
## Iteration 7 Log Likelihood: -66.2812190180394
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1963.44230103667
## Iteration 2 Log Likelihood: -1953.06368612083
## Iteration 3 Log Likelihood: -1952.76689929842
## Iteration 4 Log Likelihood: -1952.36140691651
## Iteration 5 Log Likelihood: -1951.81030716023
## Iteration 6 Log Likelihood: -1951.16558808937
## Iteration 7 Log Likelihood: -1950.58025590071
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1962.77110381135
## Iteration 2 Log Likelihood: -1716.28676060367
## Iteration 3 Log Likelihood: -1709.78850296892
## Iteration 4 Log Likelihood: -1705.75212725483
## Iteration 5 Log Likelihood: -1704.90404650105
## Iteration 6 Log Likelihood: -1704.44867731672
## Iteration 7 Log Likelihood: -1704.06054110008
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1956.02312711235
## Iteration 2 Log Likelihood: 28.6645462859907
## Iteration 3 Log Likelihood: 99.8370828093432
## Iteration 4 Log Likelihood: 106.19115709232
## Iteration 5 Log Likelihood: 106.401052390223
## Iteration 6 Log Likelihood: 106.427055576536
## Iteration 7 Log Likelihood: 106.431639259267

## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1990.18699722603
## Iteration 2 Log Likelihood: -1980.2628163163
## Iteration 3 Log Likelihood: -1980.2628163163
## Iteration 4 Log Likelihood: -1980.2628163163
## Iteration 5 Log Likelihood: -1980.2628163163
## Iteration 6 Log Likelihood: -1980.2628163163
## Iteration 7 Log Likelihood: -1980.2628163163
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1989.33543631746
## Iteration 2 Log Likelihood: -1746.02123170844
## Iteration 3 Log Likelihood: -1746.02123170844
## Iteration 4 Log Likelihood: -1746.02123170844
## Iteration 5 Log Likelihood: -1746.02123170844
## Iteration 6 Log Likelihood: -1746.02123170844
## Iteration 7 Log Likelihood: -1746.02123170844
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1987.2829120405
## Iteration 2 Log Likelihood: -72.7867796172805
## Iteration 3 Log Likelihood: -72.7867796172794
## Iteration 4 Log Likelihood: -72.786779617282
## Iteration 5 Log Likelihood: -72.7867796172813
## Iteration 6 Log Likelihood: -72.7867796172811
## Iteration 7 Log Likelihood: -72.7867796172841
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1994.392697395
## Iteration 2 Log Likelihood: -1984.46604069407
## Iteration 3 Log Likelihood: -1984.46519522359
## Iteration 4 Log Likelihood: -1984.46434047911
## Iteration 5 Log Likelihood: -1984.46347639533
## Iteration 6 Log Likelihood: -1984.46260301438
## Iteration 7 Log Likelihood: -1984.46172038173
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1993.70301635565
## Iteration 2 Log Likelihood: -1750.13878518677
## Iteration 3 Log Likelihood: -1750.13403888018
## Iteration 4 Log Likelihood: -1750.12924440127
## Iteration 5 Log Likelihood: -1750.12437773779
## Iteration 6 Log Likelihood: -1750.11943635995
## Iteration 7 Log Likelihood: -1750.11441712936
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1991.41580642562
## Iteration 2 Log Likelihood: -68.0706469826678
## Iteration 3 Log Likelihood: -67.7643281077452
## Iteration 4 Log Likelihood: -67.4062858941756
## Iteration 5 Log Likelihood: -67.0019836630671
## Iteration 6 Log Likelihood: -66.5708004258724
## Iteration 7 Log Likelihood: -66.1476702400171
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1951.9009040487
## Iteration 2 Log Likelihood: -1941.35371756045
## Iteration 3 Log Likelihood: -1940.96325527242
## Iteration 4 Log Likelihood: -1940.47240927782
## Iteration 5 Log Likelihood: -1939.86042626558
## Iteration 6 Log Likelihood: -1939.20051414567

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## Iteration 7 Log Likelihood: -1938.64013000228
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1950.96140627595
## Iteration 2 Log Likelihood: -1703.88224989381
## Iteration 3 Log Likelihood: -1696.3074217161
## Iteration 4 Log Likelihood: -1692.19231112335
## Iteration 5 Log Likelihood: -1691.38066402618
## Iteration 6 Log Likelihood: -1691.01592581294
## Iteration 7 Log Likelihood: -1690.79772824594
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1940.69880742231
## Iteration 2 Log Likelihood: 70.147633134026
## Iteration 3 Log Likelihood: 132.876309250204
## Iteration 4 Log Likelihood: 151.803261902315
## Iteration 5 Log Likelihood: 154.78729135086
## Iteration 6 Log Likelihood: 158.191873655454
## Iteration 7 Log Likelihood: 171.81453511722
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1976.37972715299
## Iteration 2 Log Likelihood: -1966.34982100139
## Iteration 3 Log Likelihood: -1966.34982100139
## Iteration 4 Log Likelihood: -1966.34982100139
## Iteration 5 Log Likelihood: -1966.34982100139
## Iteration 6 Log Likelihood: -1966.34982100139
## Iteration 7 Log Likelihood: -1966.34982100139
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1974.96779831607
## Iteration 2 Log Likelihood: -1729.23574102129
## Iteration 3 Log Likelihood: -1729.23574102129
## Iteration 4 Log Likelihood: -1729.23574102129
## Iteration 5 Log Likelihood: -1729.23574102128
## Iteration 6 Log Likelihood: -1729.23574102128
## Iteration 7 Log Likelihood: -1729.23574102128
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1971.56853295083
## Iteration 2 Log Likelihood: -65.4317434197339
## Iteration 3 Log Likelihood: -65.4317434197326
## Iteration 4 Log Likelihood: -65.431743419733
## Iteration 5 Log Likelihood: -65.4317434197299
## Iteration 6 Log Likelihood: -65.4317434197306
## Iteration 7 Log Likelihood: -65.4317434197314
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1982.39424004113
## Iteration 2 Log Likelihood: -1972.32644702577
## Iteration 3 Log Likelihood: -1972.32538939524
## Iteration 4 Log Likelihood: -1972.32433958438
## Iteration 5 Log Likelihood: -1972.32329791903
## Iteration 6 Log Likelihood: -1972.3222647101
## Iteration 7 Log Likelihood: -1972.32124024719
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1981.17608579843
## Iteration 2 Log Likelihood: -1735.00667886992
## Iteration 3 Log Likelihood: -1735.00294485454
## Iteration 4 Log Likelihood: -1734.99942097944

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## Iteration 5 Log Likelihood: -1734.99609876252
## Iteration 6 Log Likelihood: -1734.99296983007
## Iteration 7 Log Likelihood: -1734.99002509201
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1977.74026079496
## Iteration 2 Log Likelihood: -61.1857801228055
## Iteration 3 Log Likelihood: -61.0316064658308
## Iteration 4 Log Likelihood: -60.9157855086851
## Iteration 5 Log Likelihood: -60.8275489000878
## Iteration 6 Log Likelihood: -60.7571248010947
## Iteration 7 Log Likelihood: -60.695946775231
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1959.549628297
## Iteration 2 Log Likelihood: -1948.18302329984
## Iteration 3 Log Likelihood: -1947.54664858952
## Iteration 4 Log Likelihood: -1946.83048530801
## Iteration 5 Log Likelihood: -1945.88569972265
## Iteration 6 Log Likelihood: -1944.87791007521
## Iteration 7 Log Likelihood: -1944.16613451728
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1965.04837825513
## Iteration 2 Log Likelihood: -1710.75638477101
## Iteration 3 Log Likelihood: -1708.50773697975
## Iteration 4 Log Likelihood: -1701.16210579288
## Iteration 5 Log Likelihood: -1697.71916183905
## Iteration 6 Log Likelihood: -1697.07242609666
## Iteration 7 Log Likelihood: -1696.32158689565
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1965.75420823352
## Iteration 2 Log Likelihood: 41.2444976792338
## Iteration 3 Log Likelihood: 82.3647913251673
## Iteration 4 Log Likelihood: 108.202450922312
## Iteration 5 Log Likelihood: 113.410787871385
## Iteration 6 Log Likelihood: 114.320403079906
## Iteration 7 Log Likelihood: 114.52645804201
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1976.37972715299
## Iteration 2 Log Likelihood: -1966.34982100139
## Iteration 3 Log Likelihood: -1966.34982100139
## Iteration 4 Log Likelihood: -1966.34982100139
## Iteration 5 Log Likelihood: -1966.34982100139
## Iteration 6 Log Likelihood: -1966.34982100139
## Iteration 7 Log Likelihood: -1966.34982100139
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1974.96779831607
## Iteration 2 Log Likelihood: -1729.23574102128
## Iteration 3 Log Likelihood: -1729.23574102129
## Iteration 4 Log Likelihood: -1729.23574102129
## Iteration 5 Log Likelihood: -1729.23574102129
## Iteration 6 Log Likelihood: -1729.23574102129
## Iteration 7 Log Likelihood: -1729.23574102129
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1971.56853295083
## Iteration 2 Log Likelihood: -65.4317434197309

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## Iteration 3 Log Likelihood: -65.4317434197335
## Iteration 4 Log Likelihood: -65.4317434197318
## Iteration 5 Log Likelihood: -65.4317434197336
## Iteration 6 Log Likelihood: -65.431743419736
## Iteration 7 Log Likelihood: -65.4317434197308
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1982.1022093854
## Iteration 2 Log Likelihood: -1972.03523340782
## Iteration 3 Log Likelihood: -1972.03361009864
## Iteration 4 Log Likelihood: -1972.0319740341
## Iteration 5 Log Likelihood: -1972.03032563796
## Iteration 6 Log Likelihood: -1972.02866534368
## Iteration 7 Log Likelihood: -1972.0269935864
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1980.91523409073
## Iteration 2 Log Likelihood: -1734.71421223421
## Iteration 3 Log Likelihood: -1734.70829255639
## Iteration 4 Log Likelihood: -1734.70259413463
## Iteration 5 Log Likelihood: -1734.69710620209
## Iteration 6 Log Likelihood: -1734.69181646421
## Iteration 7 Log Likelihood: -1734.68671032474
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1977.50524738601
## Iteration 2 Log Likelihood: -60.7846777782064
## Iteration 3 Log Likelihood: -60.5773909524831
## Iteration 4 Log Likelihood: -60.4059352361793
## Iteration 5 Log Likelihood: -60.2601350308337
## Iteration 6 Log Likelihood: -60.130389085722
## Iteration 7 Log Likelihood: -60.0068435666324
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1951.44507091507
## Iteration 2 Log Likelihood: -1939.51424111239
## Iteration 3 Log Likelihood: -1938.12624341056
## Iteration 4 Log Likelihood: -1936.98146294429
## Iteration 5 Log Likelihood: -1936.26213564198
## Iteration 6 Log Likelihood: -1935.90496757872
## Iteration 7 Log Likelihood: -1935.74704942775
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1956.82572588087
## Iteration 2 Log Likelihood: -1697.6507345584
## Iteration 3 Log Likelihood: -1688.57988083706
## Iteration 4 Log Likelihood: -1687.2532764205
## Iteration 5 Log Likelihood: -1686.99373292671
## Iteration 6 Log Likelihood: -1686.74926138874
## Iteration 7 Log Likelihood: -1686.48592325335
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1957.0415058142
## Iteration 2 Log Likelihood: 74.7392843457721
## Iteration 3 Log Likelihood: 140.182569242955
## Iteration 4 Log Likelihood: 178.743863780746
## Iteration 5 Log Likelihood: 185.90014797243
## Iteration 6 Log Likelihood: 187.118733561431
## Iteration 7 Log Likelihood: 187.426854590646
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1986.86805012546
## Iteration 2 Log Likelihood: -1976.82699849016
## Iteration 3 Log Likelihood: -1976.82699849016
## Iteration 4 Log Likelihood: -1976.82699849016
## Iteration 5 Log Likelihood: -1976.82699849016
## Iteration 6 Log Likelihood: -1976.82699849016
## Iteration 7 Log Likelihood: -1976.82699849016
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1986.25885300394
## Iteration 2 Log Likelihood: -1739.59118256955
## Iteration 3 Log Likelihood: -1739.59118256955
## Iteration 4 Log Likelihood: -1739.59118256955
## Iteration 5 Log Likelihood: -1739.59118256955
## Iteration 6 Log Likelihood: -1739.59118256955
## Iteration 7 Log Likelihood: -1739.59118256955
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1984.80914964847
## Iteration 2 Log Likelihood: -62.6847519720189
## Iteration 3 Log Likelihood: -62.6847519720179
## Iteration 4 Log Likelihood: -62.684751972018
## Iteration 5 Log Likelihood: -62.684751972014
## Iteration 6 Log Likelihood: -62.6847519720187
## Iteration 7 Log Likelihood: -62.6847519720178
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2000.67737159853
## Iteration 2 Log Likelihood: -1990.59441370378
## Iteration 3 Log Likelihood: -1990.59254807754
## Iteration 4 Log Likelihood: -1990.59067208444
## Iteration 5 Log Likelihood: -1990.58878516198
## Iteration 6 Log Likelihood: -1990.58688672111
## Iteration 7 Log Likelihood: -1990.5849761482
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2000.20577360446
## Iteration 2 Log Likelihood: -1752.93496586513
## Iteration 3 Log Likelihood: -1752.93075360235
## Iteration 4 Log Likelihood: -1752.92646063182
## Iteration 5 Log Likelihood: -1752.92205115947
## Iteration 6 Log Likelihood: -1752.91748699095
## Iteration 7 Log Likelihood: -1752.91272733613
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1998.81212990835
## Iteration 2 Log Likelihood: -65.7665367729221
## Iteration 3 Log Likelihood: -65.5304816758796
## Iteration 4 Log Likelihood: -65.2225619509339
## Iteration 5 Log Likelihood: -64.830545763992
## Iteration 6 Log Likelihood: -64.3797504897684
## Iteration 7 Log Likelihood: -63.9424073773758
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1957.36429455598
## Iteration 2 Log Likelihood: -1945.99308002396
## Iteration 3 Log Likelihood: -1944.65354483557
## Iteration 4 Log Likelihood: -1943.31586622629
## Iteration 5 Log Likelihood: -1942.45606230857
## Iteration 6 Log Likelihood: -1942.07364058056

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## Iteration 7 Log Likelihood: -1941.9289095974
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1961.02436562788
## Iteration 2 Log Likelihood: -1704.91096770369
## Iteration 3 Log Likelihood: -1692.52194644128
## Iteration 4 Log Likelihood: -1690.71553980171
## Iteration 5 Log Likelihood: -1690.57236457195
## Iteration 6 Log Likelihood: -1690.54261133738
## Iteration 7 Log Likelihood: -1690.52470925477
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1962.71865819804
## Iteration 2 Log Likelihood: 48.5982557905912
## Iteration 3 Log Likelihood: 102.768047686274
## Iteration 4 Log Likelihood: 113.871581042262
## Iteration 5 Log Likelihood: 115.068649622537
## Iteration 6 Log Likelihood: 115.380926390583
## Iteration 7 Log Likelihood: 115.501017605323
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1986.86805012546
## Iteration 2 Log Likelihood: -1976.82699849016
## Iteration 3 Log Likelihood: -1976.82699849016
## Iteration 4 Log Likelihood: -1976.82699849016
## Iteration 5 Log Likelihood: -1976.82699849016
## Iteration 6 Log Likelihood: -1976.82699849016
## Iteration 7 Log Likelihood: -1976.82699849016
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1986.25885300394
## Iteration 2 Log Likelihood: -1739.59118256955
## Iteration 3 Log Likelihood: -1739.59118256955
## Iteration 4 Log Likelihood: -1739.59118256955
## Iteration 5 Log Likelihood: -1739.59118256955
## Iteration 6 Log Likelihood: -1739.59118256955
## Iteration 7 Log Likelihood: -1739.59118256955
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1984.80914964847
## Iteration 2 Log Likelihood: -62.6847519720188
## Iteration 3 Log Likelihood: -62.6847519720179
## Iteration 4 Log Likelihood: -62.6847519720216
## Iteration 5 Log Likelihood: -62.6847519720189
## Iteration 6 Log Likelihood: -62.6847519720191
## Iteration 7 Log Likelihood: -62.6847519720177
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2000.1514339991
## Iteration 2 Log Likelihood: -1990.07585412218
## Iteration 3 Log Likelihood: -1990.07250194777
## Iteration 4 Log Likelihood: -1990.06912837316
## Iteration 5 Log Likelihood: -1990.06573582327
## Iteration 6 Log Likelihood: -1990.06232681319
## Iteration 7 Log Likelihood: -1990.05890394023
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1999.55713793528
## Iteration 2 Log Likelihood: -1752.37361488237
## Iteration 3 Log Likelihood: -1752.36325466341
## Iteration 4 Log Likelihood: -1752.35246742933

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## Iteration 5 Log Likelihood: -1752.3411831999
## Iteration 6 Log Likelihood: -1752.32933441666
## Iteration 7 Log Likelihood: -1752.31685757129
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1998.01689576414
## Iteration 2 Log Likelihood: -64.869705662586
## Iteration 3 Log Likelihood: -64.4889656534135
## Iteration 4 Log Likelihood: -64.1228324712606
## Iteration 5 Log Likelihood: -63.7620606459282
## Iteration 6 Log Likelihood: -63.3806494133152
## Iteration 7 Log Likelihood: -62.9615647555573
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1943.40408216119
## Iteration 2 Log Likelihood: -1931.67387365288
## Iteration 3 Log Likelihood: -1930.24729284922
## Iteration 4 Log Likelihood: -1929.37617084978
## Iteration 5 Log Likelihood: -1928.98290056509
## Iteration 6 Log Likelihood: -1928.82400066968
## Iteration 7 Log Likelihood: -1928.75751430756
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1944.21247833922
## Iteration 2 Log Likelihood: -1685.28697689903
## Iteration 3 Log Likelihood: -1679.19624197703
## Iteration 4 Log Likelihood: -1677.66705095449
## Iteration 5 Log Likelihood: -1677.27756822528
## Iteration 6 Log Likelihood: -1677.1493839893
## Iteration 7 Log Likelihood: -1677.05490345972
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1942.0988143969
## Iteration 2 Log Likelihood: 117.948731275084
## Iteration 3 Log Likelihood: 177.57049102389
## Iteration 4 Log Likelihood: 189.75585437822
## Iteration 5 Log Likelihood: 194.436772625371
## Iteration 6 Log Likelihood: 195.564002798749
## Iteration 7 Log Likelihood: 195.897761514381
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1916.71303016951
## Iteration 2 Log Likelihood: -1906.70477799307
## Iteration 3 Log Likelihood: -1906.70477799307
## Iteration 4 Log Likelihood: -1906.70477799307
## Iteration 5 Log Likelihood: -1906.70477799307
## Iteration 6 Log Likelihood: -1906.70477799307
## Iteration 7 Log Likelihood: -1906.70477799307
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1914.74271734255
## Iteration 2 Log Likelihood: -1670.33782600196
## Iteration 3 Log Likelihood: -1670.33782600196
## Iteration 4 Log Likelihood: -1670.33782600197
## Iteration 5 Log Likelihood: -1670.33782600196
## Iteration 6 Log Likelihood: -1670.33782600196
## Iteration 7 Log Likelihood: -1670.33782600196
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1910.01587914604
## Iteration 2 Log Likelihood: -43.0113734002249

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## Iteration 3 Log Likelihood: -43.0113734002262
## Iteration 4 Log Likelihood: -43.0113734002267
## Iteration 5 Log Likelihood: -43.0113734002284
## Iteration 6 Log Likelihood: -43.0113734002285
## Iteration 7 Log Likelihood: -43.011373400226
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1926.30756081632
## Iteration 2 Log Likelihood: -1916.25416998518
## Iteration 3 Log Likelihood: -1916.25346280695
## Iteration 4 Log Likelihood: -1916.25275907522
## Iteration 5 Log Likelihood: -1916.25205882006
## Iteration 6 Log Likelihood: -1916.25136206575
## Iteration 7 Log Likelihood: -1916.25066882794
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1924.4044336234
## Iteration 2 Log Likelihood: -1679.46656936814
## Iteration 3 Log Likelihood: -1679.46410222726
## Iteration 4 Log Likelihood: -1679.46167816329
## Iteration 5 Log Likelihood: -1679.45928719673
## Iteration 6 Log Likelihood: -1679.45691908854
## Iteration 7 Log Likelihood: -1679.45456320532
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1919.51831337817
## Iteration 2 Log Likelihood: -41.4923232236503
## Iteration 3 Log Likelihood: -41.0995353692168
## Iteration 4 Log Likelihood: -40.6700620774156
## Iteration 5 Log Likelihood: -40.2495925188511
## Iteration 6 Log Likelihood: -39.8810916308384
## Iteration 7 Log Likelihood: -39.5857032152554
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1897.29141880732
## Iteration 2 Log Likelihood: -1886.56046909039
## Iteration 3 Log Likelihood: -1886.08064814344
## Iteration 4 Log Likelihood: -1885.50748999714
## Iteration 5 Log Likelihood: -1884.84989281052
## Iteration 6 Log Likelihood: -1884.21684696626
## Iteration 7 Log Likelihood: -1883.73979766817
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1897.08364097412
## Iteration 2 Log Likelihood: -1647.6166674555
## Iteration 3 Log Likelihood: -1639.96591167371
## Iteration 4 Log Likelihood: -1636.65558519778
## Iteration 5 Log Likelihood: -1636.09871200905
## Iteration 6 Log Likelihood: -1635.77392679454
## Iteration 7 Log Likelihood: -1635.49871233384
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1890.66225011447
## Iteration 2 Log Likelihood: 36.9879947216545
## Iteration 3 Log Likelihood: 62.2367179936739
## Iteration 4 Log Likelihood: 80.0728772380198
## Iteration 5 Log Likelihood: 106.369197701275
## Iteration 6 Log Likelihood: 122.182393291426
## Iteration 7 Log Likelihood: 127.03760297811
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1916.71303016951
## Iteration 2 Log Likelihood: -1906.70477799307
## Iteration 3 Log Likelihood: -1906.70477799307
## Iteration 4 Log Likelihood: -1906.70477799307
## Iteration 5 Log Likelihood: -1906.70477799307
## Iteration 6 Log Likelihood: -1906.70477799307
## Iteration 7 Log Likelihood: -1906.70477799307
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1914.74271734255
## Iteration 2 Log Likelihood: -1670.33782600196
## Iteration 3 Log Likelihood: -1670.33782600196
## Iteration 4 Log Likelihood: -1670.33782600196
## Iteration 5 Log Likelihood: -1670.33782600196
## Iteration 6 Log Likelihood: -1670.33782600196
## Iteration 7 Log Likelihood: -1670.33782600197
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1910.01587914604
## Iteration 2 Log Likelihood: -43.0113734002271
## Iteration 3 Log Likelihood: -43.011373400226
## Iteration 4 Log Likelihood: -43.0113734002266
## Iteration 5 Log Likelihood: -43.0113734002282
## Iteration 6 Log Likelihood: -43.0113734002285
## Iteration 7 Log Likelihood: -43.0113734002285
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1926.04106858586
## Iteration 2 Log Likelihood: -1915.98876161721
## Iteration 3 Log Likelihood: -1915.98750630251
## Iteration 4 Log Likelihood: -1915.98624241952
## Iteration 5 Log Likelihood: -1915.98497017842
## Iteration 6 Log Likelihood: -1915.98368979588
## Iteration 7 Log Likelihood: -1915.98240149219
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1924.14808939945
## Iteration 2 Log Likelihood: -1679.18930165597
## Iteration 3 Log Likelihood: -1679.18317820866
## Iteration 4 Log Likelihood: -1679.17701097271
## Iteration 5 Log Likelihood: -1679.17077507051
## Iteration 6 Log Likelihood: -1679.16444494591
## Iteration 7 Log Likelihood: -1679.15799405196
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1919.25463306955
## Iteration 2 Log Likelihood: -41.4366804474615
## Iteration 3 Log Likelihood: -41.0469199299218
## Iteration 4 Log Likelihood: -40.6002771874961
## Iteration 5 Log Likelihood: -40.1389413129008
## Iteration 6 Log Likelihood: -39.7137968860719
## Iteration 7 Log Likelihood: -39.3530495143478
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1888.39199016937
## Iteration 2 Log Likelihood: -1877.20949846576
## Iteration 3 Log Likelihood: -1876.24836680322
## Iteration 4 Log Likelihood: -1875.5398245352
## Iteration 5 Log Likelihood: -1875.10835031434
## Iteration 6 Log Likelihood: -1874.87394968372

