Lansing dataset

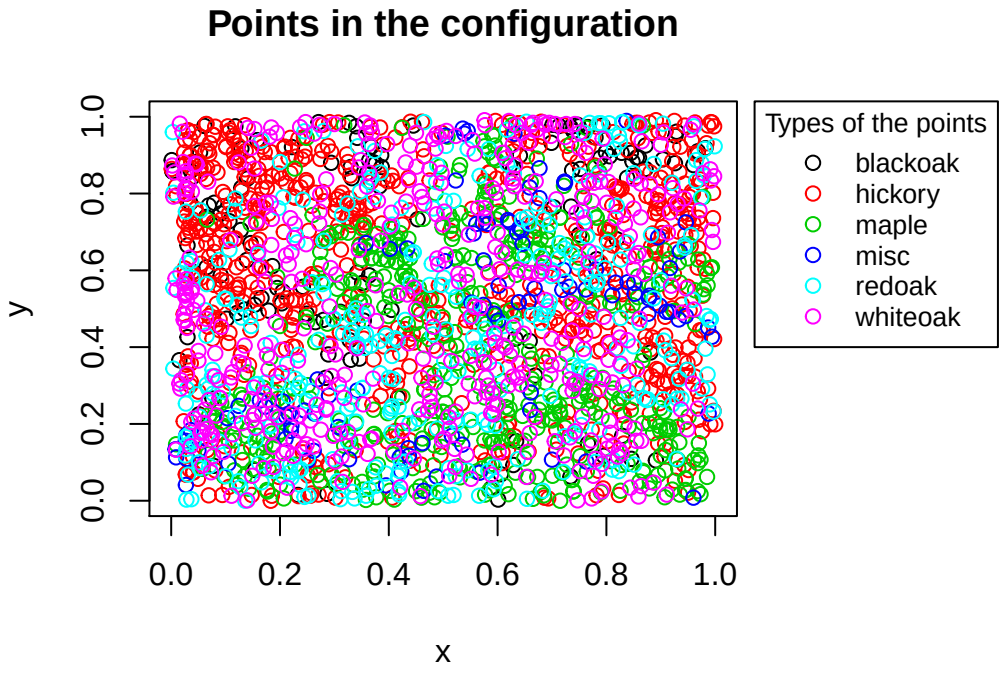
```
library(ppjsdm)
library(spatstat)
#> Loading required package: spatstat.data
#> Loading required package: nlme
#> Loading required package: rpart
#>
#> spatstat 1.63-0       (nickname: 'Space camouflage')
#> For an introduction to spatstat, type 'beginner'
remove(list = ls())

set.seed(1)
```

This vignette explains how to use the `ppjsdm` package with the Lansing dataset from `spatstat`. We begin by loading the data with all species.

