Simulation Information

Edward Gunning

2023-08-15

The simulations were run on the Irish Centre for High-End Computing (ICHEC) cluster. This document provides the `sessionInfo()` from each scenario as well as the number of cores used.

Baseline Scenario: $N = 280$, `prop_missing` $= 0.1$, `long_strength` $= 1$

```
## R version 4.1.2 (2021-11-01)
## Platform: x86_64-pc-linux-gnu (64-bit)
##
## Matrix products: default
## BLAS:   /ichec/packages/r/4.1.2/lib64/R/lib/libRblas.so
## LAPACK: /ichec/packages/r/4.1.2/lib64/R/lib/libRlapack.so
##
## locale:
##  [1] LC_CTYPE=en_IE.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_IE.UTF-8        LC_COLLATE=en_IE.UTF-8
##  [5] LC_MONETARY=en_IE.UTF-8    LC_MESSAGES=en_IE.UTF-8
##  [7] LC_PAPER=en_IE.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_IE.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] splines   stats     graphics  grDevices utils     datasets  methods
## [8] base
##
## other attached packages:
##  [1] mvtnorm_1.2-2    progress_1.2.2   data.table_1.14.8 refund_0.1-32
##  [5] lme4_1.1-34      Matrix_1.3-4     fda_6.1.4          deSolve_1.36
##  [9] fds_1.8          RCurl_1.98-1.6   rainbow_3.7        pcaPP_2.0-3
## [13] MASS_7.3-54
##
## loaded via a namespace (and not attached):
##  [1] mclust_6.0.0       Rcpp_1.0.8        here_1.0.1         lattice_0.20-45
##  [5] prettyunits_1.1.1  assertthat_0.2.1  rprojroot_2.0.2    foreach_1.5.2
##  [9] utf8_1.2.2         R6_2.5.1          magic_1.6-1        pracma_2.4.2
## [13] ggplot2_3.3.5      pillar_1.7.0      rlang_1.0.1        minqa_1.2.5
## [17] nloptr_2.0.0       grpreg_3.4.0      munsell_0.5.0      gamm4_0.2-6
## [21] compiler_4.1.2     pkgconfig_2.0.3   pbs_1.1            mgcv_1.9-0
## [25] tidyselect_1.1.1   tibble_3.1.6      hdrcde_3.4         matrixcalc_1.0-6
## [29] codetools_0.2-18   fansi_1.0.2       crayon_1.5.0       dplyr_1.0.8
## [33] bitops_1.0-7       grid_4.1.2        nlme_3.1-153       gtable_0.3.0
## [37] lifecycle_1.0.1    DBI_1.1.2         magrittr_2.0.2     scales_1.1.1
## [41] KernSmooth_2.23-20 cli_3.2.0         doParallel_1.0.17  ellipsis_0.3.2
## [45] generics_0.1.2     vctrs_0.3.8       boot_1.3-28        iterators_1.0.14
```

```
## [49] tools_4.1.2        glue_1.6.1        purrr_0.3.4       hms_1.1.1
## [53] ks_1.14.0         abind_1.4-5       parallel_4.1.2    colorspace_2.0-2
## [57] cluster_2.1.2     RLRsim_3.1-8
```

- For this scenario, there were 39 cores used.