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## Iteration 7 Log Likelihood: -1874.75199030683
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1885.9778359903
## Iteration 2 Log Likelihood: -1632.12345284123
## Iteration 3 Log Likelihood: -1628.31244957165
## Iteration 4 Log Likelihood: -1627.55464010902
## Iteration 5 Log Likelihood: -1627.1890952314
## Iteration 6 Log Likelihood: -1626.90692393905
## Iteration 7 Log Likelihood: -1626.6415668781
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1874.67022547389
## Iteration 2 Log Likelihood: 117.611750347614
## Iteration 3 Log Likelihood: 144.913011612657
## Iteration 4 Log Likelihood: 159.421917347128
## Iteration 5 Log Likelihood: 167.544618303438
## Iteration 6 Log Likelihood: 178.389663832885
## Iteration 7 Log Likelihood: 184.458879157776
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1990.90623098239
## Iteration 2 Log Likelihood: -1980.57303393419
## Iteration 3 Log Likelihood: -1980.57303393419
## Iteration 4 Log Likelihood: -1980.57303393419
## Iteration 5 Log Likelihood: -1980.57303393419
## Iteration 6 Log Likelihood: -1980.57303393419
## Iteration 7 Log Likelihood: -1980.57303393419
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1989.84072921013
## Iteration 2 Log Likelihood: -1735.95440641169
## Iteration 3 Log Likelihood: -1735.95440641169
## Iteration 4 Log Likelihood: -1735.95440641169
## Iteration 5 Log Likelihood: -1735.95440641169
## Iteration 6 Log Likelihood: -1735.95440641169
## Iteration 7 Log Likelihood: -1735.95440641169
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1987.29929632025
## Iteration 2 Log Likelihood: 38.9977582155447
## Iteration 3 Log Likelihood: 38.9977582155491
## Iteration 4 Log Likelihood: 38.9977582155482
## Iteration 5 Log Likelihood: 38.9977582155489
## Iteration 6 Log Likelihood: 38.9977582155486
## Iteration 7 Log Likelihood: 38.9977582155571
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2002.03571027954
## Iteration 2 Log Likelihood: -1991.66387516554
## Iteration 3 Log Likelihood: -1991.66281976869
## Iteration 4 Log Likelihood: -1991.66176923745
## Iteration 5 Log Likelihood: -1991.66072376847
## Iteration 6 Log Likelihood: -1991.65968353795
## Iteration 7 Log Likelihood: -1991.6586487022
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2001.17815450212
## Iteration 2 Log Likelihood: -1746.75147792974
## Iteration 3 Log Likelihood: -1746.74683092892
## Iteration 4 Log Likelihood: -1746.74226648901

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## Iteration 5 Log Likelihood: -1746.73776495731
## Iteration 6 Log Likelihood: -1746.73330532022
## Iteration 7 Log Likelihood: -1746.7288653016
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1998.71470729404
## Iteration 2 Log Likelihood: 39.2936843092236
## Iteration 3 Log Likelihood: 39.8943502864775
## Iteration 4 Log Likelihood: 40.446742179571
## Iteration 5 Log Likelihood: 40.7964230696927
## Iteration 6 Log Likelihood: 40.9854806873705
## Iteration 7 Log Likelihood: 41.0998499039431
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1968.82525176629
## Iteration 2 Log Likelihood: -1958.01966476291
## Iteration 3 Log Likelihood: -1957.76783028243
## Iteration 4 Log Likelihood: -1957.47537817345
## Iteration 5 Log Likelihood: -1957.12858328519
## Iteration 6 Log Likelihood: -1956.72732976974
## Iteration 7 Log Likelihood: -1956.30093341256
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1969.89720264229
## Iteration 2 Log Likelihood: -1712.82703967719
## Iteration 3 Log Likelihood: -1708.65786189997
## Iteration 4 Log Likelihood: -1704.45381408232
## Iteration 5 Log Likelihood: -1703.65469154482
## Iteration 6 Log Likelihood: -1703.5481071131
## Iteration 7 Log Likelihood: -1703.49679750843
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1965.39764957425
## Iteration 2 Log Likelihood: 156.593505513897
## Iteration 3 Log Likelihood: 189.457616643802
## Iteration 4 Log Likelihood: 191.81061814614
## Iteration 5 Log Likelihood: 192.887953639839
## Iteration 6 Log Likelihood: 193.495905052749
## Iteration 7 Log Likelihood: 193.887020186658
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1990.90623098239
## Iteration 2 Log Likelihood: -1980.57303393419
## Iteration 3 Log Likelihood: -1980.57303393419
## Iteration 4 Log Likelihood: -1980.57303393419
## Iteration 5 Log Likelihood: -1980.57303393419
## Iteration 6 Log Likelihood: -1980.57303393419
## Iteration 7 Log Likelihood: -1980.57303393419
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1989.84072921013
## Iteration 2 Log Likelihood: -1735.95440641169
## Iteration 3 Log Likelihood: -1735.95440641169
## Iteration 4 Log Likelihood: -1735.95440641169
## Iteration 5 Log Likelihood: -1735.95440641169
## Iteration 6 Log Likelihood: -1735.95440641169
## Iteration 7 Log Likelihood: -1735.95440641169
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1987.29929632025
## Iteration 2 Log Likelihood: 38.9977582155485

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## Iteration 3 Log Likelihood: 38.9977582155472
## Iteration 4 Log Likelihood: 38.9977582155513
## Iteration 5 Log Likelihood: 38.9977582155489
## Iteration 6 Log Likelihood: 38.9977582155519
## Iteration 7 Log Likelihood: 38.9977582155446
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2001.77615102029
## Iteration 2 Log Likelihood: -1991.39928264538
## Iteration 3 Log Likelihood: -1991.39801836876
## Iteration 4 Log Likelihood: -1991.39674993602
## Iteration 5 Log Likelihood: -1991.39547778803
## Iteration 6 Log Likelihood: -1991.39420236197
## Iteration 7 Log Likelihood: -1991.39292408844
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2001.00879155666
## Iteration 2 Log Likelihood: -1746.46728376161
## Iteration 3 Log Likelihood: -1746.46015260344
## Iteration 4 Log Likelihood: -1746.4532165391
## Iteration 5 Log Likelihood: -1746.44645978419
## Iteration 6 Log Likelihood: -1746.4398636102
## Iteration 7 Log Likelihood: -1746.43340646524
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1998.60634884583
## Iteration 2 Log Likelihood: 40.2474908562222
## Iteration 3 Log Likelihood: 41.0825891367552
## Iteration 4 Log Likelihood: 41.8813344249601
## Iteration 5 Log Likelihood: 42.470454115672
## Iteration 6 Log Likelihood: 42.8602394342396
## Iteration 7 Log Likelihood: 43.1191065582139
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1959.56289190539
## Iteration 2 Log Likelihood: -1948.66915326448
## Iteration 3 Log Likelihood: -1948.28056190962
## Iteration 4 Log Likelihood: -1947.84097253581
## Iteration 5 Log Likelihood: -1947.38256146695
## Iteration 6 Log Likelihood: -1946.95413871033
## Iteration 7 Log Likelihood: -1946.60052207629
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1959.27968888441
## Iteration 2 Log Likelihood: -1702.05971384042
## Iteration 3 Log Likelihood: -1697.7946788016
## Iteration 4 Log Likelihood: -1695.20341323619
## Iteration 5 Log Likelihood: -1694.30858038984
## Iteration 6 Log Likelihood: -1693.94723316714
## Iteration 7 Log Likelihood: -1693.72660330623
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1949.18100968837
## Iteration 2 Log Likelihood: 181.283734214336
## Iteration 3 Log Likelihood: 214.946222452101
## Iteration 4 Log Likelihood: 221.18518508527
## Iteration 5 Log Likelihood: 225.060698335218
## Iteration 6 Log Likelihood: 228.471450584046
## Iteration 7 Log Likelihood: 232.464892284779
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1998.89335719567
## Iteration 2 Log Likelihood: -1989.0926220887
## Iteration 3 Log Likelihood: -1989.0926220887
## Iteration 4 Log Likelihood: -1989.0926220887
## Iteration 5 Log Likelihood: -1989.0926220887
## Iteration 6 Log Likelihood: -1989.0926220887
## Iteration 7 Log Likelihood: -1989.0926220887
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1998.38066039478
## Iteration 2 Log Likelihood: -1755.37620036513
## Iteration 3 Log Likelihood: -1755.37620036513
## Iteration 4 Log Likelihood: -1755.37620036513
## Iteration 5 Log Likelihood: -1755.37620036513
## Iteration 6 Log Likelihood: -1755.37620036513
## Iteration 7 Log Likelihood: -1755.37620036513
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1997.15831177418
## Iteration 2 Log Likelihood: -117.432033312773
## Iteration 3 Log Likelihood: -117.432033312771
## Iteration 4 Log Likelihood: -117.432033312778
## Iteration 5 Log Likelihood: -117.432033312776
## Iteration 6 Log Likelihood: -117.432033312779
## Iteration 7 Log Likelihood: -117.432033312777
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2006.25126334902
## Iteration 2 Log Likelihood: -1996.43574613548
## Iteration 3 Log Likelihood: -1996.43542460969
## Iteration 4 Log Likelihood: -1996.43510399713
## Iteration 5 Log Likelihood: -1996.43478430322
## Iteration 6 Log Likelihood: -1996.43446553222
## Iteration 7 Log Likelihood: -1996.43414768735
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2005.86248886698
## Iteration 2 Log Likelihood: -1762.57590955471
## Iteration 3 Log Likelihood: -1762.57384587839
## Iteration 4 Log Likelihood: -1762.57179985303
## Iteration 5 Log Likelihood: -1762.56976856922
## Iteration 6 Log Likelihood: -1762.56774898887
## Iteration 7 Log Likelihood: -1762.56573793583
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2004.75788443099
## Iteration 2 Log Likelihood: -119.003074939666
## Iteration 3 Log Likelihood: -118.468788737049
## Iteration 4 Log Likelihood: -117.709539927813
## Iteration 5 Log Likelihood: -116.881184806527
## Iteration 6 Log Likelihood: -116.166186690664
## Iteration 7 Log Likelihood: -115.668109502313
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1980.45326527115
## Iteration 2 Log Likelihood: -1969.90386105366
## Iteration 3 Log Likelihood: -1969.59972009682
## Iteration 4 Log Likelihood: -1969.29255393839
## Iteration 5 Log Likelihood: -1968.93864187601
## Iteration 6 Log Likelihood: -1968.51927325336

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## Iteration 7 Log Likelihood: -1968.06590989851
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1983.67957066136
## Iteration 2 Log Likelihood: -1734.68876965273
## Iteration 3 Log Likelihood: -1730.72339835047
## Iteration 4 Log Likelihood: -1725.40054913484
## Iteration 5 Log Likelihood: -1722.7175389917
## Iteration 6 Log Likelihood: -1721.10983803959
## Iteration 7 Log Likelihood: -1720.4477395816
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1984.95411264984
## Iteration 2 Log Likelihood: 47.9766506246632
## Iteration 3 Log Likelihood: 71.1723340171121
## Iteration 4 Log Likelihood: 74.3193452165018
## Iteration 5 Log Likelihood: 76.6087538041917
## Iteration 6 Log Likelihood: 82.9679976611606
## Iteration 7 Log Likelihood: 87.4983750642377
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1998.89335719567
## Iteration 2 Log Likelihood: -1989.0926220887
## Iteration 3 Log Likelihood: -1989.0926220887
## Iteration 4 Log Likelihood: -1989.0926220887
## Iteration 5 Log Likelihood: -1989.0926220887
## Iteration 6 Log Likelihood: -1989.0926220887
## Iteration 7 Log Likelihood: -1989.0926220887
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1998.38066039478
## Iteration 2 Log Likelihood: -1755.37620036513
## Iteration 3 Log Likelihood: -1755.37620036513
## Iteration 4 Log Likelihood: -1755.37620036513
## Iteration 5 Log Likelihood: -1755.37620036513
## Iteration 6 Log Likelihood: -1755.37620036513
## Iteration 7 Log Likelihood: -1755.37620036513
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1997.15831177418
## Iteration 2 Log Likelihood: -117.432033312778
## Iteration 3 Log Likelihood: -117.432033312779
## Iteration 4 Log Likelihood: -117.432033312778
## Iteration 5 Log Likelihood: -117.432033312774
## Iteration 6 Log Likelihood: -117.432033312776
## Iteration 7 Log Likelihood: -117.432033312778
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2005.95316468871
## Iteration 2 Log Likelihood: -1996.13359459648
## Iteration 3 Log Likelihood: -1996.13317829492
## Iteration 4 Log Likelihood: -1996.13276084561
## Iteration 5 Log Likelihood: -1996.13234228229
## Iteration 6 Log Likelihood: -1996.13192264098
## Iteration 7 Log Likelihood: -1996.13150195751
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2005.62316671637
## Iteration 2 Log Likelihood: -1762.26758583456
## Iteration 3 Log Likelihood: -1762.26439654119
## Iteration 4 Log Likelihood: -1762.26124552595

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## Iteration 5 Log Likelihood: -1762.25813043518
## Iteration 6 Log Likelihood: -1762.25504874908
## Iteration 7 Log Likelihood: -1762.25199764148
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2004.54848538347
## Iteration 2 Log Likelihood: -118.350347156383
## Iteration 3 Log Likelihood: -117.892230529286
## Iteration 4 Log Likelihood: -117.241109749026
## Iteration 5 Log Likelihood: -116.443760103943
## Iteration 6 Log Likelihood: -115.702119151518
## Iteration 7 Log Likelihood: -115.185904154373
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1972.30740703981
## Iteration 2 Log Likelihood: -1961.53138494446
## Iteration 3 Log Likelihood: -1961.08795530638
## Iteration 4 Log Likelihood: -1960.64925327363
## Iteration 5 Log Likelihood: -1960.18736308217
## Iteration 6 Log Likelihood: -1959.70840411328
## Iteration 7 Log Likelihood: -1959.26309946176
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1976.27916815357
## Iteration 2 Log Likelihood: -1724.93322863094
## Iteration 3 Log Likelihood: -1719.29570458986
## Iteration 4 Log Likelihood: -1714.1439412858
## Iteration 5 Log Likelihood: -1712.2989287577
## Iteration 6 Log Likelihood: -1711.67641528667
## Iteration 7 Log Likelihood: -1711.44082084228
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1976.74802043949
## Iteration 2 Log Likelihood: 80.7643744847157
## Iteration 3 Log Likelihood: 145.769173749537
## Iteration 4 Log Likelihood: 154.110995375164
## Iteration 5 Log Likelihood: 158.8944276095
## Iteration 6 Log Likelihood: 164.144403566321
## Iteration 7 Log Likelihood: 167.958023372682
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1936.12317607714
## Iteration 2 Log Likelihood: -1926.04680564034
## Iteration 3 Log Likelihood: -1926.04680564034
## Iteration 4 Log Likelihood: -1926.04680564034
## Iteration 5 Log Likelihood: -1926.04680564034
## Iteration 6 Log Likelihood: -1926.04680564034
## Iteration 7 Log Likelihood: -1926.04680564034
## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1933.72168169896
## Iteration 2 Log Likelihood: -1688.3869553836
## Iteration 3 Log Likelihood: -1688.3869553836
## Iteration 4 Log Likelihood: -1688.3869553836
## Iteration 5 Log Likelihood: -1688.3869553836
## Iteration 6 Log Likelihood: -1688.3869553836
## Iteration 7 Log Likelihood: -1688.3869553836
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1927.93476765389
## Iteration 2 Log Likelihood: -15.4736372553605
## Iteration 3 Log Likelihood: -15.4736372553587
## Iteration 4 Log Likelihood: -15.4736372553593
## Iteration 5 Log Likelihood: -15.4736372553599
## Iteration 6 Log Likelihood: -15.4736372553577
## Iteration 7 Log Likelihood: -15.4736372553583

## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced

## Initialization by the identity.
## Iteration 1 Log Likelihood: -1946.09336787209
## Iteration 2 Log Likelihood: -1935.96745524433
## Iteration 3 Log Likelihood: -1935.96625667565
## Iteration 4 Log Likelihood: -1935.96506974591
## Iteration 5 Log Likelihood: -1935.96389441198
## Iteration 6 Log Likelihood: -1935.96273060045
## Iteration 7 Log Likelihood: -1935.96157820267

## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced

## Initialization by the identity.
## Iteration 1 Log Likelihood: -1943.77933298134
## Iteration 2 Log Likelihood: -1697.8210770413
## Iteration 3 Log Likelihood: -1697.81836306715
## Iteration 4 Log Likelihood: -1697.81575046226
## Iteration 5 Log Likelihood: -1697.81321617219
## Iteration 6 Log Likelihood: -1697.81073784354
## Iteration 7 Log Likelihood: -1697.80829364802
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1937.84340551719
## Iteration 2 Log Likelihood: -14.9362539395809
## Iteration 3 Log Likelihood: -14.6060744181164
## Iteration 4 Log Likelihood: -14.2977932636345
## Iteration 5 Log Likelihood: -14.0343143004687
## Iteration 6 Log Likelihood: -13.8216083929809
## Iteration 7 Log Likelihood: -13.6535785898254
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1913.06381288182
## Iteration 2 Log Likelihood: -1901.59543119832
## Iteration 3 Log Likelihood: -1900.65409986111
## Iteration 4 Log Likelihood: -1899.2965278279
## Iteration 5 Log Likelihood: -1897.86175931296
## Iteration 6 Log Likelihood: -1897.0391766531
## Iteration 7 Log Likelihood: -1896.75208712547
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1915.97740569959
## Iteration 2 Log Likelihood: -1662.61280742008
## Iteration 3 Log Likelihood: -1651.58878578035
## Iteration 4 Log Likelihood: -1642.42452729296
## Iteration 5 Log Likelihood: -1641.01406343061
## Iteration 6 Log Likelihood: -1640.61006092994
## Iteration 7 Log Likelihood: -1640.44334756046
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1913.81587909269
## Iteration 2 Log Likelihood: 103.610529423059

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## Iteration 3 Log Likelihood: 124.514272319794
## Iteration 4 Log Likelihood: 149.171478796641
## Iteration 5 Log Likelihood: 160.865779022684
## Iteration 6 Log Likelihood: 164.926635113441
## Iteration 7 Log Likelihood: 169.454892893493
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1936.12317607714
## Iteration 2 Log Likelihood: -1926.04680564034
## Iteration 3 Log Likelihood: -1926.04680564034
## Iteration 4 Log Likelihood: -1926.04680564034
## Iteration 5 Log Likelihood: -1926.04680564034
## Iteration 6 Log Likelihood: -1926.04680564034
## Iteration 7 Log Likelihood: -1926.04680564034
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1933.72168169896
## Iteration 2 Log Likelihood: -1688.3869553836
## Iteration 3 Log Likelihood: -1688.3869553836
## Iteration 4 Log Likelihood: -1688.3869553836
## Iteration 5 Log Likelihood: -1688.3869553836
## Iteration 6 Log Likelihood: -1688.3869553836
## Iteration 7 Log Likelihood: -1688.3869553836
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1927.93476765389
## Iteration 2 Log Likelihood: -15.4736372553602
## Iteration 3 Log Likelihood: -15.4736372553597
## Iteration 4 Log Likelihood: -15.4736372553589
## Iteration 5 Log Likelihood: -15.4736372553592
## Iteration 6 Log Likelihood: -15.473637255363
## Iteration 7 Log Likelihood: -15.4736372553564
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1945.815211577
## Iteration 2 Log Likelihood: -1935.6926088315
## Iteration 3 Log Likelihood: -1935.69051394599
## Iteration 4 Log Likelihood: -1935.68841609479
## Iteration 5 Log Likelihood: -1935.6863159621
## Iteration 6 Log Likelihood: -1935.6842142178
## Iteration 7 Log Likelihood: -1935.68211150975
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1943.47466107656
## Iteration 2 Log Likelihood: -1697.52331968094
## Iteration 3 Log Likelihood: -1697.51761999377
## Iteration 4 Log Likelihood: -1697.51198452128
## Iteration 5 Log Likelihood: -1697.50636854264
## Iteration 6 Log Likelihood: -1697.50072805896
## Iteration 7 Log Likelihood: -1697.49501984633
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1937.50152202695
## Iteration 2 Log Likelihood: -14.6322547799513
## Iteration 3 Log Likelihood: -14.3560412604561
## Iteration 4 Log Likelihood: -14.0777810207547
## Iteration 5 Log Likelihood: -13.8014309417564
## Iteration 6 Log Likelihood: -13.5373729090786
## Iteration 7 Log Likelihood: -13.2959722685252
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1901.94513754155
## Iteration 2 Log Likelihood: -1889.71449067121
## Iteration 3 Log Likelihood: -1888.11299802299
## Iteration 4 Log Likelihood: -1887.04302970538
## Iteration 5 Log Likelihood: -1886.53620535612
## Iteration 6 Log Likelihood: -1886.33002915774
## Iteration 7 Log Likelihood: -1886.23447038757
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1902.19828001244
## Iteration 2 Log Likelihood: -1640.6456664922
## Iteration 3 Log Likelihood: -1632.30951218989
## Iteration 4 Log Likelihood: -1631.14785121001
## Iteration 5 Log Likelihood: -1630.41274315517
## Iteration 6 Log Likelihood: -1629.85070727231
## Iteration 7 Log Likelihood: -1629.47734372281
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1895.67247773011
## Iteration 2 Log Likelihood: 170.991493110152
## Iteration 3 Log Likelihood: 211.263072012554
## Iteration 4 Log Likelihood: 216.707075082375
## Iteration 5 Log Likelihood: 223.08109626544
## Iteration 6 Log Likelihood: 227.95396632791
## Iteration 7 Log Likelihood: 229.229607518591
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2007.75426501213
## Iteration 2 Log Likelihood: -1997.71089039738
## Iteration 3 Log Likelihood: -1997.71089039738
## Iteration 4 Log Likelihood: -1997.71089039738
## Iteration 5 Log Likelihood: -1997.71089039738
## Iteration 6 Log Likelihood: -1997.71089039738
## Iteration 7 Log Likelihood: -1997.71089039738
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2007.25514650016
## Iteration 2 Log Likelihood: -1758.31165931117
## Iteration 3 Log Likelihood: -1758.31165931117
## Iteration 4 Log Likelihood: -1758.31165931117
## Iteration 5 Log Likelihood: -1758.31165931117
## Iteration 6 Log Likelihood: -1758.31165931117
## Iteration 7 Log Likelihood: -1758.31165931117
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2006.07361839316
## Iteration 2 Log Likelihood: -50.6069326492193
## Iteration 3 Log Likelihood: -50.6069326492173
## Iteration 4 Log Likelihood: -50.6069326492193
## Iteration 5 Log Likelihood: -50.6069326492208
## Iteration 6 Log Likelihood: -50.6069326492234
## Iteration 7 Log Likelihood: -50.6069326492159
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2014.49521672852
## Iteration 2 Log Likelihood: -2004.41667192723
## Iteration 3 Log Likelihood: -2004.41481641732
## Iteration 4 Log Likelihood: -2004.41296954907
## Iteration 5 Log Likelihood: -2004.41113077735
## Iteration 6 Log Likelihood: -2004.4092995098

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## Iteration 7 Log Likelihood: -2004.4074751106
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2014.07132350182
## Iteration 2 Log Likelihood: -1764.63856801532
## Iteration 3 Log Likelihood: -1764.63483281193
## Iteration 4 Log Likelihood: -1764.63102891559
## Iteration 5 Log Likelihood: -1764.62711983165
## Iteration 6 Log Likelihood: -1764.62306949322
## Iteration 7 Log Likelihood: -1764.61884177026
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2012.90282414528
## Iteration 2 Log Likelihood: -45.211308959307
## Iteration 3 Log Likelihood: -44.8543026297082
## Iteration 4 Log Likelihood: -44.5054210062266
## Iteration 5 Log Likelihood: -44.1862166251231
## Iteration 6 Log Likelihood: -43.9120413795279
## Iteration 7 Log Likelihood: -43.6886945184792
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1988.81853962373
## Iteration 2 Log Likelihood: -1977.24078351965
## Iteration 3 Log Likelihood: -1975.99264190352
## Iteration 4 Log Likelihood: -1974.66938603343
## Iteration 5 Log Likelihood: -1973.72705033232
## Iteration 6 Log Likelihood: -1973.28402926394
## Iteration 7 Log Likelihood: -1973.11481070912
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1991.87870494391
## Iteration 2 Log Likelihood: -1733.88315437298
## Iteration 3 Log Likelihood: -1722.02437550724
## Iteration 4 Log Likelihood: -1719.21756970014
## Iteration 5 Log Likelihood: -1718.7761438092
## Iteration 6 Log Likelihood: -1718.31045554606
## Iteration 7 Log Likelihood: -1717.82839241416
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1992.87403800555
## Iteration 2 Log Likelihood: 67.2449128309671
## Iteration 3 Log Likelihood: 113.926635686592
## Iteration 4 Log Likelihood: 133.77591833688
## Iteration 5 Log Likelihood: 139.269796447148
## Iteration 6 Log Likelihood: 141.774631550953
## Iteration 7 Log Likelihood: 142.548243325712
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2007.75426501213
## Iteration 2 Log Likelihood: -1997.71089039738
## Iteration 3 Log Likelihood: -1997.71089039738
## Iteration 4 Log Likelihood: -1997.71089039738
## Iteration 5 Log Likelihood: -1997.71089039738
## Iteration 6 Log Likelihood: -1997.71089039738
## Iteration 7 Log Likelihood: -1997.71089039738
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2007.25514650016
## Iteration 2 Log Likelihood: -1758.31165931117
## Iteration 3 Log Likelihood: -1758.31165931117
## Iteration 4 Log Likelihood: -1758.31165931117