```
data(lansing)
configuration <- as.Configuration(lansing)
window <- Rectangle_window(c(0, 1), c(0, 1))
```

The point configuration is plotted below.

```
par(mar = c(5, 4, 4, 13) + 0.1)
plot(configuration, window = window)
```

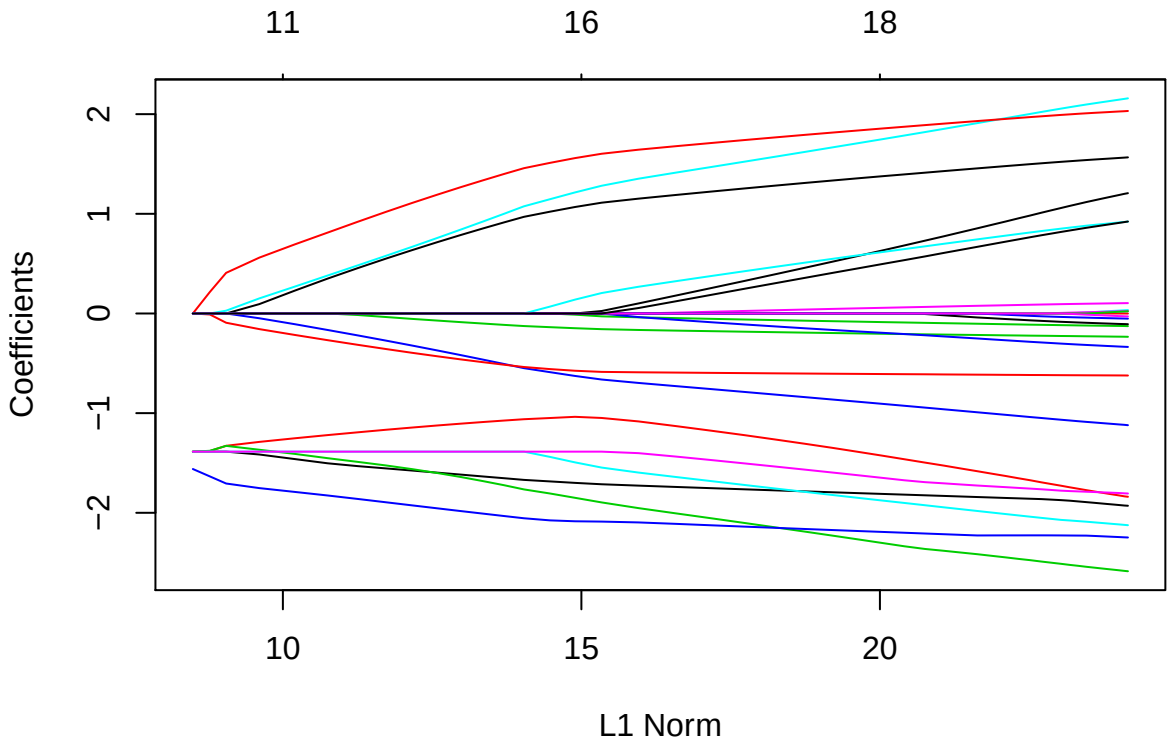


We fit the data with the Geyer model.

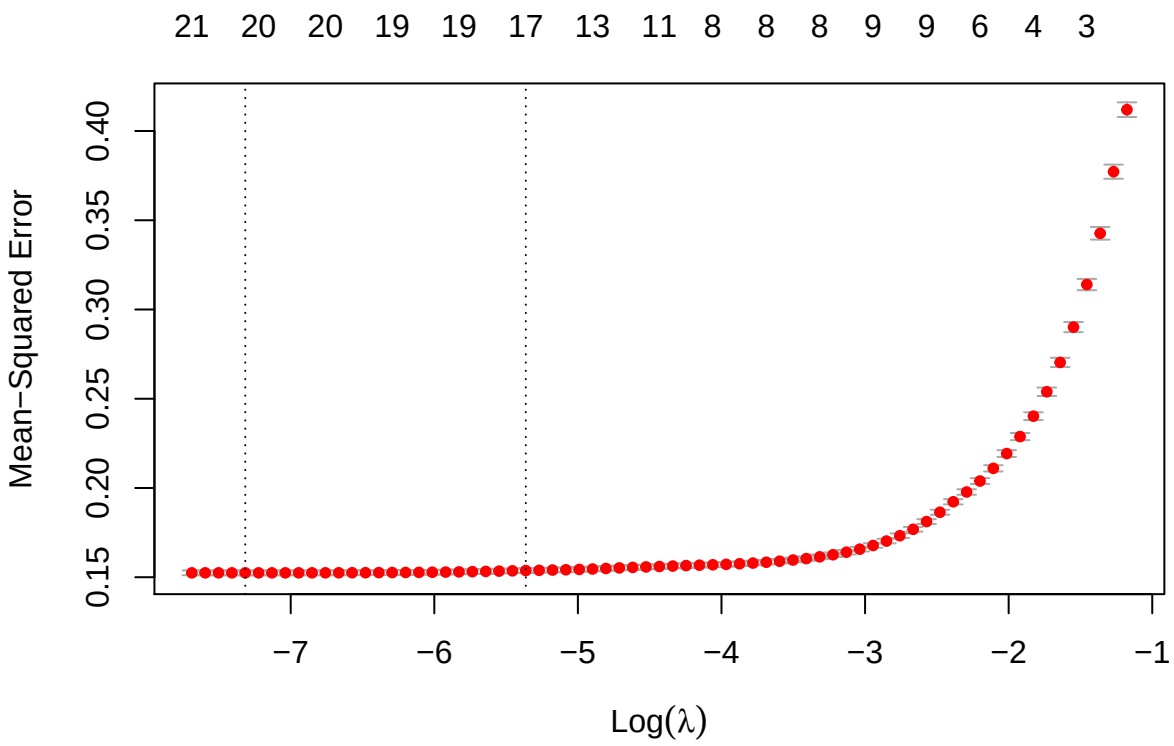
```
radii <- matrix(0.05, 6, 6)
```

The matrix `radii` models interaction radii within a species, and between species.