$N = 280$, $\texttt{prop\_missing} = 0.1$, $\texttt{long\_strength} = 2$

```
## R version 4.1.2 (2021-11-01)
## Platform: x86_64-pc-linux-gnu (64-bit)
##
## Matrix products: default
## BLAS:   /ichec/packages/r/4.1.2/lib64/R/lib/libRblas.so
## LAPACK: /ichec/packages/r/4.1.2/lib64/R/lib/libRlapack.so
##
## locale:
##  [1] LC_CTYPE=en_IE.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_IE.UTF-8        LC_COLLATE=en_IE.UTF-8
##  [5] LC_MONETARY=en_IE.UTF-8    LC_MESSAGES=en_IE.UTF-8
##  [7] LC_PAPER=en_IE.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_IE.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] splines   stats     graphics  grDevices utils     datasets  methods
## [8] base
##
## other attached packages:
##  [1] mvtnorm_1.2-2    progress_1.2.2   data.table_1.14.8 refund_0.1-32
##  [5] lme4_1.1-34      Matrix_1.3-4     fda_6.1.4         deSolve_1.36
##  [9] fds_1.8          RCurl_1.98-1.6   rainbow_3.7       pcaPP_2.0-3
## [13] MASS_7.3-54
##
## loaded via a namespace (and not attached):
##  [1] mclust_6.0.0     Rcpp_1.0.8       here_1.0.1        lattice_0.20-45
##  [5] prettyunits_1.1.1 assertthat_0.2.1 rprojroot_2.0.2  foreach_1.5.2
##  [9] utf8_1.2.2       R6_2.5.1         magic_1.6-1       pracma_2.4.2
## [13] ggplot2_3.3.5    pillar_1.7.0     rlang_1.0.1      minqa_1.2.5
## [17] nloptr_2.0.0     grpreg_3.4.0     munsell_0.5.0    gamm4_0.2-6
## [21] compiler_4.1.2   pkgconfig_2.0.3  pbs_1.1          mgcv_1.9-0
## [25] tidyselect_1.1.1 tibble_3.1.6     hdrcde_3.4       matrixcalc_1.0-6
## [29] codetools_0.2-18 fansi_1.0.2      crayon_1.5.0     dplyr_1.0.8
## [33] bitops_1.0-7     grid_4.1.2       nlme_3.1-153     gtable_0.3.0
## [37] lifecycle_1.0.1  DBI_1.1.2        magrittr_2.0.2   scales_1.1.1
## [41] KernSmooth_2.23-20 cli_3.2.0      doParallel_1.0.17 ellipsis_0.3.2
## [45] generics_0.1.2   vctrs_0.3.8      boot_1.3-28      iterators_1.0.14
## [49] tools_4.1.2      glue_1.6.1       purrr_0.3.4      hms_1.1.1
## [53] ks_1.14.0        abind_1.4-5      parallel_4.1.2   colorspace_2.0-2
## [57] cluster_2.1.2    RLRsim_3.1-8
```

- For this scenario, there were 39 cores used.

$N = 280$, $\texttt{prop\_missing} = 0.1$, $\texttt{long\_strength} = 3$

```
## R version 4.1.2 (2021-11-01)
```

```
## Platform: x86_64-pc-linux-gnu (64-bit)
##
## Matrix products: default
## BLAS:   /ichec/packages/r/4.1.2/lib64/R/lib/libRblas.so
## LAPACK: /ichec/packages/r/4.1.2/lib64/R/lib/libRlapack.so
##
## locale:
##  [1] LC_CTYPE=en_IE.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_IE.UTF-8        LC_COLLATE=en_IE.UTF-8
##  [5] LC_MONETARY=en_IE.UTF-8    LC_MESSAGES=en_IE.UTF-8
##  [7] LC_PAPER=en_IE.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_IE.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] splines   stats     graphics  grDevices utils     datasets  methods
## [8] base
##
## other attached packages:
##  [1] mvtnorm_1.2-2     progress_1.2.2    data.table_1.14.8 refund_0.1-32
##  [5] lme4_1.1-34       Matrix_1.3-4      fda_6.1.4         deSolve_1.36
##  [9] fds_1.8           RCurl_1.98-1.6    rainbow_3.7       pcaPP_2.0-3
## [13] MASS_7.3-54
##
## loaded via a namespace (and not attached):
##  [1] mclust_6.0.0     Rcpp_1.0.8       here_1.0.1        lattice_0.20-45
##  [5] prettyunits_1.1.1 assertthat_0.2.1 rprojroot_2.0.2  foreach_1.5.2
##  [9] utf8_1.2.2       R6_2.5.1         magic_1.6-1       pracma_2.4.2
## [13] ggplot2_3.3.5    pillar_1.7.0     rlang_1.0.1      minqa_1.2.5
## [17] nloptr_2.0.0     grpreg_3.4.0     munsell_0.5.0    gamm4_0.2-6
## [21] compiler_4.1.2   pkgconfig_2.0.3  pbs_1.1          mgcv_1.9-0
## [25] tidyselect_1.1.1 tibble_3.1.6     hdrcde_3.4       matrixcalc_1.0-6
## [29] codetools_0.2-18 fansi_1.0.2      crayon_1.5.0     dplyr_1.0.8
## [33] bitops_1.0-7     grid_4.1.2       nlme_3.1-153     gtable_0.3.0
## [37] lifecycle_1.0.1  DBI_1.1.2        magrittr_2.0.2   scales_1.1.1
## [41] KernSmooth_2.23-20 cli_3.2.0      doParallel_1.0.17 ellipsis_0.3.2
## [45] generics_0.1.2   vctrs_0.3.8      boot_1.3-28      iterators_1.0.14
## [49] tools_4.1.2      glue_1.6.1       purrr_0.3.4      hms_1.1.1
## [53] ks_1.14.0        abind_1.4-5      parallel_4.1.2   colorspace_2.0-2
## [57] cluster_2.1.2    RLRsim_3.1-8
```