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## Iteration 5 Log Likelihood: -1758.31165931117
## Iteration 6 Log Likelihood: -1758.31165931117
## Iteration 7 Log Likelihood: -1758.31165931117
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2006.07361839316
## Iteration 2 Log Likelihood: -50.606932649221
## Iteration 3 Log Likelihood: -50.6069326492206
## Iteration 4 Log Likelihood: -50.6069326492209
## Iteration 5 Log Likelihood: -50.6069326492169
## Iteration 6 Log Likelihood: -50.6069326492222
## Iteration 7 Log Likelihood: -50.6069326492225
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2014.12708772085
## Iteration 2 Log Likelihood: -2004.05650713554
## Iteration 3 Log Likelihood: -2004.05350564792
## Iteration 4 Log Likelihood: -2004.05052097096
## Iteration 5 Log Likelihood: -2004.04755437981
## Iteration 6 Log Likelihood: -2004.04460708272
## Iteration 7 Log Likelihood: -2004.04168022061
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2013.55511234311
## Iteration 2 Log Likelihood: -1764.21201780633
## Iteration 3 Log Likelihood: -1764.20511055305
## Iteration 4 Log Likelihood: -1764.19800490483
## Iteration 5 Log Likelihood: -1764.19065679746
## Iteration 6 Log Likelihood: -1764.18302728681
## Iteration 7 Log Likelihood: -1764.17508112665
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2012.20819947564
## Iteration 2 Log Likelihood: -44.42123583292
## Iteration 3 Log Likelihood: -44.0008717005267
## Iteration 4 Log Likelihood: -43.5620127587232
## Iteration 5 Log Likelihood: -43.1002012752633
## Iteration 6 Log Likelihood: -42.6285969334172
## Iteration 7 Log Likelihood: -42.1829974736172
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1979.62802325326
## Iteration 2 Log Likelihood: -1967.5270988649
## Iteration 3 Log Likelihood: -1966.11323510033
## Iteration 4 Log Likelihood: -1965.28351870268
## Iteration 5 Log Likelihood: -1964.90504538953
## Iteration 6 Log Likelihood: -1964.74951019286
## Iteration 7 Log Likelihood: -1964.67894444286
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1979.62362749303
## Iteration 2 Log Likelihood: -1718.55613397785
## Iteration 3 Log Likelihood: -1711.975190208
## Iteration 4 Log Likelihood: -1710.61407481916
## Iteration 5 Log Likelihood: -1710.1538078205
## Iteration 6 Log Likelihood: -1709.6313586755
## Iteration 7 Log Likelihood: -1709.09818339242
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1976.52928040106
## Iteration 2 Log Likelihood: 118.241867808985

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## Iteration 3 Log Likelihood: 190.802445444932
## Iteration 4 Log Likelihood: 203.9125405519
## Iteration 5 Log Likelihood: 207.819913363903
## Iteration 6 Log Likelihood: 208.597654896202
## Iteration 7 Log Likelihood: 208.923720948528
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1970.1367113887
## Iteration 2 Log Likelihood: -1960.04772799041
## Iteration 3 Log Likelihood: -1960.04772799041
## Iteration 4 Log Likelihood: -1960.04772799041
## Iteration 5 Log Likelihood: -1960.04772799041
## Iteration 6 Log Likelihood: -1960.04772799041
## Iteration 7 Log Likelihood: -1960.04772799041
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1969.05498608559
## Iteration 2 Log Likelihood: -1718.5563030623
## Iteration 3 Log Likelihood: -1718.5563030623
## Iteration 4 Log Likelihood: -1718.5563030623
## Iteration 5 Log Likelihood: -1718.5563030623
## Iteration 6 Log Likelihood: -1718.5563030623
## Iteration 7 Log Likelihood: -1718.5563030623
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1966.48642825588
## Iteration 2 Log Likelihood: 65.4222697822505
## Iteration 3 Log Likelihood: 65.422269782243
## Iteration 4 Log Likelihood: 65.4222697822446
## Iteration 5 Log Likelihood: 65.4222697822445
## Iteration 6 Log Likelihood: 65.4222697822543
## Iteration 7 Log Likelihood: 65.4222697822474
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1979.71273701406
## Iteration 2 Log Likelihood: -1969.60477699416
## Iteration 3 Log Likelihood: -1969.60401913916
## Iteration 4 Log Likelihood: -1969.60326078673
## Iteration 5 Log Likelihood: -1969.60250159698
## Iteration 6 Log Likelihood: -1969.60174123141
## Iteration 7 Log Likelihood: -1969.60097935339
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1978.58986868671
## Iteration 2 Log Likelihood: -1727.73801213707
## Iteration 3 Log Likelihood: -1727.73340747295
## Iteration 4 Log Likelihood: -1727.72867664861
## Iteration 5 Log Likelihood: -1727.72380814672
## Iteration 6 Log Likelihood: -1727.71879040708
## Iteration 7 Log Likelihood: -1727.71361169497
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1975.94713334701
## Iteration 2 Log Likelihood: 68.4394923730858
## Iteration 3 Log Likelihood: 69.0354944964251
## Iteration 4 Log Likelihood: 69.6694381955774
## Iteration 5 Log Likelihood: 70.1487855457824
## Iteration 6 Log Likelihood: 70.4378373260029
## Iteration 7 Log Likelihood: 70.6136769660431
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1929.82817826034
## Iteration 2 Log Likelihood: -1918.51324382229
## Iteration 3 Log Likelihood: -1917.0101424924
## Iteration 4 Log Likelihood: -1915.81071756348
## Iteration 5 Log Likelihood: -1915.23385483325
## Iteration 6 Log Likelihood: -1915.02443651649
## Iteration 7 Log Likelihood: -1914.94830662619
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1927.41666118696
## Iteration 2 Log Likelihood: -1666.91711589867
## Iteration 3 Log Likelihood: -1658.36910047834
## Iteration 4 Log Likelihood: -1657.42454003377
## Iteration 5 Log Likelihood: -1656.80041604985
## Iteration 6 Log Likelihood: -1656.14017447408
## Iteration 7 Log Likelihood: -1655.59487840076
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1922.26145288063
## Iteration 2 Log Likelihood: 210.478886820469
## Iteration 3 Log Likelihood: 225.124288027963
## Iteration 4 Log Likelihood: 233.715049306331
## Iteration 5 Log Likelihood: 237.498603067391
## Iteration 6 Log Likelihood: 239.372849716816
## Iteration 7 Log Likelihood: 241.427642403426
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1970.1367113887
## Iteration 2 Log Likelihood: -1960.04772799041
## Iteration 3 Log Likelihood: -1960.04772799041
## Iteration 4 Log Likelihood: -1960.04772799041
## Iteration 5 Log Likelihood: -1960.04772799041
## Iteration 6 Log Likelihood: -1960.04772799041
## Iteration 7 Log Likelihood: -1960.04772799041
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1969.05498608559
## Iteration 2 Log Likelihood: -1718.5563030623
## Iteration 3 Log Likelihood: -1718.5563030623
## Iteration 4 Log Likelihood: -1718.5563030623
## Iteration 5 Log Likelihood: -1718.5563030623
## Iteration 6 Log Likelihood: -1718.5563030623
## Iteration 7 Log Likelihood: -1718.5563030623
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1966.48642825588
## Iteration 2 Log Likelihood: 65.422269782247
## Iteration 3 Log Likelihood: 65.4222697822501
## Iteration 4 Log Likelihood: 65.4222697822428
## Iteration 5 Log Likelihood: 65.422269782249
## Iteration 6 Log Likelihood: 65.4222697822458
## Iteration 7 Log Likelihood: 65.422269782247
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1979.13937692368
## Iteration 2 Log Likelihood: -1969.03486237257
## Iteration 3 Log Likelihood: -1969.03360448181
## Iteration 4 Log Likelihood: -1969.03235170464
## Iteration 5 Log Likelihood: -1969.03110389786
## Iteration 6 Log Likelihood: -1969.02986092032

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## Iteration 7 Log Likelihood: -1969.0286226338
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1977.92917692066
## Iteration 2 Log Likelihood: -1727.10157097767
## Iteration 3 Log Likelihood: -1727.09620798221
## Iteration 4 Log Likelihood: -1727.09080880134
## Iteration 5 Log Likelihood: -1727.08536461386
## Iteration 6 Log Likelihood: -1727.07986682023
## Iteration 7 Log Likelihood: -1727.07430691153
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1975.18626923713
## Iteration 2 Log Likelihood: 69.3497464254723
## Iteration 3 Log Likelihood: 69.8598848478102
## Iteration 4 Log Likelihood: 70.471141594422
## Iteration 5 Log Likelihood: 71.0812574702005
## Iteration 6 Log Likelihood: 71.6145804643286
## Iteration 7 Log Likelihood: 72.0696814796423
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1910.99716180194
## Iteration 2 Log Likelihood: -1899.54764110534
## Iteration 3 Log Likelihood: -1898.34011738852
## Iteration 4 Log Likelihood: -1897.70975690073
## Iteration 5 Log Likelihood: -1897.45672191519
## Iteration 6 Log Likelihood: -1897.36341017465
## Iteration 7 Log Likelihood: -1897.32611561387
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1902.98010948405
## Iteration 2 Log Likelihood: -1646.04205136283
## Iteration 3 Log Likelihood: -1641.54821291255
## Iteration 4 Log Likelihood: -1640.02926904586
## Iteration 5 Log Likelihood: -1639.26948983095
## Iteration 6 Log Likelihood: -1638.48736892467
## Iteration 7 Log Likelihood: -1637.80722229447
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1888.06197215316
## Iteration 2 Log Likelihood: 281.467074046177
## Iteration 3 Log Likelihood: 305.745128518576
## Iteration 4 Log Likelihood: 315.616372594105
## Iteration 5 Log Likelihood: 318.929127359653
## Iteration 6 Log Likelihood: 320.106754256129
## Iteration 7 Log Likelihood: 321.356941831469
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1896.68261290001
## Iteration 2 Log Likelihood: -1886.90807336438
## Iteration 3 Log Likelihood: -1886.90807336438
## Iteration 4 Log Likelihood: -1886.90807336438
## Iteration 5 Log Likelihood: -1886.90807336438
## Iteration 6 Log Likelihood: -1886.90807336438
## Iteration 7 Log Likelihood: -1886.90807336438
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1895.59290118658
## Iteration 2 Log Likelihood: -1654.43491145658
## Iteration 3 Log Likelihood: -1654.43491145658
## Iteration 4 Log Likelihood: -1654.43491145658

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## Iteration 5 Log Likelihood: -1654.43491145658
## Iteration 6 Log Likelihood: -1654.43491145658
## Iteration 7 Log Likelihood: -1654.43491145658
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1892.96706412982
## Iteration 2 Log Likelihood: -25.127089776967
## Iteration 3 Log Likelihood: -25.1270897769699
## Iteration 4 Log Likelihood: -25.1270897769693
## Iteration 5 Log Likelihood: -25.127089776969
## Iteration 6 Log Likelihood: -25.1270897769722
## Iteration 7 Log Likelihood: -25.1270897769682
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1906.82930564814
## Iteration 2 Log Likelihood: -1897.01679529444
## Iteration 3 Log Likelihood: -1897.01656818579
## Iteration 4 Log Likelihood: -1897.016340794
## Iteration 5 Log Likelihood: -1897.01611311391
## Iteration 6 Log Likelihood: -1897.01588514034
## Iteration 7 Log Likelihood: -1897.01565686806
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1905.63209908332
## Iteration 2 Log Likelihood: -1664.07219555843
## Iteration 3 Log Likelihood: -1664.07131561682
## Iteration 4 Log Likelihood: -1664.07041711164
## Iteration 5 Log Likelihood: -1664.06949868118
## Iteration 6 Log Likelihood: -1664.06855894062
## Iteration 7 Log Likelihood: -1664.06759645422
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1902.7503401291
## Iteration 2 Log Likelihood: -26.6513295635282
## Iteration 3 Log Likelihood: -26.1534077624716
## Iteration 4 Log Likelihood: -25.5301355457645
## Iteration 5 Log Likelihood: -24.9314616335883
## Iteration 6 Log Likelihood: -24.4818410842498
## Iteration 7 Log Likelihood: -24.1864377622404
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1881.36560173368
## Iteration 2 Log Likelihood: -1870.89670187836
## Iteration 3 Log Likelihood: -1870.32024066578
## Iteration 4 Log Likelihood: -1869.65813478441
## Iteration 5 Log Likelihood: -1868.98012432033
## Iteration 6 Log Likelihood: -1868.42901506287
## Iteration 7 Log Likelihood: -1868.07847685851
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1881.88455872653
## Iteration 2 Log Likelihood: -1636.54055488753
## Iteration 3 Log Likelihood: -1629.19574899634
## Iteration 4 Log Likelihood: -1623.71115637921
## Iteration 5 Log Likelihood: -1622.95914590479
## Iteration 6 Log Likelihood: -1622.42579154527
## Iteration 7 Log Likelihood: -1621.97881576313
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1879.95762020324
## Iteration 2 Log Likelihood: 74.453660961587

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## Iteration 3 Log Likelihood: 106.863343353464
## Iteration 4 Log Likelihood: 114.408740746368
## Iteration 5 Log Likelihood: 117.825792168972
## Iteration 6 Log Likelihood: 118.867886447922
## Iteration 7 Log Likelihood: 119.157054763697
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1896.68261290001
## Iteration 2 Log Likelihood: -1886.90807336438
## Iteration 3 Log Likelihood: -1886.90807336438
## Iteration 4 Log Likelihood: -1886.90807336438
## Iteration 5 Log Likelihood: -1886.90807336438
## Iteration 6 Log Likelihood: -1886.90807336438
## Iteration 7 Log Likelihood: -1886.90807336438
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1895.59290118658
## Iteration 2 Log Likelihood: -1654.43491145659
## Iteration 3 Log Likelihood: -1654.43491145658
## Iteration 4 Log Likelihood: -1654.43491145658
## Iteration 5 Log Likelihood: -1654.43491145658
## Iteration 6 Log Likelihood: -1654.43491145658
## Iteration 7 Log Likelihood: -1654.43491145658
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1892.96706412982
## Iteration 2 Log Likelihood: -25.1270897769698
## Iteration 3 Log Likelihood: -25.1270897769679
## Iteration 4 Log Likelihood: -25.1270897769702
## Iteration 5 Log Likelihood: -25.1270897769666
## Iteration 6 Log Likelihood: -25.1270897769716
## Iteration 7 Log Likelihood: -25.127089776971
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1906.72578890415
## Iteration 2 Log Likelihood: -1896.91784241693
## Iteration 3 Log Likelihood: -1896.91742254695
## Iteration 4 Log Likelihood: -1896.91700351016
## Iteration 5 Log Likelihood: -1896.91658535455
## Iteration 6 Log Likelihood: -1896.91616813139
## Iteration 7 Log Likelihood: -1896.91575189149
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1905.43748677055
## Iteration 2 Log Likelihood: -1663.94899076405
## Iteration 3 Log Likelihood: -1663.94608148974
## Iteration 4 Log Likelihood: -1663.94310186964
## Iteration 5 Log Likelihood: -1663.94005000039
## Iteration 6 Log Likelihood: -1663.93692430628
## Iteration 7 Log Likelihood: -1663.93372338439
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1902.43177218916
## Iteration 2 Log Likelihood: -26.4690677796103
## Iteration 3 Log Likelihood: -26.0331787999757
## Iteration 4 Log Likelihood: -25.4684176946705
## Iteration 5 Log Likelihood: -24.8239534408154
## Iteration 6 Log Likelihood: -24.1861302734279
## Iteration 7 Log Likelihood: -23.6055928544199
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1874.65348956947
## Iteration 2 Log Likelihood: -1863.93847195084
## Iteration 3 Log Likelihood: -1863.13909714305
## Iteration 4 Log Likelihood: -1862.5568202476
## Iteration 5 Log Likelihood: -1862.19247334343
## Iteration 6 Log Likelihood: -1861.98463670342
## Iteration 7 Log Likelihood: -1861.86674991047
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1871.87596443283
## Iteration 2 Log Likelihood: -1623.01015579006
## Iteration 3 Log Likelihood: -1618.2947470506
## Iteration 4 Log Likelihood: -1617.41659044816
## Iteration 5 Log Likelihood: -1616.93006828168
## Iteration 6 Log Likelihood: -1616.40812560573
## Iteration 7 Log Likelihood: -1615.93198153719
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1864.615612613
## Iteration 2 Log Likelihood: 145.593630402561
## Iteration 3 Log Likelihood: 184.957424612663
## Iteration 4 Log Likelihood: 195.447510990696
## Iteration 5 Log Likelihood: 202.156911430329
## Iteration 6 Log Likelihood: 205.059911484655
## Iteration 7 Log Likelihood: 206.418914384769
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1927.88885374302
## Iteration 2 Log Likelihood: -1918.34089737012
## Iteration 3 Log Likelihood: -1918.34089737012
## Iteration 4 Log Likelihood: -1918.34089737012
## Iteration 5 Log Likelihood: -1918.34089737012
## Iteration 6 Log Likelihood: -1918.34089737012
## Iteration 7 Log Likelihood: -1918.34089737012
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1926.24835859471
## Iteration 2 Log Likelihood: -1689.0253131102
## Iteration 3 Log Likelihood: -1689.0253131102
## Iteration 4 Log Likelihood: -1689.0253131102
## Iteration 5 Log Likelihood: -1689.0253131102
## Iteration 6 Log Likelihood: -1689.0253131102
## Iteration 7 Log Likelihood: -1689.0253131102
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1922.35415486914
## Iteration 2 Log Likelihood: -52.945200433459
## Iteration 3 Log Likelihood: -52.9452004334624
## Iteration 4 Log Likelihood: -52.9452004334578
## Iteration 5 Log Likelihood: -52.945200433461
## Iteration 6 Log Likelihood: -52.9452004334654
## Iteration 7 Log Likelihood: -52.945200433464
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1935.20161436143
## Iteration 2 Log Likelihood: -1925.64077844759
## Iteration 3 Log Likelihood: -1925.6405712326
## Iteration 4 Log Likelihood: -1925.64036361259
## Iteration 5 Log Likelihood: -1925.64015558886
## Iteration 6 Log Likelihood: -1925.63994716265

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## Iteration 7 Log Likelihood: -1925.63973833514
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1933.6019515653
## Iteration 2 Log Likelihood: -1696.06428535431
## Iteration 3 Log Likelihood: -1696.06324342949
## Iteration 4 Log Likelihood: -1696.0621964398
## Iteration 5 Log Likelihood: -1696.06114398489
## Iteration 6 Log Likelihood: -1696.0600856942
## Iteration 7 Log Likelihood: -1696.05902115738
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1929.69020705054
## Iteration 2 Log Likelihood: -50.9746645574649
## Iteration 3 Log Likelihood: -50.5115237083743
## Iteration 4 Log Likelihood: -49.9592444663016
## Iteration 5 Log Likelihood: -49.4217467110305
## Iteration 6 Log Likelihood: -48.9866491787103
## Iteration 7 Log Likelihood: -48.6857365531518
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1916.36013030733
## Iteration 2 Log Likelihood: -1906.52255576022
## Iteration 3 Log Likelihood: -1906.3457430506
## Iteration 4 Log Likelihood: -1906.15015872998
## Iteration 5 Log Likelihood: -1905.93164690552
## Iteration 6 Log Likelihood: -1905.69228713844
## Iteration 7 Log Likelihood: -1905.44352087088
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1915.30079059186
## Iteration 2 Log Likelihood: -1676.25755827644
## Iteration 3 Log Likelihood: -1674.77483302755
## Iteration 4 Log Likelihood: -1671.36371974756
## Iteration 5 Log Likelihood: -1666.69277289948
## Iteration 6 Log Likelihood: -1664.42286543655
## Iteration 7 Log Likelihood: -1663.77310927431
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1911.04571251316
## Iteration 2 Log Likelihood: 74.6012060443373
## Iteration 3 Log Likelihood: 97.1081383758272
## Iteration 4 Log Likelihood: 101.831391793131
## Iteration 5 Log Likelihood: 105.78753507797
## Iteration 6 Log Likelihood: 108.345734705394
## Iteration 7 Log Likelihood: 109.70221684544
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1927.88885374302
## Iteration 2 Log Likelihood: -1918.34089737012
## Iteration 3 Log Likelihood: -1918.34089737012
## Iteration 4 Log Likelihood: -1918.34089737012
## Iteration 5 Log Likelihood: -1918.34089737012
## Iteration 6 Log Likelihood: -1918.34089737012
## Iteration 7 Log Likelihood: -1918.34089737012
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1926.24835859471
## Iteration 2 Log Likelihood: -1689.0253131102
## Iteration 3 Log Likelihood: -1689.0253131102
## Iteration 4 Log Likelihood: -1689.0253131102

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## Iteration 5 Log Likelihood: -1689.0253131102
## Iteration 6 Log Likelihood: -1689.0253131102
## Iteration 7 Log Likelihood: -1689.0253131102
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1922.35415486914
## Iteration 2 Log Likelihood: -52.9452004334589
## Iteration 3 Log Likelihood: -52.9452004334616
## Iteration 4 Log Likelihood: -52.9452004334668
## Iteration 5 Log Likelihood: -52.9452004334603
## Iteration 6 Log Likelihood: -52.9452004334599
## Iteration 7 Log Likelihood: -52.9452004334627
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1935.05261368222
## Iteration 2 Log Likelihood: -1925.49382727159
## Iteration 3 Log Likelihood: -1925.49345787351
## Iteration 4 Log Likelihood: -1925.49308716711
## Iteration 5 Log Likelihood: -1925.49271518892
## Iteration 6 Log Likelihood: -1925.49234197627
## Iteration 7 Log Likelihood: -1925.49196756717
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1933.42574386162
## Iteration 2 Log Likelihood: -1695.91154654578
## Iteration 3 Log Likelihood: -1695.90902580719
## Iteration 4 Log Likelihood: -1695.90647528655
## Iteration 5 Log Likelihood: -1695.90389470052
## Iteration 6 Log Likelihood: -1695.90128412958
## Iteration 7 Log Likelihood: -1695.89864365412
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1929.47582281533
## Iteration 2 Log Likelihood: -50.6248589237872
## Iteration 3 Log Likelihood: -50.089583282723
## Iteration 4 Log Likelihood: -49.4687770930025
## Iteration 5 Log Likelihood: -48.8797352378609
## Iteration 6 Log Likelihood: -48.4076197349732
## Iteration 7 Log Likelihood: -48.0700355847678
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1911.20939491017
## Iteration 2 Log Likelihood: -1901.29238258142
## Iteration 3 Log Likelihood: -1900.98990958456
## Iteration 4 Log Likelihood: -1900.71293372979
## Iteration 5 Log Likelihood: -1900.4769915235
## Iteration 6 Log Likelihood: -1900.28778981785
## Iteration 7 Log Likelihood: -1900.14250562282
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1908.30051234361
## Iteration 2 Log Likelihood: -1668.05393152598
## Iteration 3 Log Likelihood: -1663.49673792677
## Iteration 4 Log Likelihood: -1660.10523599804
## Iteration 5 Log Likelihood: -1659.11251060571
## Iteration 6 Log Likelihood: -1658.39839187535
## Iteration 7 Log Likelihood: -1657.61678014209
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1900.70837299517
## Iteration 2 Log Likelihood: 106.490582657109