```
fit <- ppjsdm::gibbsm(configuration,
                      window = window,
                      model = "Geyer",
                      radius = radii,
                      use_glmnet = TRUE)
#> 28 x 1 sparse Matrix of class "dgCMatrix"
#>                          1
#> (Intercept)  .
#> log_lambda1  4.362448697
#> log_lambda2  6.102477812
#> log_lambda3  5.042221358
#> log_lambda4  3.967071845
#> log_lambda5  5.108543141
#> log_lambda6  5.684656013
#> alpha_1_1    1.566451789
#> alpha_1_2   -0.000681906
#> alpha_1_3   -0.233896140
#> alpha_1_4   -1.120850971
#> alpha_1_5    0.034303462
#> alpha_1_6    0.023244580
#> alpha_2_2    1.207358722
#> alpha_2_3   -0.622449731
#> alpha_2_4   -0.126748050
#> alpha_2_5    .
#> alpha_2_6   -0.335616648
#> alpha_3_3    2.158622908
#> alpha_3_4    0.104065003
#> alpha_3_5    .
#> alpha_3_6   -0.107660808
#> alpha_4_4    2.031941448
#> alpha_4_5    0.022192487
#> alpha_4_6   -0.051731183
#> alpha_5_5    0.921885993
#> alpha_5_6   -0.029382498
#> alpha_6_6    0.922731700
plot(fit$complete)
```




```
plot(fit$cv)
```




```
print(coefficients(fit$complete))
#> 28 x 48 sparse Matrix of class "dgCMatrix"
#>    [[ suppressing 48 column names 's0', 's1', 's2' ... ]]
#>
#> (Intercept)          .          .          .           .           .
#> shifted_log_lambda1 -1.386294 -1.3862944 -1.38629436 -1.41492719 -1.4607423
#> shifted_log_lambda2 -1.386294 -1.3799036 -1.32778795 -1.28835740 -1.2523443
#> shifted_log_lambda3 -1.386294 -1.3776425 -1.32838931 -1.36744917 -1.4088642
#> shifted_log_lambda4 -1.560648 -1.6349493 -1.70610755 -1.75202957 -1.7903080
#> shifted_log_lambda5 -1.386294 -1.3862944 -1.38629436 -1.38629436 -1.3862944
#> shifted_log_lambda6 -1.386294 -1.3862944 -1.38629436 -1.38629436 -1.3862944
#> alpha_1_1            .          .          .           0.09405646  0.2289352
#> alpha_1_2            .          .          .           .           .
#> alpha_1_3            .          .          .           .           .
#> alpha_1_4            .          .          .          -0.04802388 -0.1074616
#> alpha_1_5            .          .          .           .           .
#> alpha_1_6            .          .          .           .           .
#> alpha_2_2            .          .          .           .           .
#> alpha_2_3            .         -0.0103434 -0.09290865 -0.15672127 -0.2152382
#> alpha_2_4            .          .          .           .           .
#> alpha_2_5            .          .          .           .           .
#> alpha_2_6            .          .          .           .           .
#> alpha_3_3            .          .          0.02796850  0.15133329  0.2692895
#> alpha_3_4            .          .          .           .           .
#> alpha_3_5            .          .          .           .           .
#> alpha_3_6            .          .          .           .           .
```

```
#> alpha_4_4             .         0.2160440  0.40779788  0.56045840  0.6928344
#> alpha_4_5             .         .          .           .           .
#> alpha_4_6             .         .          .           .           .
#> alpha_5_5             .         .          .           .           .
#> alpha_5_6             .         .          .           .           .
#> alpha_6_6             .         .          .           .           .
#>
#> (Intercept)           .          .           .           .           .
#> shifted_log_lambda1 -1.5032391 -1.53154045 -1.55442019 -1.57592298 -1.59702842
#> shifted_log_lambda2 -1.2202554 -1.19230793 -1.16703636 -1.14435630 -1.12381537
#> shifted_log_lambda3 -1.4518338 -1.48895653 -1.52476136 -1.56172478 -1.60078120
#> shifted_log_lambda4 -1.8262942 -1.86106991 -1.89425877 -1.92548805 -1.95489480
#> shifted_log_lambda5 -1.3862944 -1.38629436 -1.38629436 -1.38629436 -1.38629436
#> shifted_log_lambda6 -1.3862944 -1.38629436 -1.38629436 -1.38629436 -1.38629436
#> alpha_1_1            0.3501655  0.45546315  0.54996738  0.63601490  0.71506518
#> alpha_1_2             .          .           .           .           .
