Clustering of human and mouse counts

Purpose:

To assess the similarity of the samples examined in this experiment based on the counts for human and HBV genes OR counts for mouse genes.

Loading packages

```
library(dplyr)
```

```
##
## Attaching package: 'dplyr'
```

```
## The following objects are masked from 'package:stats':
##
##     filter, lag
```

```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
library(stringr)
library(ggplot2)
library(reshape2)
library(openxlsx)
library(DESeq2)
```

```
## Loading required package: S4Vectors
```

```
## Loading required package: stats4
```

```
## Loading required package: BiocGenerics
```

```
## Loading required package: parallel
```

```
##
## Attaching package: 'BiocGenerics'
```

```
## The following objects are masked from 'package:parallel':
##
##     clusterApply, clusterApplyLB, clusterCall, clusterEvalQ,
##     clusterExport, clusterMap, parApply, parCapply, parLapply,
##     parLapplyLB, parRapply, parSapply, parSapplyLB
```

```
## The following objects are masked from 'package:dplyr':
##
##     combine, intersect, setdiff, union
```

```
## The following objects are masked from 'package:stats':
##
##     IQR, mad, xtabs
```

```
## The following objects are masked from 'package:base':
##
##     anyDuplicated, append, as.data.frame, cbind, colnames,
##     do.call, duplicated, eval, evalq, Filter, Find, get, grep,
##     grepl, intersect, is.unsorted, lapply, lengths, Map, mapply,
##     match, mget, order, paste, pmax, pmax.int, pmin, pmin.int,
```

```
##     Position, rank, rbind, Reduce, rownames, sapply, setdiff,
##     sort, table, tapply, union, unique, unsplit
##
## Attaching package: 'S4Vectors'
## The following objects are masked from 'package:dplyr':
##
##     first, rename
## The following objects are masked from 'package:base':
##
##     colMeans, colSums, expand.grid, rowMeans, rowSums
## Loading required package: IRanges
##
## Attaching package: 'IRanges'
## The following objects are masked from 'package:dplyr':
##
##     collapse, desc, slice
## Loading required package: GenomicRanges
## Loading required package: GenomeInfoDb
## Loading required package: SummarizedExperiment
## Loading required package: Biobase
## Welcome to Bioconductor
##
##     Vignettes contain introductory material; view with
##     'browseVignettes()'. To cite Bioconductor, see
##     'citation("Biobase")', and for packages 'citation("pkgname")'.
library(gplots)
##
## Attaching package: 'gplots'
## The following object is masked from 'package:IRanges':
##
##     space
## The following object is masked from 'package:S4Vectors':
##
##     space
## The following object is masked from 'package:stats':
##
##     lowess
library(dplyr)
library(RColorBrewer)
library(stringr)
library(genefilter)
library(data.table)
##
## Attaching package: 'data.table'
```

```
## The following object is masked from 'package:SummarizedExperiment':
##
##     shift

## The following object is masked from 'package:GenomicRanges':
##
##     shift

## The following object is masked from 'package:IRanges':
##
##     shift

## The following objects are masked from 'package:S4Vectors':
##
##     first, second

## The following objects are masked from 'package:reshape2':
##
##     dcast, melt

## The following objects are masked from 'package:dplyr':
##
##     between, first, last
```

```
library(genefilter)
library(ggrepel)
library(viridis)
```

```
## Loading required package: viridisLite
```

PCA plot and heat map of sample-sample distances for i) the counts of all human and HBV genes and ii) the counts of all mouse genes.

```
graph_generation <- function(sampledirectory) {
a <- basename(Sys.glob(file.path(sampledirectory, "*.txt")))
sample_names <- sub('.txt', '', a)
##Here the donors are renamed based off the Hurel names (i.e. HU___) - RNASeq reads were
##all named using a different ID system.