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## Iteration 3 Log Likelihood: 140.685492443241
## Iteration 4 Log Likelihood: 147.320332320206
## Iteration 5 Log Likelihood: 150.95263672217
## Iteration 6 Log Likelihood: 152.967408877525
## Iteration 7 Log Likelihood: 154.101529552758
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1929.62442543549
## Iteration 2 Log Likelihood: -1919.50385136787
## Iteration 3 Log Likelihood: -1919.50385136787
## Iteration 4 Log Likelihood: -1919.50385136787
## Iteration 5 Log Likelihood: -1919.50385136787
## Iteration 6 Log Likelihood: -1919.50385136787
## Iteration 7 Log Likelihood: -1919.50385136787
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1928.21502833528
## Iteration 2 Log Likelihood: -1681.62261592156
## Iteration 3 Log Likelihood: -1681.62261592156
## Iteration 4 Log Likelihood: -1681.62261592156
## Iteration 5 Log Likelihood: -1681.62261592156
## Iteration 6 Log Likelihood: -1681.62261592156
## Iteration 7 Log Likelihood: -1681.62261592156
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1924.8736936344
## Iteration 2 Log Likelihood: -55.4799989471024
## Iteration 3 Log Likelihood: -55.4799989471041
## Iteration 4 Log Likelihood: -55.4799989471026
## Iteration 5 Log Likelihood: -55.479998947101
## Iteration 6 Log Likelihood: -55.4799989471052
## Iteration 7 Log Likelihood: -55.4799989471015
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1936.95398430398
## Iteration 2 Log Likelihood: -1926.79020564172
## Iteration 3 Log Likelihood: -1926.78952206626
## Iteration 4 Log Likelihood: -1926.78884243144
## Iteration 5 Log Likelihood: -1926.78816680415
## Iteration 6 Log Likelihood: -1926.78749524219
## Iteration 7 Log Likelihood: -1926.78682779532
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1935.64468528155
## Iteration 2 Log Likelihood: -1688.5539561457
## Iteration 3 Log Likelihood: -1688.55109446826
## Iteration 4 Log Likelihood: -1688.54832000952
## Iteration 5 Log Likelihood: -1688.54562732328
## Iteration 6 Log Likelihood: -1688.54301055259
## Iteration 7 Log Likelihood: -1688.54046346844
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1932.17617988376
## Iteration 2 Log Likelihood: -52.1912367859356
## Iteration 3 Log Likelihood: -51.9501041425137
## Iteration 4 Log Likelihood: -51.733914605566
## Iteration 5 Log Likelihood: -51.5458830554161
## Iteration 6 Log Likelihood: -51.3879717432975
## Iteration 7 Log Likelihood: -51.2610048274139
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1900.38406817538
## Iteration 2 Log Likelihood: -1889.08619697044
## Iteration 3 Log Likelihood: -1888.4894144
## Iteration 4 Log Likelihood: -1887.75684171204
## Iteration 5 Log Likelihood: -1886.81357711315
## Iteration 6 Log Likelihood: -1885.87787753033
## Iteration 7 Log Likelihood: -1885.24103321759
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1904.72617488166
## Iteration 2 Log Likelihood: -1649.87897396991
## Iteration 3 Log Likelihood: -1641.996134366
## Iteration 4 Log Likelihood: -1636.42169494282
## Iteration 5 Log Likelihood: -1635.07833888227
## Iteration 6 Log Likelihood: -1634.44473501602
## Iteration 7 Log Likelihood: -1634.11737970458
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1904.80425036435
## Iteration 2 Log Likelihood: 90.7699874851222
## Iteration 3 Log Likelihood: 99.4133412627744
## Iteration 4 Log Likelihood: 108.325594626781
## Iteration 5 Log Likelihood: 113.359538139096
## Iteration 6 Log Likelihood: 115.972312128183
## Iteration 7 Log Likelihood: 117.654361135041
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1929.62442543549
## Iteration 2 Log Likelihood: -1919.50385136787
## Iteration 3 Log Likelihood: -1919.50385136787
## Iteration 4 Log Likelihood: -1919.50385136787
## Iteration 5 Log Likelihood: -1919.50385136787
## Iteration 6 Log Likelihood: -1919.50385136787
## Iteration 7 Log Likelihood: -1919.50385136787
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1928.21502833528
## Iteration 2 Log Likelihood: -1681.62261592155
## Iteration 3 Log Likelihood: -1681.62261592156
## Iteration 4 Log Likelihood: -1681.62261592156
## Iteration 5 Log Likelihood: -1681.62261592156
## Iteration 6 Log Likelihood: -1681.62261592156
## Iteration 7 Log Likelihood: -1681.62261592156
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1924.8736936344
## Iteration 2 Log Likelihood: -55.4799989471038
## Iteration 3 Log Likelihood: -55.4799989471024
## Iteration 4 Log Likelihood: -55.4799989471042
## Iteration 5 Log Likelihood: -55.4799989471012
## Iteration 6 Log Likelihood: -55.4799989471036
## Iteration 7 Log Likelihood: -55.4799989471063
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1936.49571625574
## Iteration 2 Log Likelihood: -1926.32983306849
## Iteration 3 Log Likelihood: -1926.32867968414
## Iteration 4 Log Likelihood: -1926.32751512695
## Iteration 5 Log Likelihood: -1926.32633948221
## Iteration 6 Log Likelihood: -1926.32515283648

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## Iteration 7 Log Likelihood: -1926.32395527925
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1935.24913999574
## Iteration 2 Log Likelihood: -1688.09169808834
## Iteration 3 Log Likelihood: -1688.08542053462
## Iteration 4 Log Likelihood: -1688.07915957216
## Iteration 5 Log Likelihood: -1688.07289881777
## Iteration 6 Log Likelihood: -1688.06661943292
## Iteration 7 Log Likelihood: -1688.06030042967
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1931.84201820831
## Iteration 2 Log Likelihood: -51.6298304151951
## Iteration 3 Log Likelihood: -51.2981409704005
## Iteration 4 Log Likelihood: -50.98804094192
## Iteration 5 Log Likelihood: -50.7093972240015
## Iteration 6 Log Likelihood: -50.4697747719269
## Iteration 7 Log Likelihood: -50.2732895569455
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1886.84044381925
## Iteration 2 Log Likelihood: -1875.00756929541
## Iteration 3 Log Likelihood: -1873.77581068675
## Iteration 4 Log Likelihood: -1872.52803274725
## Iteration 5 Log Likelihood: -1871.56395991567
## Iteration 6 Log Likelihood: -1871.01813980122
## Iteration 7 Log Likelihood: -1870.7668512763
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1893.17560332123
## Iteration 2 Log Likelihood: -1633.35204337786
## Iteration 3 Log Likelihood: -1623.8008662509
## Iteration 4 Log Likelihood: -1621.3454680021
## Iteration 5 Log Likelihood: -1620.47572256542
## Iteration 6 Log Likelihood: -1620.00512785614
## Iteration 7 Log Likelihood: -1619.74263325747
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1894.93743821266
## Iteration 2 Log Likelihood: 117.683420985132
## Iteration 3 Log Likelihood: 157.406067380987
## Iteration 4 Log Likelihood: 188.530909277559
## Iteration 5 Log Likelihood: 205.567844637345
## Iteration 6 Log Likelihood: 214.39726806409
## Iteration 7 Log Likelihood: 219.333696004533
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1985.43064440824
## Iteration 2 Log Likelihood: -1975.18391529444
## Iteration 3 Log Likelihood: -1975.18391529444
## Iteration 4 Log Likelihood: -1975.18391529444
## Iteration 5 Log Likelihood: -1975.18391529444
## Iteration 6 Log Likelihood: -1975.18391529444
## Iteration 7 Log Likelihood: -1975.18391529444
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1984.57143656898
## Iteration 2 Log Likelihood: -1731.39759315917
## Iteration 3 Log Likelihood: -1731.39759315918
## Iteration 4 Log Likelihood: -1731.39759315918

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## Iteration 5 Log Likelihood: -1731.39759315917
## Iteration 6 Log Likelihood: -1731.39759315918
## Iteration 7 Log Likelihood: -1731.39759315917
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1982.52648322347
## Iteration 2 Log Likelihood: 48.5565803782963
## Iteration 3 Log Likelihood: 48.5565803782903
## Iteration 4 Log Likelihood: 48.556580378291
## Iteration 5 Log Likelihood: 48.5565803783019
## Iteration 6 Log Likelihood: 48.5565803782949
## Iteration 7 Log Likelihood: 48.5565803782952
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2003.63224559961
## Iteration 2 Log Likelihood: -1993.35190469182
## Iteration 3 Log Likelihood: -1993.350784478
## Iteration 4 Log Likelihood: -1993.34967115806
## Iteration 5 Log Likelihood: -1993.34856467951
## Iteration 6 Log Likelihood: -1993.3474649619
## Iteration 7 Log Likelihood: -1993.34637189564
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2002.97926008425
## Iteration 2 Log Likelihood: -1749.2326741228
## Iteration 3 Log Likelihood: -1749.23025638131
## Iteration 4 Log Likelihood: -1749.22800667252
## Iteration 5 Log Likelihood: -1749.22591545635
## Iteration 6 Log Likelihood: -1749.22397322952
## Iteration 7 Log Likelihood: -1749.22217048557
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2001.09597751007
## Iteration 2 Log Likelihood: 41.2116617832223
## Iteration 3 Log Likelihood: 41.6915913845756
## Iteration 4 Log Likelihood: 42.4191153926026
## Iteration 5 Log Likelihood: 43.2149916293678
## Iteration 6 Log Likelihood: 43.7591860126261
## Iteration 7 Log Likelihood: 44.0349357683745
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1945.23348711085
## Iteration 2 Log Likelihood: -1934.31981020866
## Iteration 3 Log Likelihood: -1933.46062202849
## Iteration 4 Log Likelihood: -1932.67976980627
## Iteration 5 Log Likelihood: -1932.13798433041
## Iteration 6 Log Likelihood: -1931.83765121479
## Iteration 7 Log Likelihood: -1931.69191480782
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1942.44571869402
## Iteration 2 Log Likelihood: -1686.28026209198
## Iteration 3 Log Likelihood: -1680.12086552859
## Iteration 4 Log Likelihood: -1678.93673158627
## Iteration 5 Log Likelihood: -1678.29048985338
## Iteration 6 Log Likelihood: -1677.38883049684
## Iteration 7 Log Likelihood: -1676.86374891029
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1933.6793394275
## Iteration 2 Log Likelihood: 193.924148133472

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## Iteration 3 Log Likelihood: 204.995196407442
## Iteration 4 Log Likelihood: 213.3948163926
## Iteration 5 Log Likelihood: 216.998185360824
## Iteration 6 Log Likelihood: 219.067543576863
## Iteration 7 Log Likelihood: 220.244685900493
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1985.43064440824
## Iteration 2 Log Likelihood: -1975.18391529444
## Iteration 3 Log Likelihood: -1975.18391529444
## Iteration 4 Log Likelihood: -1975.18391529444
## Iteration 5 Log Likelihood: -1975.18391529444
## Iteration 6 Log Likelihood: -1975.18391529444
## Iteration 7 Log Likelihood: -1975.18391529444
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1984.57143656898
## Iteration 2 Log Likelihood: -1731.39759315917
## Iteration 3 Log Likelihood: -1731.39759315917
## Iteration 4 Log Likelihood: -1731.39759315917
## Iteration 5 Log Likelihood: -1731.39759315917
## Iteration 6 Log Likelihood: -1731.39759315917
## Iteration 7 Log Likelihood: -1731.39759315917
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1982.52648322347
## Iteration 2 Log Likelihood: 48.5565803782943
## Iteration 3 Log Likelihood: 48.5565803782943
## Iteration 4 Log Likelihood: 48.5565803783007
## Iteration 5 Log Likelihood: 48.5565803782991
## Iteration 6 Log Likelihood: 48.5565803782968
## Iteration 7 Log Likelihood: 48.5565803782945
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2003.19937471883
## Iteration 2 Log Likelihood: -1992.92291567007
## Iteration 3 Log Likelihood: -1992.92092496556
## Iteration 4 Log Likelihood: -1992.91892080222
## Iteration 5 Log Likelihood: -1992.91690360436
## Iteration 6 Log Likelihood: -1992.91487380057
## Iteration 7 Log Likelihood: -1992.912831821
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2002.53292421053
## Iteration 2 Log Likelihood: -1748.80196956116
## Iteration 3 Log Likelihood: -1748.79738619699
## Iteration 4 Log Likelihood: -1748.79299311997
## Iteration 5 Log Likelihood: -1748.78877021864
## Iteration 6 Log Likelihood: -1748.78469606055
## Iteration 7 Log Likelihood: -1748.78074791251
## Initialization by the identity.
## Iteration 1 Log Likelihood: -2000.6342502595
## Iteration 2 Log Likelihood: 42.2240441138238
## Iteration 3 Log Likelihood: 42.7069969655999
## Iteration 4 Log Likelihood: 43.3124749537426
## Iteration 5 Log Likelihood: 43.9152083204563
## Iteration 6 Log Likelihood: 44.3553184008482
## Iteration 7 Log Likelihood: 44.6193918649243
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1927.24161765155
## Iteration 2 Log Likelihood: -1916.31886516511
## Iteration 3 Log Likelihood: -1915.49162707036
## Iteration 4 Log Likelihood: -1914.93470472357
## Iteration 5 Log Likelihood: -1914.62874486197
## Iteration 6 Log Likelihood: -1914.47929977499
## Iteration 7 Log Likelihood: -1914.40921212273
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1921.11853035293
## Iteration 2 Log Likelihood: -1666.69447088841
## Iteration 3 Log Likelihood: -1662.69718003366
## Iteration 4 Log Likelihood: -1661.42946825585
## Iteration 5 Log Likelihood: -1660.26586767627
## Iteration 6 Log Likelihood: -1659.65803330159
## Iteration 7 Log Likelihood: -1659.49666119796
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1907.16190906997
## Iteration 2 Log Likelihood: 227.756114615233
## Iteration 3 Log Likelihood: 262.866714926591
## Iteration 4 Log Likelihood: 274.488608614147
## Iteration 5 Log Likelihood: 277.383081598614
## Iteration 6 Log Likelihood: 279.624340787339
## Iteration 7 Log Likelihood: 281.014608805269
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1970.17753669161
## Iteration 2 Log Likelihood: -1960.07688872399
## Iteration 3 Log Likelihood: -1960.07688872399
## Iteration 4 Log Likelihood: -1960.07688872399
## Iteration 5 Log Likelihood: -1960.07688872399
## Iteration 6 Log Likelihood: -1960.07688872399
## Iteration 7 Log Likelihood: -1960.07688872399

## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced

## Initialization by the identity.
## Iteration 1 Log Likelihood: -1969.31826121474
## Iteration 2 Log Likelihood: -1723.33697611147
## Iteration 3 Log Likelihood: -1723.33697611147
## Iteration 4 Log Likelihood: -1723.33697611147
## Iteration 5 Log Likelihood: -1723.33697611147
## Iteration 6 Log Likelihood: -1723.33697611146
## Iteration 7 Log Likelihood: -1723.33697611146

## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced

## Initialization by the identity.
## Iteration 1 Log Likelihood: -1967.29298167876
## Iteration 2 Log Likelihood: -58.3986708724399
## Iteration 3 Log Likelihood: -58.3986708724428
## Iteration 4 Log Likelihood: -58.3986708724446
## Iteration 5 Log Likelihood: -58.3986708724423
## Iteration 6 Log Likelihood: -58.3986708724444
## Iteration 7 Log Likelihood: -58.3986708724459

## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced

## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1975.1445812193
## Iteration 2 Log Likelihood: -1965.02626832523
## Iteration 3 Log Likelihood: -1965.02514098971
## Iteration 4 Log Likelihood: -1965.02401167586
## Iteration 5 Log Likelihood: -1965.02288022801
## Iteration 6 Log Likelihood: -1965.02174647077
## Iteration 7 Log Likelihood: -1965.02061020616

## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced

## Initialization by the identity.
## Iteration 1 Log Likelihood: -1974.55731416342
## Iteration 2 Log Likelihood: -1728.03739728596
## Iteration 3 Log Likelihood: -1728.0340000374
## Iteration 4 Log Likelihood: -1728.0306019626
## Iteration 5 Log Likelihood: -1728.02718212719
## Iteration 6 Log Likelihood: -1728.02371739105
## Iteration 7 Log Likelihood: -1728.02018215298

## Initialization by the identity.
## Iteration 1 Log Likelihood: -1972.8256209011
## Iteration 2 Log Likelihood: -53.4504627323397
## Iteration 3 Log Likelihood: -52.8195810157139
## Iteration 4 Log Likelihood: -51.8733489318698
## Iteration 5 Log Likelihood: -50.785462556428
## Iteration 6 Log Likelihood: -49.9366470133254
## Iteration 7 Log Likelihood: -49.4356112480903

## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced

## Initialization by the identity.
## Iteration 1 Log Likelihood: -1952.03534766181
## Iteration 2 Log Likelihood: -1941.23027288796
## Iteration 3 Log Likelihood: -1940.82292950485
## Iteration 4 Log Likelihood: -1940.29932184126
## Iteration 5 Log Likelihood: -1939.65468653671
## Iteration 6 Log Likelihood: -1938.9893291457
## Iteration 7 Log Likelihood: -1938.46010056029

## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced

## Initialization by the identity.
## Iteration 1 Log Likelihood: -1954.79343019549
## Iteration 2 Log Likelihood: -1704.2604984887
## Iteration 3 Log Likelihood: -1699.07448106547
## Iteration 4 Log Likelihood: -1690.04833401562
## Iteration 5 Log Likelihood: -1688.88048792091
## Iteration 6 Log Likelihood: -1688.73007118441
## Iteration 7 Log Likelihood: -1688.64401340768

## Warning in log(det(as.matrix(newcovs[[i]]))): NaNs produced

## Initialization by the identity.
## Iteration 1 Log Likelihood: -1955.25094062249
## Iteration 2 Log Likelihood: 65.6687188571512
## Iteration 3 Log Likelihood: 143.355306159771
## Iteration 4 Log Likelihood: 156.9787245607
## Iteration 5 Log Likelihood: 159.299518793758
## Iteration 6 Log Likelihood: 159.433898204079

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## Iteration 7 Log Likelihood: 159.46369622188
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1970.17753669161
## Iteration 2 Log Likelihood: -1960.07688872399
## Iteration 3 Log Likelihood: -1960.07688872399
## Iteration 4 Log Likelihood: -1960.07688872399
## Iteration 5 Log Likelihood: -1960.07688872399
## Iteration 6 Log Likelihood: -1960.07688872399
## Iteration 7 Log Likelihood: -1960.07688872399
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1969.31826121474
## Iteration 2 Log Likelihood: -1723.33697611146
## Iteration 3 Log Likelihood: -1723.33697611146
## Iteration 4 Log Likelihood: -1723.33697611146
## Iteration 5 Log Likelihood: -1723.33697611146
## Iteration 6 Log Likelihood: -1723.33697611146
## Iteration 7 Log Likelihood: -1723.33697611146
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1967.29298167876
## Iteration 2 Log Likelihood: -58.398670872442
## Iteration 3 Log Likelihood: -58.3986708724433
## Iteration 4 Log Likelihood: -58.3986708724422
## Iteration 5 Log Likelihood: -58.3986708724446
## Iteration 6 Log Likelihood: -58.3986708724422
## Iteration 7 Log Likelihood: -58.3986708724459
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1974.88813487684
## Iteration 2 Log Likelihood: -1964.76985344606
## Iteration 3 Log Likelihood: -1964.76764174714
## Iteration 4 Log Likelihood: -1964.76539173967
## Iteration 5 Log Likelihood: -1964.76310384475
## Iteration 6 Log Likelihood: -1964.76077857174
## Iteration 7 Log Likelihood: -1964.75841651868
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1974.32934247267
## Iteration 2 Log Likelihood: -1727.80092131214
## Iteration 3 Log Likelihood: -1727.79175702623
## Iteration 4 Log Likelihood: -1727.78224154415
## Iteration 5 Log Likelihood: -1727.77232415743
## Iteration 6 Log Likelihood: -1727.76194845347
## Iteration 7 Log Likelihood: -1727.75105192576
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1972.6136580038
## Iteration 2 Log Likelihood: -53.1846809281636
## Iteration 3 Log Likelihood: -52.5902620704999
## Iteration 4 Log Likelihood: -51.716848111014
## Iteration 5 Log Likelihood: -50.6485755124749
## Iteration 6 Log Likelihood: -49.7216921914565
## Iteration 7 Log Likelihood: -49.1163701222409
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1944.0258929692
## Iteration 2 Log Likelihood: -1932.87504943007
## Iteration 3 Log Likelihood: -1932.06517012679
## Iteration 4 Log Likelihood: -1931.32261343527

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## Iteration 5 Log Likelihood: -1930.78878215357
## Iteration 6 Log Likelihood: -1930.46894746739
## Iteration 7 Log Likelihood: -1930.29423344546
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1946.20482638522
## Iteration 2 Log Likelihood: -1691.71094018718
## Iteration 3 Log Likelihood: -1683.17933527395
## Iteration 4 Log Likelihood: -1681.39284811482
## Iteration 5 Log Likelihood: -1681.13750277463
## Iteration 6 Log Likelihood: -1680.98189136819
## Iteration 7 Log Likelihood: -1680.84661743345
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1945.17098763049
## Iteration 2 Log Likelihood: 97.3043416431932
## Iteration 3 Log Likelihood: 171.978459335445
## Iteration 4 Log Likelihood: 190.515143148934
## Iteration 5 Log Likelihood: 193.00890961404
## Iteration 6 Log Likelihood: 193.534939725736
## Iteration 7 Log Likelihood: 193.741028554619
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1968.76849770766
## Iteration 2 Log Likelihood: -1958.73283683813
## Iteration 3 Log Likelihood: -1958.73283683813
## Iteration 4 Log Likelihood: -1958.73283683813
## Iteration 5 Log Likelihood: -1958.73283683813
## Iteration 6 Log Likelihood: -1958.73283683813
## Iteration 7 Log Likelihood: -1958.73283683813
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1967.46496911246
## Iteration 2 Log Likelihood: -1720.00187826585
## Iteration 3 Log Likelihood: -1720.00187826585
## Iteration 4 Log Likelihood: -1720.00187826585
## Iteration 5 Log Likelihood: -1720.00187826585
## Iteration 6 Log Likelihood: -1720.00187826585
## Iteration 7 Log Likelihood: -1720.00187826585
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1964.36391327737
## Iteration 2 Log Likelihood: 8.1949721502325
## Iteration 3 Log Likelihood: 8.1949721502324
## Iteration 4 Log Likelihood: 8.19497215023084
## Iteration 5 Log Likelihood: 8.19497215022816
## Iteration 6 Log Likelihood: 8.19497215023218
## Iteration 7 Log Likelihood: 8.19497215023294
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1986.91191668225
## Iteration 2 Log Likelihood: -1976.84214733814
## Iteration 3 Log Likelihood: -1976.84154216262
## Iteration 4 Log Likelihood: -1976.84093658901
## Iteration 5 Log Likelihood: -1976.84033043401
## Iteration 6 Log Likelihood: -1976.83972350918
## Iteration 7 Log Likelihood: -1976.83911562109
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1985.6599939442
## Iteration 2 Log Likelihood: -1737.67752186961

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## Iteration 3 Log Likelihood: -1737.67560652359
## Iteration 4 Log Likelihood: -1737.67363281352
## Iteration 5 Log Likelihood: -1737.67158752328
## Iteration 6 Log Likelihood: -1737.66945674172
## Iteration 7 Log Likelihood: -1737.66722577126
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1982.54443991551
## Iteration 2 Log Likelihood: 0.26967466093585
## Iteration 3 Log Likelihood: 0.732486117400356
## Iteration 4 Log Likelihood: 1.10669284595264
## Iteration 5 Log Likelihood: 1.32299721733509
## Iteration 6 Log Likelihood: 1.42918868313012
## Iteration 7 Log Likelihood: 1.48396702915123
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1937.67318876929
## Iteration 2 Log Likelihood: -1926.81564799877
## Iteration 3 Log Likelihood: -1926.13487435821
## Iteration 4 Log Likelihood: -1925.23199907981
## Iteration 5 Log Likelihood: -1924.30850175667
## Iteration 6 Log Likelihood: -1923.65862137502
## Iteration 7 Log Likelihood: -1923.32662945041
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1939.0764113467
## Iteration 2 Log Likelihood: -1683.98291606331
## Iteration 3 Log Likelihood: -1672.81194265478
## Iteration 4 Log Likelihood: -1671.14829332634
## Iteration 5 Log Likelihood: -1670.6720980462
## Iteration 6 Log Likelihood: -1670.28373418971
## Iteration 7 Log Likelihood: -1670.0119349388
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1938.47071220283
## Iteration 2 Log Likelihood: 132.612202426051
## Iteration 3 Log Likelihood: 164.73201223515
## Iteration 4 Log Likelihood: 177.184798283133
## Iteration 5 Log Likelihood: 188.353625116753
## Iteration 6 Log Likelihood: 198.437121759825
## Iteration 7 Log Likelihood: 202.279407732215
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1968.76849770766
## Iteration 2 Log Likelihood: -1958.73283683813
## Iteration 3 Log Likelihood: -1958.73283683813
## Iteration 4 Log Likelihood: -1958.73283683813
## Iteration 5 Log Likelihood: -1958.73283683813
## Iteration 6 Log Likelihood: -1958.73283683813
## Iteration 7 Log Likelihood: -1958.73283683813
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1967.46496911246
## Iteration 2 Log Likelihood: -1720.00187826585
## Iteration 3 Log Likelihood: -1720.00187826585
## Iteration 4 Log Likelihood: -1720.00187826585
## Iteration 5 Log Likelihood: -1720.00187826585
## Iteration 6 Log Likelihood: -1720.00187826585
## Iteration 7 Log Likelihood: -1720.00187826585
## Initialization by the identity.