#> alpha_1_3             .         -0.01526023 -0.03545253 -0.05423093 -0.07103998
#> alpha_1_4            -0.1655713 -0.22011209 -0.27183646 -0.32204925 -0.37053679
#> alpha_1_5             .          .           .           .           .
#> alpha_1_6             .          .           .           .           .
#> alpha_2_2             .          .           .           .           .
#> alpha_2_3            -0.2679039 -0.31437597 -0.35654748 -0.39468808 -0.42935676
#> alpha_2_4             .          .           .           .           .
#> alpha_2_5             .          .           .           .           .
#> alpha_2_6             .          .           .           .           .
#> alpha_3_3            0.3809947  0.48263004  0.57821988  0.66927952  0.75734869
#> alpha_3_4             .          .           .           .           .
#> alpha_3_5             .          .           .           .           .
#> alpha_3_6             .          .           .           .           .
#> alpha_4_4            0.8118663  0.92031093  1.01921350  1.10938139  1.19182519
#> alpha_4_5             .          .           .           .           .
#> alpha_4_6             .          .           .           .           .
#> alpha_5_5             .          .           .           .           .
#> alpha_5_6             .          .           .           .           .
#> alpha_6_6             .          .           .           .           .
#>
#> (Intercept)           .          .           .           .           .
#> shifted_log_lambda1 -1.61644397 -1.6353526 -1.6527609 -1.6695756 -1.68504417
#> shifted_log_lambda2 -1.10558044 -1.0890898 -1.0743412 -1.0610049 -1.04901097
#> shifted_log_lambda3 -1.64053665 -1.6818780 -1.7230114 -1.7650884 -1.80625891
#> shifted_log_lambda4 -1.98240105 -2.0082070 -2.0322981 -2.0548272 -2.07581664
#> shifted_log_lambda5 -1.38629436 -1.3862944 -1.3862944 -1.3862944 -1.43896935
#> shifted_log_lambda6 -1.38629436 -1.3862944 -1.3862944 -1.3862944 -1.38629436
#> alpha_1_1            0.78709045  0.8534378  0.9140633  0.9699744  1.02114287
#> alpha_1_2             .          .          .          .          .
#> alpha_1_3            -0.08684139 -0.1009771 -0.1142488 -0.1261362 -0.13729040
#> alpha_1_4            -0.41758339 -0.4628805 -0.5065972 -0.5485217 -0.58876081
#> alpha_1_5             .          .          .          .          .
#> alpha_1_6             .          .          .          .          .
#> alpha_2_2             .          .          .          .          .
#> alpha_2_3            -0.46044972 -0.4886638 -0.5141006 -0.5371711 -0.55805079
#> alpha_2_4             .          .          .          .          .
#> alpha_2_5             .          .          .          .          .
```

```
#> alpha_2_6            .           .           .           .           .
#> alpha_3_3            0.84134717  0.9227884   1.0002569   1.0752920   1.14640840
#> alpha_3_4            .           .           .           .           .
#> alpha_3_5            .           .           .           .           .
#> alpha_3_6            .           .           .           .           .
#> alpha_4_4            1.26720705  1.3363189   1.3996653   1.4578257   1.51120325
#> alpha_4_5            .           .           .           .           .
#> alpha_4_6            .           .           .           .           .
#> alpha_5_5            .           .           .           .           0.06890032
#> alpha_5_6            .           .           .           .           .
#> alpha_6_6            .           .           .           .           .
#>
#> (Intercept)          .           .           .           .
#> shifted_log_lambda1 -1.69968861 -1.713439447 -1.72723999 -1.740510466
#> shifted_log_lambda2 -1.03684739 -1.048453449 -1.08293856 -1.130031945
#> shifted_log_lambda3 -1.84940352 -1.895692779 -1.95289248 -2.005634934
#> shifted_log_lambda4 -2.08489789 -2.088242741 -2.09659680 -2.111027241
#> shifted_log_lambda5 -1.49385448 -1.546026710 -1.59606889 -1.640796703
#> shifted_log_lambda6 -1.38629436 -1.386219303 -1.40134542 -1.435937057
#> alpha_1_1            1.06832817  1.111756300  1.15210128  1.189300279
#> alpha_1_2            .           .           .           .