sampleTable <- data.frame(sampleName = sample_names, sampleFile = a, treatment =
                            ifelse(grepl("Ctrl", a), "mock", ifelse(grepl("*co|*HDV", a),
                                                                    "coinf", "HBV")),
                          donor = ifelse(grepl("BD330*", a), "HU1019",
                                         ifelse(grepl("BD405*", a), "HU1020",
                                                ifelse(grepl("HU1016*", a), "HU1016",
                                                       "HU1007"))), time =
                            ifelse(grepl("*D8", a), "d8", "d28"), replicate =
                            ifelse(grepl("*sample_1|*D8_ah|*D8_aa|*D8_am", a), "a",
                                   ifelse(grepl("*sample_2|D28_bh|D28_ba|D28_bm", a),
                                          "b", ifelse(grepl("*sample_3", a), "c", ""))))
sampleTable$sampleName <- with(sampleTable, paste(donor, treatment, time, replicate))
dds <- DESeqDataSetFromHTSeqCount(sampleTable = sampleTable, directory = sampledirectory,
                                  design = ~ donor + treatment)
dds@colData
rld <- rlogTransformation(dds, blind = TRUE)
distsRL <- dist(t(assay(rld)))
mat <- as.matrix(distsRL)
rownames(mat) <- colnames(mat) <- colnames(rld)
png(file = file.path(sampledirectory, paste(Sys.Date(), "heatmap.png")), units = 'in',
```

```
    height = 15, width = 15, res = 300)
distance_heatmap <- heatmap.2(mat, trace="none", keysize = 0.7, col = viridis(100),
                              dendrogram = "both", density.info = "none", margin = c(18,
                               18), Rowv = TRUE, Colv = TRUE, cexRow = 1.5, cexCol = 1.5)
print(distance_heatmap)
dev.off()
PCA <- plotPCA(rld, intgroup = c("donor", "treatment", "time")) + aes(colour = donor,
    shape = factor(treatment)) +
    geom_point(aes(size = 5)) +
    scale_color_brewer(palette = "Dark2") +
    geom_text_repel(aes(label = paste(donor, treatment, time))) +
    theme_bw() +
    theme(legend.position = "none",
          axis.title.x = element_text(face = "bold", size = 22),
          axis.text = element_text(size = 20),
          panel.grid.major = element_line(size = 0.65,
                                          color = "gray69"),
          panel.grid.minor = element_line(size = 0.3, color = "gray69"),
          axis.line = element_line(size = 2),
          axis.title.y = element_text(face = "bold", size = 18))
PCA
ggsave(file = file.path(sampledirectory, paste(Sys.Date(), "PCAplot.png")), plot = PCA,
       units = 'in', height = 10, width = 10, dpi = 300, device = "png")

}

all_graphed <- graph_generation("All human HBV genes")
```

```
## $rowInd
##  [1] 15 21 17 22 16 23 29  3  2  1 13  8  6  7 18 20 19 25 24 26  4  5 27
## [24] 30 28 14 11  9 10 12
##
## $colInd
##  [1] 15 21 17 22 16 23 29  3  2  1 13  8  6  7 18 20 19 25 24 26  4  5 27
## [24] 30 28 14 11  9 10 12
##
## $call
## heatmap.2(x = mat, Rowv = TRUE, Colv = TRUE, dendrogram = "both",
##     col = viridis(100), trace = "none", margins = c(18, 18),
##     cexRow = 1.5, cexCol = 1.5, keysize = 0.7, density.info = "none")
##
## $carpet
##                     HU1007 mock d28 a HU1007 HBV d28 a HU1007 mock d28 c
## HU1007 mock d28 a            0.00000         65.85008          50.55462
## HU1007 HBV d28 a            65.85008          0.00000          49.34143
## HU1007 mock d28 c           50.55462         49.34143           0.00000
## HU1007 HBV d28 b            53.88308         53.02205          47.34246
## HU1007 mock d28 b           40.72539         49.63019          33.91406
## HU1007 HBV d28 c            48.66628         56.10177          43.52713
## HU1016 HBV d28              91.45815         80.61330          71.39202
## HU1019 HBV d28              85.32877         87.27843          64.77668
## HU1019 mock d8              81.87945         77.69119          59.94095
## HU1019 mock d28             91.80671         86.64647          70.54932
## HU1020 coinf d28            91.02867         85.78614          71.57089
```

```