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## Iteration 1 Log Likelihood: -1964.36391327737
## Iteration 2 Log Likelihood: 8.19497215022987
## Iteration 3 Log Likelihood: 8.19497215023188
## Iteration 4 Log Likelihood: 8.19497215023353
## Iteration 5 Log Likelihood: 8.19497215023237
## Iteration 6 Log Likelihood: 8.19497215023055
## Iteration 7 Log Likelihood: 8.19497215022543
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1986.44888702871
## Iteration 2 Log Likelihood: -1976.3799693825
## Iteration 3 Log Likelihood: -1976.37903552389
## Iteration 4 Log Likelihood: -1976.3780991944
## Iteration 5 Log Likelihood: -1976.37716029774
## Iteration 6 Log Likelihood: -1976.37621873611
## Iteration 7 Log Likelihood: -1976.37527441061
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1985.16005391315
## Iteration 2 Log Likelihood: -1737.17278408823
## Iteration 3 Log Likelihood: -1737.17022196083
## Iteration 4 Log Likelihood: -1737.16758179247
## Iteration 5 Log Likelihood: -1737.1648493897
## Iteration 6 Log Likelihood: -1737.16201017896
## Iteration 7 Log Likelihood: -1737.15904917175
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1982.0012303363
## Iteration 2 Log Likelihood: 0.633432987643506
## Iteration 3 Log Likelihood: 1.1063757422064
## Iteration 4 Log Likelihood: 1.71382088932224
## Iteration 5 Log Likelihood: 2.32465765587039
## Iteration 6 Log Likelihood: 2.77679318801222
## Iteration 7 Log Likelihood: 3.03738888350113
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1923.56012264171
## Iteration 2 Log Likelihood: -1912.41407368145
## Iteration 3 Log Likelihood: -1911.50448561027
## Iteration 4 Log Likelihood: -1910.6579609988
## Iteration 5 Log Likelihood: -1910.06088093697
## Iteration 6 Log Likelihood: -1909.73032554484
## Iteration 7 Log Likelihood: -1909.57150196514
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1923.51864107511
## Iteration 2 Log Likelihood: -1666.60169663885
## Iteration 3 Log Likelihood: -1660.05995258004
## Iteration 4 Log Likelihood: -1658.40903889039
## Iteration 5 Log Likelihood: -1657.29824887047
## Iteration 6 Log Likelihood: -1656.71019943362
## Iteration 7 Log Likelihood: -1656.4154614019
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1920.8449092793
## Iteration 2 Log Likelihood: 173.786707162254
## Iteration 3 Log Likelihood: 205.878780346328
## Iteration 4 Log Likelihood: 221.89488625116
## Iteration 5 Log Likelihood: 225.145335897237
## Iteration 6 Log Likelihood: 228.292457547482

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## Iteration 7 Log Likelihood: 231.617465200671
## Initialization by the identity.
## Iteration 1 Log Likelihood: -1947.16864466471
## Iteration 2 Log Likelihood: -1693.41538698752
## Iteration 3 Log Likelihood: -1687.84823208236
## Iteration 4 Log Likelihood: -1686.70392067961
## Iteration 5 Log Likelihood: -1686.36134637538
## Iteration 6 Log Likelihood: -1686.04713726965
## Iteration 7 Log Likelihood: -1685.70577393483

## Heteroscedastic Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
##   gamma  lambda  newdim  Accuracy  Kappa
##   0.10   0.0     2       0.3720329  0.1642693
##   0.10   0.0     3       0.3873230  0.1997847
##   0.10   0.5     2       0.3754214  0.1712874
##   0.10   0.5     3       0.3908455  0.2056695
##   0.10   1.0     2       0.4305727  0.2401972
##   0.10   1.0     3       0.4549507  0.2908464
##   0.55   0.0     2       0.4776707  0.3212424
##   0.55   0.0     3       0.4949689  0.3468391
##   0.55   0.5     2       0.4824212  0.3315128
##   0.55   0.5     3       0.5074179  0.3653629
##   0.55   1.0     2       0.4609744  0.2761900
##   0.55   1.0     3       0.5497366  0.4015952
##   1.00   0.0     2       0.4790370  0.2983156
##   1.00   0.0     3       0.4819821  0.3088751
##   1.00   0.5     2       0.4943469  0.3221868
##   1.00   0.5     3       0.4998258  0.3309232
##   1.00   1.0     2       0.4591776  0.2703088
##   1.00   1.0     3       0.4956599  0.3185066
##
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were gamma = 0.55, lambda = 1
## and newdim = 3.

## # : Model      BIC
## 1 : AKJBKQKDK  -1941.913
## 2 : AKBKQKDK   -1950.864
## 3 : ABKQKDK    -1967.749
## 4 : AKJBQKDK   -2135.526
## 5 : AKBQKDK    -2144.477
## 6 : ABQKDK     -2161.362
## 7 : AKJBKQKD   -1921.538
## 8 : AKBKQKD    -1930.489
## 9 : ABKQKD     -1947.374

```

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## 10 : AKJBQKD      -2115.151
## 11 : AKBQKD       -2124.102
## 12 : ABQKD        -2140.987
## 13 : AJBQD        -2135.309
## 14 : ABQD         -2132.504
##
## SELECTED: Model AKJBKQKD, BIC=-1921.538.
## # : Model      BIC
## 1 : AKJBKQKDK  -2063.56
## 2 : AKBKQKDK   -2065.831
## 3 : ABKQKDK    -2073.863
## 4 : AKJBQKDK   -2179.559
## 5 : AKBQKDK    -2181.831
## 6 : ABQKDK     -2189.862
## 7 : AKJBKQKD   -1921.538
## 8 : AKBKQKD    -1930.489
## 9 : ABKQKD     -1947.374
## 10 : AKJBQKD   -2115.151
## 11 : AKBQKD    -2124.102
## 12 : ABQKD     -2140.987
## 13 : AJBQD     -2135.309
## 14 : ABQD      -2132.504
##
## SELECTED: Model AKJBKQKD, BIC=-1921.538.
## # : Model      BIC
## 1 : AKJBKQKDK  -2200.274
## 2 : AKBKQKDK   -2194.631
## 3 : ABKQKDK    -2207.862
## 4 : AKJBQKDK   -2542.665
## 5 : AKBQKDK    -2537.022
## 6 : ABQKDK     -2550.253
## 7 : AKJBKQKD   -1921.538
## 8 : AKBKQKD    -1930.489
## 9 : ABKQKD     -1947.374
## 10 : AKJBQKD   -2115.151
## 11 : AKBQKD    -2124.102
## 12 : ABQKD     -2140.987
## 13 : AJBQD     -2135.309
## 14 : ABQD      -2132.504
##
## SELECTED: Model AKJBKQKD, BIC=-1921.538.
## # : Model      BIC
## 1 : AKJBKQKDK  -1796.51
## 2 : AKBKQKDK   -1861.529
## 3 : ABKQKDK    -1855.602
## 4 : AKJBQKDK   -1860.104
## 5 : AKBQKDK    -1925.123
## 6 : ABQKDK     -1919.197
## 7 : AKJBKQKD   -1899.45
## 8 : AKBKQKD    -1902.11
## 9 : ABKQKD     -1906.501
## 10 : AKJBQKD   -2148.426
## 11 : AKBQKD    -2151.087
## 12 : ABQKD     -2155.477

```

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## 13 :  AJBQD      -2057.727
## 14 :  ABQD       -2054.52
##
## SELECTED: Model AKJBKQKDK, BIC=-1796.51.
## # : Model      BIC
## 1 :  AKJBKQKDK  -2166.421
## 2 :  AKBKQKDK   -2155.496
## 3 :  ABKQKDK    -2161.202
## 4 :  AKJBQKDK   -2381.678
## 5 :  AKBQKDK    -2370.753
## 6 :  ABQKDK     -2376.459
## 7 :  AKJBKQKD   -1899.45
## 8 :  AKBKQKD    -1902.11
## 9 :  ABKQKD     -1906.501
## 10 : AKJBQKD    -2148.426
## 11 : AKBQKD     -2151.087
## 12 : ABQKD      -2155.477
## 13 : AJBQD      -2057.727
## 14 : ABQD       -2054.52
##
## SELECTED: Model AKJBKQKD, BIC=-1899.45.
## # : Model      BIC
## 1 :  AKJBKQKDK  -2166.421
## 2 :  AKBKQKDK   -2155.496
## 3 :  ABKQKDK    -2161.202
## 4 :  AKJBQKDK   -2381.678
## 5 :  AKBQKDK    -2370.753
## 6 :  ABQKDK     -2376.459
## 7 :  AKJBKQKD   -1899.45
## 8 :  AKBKQKD    -1902.11
## 9 :  ABKQKD     -1906.501
## 10 : AKJBQKD    -2148.426
## 11 : AKBQKD     -2151.087
## 12 : ABQKD      -2155.477
## 13 : AJBQD      -2057.727
## 14 : ABQD       -2054.52
##
## SELECTED: Model AKJBKQKD, BIC=-1899.45.
## # : Model      BIC
## 1 :  AKJBKQKDK  -1328.23
## 2 :  AKBKQKDK   -1443.828
## 3 :  ABKQKDK    -1582.406
## 4 :  AKJBQKDK   -2187.157
## 5 :  AKBQKDK    -2302.755
## 6 :  ABQKDK     -2441.333
## 7 :  AKJBKQKD   -1902.018
## 8 :  AKBKQKD    -1901.014
## 9 :  ABKQKD     -1953.781
## 10 : AKJBQKD    -2213.386
## 11 : AKBQKD     -2212.383
## 12 : ABQKD      -2265.149
## 13 : AJBQD      -2113.446
## 14 : ABQD       -2109.54
##

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## SELECTED: Model AKJBKQKDK, BIC=-1328.23.
## # : Model      BIC
## 1 : AKJBKQKDK  -1922.393
## 2 : AKBKQKDK   -1921.389
## 3 : ABKQKDK    -1974.156
## 4 : AKJBQKDK   -2233.761
## 5 : AKBQKDK    -2232.758
## 6 : ABQKDK     -2285.524
## 7 : AKJBKQKD   -1902.018
## 8 : AKBKQKD    -1901.014
## 9 : ABKQKD     -1953.781
## 10 : AKJBQKD   -2213.386
## 11 : AKBQKD    -2212.383
## 12 : ABQKD     -2265.149
## 13 : AJBQD     -2113.446
## 14 : ABQD      -2109.54
##
## SELECTED: Model AKBKQKD, BIC=-1901.014.
## # : Model      BIC
## 1 : AKJBKQKDK  -2195.504
## 2 : AKBKQKDK   -2187.642
## 3 : ABKQKDK    -2236.006
## 4 : AKJBQKDK   -2425.736
## 5 : AKBQKDK    -2417.875
## 6 : ABQKDK     -2466.238
## 7 : AKJBKQKD   -1902.018
## 8 : AKBKQKD    -1901.014
## 9 : ABKQKD     -1953.781
## 10 : AKJBQKD   -2213.386
## 11 : AKBQKD    -2212.383
## 12 : ABQKD     -2265.149
## 13 : AJBQD     -2113.446
## 14 : ABQD      -2109.54
##
## SELECTED: Model AKBKQKD, BIC=-1901.014.
## # : Model      BIC
## 1 : AKJBKQKDK  -1769.885
## 2 : AKBKQKDK   -1776.1
## 3 : ABKQKDK    -1807.97
## 4 : AKJBQKDK   -2091.849
## 5 : AKBQKDK    -2098.064
## 6 : ABQKDK     -2129.934
## 7 : AKJBKQKD   -1842.181
## 8 : AKBKQKD    -1831.657
## 9 : ABKQKD     -1847.878
## 10 : AKJBQKD   -2040.975
## 11 : AKBQKD    -2030.452
## 12 : ABQKD     -2046.673
## 13 : AJBQD     -1936.737
## 14 : ABQD      -1935.153
##
## SELECTED: Model AKJBKQKDK, BIC=-1769.885.
## # : Model      BIC
## 1 : AKJBKQKDK  -1862.556

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## 2 : AKBKQKDK -1852.032
## 3 : ABKQKDK -1868.253
## 4 : AKJBQKDK -2061.35
## 5 : AKBQKDK -2050.827
## 6 : ABQKDK -2067.048
## 7 : AKJBKQKD -1842.181
## 8 : AKBKQKD -1831.657
## 9 : ABKQKD -1847.878
## 10 : AKJBQKD -2040.975
## 11 : AKBQKD -2030.452
## 12 : ABQKD -2046.673
## 13 : AJBQD -1936.737
## 14 : ABQD -1935.153
##
## SELECTED: Model AKBKQKD, BIC=-1831.657.
## # : Model BIC
## 1 : AKJBKQKDK -1862.556
## 2 : AKBKQKDK -1852.032
## 3 : ABKQKDK -1868.253
## 4 : AKJBQKDK -2061.35
## 5 : AKBQKDK -2050.827
## 6 : ABQKDK -2067.048
## 7 : AKJBKQKD -1842.181
## 8 : AKBKQKD -1831.657
## 9 : ABKQKD -1847.878
## 10 : AKJBQKD -2040.975
## 11 : AKBQKD -2030.452
## 12 : ABQKD -2046.673
## 13 : AJBQD -1936.737
## 14 : ABQD -1935.153
##
## SELECTED: Model AKBKQKD, BIC=-1831.657.
## # : Model BIC
## 1 : AKJBKQKDK -1829.426
## 2 : AKBKQKDK -1836.946
## 3 : ABKQKDK -1857.524
## 4 : AKJBQKDK -2044.632
## 5 : AKBQKDK -2052.152
## 6 : ABQKDK -2072.73
## 7 : AKJBKQKD -1809.051
## 8 : AKBKQKD -1816.571
## 9 : ABKQKD -1837.149
## 10 : AKJBQKD -2024.257
## 11 : AKBQKD -2031.777
## 12 : ABQKD -2052.355
## 13 : AJBQD -1897.976
## 14 : ABQD -1893.761
##
## SELECTED: Model AKJBKQKD, BIC=-1809.051.
## # : Model BIC
## 1 : AKJBKQKDK -2052.852
## 2 : AKBKQKDK -2049.522
## 3 : ABKQKDK -2065.032
## 4 : AKJBQKDK -2164.057

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## 5 : AKBQKDK -2160.727
## 6 : ABQKDK -2176.237
## 7 : AKJBKQKD -1809.051
## 8 : AKBKQKD -1816.571
## 9 : ABKQKD -1837.149
## 10 : AKJBQKD -2024.257
## 11 : AKBQKD -2031.777
## 12 : ABQKD -2052.355
## 13 : AJBQD -1897.976
## 14 : ABQD -1893.761
##
## SELECTED: Model AKJBKQKD, BIC=-1809.051.
## # : Model BIC
## 1 : AKJBKQKDK -2052.852
## 2 : AKBKQKDK -2049.522
## 3 : ABKQKDK -2065.032
## 4 : AKJBQKDK -2164.057
## 5 : AKBQKDK -2160.727
## 6 : ABQKDK -2176.237
## 7 : AKJBKQKD -1809.051
## 8 : AKBKQKD -1816.571
## 9 : ABKQKD -1837.149
## 10 : AKJBQKD -2024.257
## 11 : AKBQKD -2031.777
## 12 : ABQKD -2052.355
## 13 : AJBQD -1897.976
## 14 : ABQD -1893.761
##
## SELECTED: Model AKJBKQKD, BIC=-1809.051.
## # : Model BIC
## 1 : AKJBKQKDK -1802.826
## 2 : AKBKQKDK -1851.84
## 3 : ABKQKDK -1873.984
## 4 : AKJBQKDK -2152.405
## 5 : AKBQKDK -2201.419
## 6 : ABQKDK -2223.563
## 7 : AKJBKQKD -1903.626
## 8 : AKBKQKD -1901.446
## 9 : ABKQKD -1906.471
## 10 : AKJBQKD -2188.983
## 11 : AKBQKD -2186.804
## 12 : ABQKD -2191.828
## 13 : AJBQD -2045.737
## 14 : ABQD -2048.424
##
## SELECTED: Model AKJBKQKDK, BIC=-1802.826.
## # : Model BIC
## 1 : AKJBKQKDK -1924.001
## 2 : AKBKQKDK -1921.821
## 3 : ABKQKDK -1926.846
## 4 : AKJBQKDK -2209.358
## 5 : AKBQKDK -2207.179
## 6 : ABQKDK -2212.203
## 7 : AKJBKQKD -1903.626

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## 8 : AKBKQKD -1901.446
## 9 : ABKQKD -1906.471
## 10 : AKJBQKD -2188.983
## 11 : AKBQKD -2186.804
## 12 : ABQKD -2191.828
## 13 : AJBQD -2045.737
## 14 : ABQD -2048.424
##
## SELECTED: Model AKBKQKD, BIC=-1901.446.
## # : Model BIC
## 1 : AKJBKQKDK -2232.093
## 2 : AKBKQKDK -2223.583
## 3 : ABKQKDK -2225.194
## 4 : AKJBQKDK -2401.572
## 5 : AKBQKDK -2393.062
## 6 : ABQKDK -2394.673
## 7 : AKJBKQKD -1903.626
## 8 : AKBKQKD -1901.446
## 9 : ABKQKD -1906.471
## 10 : AKJBQKD -2188.983
## 11 : AKBQKD -2186.804
## 12 : ABQKD -2191.828
## 13 : AJBQD -2045.737
## 14 : ABQD -2048.424
##
## SELECTED: Model AKBKQKD, BIC=-1901.446.
## # : Model BIC
## 1 : AKJBKQKDK -1872.153
## 2 : AKBKQKDK -1878.175
## 3 : ABKQKDK -1880.233
## 4 : AKJBQKDK -2132.382
## 5 : AKBQKDK -2138.403
## 6 : ABQKDK -2140.461
## 7 : AKJBKQKD -1851.778
## 8 : AKBKQKD -1857.8
## 9 : ABKQKD -1859.858
## 10 : AKJBQKD -2112.007
## 11 : AKBQKD -2118.028
## 12 : ABQKD -2120.086
## 13 : AJBQD -2183.614
## 14 : ABQD -2180.285
##
## SELECTED: Model AKJBKQKD, BIC=-1851.778.
## # : Model BIC
## 1 : AKJBKQKDK -1872.153
## 2 : AKBKQKDK -1878.175
## 3 : ABKQKDK -1880.233
## 4 : AKJBQKDK -2132.382
## 5 : AKBQKDK -2138.403
## 6 : ABQKDK -2140.461
## 7 : AKJBKQKD -1851.778
## 8 : AKBKQKD -1857.8
## 9 : ABKQKD -1859.858
## 10 : AKJBQKD -2112.007

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## 11 :   AKBQKD      -2118.028
## 12 :   ABQKD      -2120.086
## 13 :   AJBQD      -2183.614
## 14 :   ABQD       -2180.285
##
## SELECTED: Model AKJBKQKD, BIC=-1851.778.
## # : Model      BIC
## 1 : AKJBKQKDK   -2183.771
## 2 : AKBKQKDK    -2182.043
## 3 : ABKQKDK     -2175.051
## 4 : AKJBQKDK    -2335.751
## 5 : AKBQKDK     -2334.023
## 6 : ABQKDK      -2327.031
## 7 : AKJBKQKD    -1851.778
## 8 : AKBKQKD     -1857.8
## 9 : ABKQKD      -1859.858
## 10 : AKJBQKD    -2112.007
## 11 : AKBQKD     -2118.028
## 12 : ABQKD      -2120.086
## 13 : AJBQD      -2183.614
## 14 : ABQD       -2180.285
##
## SELECTED: Model AKJBKQKD, BIC=-1851.778.
## # : Model      BIC
## 1 : AKJBKQKDK   -1708.762
## 2 : AKBKQKDK    -1778.294
## 3 : ABKQKDK     -1817.271
## 4 : AKJBQKDK    -2056.768
## 5 : AKBQKDK     -2126.3
## 6 : ABQKDK      -2165.277
## 7 : AKJBKQKD    -1746.708
## 8 : AKBKQKD     -1765.737
## 9 : ABKQKD      -1778.368
## 10 : AKJBQKD    -2002.725
## 11 : AKBQKD     -2021.754
## 12 : ABQKD      -2034.386
## 13 : AJBQD      -1958.198
## 14 : ABQD       -1958.48
##
## SELECTED: Model AKJBKQKDK, BIC=-1708.762.
## # : Model      BIC
## 1 : AKJBKQKDK   -2051.449
## 2 : AKBKQKDK    -2040.725
## 3 : ABKQKDK     -2043.197
## 4 : AKJBQKDK    -2162.893
## 5 : AKBQKDK     -2152.168
## 6 : ABQKDK      -2154.641
## 7 : AKJBKQKD    -1746.708
## 8 : AKBKQKD     -1765.737
## 9 : ABKQKD      -1778.368
## 10 : AKJBQKD    -2002.725
## 11 : AKBQKD     -2021.754
## 12 : ABQKD      -2034.386
## 13 : AJBQD      -1958.198

```

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## 14 : ABQD -1958.48
##
## SELECTED: Model AKJBKQKD, BIC=-1746.708.
## # : Model BIC
## 1 : AKJBKQKDK -2051.449
## 2 : AKBKQKDK -2040.725
## 3 : ABKQKDK -2043.197
## 4 : AKJBQKDK -2162.893
## 5 : AKBQKDK -2152.168
## 6 : ABQKDK -2154.641
## 7 : AKJBKQKD -1746.708
## 8 : AKBKQKD -1765.737
## 9 : ABKQKD -1778.368
## 10 : AKJBQKD -2002.725
## 11 : AKBQKD -2021.754
## 12 : ABQKD -2034.386
## 13 : AJBQD -1958.198
## 14 : ABQD -1958.48
##
## SELECTED: Model AKJBKQKD, BIC=-1746.708.
## # : Model BIC
## 1 : AKJBKQKDK -1710.675
## 2 : AKBKQKDK -1785.412
## 3 : ABKQKDK -1793.383
## 4 : AKJBQKDK -1774.757
## 5 : AKBQKDK -1849.495
## 6 : ABQKDK -1857.465
## 7 : AKJBKQKD -1843.631
## 8 : AKBKQKD -1846.216
## 9 : ABKQKD -1870.801
## 10 : AKJBQKD -2121.92
## 11 : AKBQKD -2124.505
## 12 : ABQKD -2149.09
## 13 : AJBQD -2025.871
## 14 : ABQD -2024.921
##
## SELECTED: Model AKJBKQKDK, BIC=-1710.675.
## # : Model BIC
## 1 : AKJBKQKDK -1864.006
## 2 : AKBKQKDK -1866.591
## 3 : ABKQKDK -1891.176
## 4 : AKJBQKDK -2142.295
## 5 : AKBQKDK -2144.88
## 6 : ABQKDK -2169.465
## 7 : AKJBKQKD -1843.631
## 8 : AKBKQKD -1846.216
## 9 : ABKQKD -1870.801
## 10 : AKJBQKD -2121.92
## 11 : AKBQKD -2124.505
## 12 : ABQKD -2149.09
## 13 : AJBQD -2025.871
## 14 : ABQD -2024.921
##
## SELECTED: Model AKJBKQKD, BIC=-1843.631.