#> alpha_1_3           -0.14769171 -0.157343881 -0.16531644 -0.171767698
#> alpha_1_4           -0.62667654 -0.662503169 -0.69678298 -0.728787172
#> alpha_1_5            .           .           .           .
#> alpha_1_6            .           .           .           .
#> alpha_2_2            .           0.024772474  0.10048104  0.180033445
#> alpha_2_3           -0.57441200 -0.585913052 -0.59005254 -0.593106813
#> alpha_2_4           -0.01175143 -0.028712143 -0.03855482 -0.046457746
#> alpha_2_5            .           .           .           .
#> alpha_2_6            .          -0.000203125 -0.03610594 -0.063481550
#> alpha_3_3            1.21479577  1.281483748  1.35230300  1.413492216
#> alpha_3_4            .           .           .           0.008377061
#> alpha_3_5            .           .           .           .
#> alpha_3_6            .           .           .           .
#> alpha_4_4            1.55909990  1.602778679  1.64340855  1.678601782
#> alpha_4_5            .           .           .           .
#> alpha_4_6            .           .           .           .
#> alpha_5_5            0.13914042  0.205298723  0.26811979  0.324339331
#> alpha_5_6            .           .           .           .
#> alpha_6_6            .           .           0.05440891  0.122380376
#>
#> (Intercept)          .           .           .           .           .
#> shifted_log_lambda1 -1.75299897 -1.76451577 -1.77523768 -1.78511204 -1.79423492
#> shifted_log_lambda2 -1.17663365 -1.22129446 -1.26567003 -1.30793651 -1.34857939
#> shifted_log_lambda3 -2.05533997 -2.10224853 -2.14712824 -2.18935980 -2.22924153
#> shifted_log_lambda4 -2.12544855 -2.13871969 -2.15110979 -2.16249370 -2.17300469
#> shifted_log_lambda5 -1.68238824 -1.72107667 -1.75707746 -1.79047488 -1.82144437
#> shifted_log_lambda6 -1.47098657 -1.50449175 -1.53665950 -1.56714182 -1.59599301
#> alpha_1_1            1.22353021  1.25492077  1.28375313  1.31018312  1.33442094
#> alpha_1_2            .           .           .           .           .
#> alpha_1_3           -0.17751109 -0.18284766 -0.18769329 -0.19218188 -0.19630141
#> alpha_1_4           -0.75896317 -0.78749408 -0.81440370 -0.83972870 -0.86350850
#> alpha_1_5            .           .           .           .           .
```

```
#> alpha_1_6             .          .          .          .          .
#> alpha_2_2             0.25582212 0.32712118 0.39541866 0.45953331 0.52002623
#> alpha_2_3            -0.59585677 -0.59842551 -0.60063307 -0.60269351 -0.60455604
#> alpha_2_4            -0.05369961 -0.06042920 -0.06652143 -0.07217237 -0.07736355
#> alpha_2_5             .          .          .          .          .
#> alpha_2_6            -0.08800744 -0.11037920 -0.13043716 -0.14874805 -0.16537546
#> alpha_3_3             1.47028815 1.52373137 1.57443977 1.62204001 1.66680504
#> alpha_3_4             0.01731044 0.02543082 0.03289082 0.03967613 0.04587357
#> alpha_3_5             .          .          .          .          .
#> alpha_3_6             .          .          .          .          .
#> alpha_4_4             1.71078741 1.74038907 1.76759410 1.79259138 1.81554934
#> alpha_4_5             .          .          .          .          .
#> alpha_4_6             .          .          .          .          .
#> alpha_5_5             0.37637098 0.42455139 0.46918825 0.51044169 0.54856063
#> alpha_5_6             .          .          .          .          .
#> alpha_6_6             0.18750413 0.24840367 0.30522634 0.35818455 0.40745048
#>
#> (Intercept)           .          .          .          .
#> shifted_log_lambda1 -1.80271993 -1.81050267 -1.81767134 -1.824378428
#> shifted_log_lambda2 -1.38873352 -1.42655634 -1.46251186 -1.495969417
#> shifted_log_lambda3 -2.26727193 -2.30277174 -2.33607263 -2.362756873
#> shifted_log_lambda4 -2.18282103 -2.19180940 -2.20008385 -2.207774614
#> shifted_log_lambda5 -1.85017948 -1.87672575 -1.90125851 -1.923907579
#> shifted_log_lambda6 -1.62350024 -1.64933176 -1.67356891 -1.692322354
#> alpha_1_1             1.35667143 1.37704343 1.39570613 1.412841543
#> alpha_1_2             .          .          .          .