## HU1019 coinf d8             88.31422         85.44002          65.02507
## HU1019 coinf d28            85.61477         82.42092          65.76686
## HU1019 coinf d8 a           91.03351         85.24631          67.75662
## HU1007 mock d8 a            82.57714         63.09279          56.30874
## HU1007 mock d8 c            78.43822         57.03184          56.39378
## HU1007 mock d8 b            85.16189         58.05014          63.07827
## HU1007 HBV d8 b             89.18477         68.23443          70.56884
## HU1007 HBV d8 a             89.44084         66.03213          68.04626
## HU1007 HBV d8 c             89.70197         66.91500          69.49029
## HU1019 HBV d8               89.63997         75.41464          65.79892
## HU1019 coinf d28 b          89.57509         77.65772          70.04912
## HU1016 coinf d28            82.77734         64.69253          61.20249
## HU1016 HBV d8               88.46150         72.45124          66.64062
## HU1016 coinf d8             92.06032         74.44702          69.96613
## HU1020 coinf d8             96.44105         77.82425          73.99231
## HU1020 HBV d28              92.67055         73.88652          72.13845
## HU1020 mock d28             90.07510         70.42435          70.05777
## HU1020 mock d8              89.42591         68.13778          69.64965
## HU1020 HBV d8               93.54675         73.49934          73.57256
##                    HU1007 HBV d28 b HU1007 mock d28 b HU1007 HBV d28 c
## HU1007 mock d28 a          53.88308          40.72539          48.66628
## HU1007 HBV d28 a           53.02205          49.63019          56.10177
## HU1007 mock d28 c          47.34246          33.91406          43.52713
## HU1007 HBV d28 b            0.00000          43.84417          48.55086
## HU1007 mock d28 b          43.84417           0.00000          38.94855
## HU1007 HBV d28 c           48.55086          38.94855           0.00000
## HU1016 HBV d28             81.81466          77.53797          76.43920
## HU1019 HBV d28             80.14250          76.99108          78.86672
## HU1019 mock d8             72.89261          70.27370          72.97539
## HU1019 mock d28            82.39091          80.64540          82.63871
## HU1020 coinf d28           80.93056          81.11394          82.19320
## HU1019 coinf d8            80.24057          77.60773          77.98406
## HU1019 coinf d28           77.69495          76.11544          76.05741
## HU1019 coinf d8 a          81.67026          79.94626          79.32149
## HU1007 mock d8 a           65.16927          65.95038          67.95626
## HU1007 mock d8 c           60.71902          63.33076          64.30778
## HU1007 mock d8 b           66.85707          69.94120          72.00968
## HU1007 HBV d8 b            72.43850          75.78339          74.94552
## HU1007 HBV d8 a            72.01945          74.57355          73.34640
## HU1007 HBV d8 c            72.30177          75.53939          74.79482
## HU1019 HBV d8              77.06201          75.26610          74.74754
## HU1019 coinf d28 b         79.39021          77.79714          76.44474
## HU1016 coinf d28           72.80784          67.79944          67.64068
## HU1016 HBV d8              77.50956          74.06397          72.61057
## HU1016 coinf d8            80.01108          77.78245          75.85872
## HU1020 coinf d8            82.79131          82.70665          80.91284
## HU1020 HBV d28             79.92493          79.00723          77.89064
## HU1020 mock d28            76.73550          76.97615          77.04532
## HU1020 mock d8             75.97662          76.27239          76.74207
## HU1020 HBV d8              79.53624          80.62176          79.59396
##                    HU1016 HBV d28  HU1019 HBV d28  HU1019 mock d8
## HU1007 mock d28 a         91.45815        85.32877        81.87945
## HU1007 HBV d28 a          80.61330        87.27843        77.69119
## HU1007 mock d28 c         71.39202        64.77668        59.94095
```

```
## HU1007 HBV d28 b          81.81466        80.14250        72.89261
## HU1007 mock d28 b         77.53797        76.99108        70.27370
## HU1007 HBV d28 c          76.43920        78.86672        72.97539
## HU1016 HBV d28             0.00000        77.91580        69.59318
## HU1019 HBV d28            77.91580         0.00000        51.53384
## HU1019 mock d8            69.59318        51.53384         0.00000
## HU1019 mock d28           68.96958        55.47370        43.93239
## HU1020 coinf d28          69.13642        56.46865        50.23144
## HU1019 coinf d8           72.70181        48.15985        43.73907
## HU1019 coinf d28          74.21941        59.20774        50.33002
## HU1019 coinf d8 a         74.36897        57.19517        53.11754
## HU1007 mock d8 a          74.27485        72.56752        59.32782
## HU1007 mock d8 c          76.56492        77.71289        