```

```

## # : Model      BIC
## 1 : AKJBKQKDK  -2051.795
## 2 : AKBKQKDK   -2045.732
## 3 : ABKQKDK    -2050.316
## 4 : AKJBQKDK   -2218.995
## 5 : AKBQKDK    -2212.932
## 6 : ABQKDK     -2217.516
## 7 : AKJBKQKD   -1843.631
## 8 : AKBKQKD    -1846.216
## 9 : ABKQKD     -1870.801
## 10 : AKJBQKD   -2121.92
## 11 : AKBQKD    -2124.505
## 12 : ABQKD     -2149.09
## 13 : AJBQD     -2025.871
## 14 : ABQD      -2024.921
##
## SELECTED: Model AKJBKQKD, BIC=-1843.631.
## # : Model      BIC
## 1 : AKJBKQKDK  -1703.177
## 2 : AKBKQKDK   -1712.774
## 3 : ABKQKDK    -1744.056
## 4 : AKJBQKDK   -2053.458
## 5 : AKBQKDK    -2063.055
## 6 : ABQKDK     -2094.337
## 7 : AKJBKQKD   -1682.802
## 8 : AKBKQKD    -1692.399
## 9 : ABKQKD     -1723.681
## 10 : AKJBQKD   -2033.083
## 11 : AKBQKD    -2042.68
## 12 : ABQKD     -2073.962
## 13 : AJBQD     -2151.34
## 14 : ABQD      -2151.971
##
## SELECTED: Model AKJBKQKD, BIC=-1682.802.
## # : Model      BIC
## 1 : AKJBKQKDK  -1940.754
## 2 : AKBKQKDK   -1934.494
## 3 : ABKQKDK    -1951.697
## 4 : AKJBQKDK   -2131.033
## 5 : AKBQKDK    -2124.773
## 6 : ABQKDK     -2141.976
## 7 : AKJBKQKD   -1682.802
## 8 : AKBKQKD    -1692.399
## 9 : ABKQKD     -1723.681
## 10 : AKJBQKD   -2033.083
## 11 : AKBQKD    -2042.68
## 12 : ABQKD     -2073.962
## 13 : AJBQD     -2151.34
## 14 : ABQD      -2151.971
##
## SELECTED: Model AKJBKQKD, BIC=-1682.802.
## # : Model      BIC
## 1 : AKJBKQKDK  -1940.754
## 2 : AKBKQKDK   -1934.494

```

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## 3 : ABKQKDK -1951.697
## 4 : AKJBQKDK -2131.033
## 5 : AKBQKDK -2124.773
## 6 : ABQKDK -2141.976
## 7 : AKJBKQKD -1682.802
## 8 : AKBKQKD -1692.399
## 9 : ABKQKD -1723.681
## 10 : AKJBQKD -2033.083
## 11 : AKBQKD -2042.68
## 12 : ABQKD -2073.962
## 13 : AJBQD -2151.34
## 14 : ABQD -2151.971
##
## SELECTED: Model AKJBKQKD, BIC=-1682.802.
## # : Model BIC
## 1 : AKJBKQKDK -1694.074
## 2 : AKBKQKDK -1821.849
## 3 : ABKQKDK -1823.417
## 4 : AKJBQKDK -2008.588
## 5 : AKBQKDK -2136.364
## 6 : ABQKDK -2137.932
## 7 : AKJBKQKD -1999.56
## 8 : AKBKQKD -2019.24
## 9 : ABKQKD -2017.717
## 10 : AKJBQKD -2206.958
## 11 : AKBQKD -2226.639
## 12 : ABQKD -2225.115
## 13 : AJBQD -2115.365
## 14 : ABQD -2111.937
##
## SELECTED: Model AKJBKQKDK, BIC=-1694.074.
## # : Model BIC
## 1 : AKJBKQKDK -2210.283
## 2 : AKBKQKDK -2202.092
## 3 : ABKQKDK -2186.924
## 4 : AKJBQKDK -2272.052
## 5 : AKBQKDK -2263.862
## 6 : ABQKDK -2248.693
## 7 : AKJBKQKD -1999.56
## 8 : AKBKQKD -2019.24
## 9 : ABKQKD -2017.717
## 10 : AKJBQKD -2206.958
## 11 : AKBQKD -2226.639
## 12 : ABQKD -2225.115
## 13 : AJBQD -2115.365
## 14 : ABQD -2111.937
##
## SELECTED: Model AKJBKQKD, BIC=-1999.56.
## # : Model BIC
## 1 : AKJBKQKDK -2210.283
## 2 : AKBKQKDK -2202.092
## 3 : ABKQKDK -2186.924
## 4 : AKJBQKDK -2272.052
## 5 : AKBQKDK -2263.862

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## 6 : ABQKDK -2248.693
## 7 : AKJBKQKD -1999.56
## 8 : AKBKQKD -2019.24
## 9 : ABKQKD -2017.717
## 10 : AKJBQKD -2206.958
## 11 : AKBQKD -2226.639
## 12 : ABQKD -2225.115
## 13 : AJBQD -2115.365
## 14 : ABQD -2111.937
##
## SELECTED: Model AKJBKQKD, BIC=-1999.56.
## # : Model BIC
## 1 : AKJBKQKDK -1665.668
## 2 : AKBKQKDK -1665.459
## 3 : ABKQKDK -1696.899
## 4 : AKJBQKDK -2007.845
## 5 : AKBQKDK -2007.636
## 6 : ABQKDK -2039.077
## 7 : AKJBKQKD -1645.293
## 8 : AKBKQKD -1645.084
## 9 : ABKQKD -1676.524
## 10 : AKJBQKD -1987.47
## 11 : AKBQKD -1987.261
## 12 : ABQKD -2018.702
## 13 : AJBQD -1934.525
## 14 : ABQD -1931.725
##
## SELECTED: Model AKBKQKD, BIC=-1645.084.
## # : Model BIC
## 1 : AKJBKQKDK -1665.668
## 2 : AKBKQKDK -1665.459
## 3 : ABKQKDK -1696.899
## 4 : AKJBQKDK -2007.845
## 5 : AKBQKDK -2007.636
## 6 : ABQKDK -2039.077
## 7 : AKJBKQKD -1645.293
## 8 : AKBKQKD -1645.084
## 9 : ABKQKD -1676.524
## 10 : AKJBQKD -1987.47
## 11 : AKBQKD -1987.261
## 12 : ABQKD -2018.702
## 13 : AJBQD -1934.525
## 14 : ABQD -1931.725
##
## SELECTED: Model AKBKQKD, BIC=-1645.084.
## # : Model BIC
## 1 : AKJBKQKDK -1865.284
## 2 : AKBKQKDK -1862.411
## 3 : ABKQKDK -1885.438
## 4 : AKJBQKDK -2080.353
## 5 : AKBQKDK -2077.48
## 6 : ABQKDK -2100.507
## 7 : AKJBKQKD -1645.293
## 8 : AKBKQKD -1645.084

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## 9 : ABKQKD -1676.524
## 10 : AKJBQKD -1987.47
## 11 : AKBQKD -1987.261
## 12 : ABQKD -2018.702
## 13 : AJBQD -1934.525
## 14 : ABQD -1931.725
##
## SELECTED: Model AKBKQKD, BIC=-1645.084.
## # : Model BIC
## 1 : AKJBKQKDK -1570.695
## 2 : AKBKQKDK -1698.571
## 3 : ABKQKDK -1773.977
## 4 : AKJBQKDK -2051.539
## 5 : AKBQKDK -2179.415
## 6 : ABQKDK -2254.82
## 7 : AKJBKQKD -1757.683
## 8 : AKBKQKD -1768.991
## 9 : ABKQKD -1796.459
## 10 : AKJBQKD -2037.693
## 11 : AKBQKD -2049
## 12 : ABQKD -2076.468
## 13 : AJBQD -2134.144
## 14 : ABQD -2131.49
##
## SELECTED: Model AKJBKQKDK, BIC=-1570.695.
## # : Model BIC
## 1 : AKJBKQKDK -2038.091
## 2 : AKBKQKDK -2031.5
## 3 : ABKQKDK -2054.128
## 4 : AKJBQKDK -2177.774
## 5 : AKBQKDK -2171.183
## 6 : ABQKDK -2193.811
## 7 : AKJBKQKD -1757.683
## 8 : AKBKQKD -1768.991
## 9 : ABKQKD -1796.459
## 10 : AKJBQKD -2037.693
## 11 : AKBQKD -2049
## 12 : ABQKD -2076.468
## 13 : AJBQD -2134.144
## 14 : ABQD -2131.49
##
## SELECTED: Model AKJBKQKD, BIC=-1757.683.
## # : Model BIC
## 1 : AKJBKQKDK -2038.091
## 2 : AKBKQKDK -2031.5
## 3 : ABKQKDK -2054.128
## 4 : AKJBQKDK -2177.774
## 5 : AKBQKDK -2171.183
## 6 : ABQKDK -2193.811
## 7 : AKJBKQKD -1757.683
## 8 : AKBKQKD -1768.991
## 9 : ABKQKD -1796.459
## 10 : AKJBQKD -2037.693
## 11 : AKBQKD -2049

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## 12 : ABQKD      -2076.468
## 13 : AJBQD      -2134.144
## 14 : ABQD       -2131.49
##
## SELECTED: Model AKJBKQKD, BIC=-1757.683.
## # : Model      BIC
## 1 : AKJBKQKDK  -1746.028
## 2 : AKBKQKDK   -1749.982
## 3 : ABKQKDK    -1764.91
## 4 : AKJBQKDK   -2103.088
## 5 : AKBQKDK    -2107.042
## 6 : ABQKDK     -2121.97
## 7 : AKJBKQKD   -1725.653
## 8 : AKBKQKD    -1729.607
## 9 : ABKQKD     -1744.535
## 10 : AKJBQKD   -2082.713
## 11 : AKBQKD    -2086.667
## 12 : ABQKD     -2101.595
## 13 : AJBQD     -2136.075
## 14 : ABQD      -2134.171
##
## SELECTED: Model AKJBKQKD, BIC=-1725.653.
## # : Model      BIC
## 1 : AKJBKQKDK  -1746.028
## 2 : AKBKQKDK   -1749.982
## 3 : ABKQKDK    -1764.91
## 4 : AKJBQKDK   -2103.088
## 5 : AKBQKDK    -2107.042
## 6 : ABQKDK     -2121.97
## 7 : AKJBKQKD   -1725.653
## 8 : AKBKQKD    -1729.607
## 9 : ABKQKD     -1744.535
## 10 : AKJBQKD   -2082.713
## 11 : AKBQKD    -2086.667
## 12 : ABQKD     -2101.595
## 13 : AJBQD     -2136.075
## 14 : ABQD      -2134.171
##
## SELECTED: Model AKJBKQKD, BIC=-1725.653.
## # : Model      BIC
## 1 : AKJBKQKDK  -1994.676
## 2 : AKBKQKDK   -1993.851
## 3 : ABKQKDK    -1998.982
## 4 : AKJBQKDK   -2185.287
## 5 : AKBQKDK    -2184.463
## 6 : ABQKDK     -2189.593
## 7 : AKJBKQKD   -1725.653
## 8 : AKBKQKD    -1729.607
## 9 : ABKQKD     -1744.535
## 10 : AKJBQKD   -2082.713
## 11 : AKBQKD    -2086.667
## 12 : ABQKD     -2101.595
## 13 : AJBQD     -2136.075
## 14 : ABQD      -2134.171

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##
## SELECTED: Model AKJBKQKD, BIC=-1725.653.
## # : Model      BIC
## 1 : AKJBKQKDK  -1811.308
## 2 : AKBKQKDK   -1815.116
## 3 : ABKQKDK    -1831.807
## 4 : AKJBQKDK   -2043.902
## 5 : AKBQKDK    -2047.709
## 6 : ABQKDK     -2064.4
## 7 : AKJBKQKD   -1790.933
## 8 : AKBKQKD    -1794.741
## 9 : ABKQKD     -1811.432
## 10 : AKJBQKD   -2023.527
## 11 : AKBQKD    -2027.334
## 12 : ABQKD     -2044.025
## 13 : AJBQD     -1969.888
## 14 : ABQD      -1970.212
##
## SELECTED: Model AKJBKQKD, BIC=-1790.933.
## # : Model      BIC
## 1 : AKJBKQKDK  -1961.841
## 2 : AKBKQKDK   -1958.226
## 3 : ABKQKDK    -1964.137
## 4 : AKJBQKDK   -2065.559
## 5 : AKBQKDK    -2061.945
## 6 : ABQKDK     -2067.856
## 7 : AKJBKQKD   -1790.933
## 8 : AKBKQKD    -1794.741
## 9 : ABKQKD     -1811.432
## 10 : AKJBQKD   -2023.527
## 11 : AKBQKD    -2027.334
## 12 : ABQKD     -2044.025
## 13 : AJBQD     -1969.888
## 14 : ABQD      -1970.212
##
## SELECTED: Model AKJBKQKD, BIC=-1790.933.
## # : Model      BIC
## 1 : AKJBKQKDK  -1961.841
## 2 : AKBKQKDK   -1958.226
## 3 : ABKQKDK    -1964.137
## 4 : AKJBQKDK   -2065.559
## 5 : AKBQKDK    -2061.945
## 6 : ABQKDK     -2067.856
## 7 : AKJBKQKD   -1790.933
## 8 : AKBKQKD    -1794.741
## 9 : ABKQKD     -1811.432
## 10 : AKJBQKD   -2023.527
## 11 : AKBQKD    -2027.334
## 12 : ABQKD     -2044.025
## 13 : AJBQD     -1969.888
## 14 : ABQD      -1970.212
##
## SELECTED: Model AKJBKQKD, BIC=-1790.933.
## # : Model      BIC

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## 1 : AKJBKQKDK -2048.274
## 2 : AKBKQKDK -2067.069
## 3 : ABKQKDK -2080.609
## 4 : AKJBQKDK -2210.715
## 5 : AKBQKDK -2229.51
## 6 : ABQKDK -2243.051
## 7 : AKJBKQKD -2027.899
## 8 : AKBKQKD -2046.694
## 9 : ABKQKD -2060.234
## 10 : AKJBQKD -2190.34
## 11 : AKBQKD -2209.135
## 12 : ABQKD -2222.676
## 13 : AJBQD -2134.162
## 14 : ABQD -2131.853
##
## SELECTED: Model AKJBKQKD, BIC=-2027.899.
## # : Model BIC
## 1 : AKJBKQKDK -2189.352
## 2 : AKBKQKDK -2183.232
## 3 : ABKQKDK -2193.975
## 4 : AKJBQKDK -2274.786
## 5 : AKBQKDK -2268.665
## 6 : ABQKDK -2279.408
## 7 : AKJBKQKD -2027.899
## 8 : AKBKQKD -2046.694
## 9 : ABKQKD -2060.234
## 10 : AKJBQKD -2190.34
## 11 : AKBQKD -2209.135
## 12 : ABQKD -2222.676
## 13 : AJBQD -2134.162
## 14 : ABQD -2131.853
##
## SELECTED: Model AKJBKQKD, BIC=-2027.899.
## # : Model BIC
## 1 : AKJBKQKDK -2189.352
## 2 : AKBKQKDK -2183.232
## 3 : ABKQKDK -2193.975
## 4 : AKJBQKDK -2274.786
## 5 : AKBQKDK -2268.665
## 6 : ABQKDK -2279.408
## 7 : AKJBKQKD -2027.899
## 8 : AKBKQKD -2046.694
## 9 : ABKQKD -2060.234
## 10 : AKJBQKD -2190.34
## 11 : AKBQKD -2209.135
## 12 : ABQKD -2222.676
## 13 : AJBQD -2134.162
## 14 : ABQD -2131.853
##
## SELECTED: Model AKJBKQKD, BIC=-2027.899.
## # : Model BIC
## 1 : AKJBKQKDK -1915.563
## 2 : AKBKQKDK -1977.093
## 3 : ABKQKDK -2018.557

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## 4 : AKJBQKDK -2235.504
## 5 : AKBQKDK -2297.034
## 6 : ABQKDK -2338.499
## 7 : AKJBKQKD -1961.383
## 8 : AKBKQKD -1982.753
## 9 : ABKQKD -1991.41
## 10 : AKJBQKD -2211.061
## 11 : AKBQKD -2232.431
## 12 : ABQKD -2241.087
## 13 : AJBQD -2259.05
## 14 : ABQD -2254.909
##
## SELECTED: Model AKJBKQKD, BIC=-1915.563.
## # : Model BIC
## 1 : AKJBKQKD -2031.576
## 2 : AKBKQKD -2018.859
## 3 : ABKQKD -2019.411
## 4 : AKJBQKDK -2200.487
## 5 : AKBQKDK -2187.77
## 6 : ABQKDK -2188.322
## 7 : AKJBKQKD -1961.383
## 8 : AKBKQKD -1982.753
## 9 : ABKQKD -1991.41
## 10 : AKJBQKD -2211.061
## 11 : AKBQKD -2232.431
## 12 : ABQKD -2241.087
## 13 : AJBQD -2259.05
## 14 : ABQD -2254.909
##
## SELECTED: Model AKJBKQKD, BIC=-1961.383.
## # : Model BIC
## 1 : AKJBKQKD -2031.576
## 2 : AKBKQKD -2018.859
## 3 : ABKQKD -2019.411
## 4 : AKJBQKDK -2200.487
## 5 : AKBQKDK -2187.77
## 6 : ABQKDK -2188.322
## 7 : AKJBKQKD -1961.383
## 8 : AKBKQKD -1982.753
## 9 : ABKQKD -1991.41
## 10 : AKJBQKD -2211.061
## 11 : AKBQKD -2232.431
## 12 : ABQKD -2241.087
## 13 : AJBQD -2259.05
## 14 : ABQD -2254.909
##
## SELECTED: Model AKJBKQKD, BIC=-1961.383.
## # : Model BIC
## 1 : AKJBKQKD -1734.123
## 2 : AKBKQKD -1763.231
## 3 : ABKQKD -1781.083
## 4 : AKJBQKDK -2047.08
## 5 : AKBQKDK -2076.188
## 6 : ABQKDK -2094.04

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## 7 : AKJBKQKD -1763.249
## 8 : AKBKQKD -1761.285
## 9 : ABKQKD -1772.248
## 10 : AKJBQKD -2057.868
## 11 : AKBQKD -2055.903
## 12 : ABQKD -2066.866
## 13 : AJBQD -1993.925
## 14 : ABQD -1994.152
##
## SELECTED: Model AKJBKQDK, BIC=-1734.123.
## # : Model BIC
## 1 : AKJBKQDK -1783.624
## 2 : AKBKQDK -1781.66
## 3 : ABKQDK -1792.623
## 4 : AKJBQDK -2078.243
## 5 : AKBQDK -2076.278
## 6 : ABQDK -2087.241
## 7 : AKJBKQKD -1763.249
## 8 : AKBKQKD -1761.285
## 9 : ABKQKD -1772.248
## 10 : AKJBQKD -2057.868
## 11 : AKBQKD -2055.903
## 12 : ABQKD -2066.866
## 13 : AJBQD -1993.925
## 14 : ABQD -1994.152
##
## SELECTED: Model AKBKQKD, BIC=-1761.285.
## # : Model BIC
## 1 : AKJBKQDK -1783.624
## 2 : AKBKQDK -1781.66
## 3 : ABKQDK -1792.623
## 4 : AKJBQDK -2078.243
## 5 : AKBQDK -2076.278
## 6 : ABQDK -2087.241
## 7 : AKJBKQKD -1763.249
## 8 : AKBKQKD -1761.285
## 9 : ABKQKD -1772.248
## 10 : AKJBQKD -2057.868
## 11 : AKBQKD -2055.903
## 12 : ABQKD -2066.866
## 13 : AJBQD -1993.925
## 14 : ABQD -1994.152
##
## SELECTED: Model AKBKQKD, BIC=-1761.285.
## # : Model BIC
## 1 : AKJBKQDK -1881.744
## 2 : AKBKQDK -1893.962
## 3 : ABKQDK -1903.716
## 4 : AKJBQDK -2055.214
## 5 : AKBQDK -2067.432
## 6 : ABQDK -2077.186
## 7 : AKJBKQKD -1861.369
## 8 : AKBKQKD -1873.587
## 9 : ABKQKD -1883.341

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## 10 : AKJBQKD      -2034.839
## 11 : AKBQKD       -2047.057
## 12 : ABQKD        -2056.811
## 13 : AJBQD        -2010.995
## 14 : ABQD         -2007.826
##
## SELECTED: Model AKJBKQKD, BIC=-1861.369.
## # : Model      BIC
## 1 : AKJBKQKDK  -2039.38
## 2 : AKBKQKDK   -2033.734
## 3 : ABKQKDK    -2034.264
## 4 : AKJBQKDK   -2095.194
## 5 : AKBQKDK    -2089.548
## 6 : ABQKDK     -2090.078
## 7 : AKJBKQKD   -1861.369
## 8 : AKBKQKD    -1873.587
## 9 : ABKQKD     -1883.341
## 10 : AKJBQKD   -2034.839
## 11 : AKBQKD    -2047.057
## 12 : ABQKD     -2056.811
## 13 : AJBQD     -2010.995
## 14 : ABQD      -2007.826
##
## SELECTED: Model AKJBKQKD, BIC=-1861.369.
## # : Model      BIC
## 1 : AKJBKQKDK  -2039.38
## 2 : AKBKQKDK   -2033.734
## 3 : ABKQKDK    -2034.264
## 4 : AKJBQKDK   -2095.194
## 5 : AKBQKDK    -2089.548
## 6 : ABQKDK     -2090.078
## 7 : AKJBKQKD   -1861.369
## 8 : AKBKQKD    -1873.587
## 9 : ABKQKD     -1883.341
## 10 : AKJBQKD   -2034.839
## 11 : AKBQKD    -2047.057
## 12 : ABQKD     -2056.811
## 13 : AJBQD     -2010.995
## 14 : ABQD      -2007.826
##
## SELECTED: Model AKJBKQKD, BIC=-1861.369.
## # : Model      BIC
## 1 : AKJBKQKDK  -1778.027
## 2 : AKBKQKDK   -1789.171
## 3 : ABKQKDK    -1799.316
## 4 : AKJBQKDK   -1986.839
## 5 : AKBQKDK    -1997.982
## 6 : ABQKDK     -2008.128
## 7 : AKJBKQKD   -1723.062
## 8 : AKBKQKD    -1784.705
## 9 : ABKQKD     -1795.348
## 10 : AKJBQKD   -2000.699
## 11 : AKBQKD    -2062.341
## 12 : ABQKD     -2072.984

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## 13 :  AJBQD      -1931.023
## 14 :  ABQD       -1928.082
##
## SELECTED: Model AKJBKQKD, BIC=-1723.062.
## # : Model      BIC
## 1 :  AKJBKQKDK  -1907.297
## 2 :  AKBKQKDK   -1905.402
## 3 :  ABKQKDK    -1900.033
## 4 :  AKJBQKDK   -2048.837
## 5 :  AKBQKDK    -2046.943
## 6 :  ABQKDK     -2041.573
## 7 :  AKJBKQKD   -1723.062
## 8 :  AKBKQKD    -1784.705
## 9 :  ABKQKD     -1795.348
## 10 : AKJBQKD    -2000.699
## 11 : AKBQKD     -2062.341
## 12 : ABQKD      -2072.984
## 13 : AJBQD      -1931.023
## 14 : ABQD       -1928.082
##
## SELECTED: Model AKJBKQKD, BIC=-1723.062.
## # : Model      BIC
## 1 :  AKJBKQKDK  -1907.297
## 2 :  AKBKQKDK   -1905.402
## 3 :  ABKQKDK    -1900.033
## 4 :  AKJBQKDK   -2048.837
## 5 :  AKBQKDK    -2046.943
## 6 :  ABQKDK     -2041.573
## 7 :  AKJBKQKD   -1723.062
## 8 :  AKBKQKD    -1784.705
## 9 :  ABKQKD     -1795.348
## 10 : AKJBQKD    -2000.699
## 11 : AKBQKD     -2062.341
## 12 : ABQKD      -2072.984
## 13 : AJBQD      -1931.023
## 14 : ABQD       -1928.082
##
## SELECTED: Model AKJBKQKD, BIC=-1723.062.
## # : Model      BIC
## 1 :  AKJBKQKDK  -1635.835
## 2 :  AKBKQKDK   -1792.358
## 3 :  ABKQKDK    -1823.745
## 4 :  AKJBQKDK   -1849.419
## 5 :  AKBQKDK    -2005.941
## 6 :  ABQKDK     -2037.329
## 7 :  AKJBKQKD   -1866.163
## 8 :  AKBKQKD    -1887.611
## 9 :  ABKQKD     -1901.852
## 10 : AKJBQKD    -2187.609
## 11 : AKBQKD     -2209.057
## 12 : ABQKD      -2223.299
## 13 : AJBQD      -2147.436
## 14 : ABQD       -2147.558
##

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## SELECTED: Model AKJBKQKDK, BIC=-1635.835.