#> alpha_1_3            -0.20001683 -0.20346339 -0.20662397 -0.209373101
#> alpha_1_4            -0.88579077 -0.90662995 -0.92608158 -0.944226429
#> alpha_1_5             .          .          .          .
#> alpha_1_6             .          .          .          .
#> alpha_2_2             0.57797557 0.63207752 0.68285073 0.730462116
#> alpha_2_3            -0.60612074 -0.60759490 -0.60893207 -0.610229354
#> alpha_2_4            -0.08202562 -0.08634721 -0.09031368 -0.093895565
#> alpha_2_5             .          .          .          .
#> alpha_2_6            -0.18025721 -0.19386502 -0.20624807 -0.218287053
#> alpha_3_3             1.70915888 1.74865516 1.78559644 1.820171851
#> alpha_3_4             0.05157955 0.05676205 0.06149300 0.065857805
#> alpha_3_5             .          .          .          .
#> alpha_3_6             .          .          .         -0.005282087
#> alpha_4_4             1.83661950 1.85595626 1.87369287 1.889947132
#> alpha_4_5             .          .          .          .
#> alpha_4_6             .          .          .          .
#> alpha_5_5             0.58380622 0.61627737 0.64620472 0.673766117
#> alpha_5_6             .          .          .          .
#> alpha_6_6             0.45331963 0.49591477 0.53540558 0.572390685
#>
#> (Intercept)           .          .          .            .
#> shifted_log_lambda1 -1.83061269 -1.83645436 -1.8417227929 -1.846604276
#> shifted_log_lambda2 -1.52593645 -1.55590437 -1.5828159876 -1.608073073
#> shifted_log_lambda3 -2.38098422 -2.39919120 -2.4154661275 -2.432305929
#> shifted_log_lambda4 -2.21482577 -2.22147429 -2.2272966480 -2.226802481
#> shifted_log_lambda5 -1.94471596 -1.96404182 -1.9816665946 -1.997951870
#> shifted_log_lambda6 -1.70432962 -1.71586980 -1.7264012314 -1.735059107
```

```
#> alpha_1_1            1.42854708  1.44297465  1.4561283608  1.468197020
#> alpha_1_2            .           .           .             .
#> alpha_1_3           -0.21176074 -0.21383635 -0.2158273591 -0.217653709
#> alpha_1_4           -0.96114127 -0.97684930 -0.9914167015 -1.004741661
#> alpha_1_5            .           .           .             .
#> alpha_1_6            .           .           .             .
#> alpha_2_2            0.77415190  0.81641159  0.8546910987  0.890710174
#> alpha_2_3           -0.61163026 -0.61272567 -0.6138679339 -0.614781985
#> alpha_2_4           -0.09719400 -0.10008050 -0.1028294760 -0.105424871
#> alpha_2_5            .           .           .             .
#> alpha_2_6           -0.23018722 -0.24086646 -0.2507297793 -0.260267099
#> alpha_3_3            1.85214862  1.88255559  1.9102583688  1.936154455
#> alpha_3_4            0.06985002  0.07357126  0.0769010749  0.079981944
#> alpha_3_5            .           .           .             .
#> alpha_3_6           -0.01794013 -0.02931315 -0.0398518297 -0.047992631
#> alpha_4_4            1.90483101  1.91845669  1.9309410339  1.942204857
#> alpha_4_5            .           .           .             .
#> alpha_4_6            .           .          -0.0002470025 -0.007004895
#> alpha_5_5            0.69904375  0.72244813  0.7437787905  0.763443452
#> alpha_5_6            .           .           .             .
#> alpha_6_6            0.60727784  0.63939512  0.6689677295  0.696292407
#>
#> (Intercept)          .           .           .             .
#> shifted_log_lambda1 -1.85101985 -1.85518987 -1.85881765 -1.86238814
#> shifted_log_lambda2 -1.63089116 -1.65395516 -1.67314120 -1.69394387
#> shifted_log_lambda3 -2.44741936 -2.46263680 -2.47518621 -2.48889868
#> shifted_log_lambda4 -2.22651769 -2.22641442 -2.22612218 -2.22612185
#> shifted_log_lambda5 -2.01278881 -2.02665816 -2.03895010 -2.05081513
#> shifted_log_lambda6 -1.74280738 -1.75051011 -1.75709925 -1.76392328
#> alpha_1_1            1.47920065  1.48931999  1.49847013  1.50695788
#> alpha_1_2            .           .           .           .