64.27776
## HU1007 mock d8 b          78.87634        83.62221        68.66479
## HU1007 HBV d8 b           77.92711        86.44439        69.49708
## HU1007 HBV d8 a           74.46871        85.55620        68.38541
## HU1007 HBV d8 c           76.07227        86.05291        69.43499
## HU1019 HBV d8             61.01364        66.11498        50.39641
## HU1019 coinf d28 b        65.11284        73.38246        57.08389
## HU1016 coinf d28          52.68355        78.58542        66.75134
## HU1016 HBV d8             58.54231        79.14211        63.15599
## HU1016 coinf d8           59.46299        80.96195        65.55048
## HU1020 coinf d8           66.60468        82.39751        66.77260
## HU1020 HBV d28            62.54969        80.87246        64.86344
## HU1020 mock d28           67.25066        80.27164        63.59991
## HU1020 mock d8            69.36806        83.02527        66.31989
## HU1020 HBV d8             68.12589        81.80710        66.20865
##                    HU1019 mock d28  HU1020 coinf d28  HU1019 coinf d8
## HU1007 mock d28 a          91.80671          91.02867         88.31422
## HU1007 HBV d28 a           86.64647          85.78614         85.44002
## HU1007 mock d28 c          70.54932          71.57089         65.02507
## HU1007 HBV d28 b           82.39091          80.93056         80.24057
## HU1007 mock d28 b          80.64540          81.11394         77.60773
## HU1007 HBV d28 c           82.63871          82.19320         77.98406
## HU1016 HBV d28             68.96958          69.13642         72.70181
## HU1019 HBV d28             55.47370          56.46865         48.15985
## HU1019 mock d8             43.93239          50.23144         43.73907
## HU1019 mock d28             0.00000          49.31575         52.21982
## HU1020 coinf d28           49.31575           0.00000         54.81105
## HU1019 coinf d8            52.21982          54.81105          0.00000
## HU1019 coinf d28           58.04354          59.08458         45.28618
## HU1019 coinf d8 a          61.78746          63.60469         42.21965
## HU1007 mock d8 a           67.51375          69.46925         65.20850
## HU1007 mock d8 c           73.43107          74.08412         71.21449
## HU1007 mock d8 b           76.29583          77.19521         76.67459
## HU1007 HBV d8 b            76.23719          76.19537         75.92869
## HU1007 HBV d8 a            74.80160          75.40991         73.40073
## HU1007 HBV d8 c            75.69046          75.83887         75.44945
## HU1019 HBV d8              54.32180          59.91159         55.47516
## HU1019 coinf d28 b         57.98150          63.48526         62.43355
## HU1016 coinf d28           69.54635          70.35859         69.98698
## HU1016 HBV d8              66.83534          68.71056         66.03265
## HU1016 coinf d8            69.25319          70.08542         67.27735
## HU1020 coinf d8            71.21834          70.08562         67.42569
```

```
## HU1020 HBV d28             66.23155          64.46097         70.41675
## HU1020 mock d28            66.82319          64.14073         71.09224
## HU1020 mock d8             71.81123          69.57675         73.23320
## HU1020 HBV d8              70.09367          66.83200         71.71209
##                     HU1019 coinf d28  HU1019 coinf d8 a HU1007 mock d8 a
## HU1007 mock d28 a           85.61477          91.03351         82.57714
## HU1007 HBV d28 a            82.42092          85.24631         63.09279
## HU1007 mock d28 c           65.76686          67.75662         56.30874
## HU1007 HBV d28 b            77.69495          81.67026         65.16927
## HU1007 mock d28 b           76.11544          79.94626         65.95038
## HU1007 HBV d28 c            76.05741          79.32149         67.95626
## HU1016 HBV d28              74.21941          74.36897         74.27485
## HU1019 HBV d28              59.20774          57.19517         72.56752
## HU1019 mock d8              50.33002          53.11754         59.32782
## HU1019 mock d28             58.04354          61.78746         67.51375
## HU1020 coinf d28            59.08458          63.60469         69.46925
## HU1019 coinf d8             45.28618          42.21965         65.20850
## HU1019 coinf d28             0.00000          43.78461         69.10402
## HU1019 coinf d8 a           43.78461           0.00000         66.82448
## HU1007 mock d8 a            69.10402          66.82448          0.00000
## HU1007 mock d8 