- For this scenario, there were 39 cores used.

$N = 280$, prop_missing $= 0.2$, long_strength $= 1$

```
## R version 4.1.2 (2021-11-01)
## Platform: x86_64-pc-linux-gnu (64-bit)
##
## Matrix products: default
## BLAS:   /ichec/packages/r/4.1.2/lib64/R/lib/libRblas.so
## LAPACK: /ichec/packages/r/4.1.2/lib64/R/lib/libRlapack.so
##
## locale:
##  [1] LC_CTYPE=en_IE.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_IE.UTF-8        LC_COLLATE=en_IE.UTF-8
```

```
## [5] LC_MONETARY=en_IE.UTF-8    LC_MESSAGES=en_IE.UTF-8
## [7] LC_PAPER=en_IE.UTF-8       LC_NAME=C
## [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_IE.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] splines   stats     graphics  grDevices utils     datasets  methods
## [8] base
##
## other attached packages:
##  [1] mvtnorm_1.2-2      progress_1.2.2    data.table_1.14.8 refund_0.1-32
##  [5] lme4_1.1-34        Matrix_1.3-4      fda_6.1.4          deSolve_1.36
##  [9] fds_1.8            RCurl_1.98-1.6    rainbow_3.7        pcaPP_2.0-3
## [13] MASS_7.3-54
##
## loaded via a namespace (and not attached):
##  [1] mclust_6.0.0      Rcpp_1.0.8        here_1.0.1        lattice_0.20-45
##  [5] prettyunits_1.1.1 assertthat_0.2.1  rprojroot_2.0.2   foreach_1.5.2
##  [9] utf8_1.2.2        R6_2.5.1          magic_1.6-1       pracma_2.4.2
## [13] ggplot2_3.3.5     pillar_1.7.0      rlang_1.0.1       minqa_1.2.5
## [17] nloptr_2.0.0      grpreg_3.4.0      munsell_0.5.0     gamm4_0.2-6
## [21] compiler_4.1.2    pkgconfig_2.0.3   pbs_1.1           mgcv_1.9-0
## [25] tidyselect_1.1.1  tibble_3.1.6      hdrcde_3.4        matrixcalc_1.0-6
## [29] codetools_0.2-18  fansi_1.0.2       crayon_1.5.0      dplyr_1.0.8
## [33] bitops_1.0-7      grid_4.1.2        nlme_3.1-153      gtable_0.3.0
## [37] lifecycle_1.0.1   DBI_1.1.2         magrittr_2.0.2    scales_1.1.1
## [41] KernSmooth_2.23-20 cli_3.2.0        doParallel_1.0.17 ellipsis_0.3.2
## [45] generics_0.1.2    vctrs_0.3.8       boot_1.3-28       iterators_1.0.14
## [49] tools_4.1.2       glue_1.6.1        purrr_0.3.4       hms_1.1.1
## [53] ks_1.14.0         abind_1.4-5       parallel_4.1.2    colorspace_2.0-2
## [57] cluster_2.1.2     RLRsim_3.1-8
```

- For this scenario, there were 39 cores used.