#> alpha_1_3           -0.21937865 -0.22083921 -0.22235358 -0.22350828
#> alpha_1_4           -1.01707587 -1.02846485 -1.03898780 -1.04866969
#> alpha_1_5            .           .           .           .
#> alpha_1_6            .           .           .           .
#> alpha_2_2            0.92341740  0.95532013  0.98271674  1.01086160
#> alpha_2_3           -0.61570944 -0.61637268 -0.61723719 -0.61769612
#> alpha_2_4           -0.10786492 -0.10996660 -0.11207479 -0.11377122
#> alpha_2_5            .           .           .           .
#> alpha_2_6           -0.26901435 -0.27686300 -0.28409203 -0.29064724
#> alpha_3_3            1.95980048  1.98242510  2.00222165  2.02193923
#> alpha_3_4            0.08275049  0.08535943  0.08761137  0.08982869
#> alpha_3_5            .           .           .           .
#> alpha_3_6           -0.05561162 -0.06235469 -0.06874664 -0.07429376
#> alpha_4_4            1.95252573  1.96196127  1.97059568  1.97848836
#> alpha_4_5            .           .           .           .
#> alpha_4_6           -0.01301016 -0.01854162 -0.02351958 -0.02817595
#> alpha_5_5            0.78135177  0.79803153  0.81286087  0.82706791
#> alpha_5_6            .           .           .           .
#> alpha_6_6            0.72117234  0.74425678  0.76505884  0.78465858
#>
#> (Intercept)          .            .           .            .
#> shifted_log_lambda1 -1.867616888 -1.872845866 -1.878735782 -1.885936265
```

```
#> shifted_log_lambda2 -1.711605579 -1.728123636 -1.744679225 -1.758682679
#> shifted_log_lambda3 -2.500635733 -2.511689181 -2.522844478 -2.532194063
#> shifted_log_lambda4 -2.226430573 -2.226985575 -2.227779541 -2.228353182
#> shifted_log_lambda5 -2.061259141 -2.070927086 -2.077320703 -2.083256080
#> shifted_log_lambda6 -1.770851919 -1.777808352 -1.782070451 -1.785195655
#> alpha_1_1            1.514637251  1.521623492  1.528094131  1.534019176
#> alpha_1_2            .            .            .            .
#> alpha_1_3           -0.224650380 -0.225777184 -0.226765176 -0.227847705
#> alpha_1_4           -1.057700351 -1.066043385 -1.073767053 -1.080985776
#> alpha_1_5            .            .            0.001684133  0.005845963
#> alpha_1_6            0.002670586  0.005629503  0.008149006  0.010437566
#> alpha_2_2            1.035366895  1.058111639  1.080251907  1.099332584
#> alpha_2_3           -0.618505240 -0.619036186 -0.619382065 -0.619859466
#> alpha_2_4           -0.115479073 -0.116995832 -0.118286727 -0.119576447
#> alpha_2_5            .            .            .            .
#> alpha_2_6           -0.296600498 -0.302149650 -0.307164097 -0.311659149
#> alpha_3_3            2.039302887  2.055311046  2.070615865  2.083937461
#> alpha_3_4            0.091741153  0.093487655  0.095130795  0.096529681
#> alpha_3_5            .            .            .            .
#> alpha_3_6           -0.079093171 -0.083439154 -0.087122417 -0.090479138
#> alpha_4_4            1.985637164  1.992225236  1.998249741  2.003710831
#> alpha_4_5            .            .            .            .
#> alpha_4_6           -0.031675925 -0.034691466 -0.037271528 -0.039529223
#> alpha_5_5            0.839623133  0.851219473  0.861928668  0.871511553
#> alpha_5_6            .            .           -0.003681690 -0.007897044
#> alpha_6_6            0.801867663  0.818055410  0.833253010  0.846878896
#>
#> (Intercept)          .            .            .            .
#> shifted_log_lambda1 -1.892767725 -1.899569765 -1.905941766 -1.91174549
#> shifted_log_lambda2 -1.772711404 -1.785488449 -1.797051081 -1.80748367
#> shifted_log_lambda3 -2.541600235 -2.550069692 -2.557705439 -2.56460489
#> shifted_log_lambda4 -2.229012596 -2.232083489 -2.235328238 -2.23827571
#> shifted_log_lambda5 -2.089268446 -2.095553697 -2.101478755 -2.10691232
#> shifted_log_lambda6 -1.788477264 -1.791483364 -1.794251286 -1.79680603
#> alpha_1_1            1.539500623  1.544511620  1.549085525  1.55325107
#> alpha_1_2            .            .            .            .