c            71.00902          69.90792         44.30910
## HU1007 mock d8 b            76.53335          76.02436         46.05773
## HU1007 HBV d8 b             75.52469          75.54495         53.73082
## HU1007 HBV d8 a             72.34181          71.48412         51.36702
## HU1007 HBV d8 c             74.92196          74.44051         52.45918
## HU1019 HBV d8               61.01619          60.39767         56.28398
## HU1019 coinf d28 b          62.00286          63.20684         65.38377
## HU1016 coinf d28            69.41386          70.79753         63.97509
## HU1016 HBV d8               67.89269          68.82748         60.76660
## HU1016 coinf d8             68.59255          68.23509         62.09894
## HU1020 coinf d8             66.83743          63.41874         62.60988
## HU1020 HBV d28              69.16806          70.51719         64.69299
## HU1020 mock d28             67.45667          68.82011         62.09118
## HU1020 mock d8              71.07025          71.57321         60.26348
## HU1020 HBV d8               71.39372          71.53687         61.40933
##                     HU1007 mock d8 c HU1007 mock d8 b HU1007 HBV d8 b
## HU1007 mock d28 a          78.43822         85.16189        89.18477
## HU1007 HBV d28 a           57.03184         58.05014        68.23443
## HU1007 mock d28 c          56.39378         63.07827        70.56884
## HU1007 HBV d28 b           60.71902         66.85707        72.43850
## HU1007 mock d28 b          63.33076         69.94120        75.78339
## HU1007 HBV d28 c           64.30778         72.00968        74.94552
## HU1016 HBV d28             76.56492         78.87634        77.92711
## HU1019 HBV d28             77.71289         83.62221        86.44439
## HU1019 mock d8             64.27776         68.66479        69.49708
## HU1019 mock d28            73.43107         76.29583        76.23719
## HU1020 coinf d28           74.08412         77.19521        76.19537
## HU1019 coinf d8            71.21449         76.67459        75.92869
## HU1019 coinf d28           71.00902         76.53335        75.52469
## HU1019 coinf d8 a          69.90792         76.02436        75.54495
## HU1007 mock d8 a           44.30910         46.05773        53.73082
## HU1007 mock d8 c            0.00000         40.57709        51.61422
## HU1007 mock d8 b           40.57709          0.00000        49.22697
## HU1007 HBV d8 b            51.61422         49.22697         0.00000
```

```
## HU1007 HBV d8 a            48.85959         46.42676        46.22855
## HU1007 HBV d8 c            49.34929         46.55985        46.26750
## HU1019 HBV d8              60.68288         60.49562        58.97036
## HU1019 coinf d28 b         67.00652         67.67775        63.52070
## HU1016 coinf d28           63.67947         63.39310        63.04373
## HU1016 HBV d8              63.55667         62.49637        57.85296
## HU1016 coinf d8            63.13397         61.99848        57.68494
## HU1020 coinf d8            63.00616         61.67997        59.20809
## HU1020 HBV d28             65.61343         64.26422        60.81873
## HU1020 mock d28            59.01215         58.37052        59.73828
## HU1020 mock d8             56.10375         52.93584        55.56224
## HU1020 HBV d8              59.41478         56.26154        55.52097
##                     HU1007 HBV d8 a HU1007 HBV d8 c HU1019 HBV d8
## HU1007 mock d28 a         89.44084        89.70197       89.63997
## HU1007 HBV d28 a          66.03213        66.91500       75.41464
## HU1007 mock d28 c         68.04626        69.49029       65.79892
## HU1007 HBV d28 b          72.01945        72.30177       77.06201
## HU1007 mock d28 b         74.57355        75.53939       75.26610
## HU1007 HBV d28 c          73.34640        74.79482       74.74754
## HU1016 HBV d28            74.46871        76.07227       61.01364
## HU1019 HBV d28            85.55620        86.05291       66.11498
## HU1019 mock d8            68.38541        69.43499       50.39641
## HU1019 mock d28           74.80160        75.69046       54.32180
## HU1020 coinf d28          75.40991        75.83887       59.91159
## HU1019 coinf d8           73.40073        75.44945       55.47516
## HU1019 coinf d28          72.34181        74.92196       61.01619
## HU1019 coinf d8 a         71.48412        74.44051       60.39767
## HU1007 mock d8 a          51.36702        52.45918       56.28398
## HU1007 mock d8 c          48.85959        49.34929       