$N = 280$, prop_missing $= 0.5$, long_strength $= 1$

```
## R version 4.1.2 (2021-11-01)
## Platform: x86_64-pc-linux-gnu (64-bit)
##
## Matrix products: default
## BLAS:   /ichec/packages/r/4.1.2/lib64/R/lib/libRblas.so
## LAPACK: /ichec/packages/r/4.1.2/lib64/R/lib/libRlapack.so
##
## locale:
##  [1] LC_CTYPE=en_IE.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_IE.UTF-8        LC_COLLATE=en_IE.UTF-8
##  [5] LC_MONETARY=en_IE.UTF-8    LC_MESSAGES=en_IE.UTF-8
##  [7] LC_PAPER=en_IE.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_IE.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] splines   stats     graphics  grDevices utils     datasets  methods
## [8] base
##
```

```
## other attached packages:
##  [1] mvtnorm_1.2-2     progress_1.2.2    data.table_1.14.8 refund_0.1-32
##  [5] lme4_1.1-34       Matrix_1.3-4      fda_6.1.4          deSolve_1.36
##  [9] fds_1.8           RCurl_1.98-1.6    rainbow_3.7        pcaPP_2.0-3
## [13] MASS_7.3-54
##
## loaded via a namespace (and not attached):
##  [1] mclust_6.0.0      Rcpp_1.0.8        here_1.0.1         lattice_0.20-45
##  [5] prettyunits_1.1.1 assertthat_0.2.1  rprojroot_2.0.2    foreach_1.5.2
##  [9] utf8_1.2.2        R6_2.5.1          magic_1.6-1        pracma_2.4.2
## [13] ggplot2_3.3.5     pillar_1.7.0      rlang_1.0.1        minqa_1.2.5
## [17] nloptr_2.0.0      grpreg_3.4.0      munsell_0.5.0      gamm4_0.2-6
## [21] compiler_4.1.2    pkgconfig_2.0.3   pbs_1.1            mgcv_1.9-0
## [25] tidyselect_1.1.1  tibble_3.1.6      hdrcde_3.4         matrixcalc_1.0-6
## [29] codetools_0.2-18  fansi_1.0.2       crayon_1.5.0       dplyr_1.0.8
## [33] bitops_1.0-7      grid_4.1.2        nlme_3.1-153       gtable_0.3.0
## [37] lifecycle_1.0.1   DBI_1.1.2         magrittr_2.0.2     scales_1.1.1
## [41] KernSmooth_2.23-20 cli_3.2.0        doParallel_1.0.17  ellipsis_0.3.2
## [45] generics_0.1.2    vctrs_0.3.8       boot_1.3-28        iterators_1.0.14
## [49] tools_4.1.2       glue_1.6.1        purrr_0.3.4        hms_1.1.1
## [53] ks_1.14.0         abind_1.4-5       parallel_4.1.2     colorspace_2.0-2
## [57] cluster_2.1.2     RLRsim_3.1-8
```

- For this scenario, there were 39 cores used.