##	#	Model	BIC
##	1	AKJBKQKDK	-2079.075
##	2	AKBKQKDK	-2072.634
##	3	ABKQKDK	-2087.261
##	4	AKJBQKDK	-2265.451
##	5	AKBQKDK	-2259.009
##	6	ABQKDK	-2273.636
##	7	AKJBKQKD	-1866.163
##	8	AKBKQKD	-1887.611
##	9	ABKQKD	-1901.852
##	10	AKJBQKD	-2187.609
##	11	AKBQKD	-2209.057
##	12	ABQKD	-2223.299
##	13	AJBQD	-2147.436
##	14	ABQD	-2147.558

##

## SELECTED: Model AKJBKQKD, BIC=-1866.163.

##	#	Model	BIC
##	1	AKJBKQKDK	-2079.075
##	2	AKBKQKDK	-2072.634
##	3	ABKQKDK	-2087.261
##	4	AKJBQKDK	-2265.451
##	5	AKBQKDK	-2259.009
##	6	ABQKDK	-2273.636
##	7	AKJBKQKD	-1866.163
##	8	AKBKQKD	-1887.611
##	9	ABKQKD	-1901.852
##	10	AKJBQKD	-2187.609
##	11	AKBQKD	-2209.057
##	12	ABQKD	-2223.299
##	13	AJBQD	-2147.436
##	14	ABQD	-2147.558

##

## SELECTED: Model AKJBKQKD, BIC=-1866.163.

##	#	Model	BIC
##	1	AKJBKQKDK	-1886.867
##	2	AKBKQKDK	-1918.754
##	3	ABKQKDK	-1948.693
##	4	AKJBQKDK	-2067.624
##	5	AKBQKDK	-2099.511
##	6	ABQKDK	-2129.45
##	7	AKJBKQKD	-1847.87
##	8	AKBKQKD	-1865.183
##	9	ABKQKD	-1882.908
##	10	AKJBQKD	-2086.173
##	11	AKBQKD	-2103.485
##	12	ABQKD	-2121.211
##	13	AJBQD	-2051.819
##	14	ABQD	-2046.961

##

## SELECTED: Model AKJBKQKD, BIC=-1847.87.

##	#	Model	BIC
##	1	AKJBKQKDK	-1932.29

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## 2 : AKBKQKDK -1925.518
## 3 : ABKQKDK -1942.199
## 4 : AKJBQKDK -2095.751
## 5 : AKBQKDK -2088.979
## 6 : ABQKDK -2105.66
## 7 : AKJBKQKD -1847.87
## 8 : AKBKQKD -1865.183
## 9 : ABKQKD -1882.908
## 10 : AKJBQKD -2086.173
## 11 : AKBQKD -2103.485
## 12 : ABQKD -2121.211
## 13 : AJBQD -2051.819
## 14 : ABQD -2046.961
##
## SELECTED: Model AKJBKQKD, BIC=-1847.87.
## # : Model BIC
## 1 : AKJBKQKDK -1932.29
## 2 : AKBKQKDK -1925.518
## 3 : ABKQKDK -1942.199
## 4 : AKJBQKDK -2095.751
## 5 : AKBQKDK -2088.979
## 6 : ABQKDK -2105.66
## 7 : AKJBKQKD -1847.87
## 8 : AKBKQKD -1865.183
## 9 : ABKQKD -1882.908
## 10 : AKJBQKD -2086.173
## 11 : AKBQKD -2103.485
## 12 : ABQKD -2121.211
## 13 : AJBQD -2051.819
## 14 : ABQD -2046.961
##
## SELECTED: Model AKJBKQKD, BIC=-1847.87.
## # : Model BIC
## 1 : AKJBKQKDK -1885.14
## 2 : AKBKQKDK -1912.51
## 3 : ABKQKDK -1924.451
## 4 : AKJBQKDK -2094.279
## 5 : AKBQKDK -2121.65
## 6 : ABQKDK -2133.591
## 7 : AKJBKQKD -1925.18
## 8 : AKBKQKD -1927.902
## 9 : ABKQKD -1933.781
## 10 : AKJBQKD -2124.729
## 11 : AKBQKD -2127.451
## 12 : ABQKD -2133.33
## 13 : AJBQD -2037.126
## 14 : ABQD -2034.42
##
## SELECTED: Model AKJBKQKDK, BIC=-1885.14.
## # : Model BIC
## 1 : AKJBKQKDK -1945.555
## 2 : AKBKQKDK -1948.277
## 3 : ABKQKDK -1954.156
## 4 : AKJBQKDK -2145.104

```

```

## 5 : AKBQKDK -2147.826
## 6 : ABQKDK -2153.705
## 7 : AKJBKQKD -1925.18
## 8 : AKBKQKD -1927.902
## 9 : ABKQKD -1933.781
## 10 : AKJBQKD -2124.729
## 11 : AKBQKD -2127.451
## 12 : ABQKD -2133.33
## 13 : AJBQD -2037.126
## 14 : ABQD -2034.42
##
## SELECTED: Model AKJBKQKD, BIC=-1925.18.
## # : Model BIC
## 1 : AKJBKQKDK -2230.963
## 2 : AKBKQKDK -2223.81
## 3 : ABKQKDK -2219.457
## 4 : AKJBQKDK -2334.062
## 5 : AKBQKDK -2326.909
## 6 : ABQKDK -2322.556
## 7 : AKJBKQKD -1925.18
## 8 : AKBKQKD -1927.902
## 9 : ABKQKD -1933.781
## 10 : AKJBQKD -2124.729
## 11 : AKBQKD -2127.451
## 12 : ABQKD -2133.33
## 13 : AJBQD -2037.126
## 14 : ABQD -2034.42
##
## SELECTED: Model AKJBKQKD, BIC=-1925.18.
## # : Model BIC
## 1 : AKJBKQKDK -1435.983
## 2 : AKBKQKDK -1578.789
## 3 : ABKQKDK -1684.656
## 4 : AKJBQKDK -1924.571
## 5 : AKBQKDK -2067.376
## 6 : ABQKDK -2173.244
## 7 : AKJBKQKD -1797.574
## 8 : AKBKQKD -1802.727
## 9 : ABKQKD -1839.334
## 10 : AKJBQKD -1979.944
## 11 : AKBQKD -1985.097
## 12 : ABQKD -2021.704
## 13 : AJBQD -1933.923
## 14 : ABQD -1934.403
##
## SELECTED: Model AKJBKQKDK, BIC=-1435.983.
## # : Model BIC
## 1 : AKJBKQKDK -1817.949
## 2 : AKBKQKDK -1823.102
## 3 : ABKQKDK -1859.709
## 4 : AKJBQKDK -2000.319
## 5 : AKBQKDK -2005.472
## 6 : ABQKDK -2042.079
## 7 : AKJBKQKD -1797.574

```

```

## 8 : AKBKQKD -1802.727
## 9 : ABKQKD -1839.334
## 10 : AKJBQKD -1979.944
## 11 : AKBQKD -1985.097
## 12 : ABQKD -2021.704
## 13 : AJBQD -1933.923
## 14 : ABQD -1934.403
##
## SELECTED: Model AKJBKQKD, BIC=-1797.574.
## # : Model BIC
## 1 : AKJBKQKDK -2080.981
## 2 : AKBKQKDK -2073.863
## 3 : ABKQKDK -2102.127
## 4 : AKJBQKDK -2159.457
## 5 : AKBQKDK -2152.338
## 6 : ABQKDK -2180.602
## 7 : AKJBKQKD -1797.574
## 8 : AKBKQKD -1802.727
## 9 : ABKQKD -1839.334
## 10 : AKJBQKD -1979.944
## 11 : AKBQKD -1985.097
## 12 : ABQKD -2021.704
## 13 : AJBQD -1933.923
## 14 : ABQD -1934.403
##
## SELECTED: Model AKJBKQKD, BIC=-1797.574.
## # : Model BIC
## 1 : AKJBKQKDK -1724.319
## 2 : AKBKQKDK -1811.826
## 3 : ABKQKDK -1853.998
## 4 : AKJBQKDK -2143.997
## 5 : AKBQKDK -2231.504
## 6 : ABQKDK -2273.676
## 7 : AKJBKQKD -1870.969
## 8 : AKBKQKD -1880.576
## 9 : ABKQKD -1895.866
## 10 : AKJBQKD -2147.643
## 11 : AKBQKD -2157.249
## 12 : ABQKD -2172.54
## 13 : AJBQD -2054.318
## 14 : ABQD -2051.382
##
## SELECTED: Model AKJBKQKDK, BIC=-1724.319.
## # : Model BIC
## 1 : AKJBKQKDK -2203.227
## 2 : AKBKQKDK -2191.377
## 3 : ABKQKDK -2208.564
## 4 : AKJBQKDK -2399.143
## 5 : AKBQKDK -2387.293
## 6 : ABQKDK -2404.479
## 7 : AKJBKQKD -1870.969
## 8 : AKBKQKD -1880.576
## 9 : ABKQKD -1895.866
## 10 : AKJBQKD -2147.643

```

```

## 11 :   AKBQKD      -2157.249
## 12 :   ABQKD      -2172.54
## 13 :   AJBQD      -2054.318
## 14 :   ABQD       -2051.382
##
## SELECTED: Model AKJBKQKD, BIC=-1870.969.
## # : Model      BIC
## 1 : AKJBKQKDK  -2203.227
## 2 : AKBKQKDK   -2191.377
## 3 : ABKQKDK    -2208.564
## 4 : AKJBQKDK   -2399.143
## 5 : AKBQKDK    -2387.293
## 6 : ABQKDK     -2404.479
## 7 : AKJBKQKD   -1870.969
## 8 : AKBKQKD    -1880.576
## 9 : ABKQKD     -1895.866
## 10 : AKJBQKD   -2147.643
## 11 : AKBQKD    -2157.249
## 12 : ABQKD     -2172.54
## 13 : AJBQD     -2054.318
## 14 : ABQD      -2051.382
##
## SELECTED: Model AKJBKQKD, BIC=-1870.969.
## # : Model      BIC
## 1 : AKJBKQKDK  -2235.237
## 2 : AKBKQKDK   -2221.781
## 3 : ABKQKDK    -2228.412
## 4 : AKJBQKDK   -2363.291
## 5 : AKBQKDK    -2349.835
## 6 : ABQKDK     -2356.466
## 7 : AKJBKQKD   -2017.416
## 8 : AKBKQKD    -2014.632
## 9 : ABKQKD     -2028.263
## 10 : AKJBQKD   -2239.336
## 11 : AKBQKD    -2236.552
## 12 : ABQKD     -2250.183
## 13 : AJBQD     -2120.605
## 14 : ABQD      -2118.02
##
## SELECTED: Model AKBKQKD, BIC=-2014.632.

## High Dimensional Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
## threshold Accuracy Kappa
## 0.050      0.5872287 0.4540692

```

```

##    0.175      0.6173838  0.4952775
##    0.300      0.6173838  0.4952775
##
## Tuning parameter 'model' was held constant at a value of all
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were threshold = 0.3 and model = all.

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.42316; in: "r_mean"; variables (1): r_mean
## correctness rate: 0.49706; in: "b_mean"; variables (2): r_mean, b_mean
## correctness rate: 0.5636; in: "gbi_mean"; variables (3): r_mean, b_mean, gbi_mean
## correctness rate: 0.63088; in: "rgi_mean"; variables (4): r_mean, b_mean, gbi_mean, rgi_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.58

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.53382; in: "g_mean"; variables (1): g_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.23

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.48382; in: "g_mean"; variables (1): g_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.23

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.45882; in: "g_mean"; variables (1): g_mean
## correctness rate: 0.55221; in: "gbi_mean"; variables (2): g_mean, gbi_mean
## correctness rate: 0.67463; in: "rgi_mean"; variables (3): g_mean, gbi_mean, rgi_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.45

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.41654; in: "re_mean"; variables (1): re_mean
##

```

```

## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.22

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.48529; in: "g_mean"; variables (1): g_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.24

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.39191; in: "r_mean"; variables (1): r_mean
## correctness rate: 0.49044; in: "b_mean"; variables (2): r_mean, b_mean
## correctness rate: 0.58199; in: "g_mean"; variables (3): r_mean, b_mean, g_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.44

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.39449; in: "re_mean"; variables (1): re_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.23

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.44265; in: "r_mean"; variables (1): r_mean
## correctness rate: 0.52978; in: "b_mean"; variables (2): r_mean, b_mean
## correctness rate: 0.61581; in: "g_mean"; variables (3): r_mean, b_mean, g_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.45

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.50221; in: "r_mean"; variables (1): r_mean
## correctness rate: 0.55772; in: "b_mean"; variables (2): r_mean, b_mean
## correctness rate: 0.63787; in: "gbi_mean"; variables (3): r_mean, b_mean, gbi_mean
## correctness rate: 0.69338; in: "ndvi_mean"; variables (4): r_mean, b_mean, gbi_mean, ndvi_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.56

```



```

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.44228; in: "r_mean"; variables (1): r_mean
## correctness rate: 0.50441; in: "b_mean"; variables (2): r_mean, b_mean
##
## hr.elapsed min.elapsed sec.elapsed
##          0.00          0.00          0.33
## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.42279; in: "g_mean"; variables (1): g_mean
## correctness rate: 0.52132; in: "re_mean"; variables (2): g_mean, re_mean
##
## hr.elapsed min.elapsed sec.elapsed
##          0.00          0.00          0.34
## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.40993; in: "r_mean"; variables (1): r_mean
##
## hr.elapsed min.elapsed sec.elapsed
##          0.00          0.00          0.24
## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.41654; in: "gbi_mean"; variables (1): gbi_mean
## correctness rate: 0.56471; in: "rgi_mean"; variables (2): gbi_mean, rgi_mean
## correctness rate: 0.70551; in: "ndvi_mean"; variables (3): gbi_mean, rgi_mean, ndvi_mean
##
## hr.elapsed min.elapsed sec.elapsed
##          0.00          0.00          0.43
## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.45993; in: "g_mean"; variables (1): g_mean
##
## hr.elapsed min.elapsed sec.elapsed
##          0.00          0.00          0.24
## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.

```

```

## correctness rate: 0.40368; in: "gbi_mean"; variables (1): gbi_mean
## correctness rate: 0.55147; in: "rgi_mean"; variables (2): gbi_mean, rgi_mean
## correctness rate: 0.6125; in: "ndre_mean"; variables (3): gbi_mean, rgi_mean, ndre_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.45

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.

## correctness rate: 0.5011; in: "r_mean"; variables (1): r_mean
## correctness rate: 0.5625; in: "b_mean"; variables (2): r_mean, b_mean
## correctness rate: 0.625; in: "ndvi_mean"; variables (3): r_mean, b_mean, ndvi_mean
## correctness rate: 0.69338; in: "gbi_mean"; variables (4): r_mean, b_mean, ndvi_mean, gbi_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.57

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.

## correctness rate: 0.41765; in: "gbi_mean"; variables (1): gbi_mean
## correctness rate: 0.625; in: "rgi_mean"; variables (2): gbi_mean, rgi_mean
## correctness rate: 0.69265; in: "re_mean"; variables (3): gbi_mean, rgi_mean, re_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.45

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.

## correctness rate: 0.41691; in: "b_mean"; variables (1): b_mean
## correctness rate: 0.50956; in: "r_mean"; variables (2): b_mean, r_mean
## correctness rate: 0.61397; in: "gbi_mean"; variables (3): b_mean, r_mean, gbi_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.45

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.

## correctness rate: 0.45993; in: "gbi_mean"; variables (1): gbi_mean
## correctness rate: 0.57096; in: "rgi_mean"; variables (2): gbi_mean, rgi_mean
## correctness rate: 0.69301; in: "ndvi_mean"; variables (3): gbi_mean, rgi_mean, ndvi_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.46

## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both

```

```

## stop criterion: improvement less than 5%.
## correctness rate: 0.48456; in: "g_mean"; variables (1): g_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.23
## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.41654; in: "g_mean"; variables (1): g_mean
## correctness rate: 0.52022; in: "re_mean"; variables (2): g_mean, re_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.33
## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.45956; in: "b_mean"; variables (1): b_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.24
## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.42904; in: "gbi_mean"; variables (1): gbi_mean
## correctness rate: 0.57206; in: "ndre_mean"; variables (2): gbi_mean, ndre_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.32
## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.38603; in: "b_mean"; variables (1): b_mean
## correctness rate: 0.48456; in: "r_mean"; variables (2): b_mean, r_mean
## correctness rate: 0.6739; in: "gbi_mean"; variables (3): b_mean, r_mean, gbi_mean
##
## hr.elapsed min.elapsed sec.elapsed
##      0.00      0.00      0.45
## `stepwise classification', using 10-fold cross-validated correctness rate of method lda'.
## 163 observations of 9 variables in 5 classes; direction: both
## stop criterion: improvement less than 5%.
## correctness rate: 0.4239; in: "g_mean"; variables (1): g_mean
##
## hr.elapsed min.elapsed sec.elapsed

```

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]



[illegible]

```

## Warning in v/sqrt(v %*% RightMult(A, v)): Recycling array of length 1 in vector-array arithmetic is
## Use c() or as.vector() instead.

## Warning in v/sqrt(v %*% RightMult(A, v)): Recycling array of length 1 in vector-array arithmetic is
## Use c() or as.vector() instead.

## Maximum Uncertainty Linear Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results:
##
## Accuracy Kappa
## 0.4507712 0.2418762

## Warning: model fit failed for Resample08: parameter=none Error in qda.default(x, grouping, ...) : ran
## Warning: model fit failed for Resample09: parameter=none Error in qda.default(x, grouping, ...) : ran
## Warning: model fit failed for Resample12: parameter=none Error in qda.default(x, grouping, ...) : ran
## Warning: model fit failed for Resample17: parameter=none Error in qda.default(x, grouping, ...) :
## some group is too small for 'qda'
## Warning: model fit failed for Resample20: parameter=none Error in qda.default(x, grouping, ...) :
## some group is too small for 'qda'
## Warning: model fit failed for Resample22: parameter=none Error in qda.default(x, grouping, ...) : ran
## Warning: model fit failed for Resample23: parameter=none Error in qda.default(x, grouping, ...) : ran
## Warning: model fit failed for Resample25: parameter=none Error in qda.default(x, grouping, ...) : ran

## Warning in nominalTrainWorkflow(x = x, y = y, wts = weights, info =
## trainInfo, : There were missing values in resampled performance measures.

## Quadratic Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results:
##
## Accuracy Kappa
## 0.5458175 0.3740354

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 14 observations (in the entire dataset of 18 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip

```

```

## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(0.7352858, -0.4479708,
## -0.2544218, 0.1521101, -0.1485645, 0.1685057, 0.1581281,
## 0.2965638, -0.0859585)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 12 observations (in the entire dataset of 14 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip
## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(0.4881333, -0.7289982,
## -0.1972881, 0.2859715, 0.0451978, -0.1888423, -0.1614149,
## 0.1722082, -0.1271637)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 16 observations (in the entire dataset of 19 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip
## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(0.5038439, -0.6200517,
## 0.1959216, 0.3594726, -0.2788354, 0.2101022, 0.1261546, 0.2307515,
## 0.054937)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 32 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip
## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(0.6138727, -0.2478454,
## -0.3648178, -0.0763229, -0.0392478, -0.145172, 0.4592285,
## 0.363349, 0.2393472)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 15 observations (in the entire dataset of 19 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip
## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(-0.2255721, 0.6302953,
## -0.015187, -0.4925283, 0.1139045, -0.227154, 0.2364241,
## -0.1438878, 0.4097035)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 15 observations (in the entire dataset of 20 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip
## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(-0.4304191, 0.8024479,
## -0.0267444, -0.3663792, 0.0954436, -0.0984111, -0.0097601,
## -0.1132676, 0.0644104)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.

```

```

## There are 0 observations (in the entire dataset of 17 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.6245539, 0.025513,$ 
##  $-0.2084874, -0.1614487, -0.3690578, 0.3308208, 0.3617478,$ 
##  $0.4021412, -0.0390348)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## the iterations of the MCD algorithm.
## There are 15 observations (in the entire dataset of 18 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.2133083, 0.4783343,$ 
##  $-0.0877415, -0.6526983, 0.0419407, -0.0424488, 0.356431,$ 
##  $0.0573719, 0.3976012)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 22 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.0556602, 0.5183962,$ 
##  $-0.3027485, -0.4605649, 0.1812124, -0.4280309, 0.196372,$ 
##  $0.0115686, 0.4118816)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 32 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.1484965, 0.7713129,$ 
##  $-0.1938223, -0.3433383, -0.1111354, 0.0441101, 0.3456508,$ 
##  $-0.1365792, 0.2741384)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## the iterations of the MCD algorithm.
## There are 13 observations (in the entire dataset of 16 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.3066992, 0.1115324,$ 
##  $-0.5070885, 0.5619434, 0.0907374, -0.1011779, -0.2246559,$ 
##  $-0.2245785, -0.4485544)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## the iterations of the MCD algorithm.
## There are 18 observations (in the entire dataset of 25 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.0732836, 0.4288165,$ 
##  $-0.1962972, -0.7985274, 0.2983467, -0.0536387, -0.0511032,$ 
##  $0.1510265, -0.1313732)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## the iterations of the MCD algorithm.

```

```

## There are 0 observations (in the entire dataset of 21 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.1806364, -0.5057321,$ 
##  $0.1594157, 0.1829762, 0.3385285, -0.3397432, -0.5779026,$ 
##  $-0.0432978, -0.2946841)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## the iterations of the MCD algorithm.
## There are 15 observations (in the entire dataset of 18 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.5838449, -0.7245328,$ 
##  $-0.0287397, 0.1838731, -0.0618923, -0.0163727, 0.0460172,$ 
##  $0.2971605, 0.0708613)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## nsamp, :  $n < 2 * p$ , i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## the iterations of the MCD algorithm.
## There are 14 observations (in the entire dataset of 17 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.0802023, -0.6640368,$ 
##  $-0.2874413, 0.5213396, 0.078211, -0.2251445, -0.2970392,$ 
##  $-0.0120548, -0.2302622)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## nsamp, :  $n < 2 * p$ , i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## the iterations of the MCD algorithm.
## There are 13 observations (in the entire dataset of 16 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.3856977, -0.5091807,$ 
##  $-0.0773425, 0.4724103, -0.2929064, 0.3301899, -0.0041804,$ 
##  $0.2317018, -0.3380772)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## the iterations of the MCD algorithm.
## There are 16 observations (in the entire dataset of 21 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.6043586, -0.6362794,$ 
##  $-0.1182252, -0.1387717, 0.1615447, -0.1761877, 0.0636075,$ 
##  $0.3501133, 0.1135801)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## nsamp, :  $n < 2 * p$ , i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is not positive definite
## the iterations of the MCD algorithm.
## There are 13 observations (in the entire dataset of 17 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.3398138, 0.7953102,$ 

```

```

## -0.0760828, -0.3193388, 0.0452949, -0.0826106, 0.2085092,
## -0.1653092, 0.2540925)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 13 observations (in the entire dataset of 17 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.4838517, 0.2661296,$ 
##  $0.1822881, -0.3420912, 0.3196212, -0.4870204, -0.1154314,$ 
##  $-0.259994, 0.3529013)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 13 observations (in the entire dataset of 15 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.2904053, -0.2719289,$ 
##  $-0.1276482, 0.697229, -0.0812632, -0.0849497, -0.3733672,$ 
##  $-0.1648284, -0.3986295)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 14 observations (in the entire dataset of 19 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.7883598, -0.0309533,$ 
##  $-0.2515399, -0.2136833, -0.176878, 0.1485111, 0.3499873,$ 
##  $0.1550814, 0.2621357)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 21 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.4976804, -0.1083752,$ 
##  $-0.0647055, 0.0066599, -0.3420859, 0.6089384, 0.3603717,$ 
##  $0.3254575, -0.1127778)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 22 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.237823, 0.1764665,$ 
##  $0.3316666, 0.1230398, -0.2292423, 0.6269725, -0.2703015,$ 
##  $-0.0645974, -0.5140779)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 20 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.4976804, -0.1083752,$ 
##  $-0.0647055, 0.0066599, -0.3420859, 0.6089384, 0.3603717,$ 
##  $0.3254575, -0.1127778)$ 

```

```

## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(0.4805383, -0.6263364,
## -0.3016382, 0.4751769, -0.0683276, 0.0900746, -0.014271,
## 0.1007837, -0.1919998)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 15 observations (in the entire dataset of 21 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip
## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(0.3316094, -0.3016572,
## -0.3289791, 0.2768988, -0.0133261, 0.2639893, -0.1365348,
## 0.2665507, -0.6742247)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 22 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip
## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(-0.4936606, 0.2595655,
## 0.1380026, 0.4486507, -0.2696615, 0.4028258, -0.1484056,
## -0.2335879, -0.3962567)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## There are 12 observations (in the entire dataset of 12 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip
## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(0.6869201, -0.2586332,
## -0.6161791, 0.0874757, -0.0051386, -0.0560703, 0.1943518,
## 0.1796992, 0.026197)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 14 observations (in the entire dataset of 19 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip
## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(0.4380454, -0.199802,
## -0.513139, -0.1006113, 0.2885831, -0.5625166, 0.0655979,
## 0.2452371, 0.1749622)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 21 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip
## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and
## coefficients a_i from the vector a <- c(0.3223195, -0.7796366,
## -0.0040505, 0.4460588, -0.0242066, -0.0385779, -0.1582942,
## 0.1981835, -0.1512752)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 32 obs.) lying
## on the hyperplane with equation a_1*(x_i1 - m_1) + ... + a_p*(x_ip
## - m_p) = 0 with (m_1, ..., m_p) the mean of these observations and

```

```

## coefficients a_i from the vector a <- c(-0.1017669, -0.5337685,
## 0.1077856, 0.7138454, -0.1608045, 0.1299699, -0.2251163,
## -0.0844128, -0.2880775)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 13 observations (in the entire dataset of 17 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients a_i from the vector a <- c(-0.2283661, 0.0188949,
## 0.2032051, -0.5321012, 0.6316827, -0.2350526, 0.0229421,
## -0.2211623, 0.3454796)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 14 observations (in the entire dataset of 19 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients a_i from the vector a <- c(0.2678061, 0.2595618,
## -0.0255791, 0.0447958, -0.4124958, 0.6015386, 0.5546275,
## 0.1090543, 0.082101)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 20 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients a_i from the vector a <- c(0.1796111, -0.5940017,
## 0.0491082, 0.6566027, -0.1985871, 0.2974414, 0.0376538, 0.0544558,
## -0.2215211)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 12 observations (in the entire dataset of 14 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients a_i from the vector a <- c(0.587059, -0.345511,
## -0.2127557, 0.2963321, -0.4497497, 0.1394848, 0.3248462,
## 0.2092453, 0.1785127)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 13 observations (in the entire dataset of 17 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients a_i from the vector a <- c(0.5131962, -0.7329505,
## -0.1696134, 0.2670007, 0.0210641, -0.0176472, -0.0668834, 0.25284,
## -0.1737775)

```



```

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 20 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.5922149, -0.6643656,$ 
##  $-0.2578752, 0.3120992, -0.0865087, 0.0919887, 0.0370312,$ 
##  $0.1305394, -0.0981671)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix
## the iterations of the MCD algorithm.
## There are 19 observations (in the entire dataset of 29 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.3081401, 0.6057342,$ 
##  $-0.0752589, -0.5870739, 0.2928128, -0.2213191, 0.1729013,$ 
##  $0.0716352, 0.1344175)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 18 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.0706002, 0.501828,$ 
##  $0.1311136, -0.3584067, -0.2375006, 0.4151396, 0.529084, 0.0203088,$ 
##  $0.2974027)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, :  $n < 2 * p$ , i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 15 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.7746943, -0.4460559,$ 
##  $-0.3744712, 0.0158866, -0.0288203, 0.0360309, 0.1517877,$ 
##  $0.1864472, 0.0217004)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix
## the iterations of the MCD algorithm.
## There are 18 observations (in the entire dataset of 26 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.6524506, -0.2869391,$ 
##  $-0.5263576, -0.0956779, 0.1544599, 0.0605946, 0.1175317,$ 
##  $0.3666838, -0.1731109)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, :  $n < 2 * p$ , i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix
## the iterations of the MCD algorithm.
## There are 16 observations (in the entire dataset of 17 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.5171398, 0.1267224,$ 

```