60.68288
## HU1007 mock d8 b          46.42676        46.55985       60.49562
## HU1007 HBV d8 b           46.22855        46.26750       58.97036
## HU1007 HBV d8 a            0.00000        42.74417       56.69059
## HU1007 HBV d8 c           42.74417         0.00000       58.03005
## HU1019 HBV d8             56.69059        58.03005        0.00000
## HU1019 coinf d28 b        60.28535        62.46573       45.42879
## HU1016 coinf d28          59.08992        61.09210       51.58774
## HU1016 HBV d8             53.89853        56.45131       43.75930
## HU1016 coinf d8           53.64905        55.98573       46.21897
## HU1020 coinf d8           53.47183        56.46455       50.64090
## HU1020 HBV d28            56.64796        59.05903       49.69734
## HU1020 mock d28           55.67612        57.60803       53.80636
## HU1020 mock d8            52.89434        53.95056       52.78107
## HU1020 HBV d8             53.23355        54.35667       48.24859
##                     HU1019 coinf d28 b HU1016 coinf d28  HU1016 HBV d8
## HU1007 mock d28 a            89.57509          82.77734       88.46150
## HU1007 HBV d28 a             77.65772          64.69253       72.45124
## HU1007 mock d28 c            70.04912          61.20249       66.64062
## HU1007 HBV d28 b             79.39021          72.80784       77.50956
## HU1007 mock d28 b            77.79714          67.79944       74.06397
## HU1007 HBV d28 c             76.44474          67.64068       72.61057
## HU1016 HBV d28               65.11284          52.68355       58.54231
## HU1019 HBV d28               73.38246          78.58542       79.14211
## HU1019 mock d8               57.08389          66.75134       63.15599
## HU1019 mock d28              57.98150          69.54635       66.83534
```

```
## HU1020 coinf d28            63.48526          70.35859       68.71056
## HU1019 coinf d8             62.43355          69.98698       66.03265
## HU1019 coinf d28            62.00286          69.41386       67.89269
## HU1019 coinf d8 a           63.20684          70.79753       68.82748
## HU1007 mock d8 a            65.38377          63.97509       60.76660
## HU1007 mock d8 c            67.00652          63.67947       63.55667
## HU1007 mock d8 b            67.67775          63.39310       62.49637
## HU1007 HBV d8 b             63.52070          63.04373       57.85296
## HU1007 HBV d8 a             60.28535          59.08992       53.89853
## HU1007 HBV d8 c             62.46573          61.09210       56.45131
## HU1019 HBV d8               45.42879          51.58774       43.75930
## HU1019 coinf d28 b           0.00000          53.78038       49.22749
## HU1016 coinf d28            53.78038           0.00000       40.50418
## HU1016 HBV d8               49.22749          40.50418        0.00000
## HU1016 coinf d8             51.07858          42.26606       35.49706
## HU1020 coinf d8             52.85727          53.40916       47.46535
## HU1020 HBV d28              47.03889          48.87308       46.23523
## HU1020 mock d28             49.28992          53.89343       53.73798
## HU1020 mock d8              53.90468          52.11972       51.10487
## HU1020 HBV d8               50.93320          52.77252       47.73580
##                    HU1016 coinf d8  HU1020 coinf d8  HU1020 HBV d28
## HU1007 mock d28 a         92.06032         96.44105        92.67055
## HU1007 HBV d28 a          74.44702         77.82425        73.88652
## HU1007 mock d28 c         69.96613         73.99231        72.13845
## HU1007 HBV d28 b          80.01108         82.79131        79.92493
## HU1007 mock d28 b         77.78245         82.70665        79.00723
## HU1007 HBV d28 c          75.85872         80.91284        77.89064
## HU1016 HBV d28            59.46299         66.60468        62.54969
## HU1019 HBV d28            80.96195         82.39751        80.87246
## HU1019 mock d8            65.55048         66.77260        64.86344
## HU1019 mock d28           69.25319         71.21834        66.23155
## HU1020 coinf d28          70.08542         70.08562        64.46097
## HU1019 coinf d8           67.27735         67.42569        70.41675
## HU1019 coinf d28          68.59255         66.83743        69.16806
## HU1019 coinf d8 a         68.23509         63.41874        70.51719
## HU1007 mock d8 a          62.09894         62.60988        64.69299
## HU1007 mock d8 c          63.13397         63.00616        65.61343
## HU1007 mock d8 b          