$N = 500$, `prop_missing` $= 0.1$, `long_strength` $= 1$

```
## R version 4.1.2 (2021-11-01)
## Platform: x86_64-pc-linux-gnu (64-bit)
##
## Matrix products: default
## BLAS:   /ichec/packages/r/4.1.2/lib64/R/lib/libRblas.so
## LAPACK: /ichec/packages/r/4.1.2/lib64/R/lib/libRlapack.so
##
## locale:
##  [1] LC_CTYPE=en_IE.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_IE.UTF-8        LC_COLLATE=en_IE.UTF-8
##  [5] LC_MONETARY=en_IE.UTF-8    LC_MESSAGES=en_IE.UTF-8
##  [7] LC_PAPER=en_IE.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_IE.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] splines   stats     graphics  grDevices utils     datasets  methods
## [8] base
##
## other attached packages:
##  [1] mvtnorm_1.2-2     progress_1.2.2    data.table_1.14.8 refund_0.1-32
##  [5] lme4_1.1-34       Matrix_1.3-4      fda_6.1.4          deSolve_1.36
##  [9] fds_1.8           RCurl_1.98-1.6    rainbow_3.7        pcaPP_2.0-3
## [13] MASS_7.3-54
##
## loaded via a namespace (and not attached):
##  [1] mclust_6.0.0      Rcpp_1.0.8        here_1.0.1         lattice_0.20-45
##  [5] prettyunits_1.1.1 assertthat_0.2.1  rprojroot_2.0.2    foreach_1.5.2
```

```
##  [9] utf8_1.2.2          R6_2.5.1         magic_1.6-1     pracma_2.4.2
## [13] ggplot2_3.3.5       pillar_1.7.0     rlang_1.0.1     minqa_1.2.5
## [17] nloptr_2.0.0        grpreg_3.4.0     munsell_0.5.0   gamm4_0.2-6
## [21] compiler_4.1.2      pkgconfig_2.0.3  pbs_1.1         mgcv_1.9-0
## [25] tidyselect_1.1.1    tibble_3.1.6     hdrcde_3.4      matrixcalc_1.0-6
## [29] codetools_0.2-18    fansi_1.0.2      crayon_1.5.0    dplyr_1.0.8
## [33] bitops_1.0-7        grid_4.1.2       nlme_3.1-153    gtable_0.3.0
## [37] lifecycle_1.0.1     DBI_1.1.2        magrittr_2.0.2  scales_1.1.1
## [41] KernSmooth_2.23-20  cli_3.2.0        doParallel_1.0.17 ellipsis_0.3.2
## [45] generics_0.1.2      vctrs_0.3.8      boot_1.3-28     iterators_1.0.14
## [49] tools_4.1.2         glue_1.6.1       purrr_0.3.4     hms_1.1.1
## [53] ks_1.14.0           abind_1.4-5      parallel_4.1.2  colorspace_2.0-2
## [57] cluster_2.1.2       RLRsim_3.1-8
```

- For this scenario, there were 30 cores used.

$N = 1000$, `prop_missing` $= 0.1$, `long_strength` $= 1$

Due to out-of-memory (OOM) errors, this was split into two smaller batches of simulations (250 replicates each).

Part 1

```
## R version 4.1.2 (2021-11-01)
## Platform: x86_64-pc-linux-gnu (64-bit)
##
## Matrix products: default
## BLAS:   /ichec/packages/r/4.1.2/lib64/R/lib/libRblas.so
## LAPACK: /ichec/packages/r/4.1.2/lib64/R/lib/libRlapack.so
##
## locale:
##  [1] LC_CTYPE=en_IE.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_IE.UTF-8        LC_COLLATE=en_IE.UTF-8
##  [5] LC_MONETARY=en_IE.UTF-8    LC_MESSAGES=en_IE.UTF-8
##  [7] LC_PAPER=en_IE.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_IE.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] splines   stats     graphics  grDevices utils     datasets  methods
## [8] base
##
## other attached packages:
##  [1] mvtnorm_1.2-2      progress_1.2.2    data.table_1.14.8 refund_0.1-32
##  [5] lme4_1.1-34        Matrix_1.3-4      fda_6.1.4          deSolve_1.36
##  [9] fds_1.8            RCurl_1.98-1.6    rainbow_3.7        pcaPP_2.0-3
## [13] MASS_7.3-54
##
## loaded via a namespace (and not attached):
##  [1] mclust_6.0.0       Rcpp_1.0.8        here_1.0.1       lattice_0.20-45
##  [5] prettyunits_1.1.1  assertthat_0.2.1  rprojroot_2.0.2  foreach_1.5.2
##  [9] utf8_1.2.2         R6_2.5.1          magic_1.6-1      pracma_2.4.2
## [13] ggplot2_3.3.5      pillar_1.7.0      rlang_1.0.1      minqa_1.2.5
## [17] nloptr_2.0.0       grpreg_3.4.0      munsell_0.5.0    gamm4_0.2-6
## [21] compiler_4.1.2     pkgconfig_2.0.3   pbs_1.1          mgcv_1.9-0
```

```
## [25] tidyselect_1.1.1   tibble_3.1.6    hdrcde_3.4         matrixcalc_1.0-6
## [29] codetools_0.2-18   fansi_1.0.2     crayon_1.5.0       dplyr_1.0.8
## [33] bitops_1.0-7       grid_4.1.2      nlme_3.1-153       gtable_0.3.0
## [37] lifecycle_1.0.1    DBI_1.1.2       magrittr_2.0.2     scales_1.1.1
## [41] KernSmooth_2.23-20 cli_3.2.0       doParallel_1.0.17  ellipsis_0.3.2
## [45] generics_0.1.2     vctrs_0.3.8     boot_1.3-28        iterators_1.0.14
## [49] tools_4.1.2        glue_1.6.1      purrr_0.3.4        hms_1.1.1
## [53] ks_1.14.0          abind_1.4-5     parallel_4.1.2     colorspace_2.0-2
## [57] cluster_2.1.2      RLRsim_3.1-8
```