```

## 0.0547836, 0.5448392, -0.1743367, 0.238714, -0.2667954,
## -0.2608853, -0.4359337)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is
## the iterations of the MCD algorithm.
## There are 14 observations (in the entire dataset of 19 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.7273461, -0.4951301,$ 
##  $-0.1423771, 0.2295094, -0.2010001, 0.2340951, 0.2047043,$ 
##  $0.1239418, 0.0200294)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is
## nsamp, :  $n < 2 * p$ , i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is
## There are 13 observations (in the entire dataset of 13 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.3308937, 0.5186402,$ 
##  $-0.3439644, -0.375792, -0.1625898, 0.1054085, 0.4664084,$ 
##  $0.0627101, 0.3208968)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is
## the iterations of the MCD algorithm.
## There are 16 observations (in the entire dataset of 22 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.6431182, -0.5270077,$ 
##  $-0.1765755, -0.1099971, 0.0626678, -0.2085664, 0.2153789,$ 
##  $0.3082271, 0.2767028)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is
## the iterations of the MCD algorithm.
## There are 15 observations (in the entire dataset of 21 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.7991, -0.3117098,$ 
##  $-0.2915242, -0.1172158, -0.0621696, 0.1274131, 0.2756222,$ 
##  $0.248956, 0.086628)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is
## the iterations of the MCD algorithm.
## There are 14 observations (in the entire dataset of 19 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.2867418, -0.7400578,$ 
##  $-0.0568143, 0.02941, 0.3509788, -0.3548307, -0.2110351, 0.2547772,$ 
##  $-0.0863862)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix is
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 18 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.5173703, -0.7531539,$ 
##  $-0.1457628, 0.1376839, 0.1092528, -0.1988687, -0.1028056,$ 

```

```

## 0.2406179, -0.0702322)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 21 observations (in the entire dataset of 28 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.5227284, -0.5744998,$ 
##  $-0.4508339, 0.3915619, 0.0039939, 0.068145, 0.0344469, 0.0888971,$ 
##  $-0.1624319)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 19 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.2345333, 0.5202001,$ 
##  $-0.1473961, -0.4073033, 0.2497661, -0.3815682, 0.2277859,$ 
##  $-0.2033601, 0.4307497)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, :  $n < 2 * p$ , i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 17 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.3106932, 0.714722,$ 
##  $0.2024883, -0.3772126, -0.1083886, 0.3620217, 0.1964804,$ 
##  $-0.1408344, 0.0900262)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 17 observations (in the entire dataset of 23 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.1657794, -0.0022901,$ 
##  $0.6931856, 0.1296905, -0.4870855, 0.3098779, 0.1103607, -0.192312,$ 
##  $0.3045424)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 17 observations (in the entire dataset of 25 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.6349175, -0.6050298,$ 
##  $-0.2399476, 0.2344392, -0.0747489, 0.1366741, 0.0750823,$ 
##  $0.2654713, -0.1338008)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, :  $n < 2 * p$ , i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 25 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and

```

```

## coefficients a_i from the vector a <- c(-0.3440875, 0.3572541,
## 0.1628731, -0.5027937, 0.3124319, -0.4672305, 0.0627423, -0.04815,
## 0.3904755)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 15 observations (in the entire dataset of 21 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients a_i from the vector a <- c(0.0415007, 0.4662708,
## -0.2804863, -0.5269129, 0.1901459, -0.297276, 0.3607577,
## 0.1050783, 0.3985517)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 15 observations (in the entire dataset of 21 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients a_i from the vector a <- c(0.268439, 0.4891881,
## -0.6891108, -0.2639472, 0.11969, -0.2954697, 0.0049959, -0.170228,
## 0.1160307)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 15 observations (in the entire dataset of 20 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients a_i from the vector a <- c(0.5908062, -0.7170782,
## -0.0722778, 0.0472418, 0.0673854, 0.0384688, 0.06705, 0.3432315,
## -0.0310918)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 13 observations (in the entire dataset of 16 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients a_i from the vector a <- c(0.5184262, -0.6066492,
## -0.2642244, 0.27791, -0.0233707, 0.1978557, -0.0353055, 0.2688242,
## -0.3208684)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 20 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients a_i from the vector a <- c(0.0683238, 0.3349706,
## -0.8257086, -0.0188915, 0.1931122, -0.3318361, -0.1870586,
## -0.0540528, -0.1251196)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 16 obs.) lying

```

```

## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.274194, -0.6449253,$ 
##  $0.0826454, -0.0885391, 0.391337, -0.3673039, -0.3628086,$ 
##  $0.2389698, -0.1320083)$ 

## Warning: model fit failed for Resample21: parameter=none Error in covMcd(x = x, raw.only = raw.only,
## n == p+1 is too small sample size for MCD

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 0 observations (in the entire dataset of 25 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.4226802, 0.0221183,$ 
##  $-0.4181419, -0.4305043, 0.2843385, -0.394266, 0.2747316,$ 
##  $0.2602158, 0.2849418)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 14 observations (in the entire dataset of 17 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.6811515, -0.4767874,$ 
##  $-0.084205, -0.2526322, 0.0393663, -0.0684354, 0.2077526,$ 
##  $0.3669324, 0.2318606)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 18 observations (in the entire dataset of 25 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.103504, -0.6593946,$ 
##  $0.2989982, 0.4992187, -0.2122448, 0.2927533, -0.0736446, 0.148077,$ 
##  $-0.2403409)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 17 observations (in the entire dataset of 21 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.2111563, -0.4492749,$ 
##  $-0.109714, 0.5743822, -0.2076717, 0.3302899, -0.0928986,$ 
##  $0.1273813, -0.4842911)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, : n < 2 * p, i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 12 observations (in the entire dataset of 15 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.1867434, -0.3675211,$ 
##  $0.2700589, -0.2520568, 0.1580127, -0.4761123, 0.1899909,$ 

```

```

## 0.0881504, 0.63093)

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 18 observations (in the entire dataset of 24 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.5725057, -0.6159117,$ 
##  $-0.3871394, 0.3216819, -0.0035761, 0.0391968, 0.0388287,$ 
##  $0.1230633, -0.1460563)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 17 observations (in the entire dataset of 25 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.3491866, -0.1723038,$ 
##  $-0.5589788, 0.1091534, 0.2158706, 0.1633483, 0.6059525, 0.2733361,$ 
##  $-0.0939923)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, :  $n < 2 * p$ , i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 13 observations (in the entire dataset of 15 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.6480404, -0.5055252,$ 
##  $-0.0157737, 0.0239306, -0.1213115, 0.3864719, 0.1451271,$ 
##  $0.3357758, -0.1605681)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 17 observations (in the entire dataset of 25 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.396985, 0.1309622,$ 
##  $0.222981, -0.2325721, 0.2519341, -0.5975962, -0.0906347,$ 
##  $-0.208581, 0.499128)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, :  $n < 2 * p$ , i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## the iterations of the MCD algorithm.
## There are 11 observations (in the entire dataset of 12 obs.) lying
## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(0.4879093, 0.1326802,$ 
##  $-0.1129401, -0.5482276, 0.0143748, -0.0584229, 0.4193438,$ 
##  $0.1859695, 0.4658088)$ 

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp =
## nsamp, :  $n < 2 * p$ , i.e., possibly too small sample size

## Warning in covMcd(x = x, raw.only = raw.only, alpha = alpha, nsamp = nsamp, : The covariance matrix I
## There are 14 observations (in the entire dataset of 14 obs.) lying

```

```

## on the hyperplane with equation  $a_1(x_{i1} - m_1) + \dots + a_p(x_{ip} - m_p) = 0$  with  $(m_1, \dots, m_p)$  the mean of these observations and
## coefficients  $a_i$  from the vector  $a \leftarrow c(-0.7603714, -0.0760599,$ 
##  $0.3997999, -0.0251377, 0.2665401, -0.2950987, -0.2680339,$ 
##  $-0.1541636, 0.0429284)$ 

## Warning in nominalTrainWorkflow(x = x, y = y, wts = weights, info =
## trainInfo, : There were missing values in resampled performance measures.

## Robust Linear Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results:
##
## Accuracy Kappa
## 0.5241973 0.3816123

## Loading required package: rrllda
## Loading required package: pcaPP
## Loading required package: mvoutlier
## Loading required package: sgeostat
## sROC 0.1-2 loaded

## Loading required package: glasso
## Loading required package: matrixcalc

## Robust Regularized Linear Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
## lambda hp Accuracy Kappa
## 0.25 0.50 0.4055168 0.2570705
## 0.25 0.75 0.4239279 0.2783683
## 0.25 1.00 0.4701401 0.3274136
## 0.50 0.50 0.4027951 0.2549208
## 0.50 0.75 0.4165101 0.2705563
## 0.50 1.00 0.4506090 0.3051821
## 0.75 0.50 0.3995692 0.2511601
## 0.75 0.75 0.4146012 0.2691290
## 0.75 1.00 0.4432357 0.2970036
##

```

```

## Tuning parameter 'penalty' was held constant at a value of L2
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were lambda = 0.25, hp = 1 and
##  penalty = L2.

## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1513
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1513
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1513
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1513
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1513
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)

```



```

## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1513
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0785
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8069
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0785
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8069
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0785
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8069
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0785
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8069
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9

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## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0785
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8069
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0785
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8069
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1568
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1568
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1568
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

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## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1568
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1568
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1568
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0985
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0985
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```

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## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0985
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0985
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0985
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0985
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0855
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

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## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0855
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0855
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0855
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0855
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0855
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```

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## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1236
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1236
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1236
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1236
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1236
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1236
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1

```

```

##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.13
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.9722
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.13
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.9722
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.13
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.9722
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.13
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.9722
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.13
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.9722
##
##
##Computing inverse correlation matrix (pooled across classes)

```

```

## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.13
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.9722
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1053
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1053
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1053
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1053
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9

```



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## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1053
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1053
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1491
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1491
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1491
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

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## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1491
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1491
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1491
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1653
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.6798
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1653
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.6798
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```

```

## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1653
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.6798
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1653
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.6798
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1653
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.6798
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1653
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.6798
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0729
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```

```

## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0729
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0729
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0729
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0729
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0729
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```

```

## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0615
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0615
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0615
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0615
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0615
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0615
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1

```

```

##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1013
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1013
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1013
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1013
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1013
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)

```

```

## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1013
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1369
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1369
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1369
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1369
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9

```

```

## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1369
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1369
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1016
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8992
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1016
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8992
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1016
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8992
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```



```

## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1016
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8992
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1016
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8992
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1016
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.8992
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0573
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0573
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```

```

## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0573
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0573
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0573
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0573
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0997
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.3497
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```

```

## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0997
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.3497
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0997
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.3497
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0997
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.3497
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0997
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.3497
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0997
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 0.3497
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```

```

## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0922
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0922
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0922
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0922
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0922
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0922
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1

```

```

##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0858
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0858
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0858
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0858
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0858
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)

```

```

## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0858
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0847
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0847
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0847
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0847
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9

```

```

## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0847
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0847
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0566
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0566
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0566
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```

```

## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0566
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0566
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0566
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0682
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0682
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```



```

## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0682
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0682
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0682
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0682
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0966
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```

```

## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0966
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0966
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0966
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0966
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.0966
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##

```

```

## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1644
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1644
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1644
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1644
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1644
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1644
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1

```

```

##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1462
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1462
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1462
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1462
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1462
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
##Computing inverse correlation matrix (pooled across classes)

```

```

## Specified shrinkage intensity lambda (correlation matrix): 0.5
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1462
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 1
## Prediction uses 9 features.
## Number of variables: 9
## Number of observations: 163
## Number of classes: 5
##
## Estimating optimal shrinkage intensity lambda.freq (frequencies): 0.1084
## Estimating variances (pooled across classes)
## Estimating optimal shrinkage intensity lambda.var (variance vector): 1
##
##
## Computing inverse correlation matrix (pooled across classes)
## Specified shrinkage intensity lambda (correlation matrix): 0

## Shrinkage Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
##   lambda  diagonal  Accuracy  Kappa
##   0.0      FALSE    0.5853861  0.4516831
##   0.0      TRUE     0.4004158  0.2196441
##   0.5      FALSE    0.4889623  0.3129819
##   0.5      TRUE     0.4004158  0.2196441
##   1.0      FALSE    0.4011430  0.2207641
##   1.0      TRUE     0.4004158  0.2196441
##
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were diagonal = FALSE and lambda = 0.

## Sparse Linear Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)

```

```

## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results across tuning parameters:
##
##   NumVars  lambda  Accuracy  Kappa
##   2        0e+00  0.5876340  0.4504629
##   2        1e-04  0.5881414  0.4508736
##   2        1e-01  0.5894284  0.4527128
##   5        0e+00  0.6092687  0.4800925
##   5        1e-04  0.6079138  0.4777670
##   5        1e-01  0.6039093  0.4729263
##   9        0e+00  0.6089416  0.4789530
##   9        1e-04  0.6089416  0.4789530
##   9        1e-01  0.6104325  0.4815141
##
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were NumVars = 9 and lambda = 0.1.

##           abco      cade      pila      pipo      quke
## 1 0.006203518 0.43061380 0.0005519243 0.56066923 1.961519e-03
## 2 0.175466148 0.19283727 0.0663534053 0.55928206 6.061116e-03
## 3 0.001027451 0.14019553 0.0039545957 0.74530258 1.095198e-01
## 4 0.003679844 0.08844057 0.0094887346 0.61341786 2.849730e-01
## 5 0.047340963 0.49471320 0.0008036506 0.45592230 1.219881e-03
## 6 0.010507604 0.93730519 0.0000314354 0.05214753 8.233521e-06

## # A tibble: 39 x 18
##   treeID height ch_area live species      x      y b_mean g_mean r_mean
##   <chr>   <dbl>   <dbl> <int> <chr>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~  11.6    20.6     1 pipo    7.16e5 4.27e6 0.0247 0.0598 0.0325
## 2 eldo_~  32.9    24.8     1 pipo    7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~  17.7    20.2     1 pipo    7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~  16.0   111.     1 pipo    7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~  53.8    53.5     1 pipo    7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~  17.5    26.6     1 cade    7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~  39.8     9.26     1 cade    7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~  15.6    27.2     1 cade    7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~   9.69   21.5     1 abco    7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~  6.83    7.83     1 abco    7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,
## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>

## Stabilized Linear Discriminant Analysis
##
## 163 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 163, 163, 163, 163, 163, 163, ...
## Resampling results:
##
##   Accuracy  Kappa

```

```
## 0.3656795 0.1342287

##      abco      cade      pila      pipo      quke
## 1 0.12138969 0.4563639 0.1305985 0.2803396 0.01130843
## 2 0.14730624 0.3489570 0.1196560 0.3533356 0.03074504
## 3 0.09220922 0.3230642 0.1516746 0.3583426 0.07470928
## 4 0.07732804 0.2364220 0.1403012 0.3708824 0.17506636
## 5 0.12347554 0.3330136 0.1319524 0.3633620 0.04819640
## 6 0.09574813 0.4444817 0.1517080 0.2889711 0.01909106

## # A tibble: 39 x 18
##   treeID height ch_area live species      x      y b_mean g_mean r_mean
##   <chr>   <dbl>   <dbl> <int> <chr>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~  11.6    20.6     1 pipo   7.16e5 4.27e6 0.0247 0.0598 0.0325
## 2 eldo_~  32.9    24.8     1 pipo   7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~  17.7    20.2     1 pipo   7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~  16.0   111.     1 pipo   7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~  53.8    53.5     1 pipo   7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~  17.5    26.6     1 cade   7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~  39.8     9.26     1 cade   7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~  15.6    27.2     1 cade   7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~   9.69   21.5     1 abco   7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~  6.83    7.83     1 abco   7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,
## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>
```

## Summary table of methods

Table 1: Summary of classification methods arranged in descending order of accuracy.

method	accuracy	kappa
rda	0.6593460	0.5423541
loclda	0.6403723	0.5216603
pda2	0.6388658	0.5178264
lda	0.6181074	0.4883564
hdda	0.6173838	0.4952775
sparseLDA	0.6104325	0.4815141
pda	0.6097962	0.4836279
mda	0.6068364	0.4773618
lda2	0.5958188	0.4635799
sda	0.5853861	0.4516831
rf	0.5540786	0.4009981
hda	0.5497366	0.4015952
qda	0.5458175	0.3740354
Linda	0.5241973	0.3816123
cforest	0.5185669	0.3499542
rrlda	0.4701401	0.3274136
stepLDA	0.4665059	0.2752575
Mlda	0.4507712	0.2418762
sllda	0.3656795	0.1342287
bstTree	0.3182723	0.0284748

## Some packages removed from CRAN

These packages were removed from CRAN, which means the methods available in `caret` don't work.

- `sparsediscrim` (for `rla`, `dda`, `hdrda` method)
- `adaptDA` (for `amda` method)

## Using spectral libraries

We may also be able to take advantage of pre-existing spectral libraries to train a classifier. If a previous effort to measure reflectance on known tree species exists, then we can use those values if they match up to the reflectance sensitivity on my instrument.

## Information about my instrument

I used the MicaSense RedEdge3 and calibrated the imagery each flight to a reflectance panel with known reflectance values for the 5 narrow bands of the RedEdge instrument.

The manual with more information can be found here: [http://www.lepton.com/manuals/RedEdge\\_User\\_Manual.pdf](http://www.lepton.com/manuals/RedEdge_User_Manual.pdf)

## Some pre-existing libraries

### Serbin

NASA HypsIRI Airborne Campaign Leaf and Canopy Spectra and Leaf Traits <https://ecosis.org/#result/dd94f09c-1794-44f4-82e9-a7ca707a1ec0> The file is called: `data/data_raw/nasa-hypisiri-airborne-campaign-leaf-and-canopy-spectra-and-leaf-traits`

This dataset includes all the species that I want to classify, but it seems to not do a great job of matching up to the measurements that I took with the Micasense RedEdge

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   `Acquisition Method` = col_character(),
##   `Common Name` = col_character(),
##   GasExchange_Leaf = col_character(),
##   `Instrument Model` = col_character(),
##   `Latin Genus` = col_character(),
##   `Latin Species` = col_character(),
##   Leaf_or_Canopy = col_character(),
##   `Location Name` = col_character(),
##   `Measurement Date` = col_character(),
##   `Measurement Quantity` = col_character(),
##   `Measurement Units` = col_character(),
##   Sample_Name = col_character(),
##   Site_Long = col_character(),
##   Spectra = col_character(),
##   Spectral_Resolution = col_character(),
##   `Target Type` = col_character(),
##   `USDA Symbol` = col_character(),
##   `Wavelength Units` = col_character()
## )
## See spec(...) for full column specifications.
```



```
## Warning in evalq(as.numeric(wavelength), <environment>): NAs introduced by
## coercion

## Warning in evalq(as.numeric(reflectance), <environment>): NAs introduced by
## coercion
```

## Susan Meerdink

<https://www.sciencedirect.com/science/article/pii/S0034425716303066?via%3Dihub> <https://ecosis.org/#result/0fadcc45-f79e-4fd3-a6ca-8afaf26ae299> The file is called data/data\_raw/fresh-leaf-spectra-to-estimate-leaf-traits-for-california-ecosystems.csv

This dataset does include almost all of the species I want to classify, but seems to do a pretty bad job matching up to the reflectance values that I captured.

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   `Acquisition Method` = col_character(),
##   `Cellulose units` = col_character(),
##   `Funding Source` = col_character(),
##   `Instrument Model` = col_character(),
##   `LMA units` = col_character(),
##   `Latin Genus` = col_character(),
##   `Latin Species` = col_character(),
##   `Lignin Units` = col_character(),
##   `Location Name` = col_character(),
##   Maintainer = col_character(),
##   `Measurement Units` = col_character(),
##   `Nitrogen Units` = col_character(),
##   Replicate = col_integer(),
##   `Sample Collection Date` = col_integer(),
##   `Target Type` = col_character(),
##   `Water Content Units` = col_character(),
##   `Wavelength Units` = col_character(),
##   affiliation = col_character(),
##   age = col_character(),
##   calibration = col_character()
##   # ... with 7 more columns
## )

## See spec(...) for full column specifications.
```

## Natalie Queally

<https://ecosis.org/#result/c1a5b651-9c46-4e06-a07f-38a2e7b4faf4> The file is called: data/data\_raw/california\_species\_data.csv

This dataset seems to best align with my imagery, perhaps because it was a field-based instrument capturing canopy reflectance instead of a lab-based instrument capturing cut leaf reflectance. Unfortunately, not all of the key species I need to classify are represented.

```
## Parsed with column specification:
## cols(
##   .default = col_double(),
##   Name = col_character(),
##   common_name = col_character(),
##   USDA_symbol = col_character(),
##   Genus = col_character(),
```

```

## species = col_character(),
## veg_type = col_character(),
## note = col_character(),
## measurement_type = col_character(),
## field_data_type = col_character(),
## data_provider = col_character(),
## field_data_affiliation = col_character(),
## site = col_character(),
## state = col_character(),
## measurement_source = col_character(),
## image_product = col_character(),
## image_year = col_integer(),
## image_month = col_integer(),
## AVIRIS_line = col_character(),
## wavelengths = col_character(),
## project = col_character()
## # ... with 3 more columns
## )

## See spec(...) for full column specifications.

Hmm... I'm not hopeful about this approach.

## Linear Discriminant Analysis
##
## 281 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## No pre-processing
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 281, 281, 281, 281, 281, 281, ...
## Resampling results:
##
## Accuracy Kappa
## 0.6525328 0.5582316

## # A tibble: 20 x 2
## species predicted_species
## <chr> <fct>
## 1 pipo quke
## 2 pipo abco
## 3 pipo pipo
## 4 pipo abco
## 5 pipo quke
## 6 cade quke
## 7 cade quke
## 8 cade quke
## 9 abco cade
## 10 abco cade
## 11 pipo cade
## 12 pipo cade
## 13 pipo pipo
## 14 pipo quke
## 15 pipo quke
## 16 cade abco

```

```

## 17 pila    quke
## 18 pipo    pipo
## 19 pila    abco
## 20 pila    abco

## Regularized Discriminant Analysis
##
## 281 samples
## 9 predictor
## 5 classes: 'abco', 'cade', 'pila', 'pipo', 'quke'
##
## Pre-processing: centered (9), scaled (9)
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 281, 281, 281, 281, 281, 281, ...
## Resampling results across tuning parameters:
##
##  lambda  Accuracy  Kappa
##  0.2      0.7129721 0.6327308
##  0.3      0.7043760 0.6215473
##  0.4      0.6949314 0.6093903
##  0.5      0.6925216 0.6063788
##  0.6      0.6867489 0.5992713
##  0.7      0.6767792 0.5868017
##  0.8      0.6693587 0.5778869
##  0.9      0.6561809 0.5620560
##  1.0      0.6412294 0.5437630
##
## Tuning parameter 'gamma' was held constant at a value of 0
## Accuracy was used to select the optimal model using the largest value.
## The final values used for the model were gamma = 0 and lambda = 0.2.

##      abco      cade      pila      pipo      quke
## 1 0.1718809 4.725834e-05 0.101858671 0.36516519 3.610480e-01
## 2 0.8883885 5.601002e-02 0.009725923 0.04411463 1.760941e-03
## 3 0.4536771 2.992149e-05 0.205095550 0.31539656 2.580084e-02
## 4 0.9406243 1.054935e-03 0.023267045 0.03499956 5.415662e-05
## 5 0.9236477 8.061538e-03 0.006695212 0.05823380 3.361721e-03
## 6 0.5726875 1.277208e-05 0.064865270 0.07270868 2.897257e-01

## # A tibble: 39 x 18
##   treeID height ch_area live species      x      y b_mean g_mean r_mean
##   <chr>   <dbl>   <dbl> <int> <chr>   <dbl> <dbl> <dbl> <dbl> <dbl>
## 1 eldo_~  11.6    20.6     1 pipo    7.16e5 4.27e6 0.0247 0.0598 0.0325
## 2 eldo_~  32.9    24.8     1 pipo    7.16e5 4.27e6 0.0254 0.0504 0.0335
## 3 eldo_~  17.7    20.2     1 pipo    7.16e5 4.27e6 0.0188 0.0404 0.0250
## 4 eldo_~  16.0   111.     1 pipo    7.16e5 4.27e6 0.0164 0.0334 0.0220
## 5 eldo_~  53.8    53.5     1 pipo    7.15e5 4.27e6 0.0217 0.0486 0.0308
## 6 eldo_~  17.5    26.6     1 cade    7.15e5 4.27e6 0.0214 0.0603 0.0275
## 7 eldo_~  39.8     9.26     1 cade    7.15e5 4.27e6 0.0206 0.0563 0.0266
## 8 eldo_~  15.6    27.2     1 cade    7.15e5 4.27e6 0.0233 0.0546 0.0305
## 9 eldo_~   9.69   21.5     1 abco    7.15e5 4.27e6 0.0249 0.0483 0.0326
## 10 eldo_~  6.83    7.83     1 abco    7.15e5 4.27e6 0.0278 0.0546 0.0368
## # ... with 29 more rows, and 8 more variables: re_mean <dbl>,
## #   nir_mean <dbl>, ndvi_mean <dbl>, rgi_mean <dbl>, gbi_mean <dbl>,
## #   ndre_mean <dbl>, crs <chr>, functional_group <chr>

```