61.99848         61.67997        64.26422
## HU1007 HBV d8 b           57.68494         59.20809        60.81873
## HU1007 HBV d8 a           53.64905         53.47183        56.64796
## HU1007 HBV d8 c           55.98573         56.46455        59.05903
## HU1019 HBV d8             46.21897         50.64090        49.69734
## HU1019 coinf d28 b        51.07858         52.85727        47.03889
## HU1016 coinf d28          42.26606         53.40916        48.87308
## HU1016 HBV d8             35.49706         47.46535        46.23523
## HU1016 coinf d8            0.00000         45.73937        47.80545
## HU1020 coinf d8           45.73937          0.00000        48.70426
## HU1020 HBV d28            47.80545         48.70426         0.00000
## HU1020 mock d28           53.67198         50.27382        42.17528
## HU1020 mock d8            50.22780         48.12892        46.58475
## HU1020 HBV d8             47.48032         46.09558        43.60247
##                    HU1020 mock d28  HU1020 mock d8  HU1020 HBV d8
## HU1007 mock d28 a         90.07510        89.42591       93.54675
## HU1007 HBV d28 a          70.42435        68.13778       73.49934
```

```
## HU1007 mock d28 c          70.05777       69.64965       73.57256
## HU1007 HBV d28 b           76.73550       75.97662       79.53624
## HU1007 mock d28 b          76.97615       76.27239       80.62176
## HU1007 HBV d28 c           77.04532       76.74207       79.59396
## HU1016 HBV d28             67.25066       69.36806       68.12589
## HU1019 HBV d28             80.27164       83.02527       81.80710
## HU1019 mock d8             63.59991       66.31989       66.20865
## HU1019 mock d28            66.82319       71.81123       70.09367
## HU1020 coinf d28           64.14073       69.57675       66.83200
## HU1019 coinf d8            71.09224       73.23320       71.71209
## HU1019 coinf d28           67.45667       71.07025       71.39372
## HU1019 coinf d8 a          68.82011       71.57321       71.53687
## HU1007 mock d8 a           62.09118       60.26348       61.40933
## HU1007 mock d8 c           59.01215       56.10375       59.41478
## HU1007 mock d8 b           58.37052       52.93584       56.26154
## HU1007 HBV d8 b            59.73828       55.56224       55.52097
## HU1007 HBV d8 a            55.67612       52.89434       53.23355
## HU1007 HBV d8 c            57.60803       53.95056       54.35667
## HU1019 HBV d8              53.80636       52.78107       48.24859
## HU1019 coinf d28 b         49.28992       53.90468       50.93320
## HU1016 coinf d28           53.89343       52.11972       52.77252
## HU1016 HBV d8              53.73798       51.10487       47.73580
## HU1016 coinf d8            53.67198       50.22780       47.48032
## HU1020 coinf d8            50.27382       48.12892       46.09558
## HU1020 HBV d28             42.17528       46.58475       43.60247
## HU1020 mock d28             0.00000       39.59677       40.92511
## HU1020 mock d8             39.59677        0.00000       37.49210
## HU1020 HBV d8              40.92511       37.49210        0.00000
##
## $rowDendrogram
## 'dendrogram' with 2 branches and 30 members total, at height 217.1647
##
## $colDendrogram
## 'dendrogram' with 2 branches and 30 members total, at height 217.1647
##
## $breaks
##   [1]  0.0000000  0.9644105  1.9288209  2.8932314  3.8576418  4.8220523
##   [7]  5.7864627  6.7508732  7.7152836  8.6796941  9.6441045 10.6085150
##  [13] 11.5729255 12.5373359 13.5017464 14.4661568 15.4305673 16.3949777
##  [19] 17.3593882 18.3237986 19.2882091 20.2526195 21.2170300 22.1814405
##  [25] 23.1458509 24.1102614 25.0746718 26.0390823 27.0034927 27.9679032
##  [31] 28.9323136 29.8967241 30.8611345 31.8255450 32.7899555 33.7543659
##  [37] 34.7187764 35.6831868 36.6475973 37.6120077 38.5764182 39.5408286
##  [43] 40.5052391 41.4696495 42.4340600 43.3984705 44.3628809 45.3272914
##  [49] 46.2917018 47.2561123 48.2205227 49.1849332 50.1493436 51.1137541
##  [55] 52.0781645 53.0425750 54.0069854 54.9713959 55.9358064 56.9002168
##  [61] 57.8646273 58.8290377 59.7934482 60.7578586 61.7222691 62.6866795
##  [67] 63.6510900 64.6155004 65.5799109 66.5443214 67.5087318 68.4731423
##  [73] 69.4375527 70.4019632 71.3663736 72.3307841 73.2951945 74.2596050
##  [79] 75.2240154 76.1884259 77.1528364 78.1172468 79.0816573 80.0460677
##  [85] 81.0104782 81.9748886 82.9392991 83.9037095 84.8681200 85.8325304
##  [91] 86.7969409 87.7613514 88.7257618 89.6901723 90.6545827 91.6189932
##  [97] 92.5834036 93.5478141 94.5122245 95.4766350 96.4410454
##
```