- For this scenario, there were 20 cores used.

Part 2

```
## R version 4.1.2 (2021-11-01)
## Platform: x86_64-pc-linux-gnu (64-bit)
##
## Matrix products: default
## BLAS:   /ichec/packages/r/4.1.2/lib64/R/lib/libRblas.so
## LAPACK: /ichec/packages/r/4.1.2/lib64/R/lib/libRlapack.so
##
## locale:
##  [1] LC_CTYPE=en_IE.UTF-8       LC_NUMERIC=C
##  [3] LC_TIME=en_IE.UTF-8        LC_COLLATE=en_IE.UTF-8
##  [5] LC_MONETARY=en_IE.UTF-8    LC_MESSAGES=en_IE.UTF-8
##  [7] LC_PAPER=en_IE.UTF-8       LC_NAME=C
##  [9] LC_ADDRESS=C               LC_TELEPHONE=C
## [11] LC_MEASUREMENT=en_IE.UTF-8 LC_IDENTIFICATION=C
##
## attached base packages:
## [1] splines   stats     graphics  grDevices utils     datasets  methods
## [8] base
##
## other attached packages:
##  [1] mvtnorm_1.2-2     progress_1.2.2   data.table_1.14.8 refund_0.1-32
##  [5] lme4_1.1-34       Matrix_1.3-4     fda_6.1.4          deSolve_1.36
##  [9] fds_1.8           RCurl_1.98-1.6   rainbow_3.7        pcaPP_2.0-3
## [13] MASS_7.3-54
##
## loaded via a namespace (and not attached):
##  [1] mclust_6.0.0       Rcpp_1.0.8       here_1.0.1         lattice_0.20-45
##  [5] prettyunits_1.1.1  assertthat_0.2.1 rprojroot_2.0.2    foreach_1.5.2
##  [9] utf8_1.2.2         R6_2.5.1         magic_1.6-1        pracma_2.4.2
## [13] ggplot2_3.3.5      pillar_1.7.0     rlang_1.0.1        minqa_1.2.5
## [17] nloptr_2.0.0       grpreg_3.4.0     munsell_0.5.0      gamm4_0.2-6
## [21] compiler_4.1.2     pkgconfig_2.0.3  pbs_1.1            mgcv_1.9-0
## [25] tidyselect_1.1.1   tibble_3.1.6     hdrcde_3.4         matrixcalc_1.0-6
## [29] codetools_0.2-18   fansi_1.0.2      crayon_1.5.0       dplyr_1.0.8
## [33] bitops_1.0-7       grid_4.1.2       nlme_3.1-153       gtable_0.3.0
## [37] lifecycle_1.0.1    DBI_1.1.2        magrittr_2.0.2     scales_1.1.1
## [41] KernSmooth_2.23-20 cli_3.2.0        doParallel_1.0.17  ellipsis_0.3.2
## [45] generics_0.1.2     vctrs_0.3.8      boot_1.3-28        iterators_1.0.14
## [49] tools_4.1.2        glue_1.6.1       purrr_0.3.4        hms_1.1.1
## [53] ks_1.14.0          abind_1.4-5      parallel_4.1.2     colorspace_2.0-2
## [57] cluster_2.1.2      RLRsim_3.1-8
```

- For this scenario, there were 20 cores used.