#> alpha_1_3           -0.228743687 -0.229621789 -0.230447446 -0.23121376
#> alpha_1_4           -1.087601755 -1.093640676 -1.099189790 -1.10427913
#> alpha_1_5            0.009720172  0.014158035  0.018397761  0.02226382
#> alpha_1_6            0.012595687  0.014521628  0.016311821  0.01794766
#> alpha_2_2            1.118042537  1.135006357  1.150390691  1.16432026
#> alpha_2_3           -0.620156668 -0.620464571 -0.620771642 -0.62107673
#> alpha_2_4           -0.120661442 -0.121682461 -0.122633462 -0.12351849
#> alpha_2_5            .            .            .            .
#> alpha_2_6           -0.315869530 -0.319600458 -0.322997206 -0.32609744
#> alpha_3_3            2.096805696  2.108431281  2.118980963  2.12855940
#> alpha_3_4            0.097872688  0.099053111  0.100110798  0.10106614
#> alpha_3_5            .            .            .            .
#> alpha_3_6           -0.093519489 -0.096228182 -0.098709872 -0.10097284
#> alpha_4_4            2.008720150  2.013055393  2.016952259  2.02050686
#> alpha_4_5            .            0.003760655  0.007580354  0.01106793
#> alpha_4_6           -0.041629930 -0.043642761 -0.045354350 -0.04691039
#> alpha_5_5            0.880816931  0.888563420  0.895630828  0.90206573
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#> alpha_5_6           -0.011699386 -0.015146370 -0.018286982 -0.02111355
#> alpha_6_6            0.859781247  0.871441357  0.882049650  0.89172187
#>
#> (Intercept)          .            .            .            .
#> shifted_log_lambda1 -1.91702341 -1.92182011 -1.92691907 -1.929120443
#> shifted_log_lambda2 -1.81685583 -1.82521959 -1.83443092 -1.839173441
#> shifted_log_lambda3 -2.57083125 -2.57642707 -2.58275176 -2.586296269
#> shifted_log_lambda4 -2.24094853 -2.24337052 -2.24598327 -2.247536254
#> shifted_log_lambda5 -2.11185964 -2.11634758 -2.12119702 -2.124189995
#> shifted_log_lambda6 -1.79917159 -1.80137753 -1.80458631 -1.806431580
#> alpha_1_1            1.55704250  1.56049059  1.56382775  1.566451789
#> alpha_1_2            .           .           .          -0.000681906
#> alpha_1_3           -0.23192470 -0.23258548 -0.23301320 -0.233896140
#> alpha_1_4           -1.10894371 -1.11321721 -1.11709302 -1.120850971
#> alpha_1_5            0.02578141  0.02897834  0.03212832  0.034303462
#> alpha_1_6            0.01944336  0.02081447  0.02231655  0.023244580
#> alpha_2_2            1.17689145  1.18818113  1.20016061  1.207358722
#> alpha_2_3           -0.62138236 -0.62169359 -0.62193352 -0.622449731
#> alpha_2_4           -0.12434363 -0.12511569 -0.12568881 -0.126748050
#> alpha_2_5            .           .           .           .
#> alpha_2_6           -0.32892371 -0.33149557 -0.33391757 -0.335616648
#> alpha_3_3            2.13724093  2.14508332  2.15316288  2.158622908
#> alpha_3_4            0.10192952  0.10270903  0.10350413  0.104065003
#> alpha_3_5            .           .           .           .
#> alpha_3_6           -0.10302559 -0.10487835 -0.10634835 -0.107660808
#> alpha_4_4            2.02375132  2.02671280  2.02943759  2.031941448
#> alpha_4_5            0.01424721  0.01714443  0.01993375  0.022192487
#> alpha_4_6           -0.04832458 -0.04960696 -0.05073554 -0.051731183
#> alpha_5_5            0.90789535  0.91315243  0.91850461  0.921885993
#> alpha_5_6           -0.02366030 -0.02594627 -0.02790398 -0.029382498
#> alpha_6_6            0.90054060  0.90857891  0.91685539  0.922731700
```