```
## $col
##   [1] "#440154FF" "#450558FF" "#46085CFF" "#470D60FF" "#471063FF"
##   [6] "#481467FF" "#481769FF" "#481B6DFF" "#481E70FF" "#482173FF"
##  [11] "#482576FF" "#482878FF" "#472C7AFF" "#472F7CFF" "#46327EFF"
##  [16] "#453581FF" "#453882FF" "#443B84FF" "#433E85FF" "#424186FF"
##  [21] "#404587FF" "#3F4788FF" "#3E4A89FF" "#3D4D8AFF" "#3C508BFF"
##  [26] "#3B528BFF" "#39558CFF" "#38598CFF" "#375B8DFF" "#355E8DFF"
##  [31] "#34608DFF" "#33638DFF" "#32658EFF" "#31688EFF" "#2F6B8EFF"
##  [36] "#2E6D8EFF" "#2D708EFF" "#2C718EFF" "#2B748EFF" "#2A768EFF"
##  [41] "#29798EFF" "#287C8EFF" "#277E8EFF" "#26818EFF" "#26828EFF"
##  [46] "#25858EFF" "#24878EFF" "#238A8DFF" "#228D8DFF" "#218F8DFF"
##  [51] "#20928CFF" "#20938CFF" "#1F968BFF" "#1F998AFF" "#1E9B8AFF"
##  [56] "#1F9E89FF" "#1FA088FF" "#1FA287FF" "#20A486FF" "#22A785FF"
##  [61] "#24AA83FF" "#25AC82FF" "#28AE80FF" "#2BB07FFF" "#2EB37CFF"
##  [66] "#31B67BFF" "#35B779FF" "#39BA76FF" "#3DBC74FF" "#41BE71FF"
##  [71] "#47C06FFF" "#4CC26CFF" "#51C56AFF" "#56C667FF" "#5BC863FF"
##  [76] "#61CA60FF" "#67CC5CFF" "#6DCD59FF" "#73D056FF" "#78D152FF"
##  [81] "#7FD34EFF" "#85D54AFF" "#8CD646FF" "#92D741FF" "#99D83DFF"
##  [86] "#A0DA39FF" "#A7DB35FF" "#ADDC30FF" "#B4DE2CFF" "#BBDE28FF"
##  [91] "#C2DF23FF" "#C9E020FF" "#D0E11CFF" "#D7E219FF" "#DDE318FF"
##  [96] "#E4E419FF" "#EBE51AFF" "#F1E51DFF" "#F7E620FF" "#FDE725FF"
##
## $colorTable
##            low       high     color
## 1    0.0000000  0.9644105 #440154FF
## 2    0.9644105  1.9288209 #450558FF
## 3    1.9288209  2.8932314 #46085CFF
## 4    2.8932314  3.8576418 #470D60FF
## 5    3.8576418  4.8220523 #471063FF
## 6    4.8220523  5.7864627 #481467FF
## 7    5.7864627  6.7508732 #481769FF
## 8    6.7508732  7.7152836 #481B6DFF
## 9    7.7152836  8.6796941 #481E70FF
## 10   8.6796941  9.6441045 #482173FF
## 11   9.6441045 10.6085150 #482576FF
## 12  10.6085150 11.5729255 #482878FF
## 13  11.5729255 12.5373359 #472C7AFF
## 14  12.5373359 13.5017464 #472F7CFF
## 15  13.5017464 14.4661568 #46327EFF
## 16  14.4661568 15.4305673 #453581FF
## 17  15.4305673 16.3949777 #453882FF
## 18  16.3949777 17.3593882 #443B84FF
## 19  17.3593882 18.3237986 #433E85FF
## 20  18.3237986 19.2882091 #424186FF
## 21  19.2882091 20.2526195 #404587FF
## 22  20.2526195 21.2170300 #3F4788FF
## 23  21.2170300 22.1814405 #3E4A89FF
## 24  22.1814405 23.1458509 #3D4D8AFF
## 25  23.1458509 24.1102614 #3C508BFF
## 26  24.1102614 25.0746718 #3B528BFF
## 27  25.0746718 26.0390823 #39558CFF
## 28  26.0390823 27.0034927 #38598CFF
## 29  27.0034927 27.9679032 #375B8DFF
## 30  27.9679032 28.9323136 #355E8DFF
```

```
## 31  28.9323136 29.8967241 #34608DFF
## 32  29.8967241 30.8611345 #33638DFF
## 33  30.8611345 31.8255450 #32658EFF
## 34  31.8255450 32.7899555 #31688EFF
## 35  32.7899555 33.7543659 #2F6B8EFF
## 36  33.7543659 34.7187764 #2E6D8EFF
## 37  34.7187764 35.6831868 #2D708EFF
## 38  35.6831868 36.6475973 #2C718EFF
## 39  36.6475973 37.6120077 #2B748EFF
## 40  37.6120077 38.5764182 #2A768EFF
## 41  38.5764182 39.5408286 #29798EFF
## 42  39.5408286 40.5052391 #287C8EFF
## 43  40.5052391 41.4696495 #277E8EFF
## 44  41.4696495 42.4340600 #26818EFF
## 45  42.4340600 43.3984705 #26828EFF
## 46  43.3984705 44.3628809 #25858EFF
## 47  44.3628809 45.3272914 #24878EFF
## 48  45.3272914 46.2917018 #238A8DFF
## 49  46.2917018 47.2561123 #228D8DFF
## 50  47.2561123 48.2205227 #218F8DFF
## 51  48.2205227 49.1849332 #20928CFF
## 52  49.1849332 50.1493436 #20938CFF
## 53  50.1493436 51.1137541 #1F968BFF
## 54  51.1137541 52.0781645 #1F998AFF
## 55  52.0781645 53.0425750 #1E9B8AFF
## 56  53.0425750 54.0069854 #1F9E89FF
## 57  54.0069854 54.9713959 #1FA088FF
## 58  54.9713959 55.9358064 #1FA287FF
## 59  55.9358064 56.9002168 #20A486FF
## 60  56.9002168 57.8646273 #22A785FF
## 61  57.8646273 58.8290377 #24AA83FF
## 62  58.8290377 59.7934482 #25AC82FF
## 63  59.7934482 60.7578586 #28AE80FF
## 64  60.7578586 61.7222691 #2BB07FFF
## 65  61.7222691 62.6866795 #2EB37CFF
## 66  62.6866795 63.6510900 #31B67BFF
## 67  63.6510900 64.6155004 #35B779FF
## 68  64.6155004 65.5799109 #39BA76FF
## 69  65.5799109 66.5443214 #3DBC74FF
## 70  66.5443214 67.5087318 #41BE71FF
## 71  67.5087318 68.4731423 #47C06FFF
## 72  68.4731423 69.4375527 #4CC26CFF
## 73  69.4375527 70.4019632 #51C56AFF
## 74  70.4019632 71.3663736 #56C667FF
## 75  71.3663736 72.3307841 #5BC863FF
## 76  72.3307841 73.2951945 #61CA60FF
## 77  73.2951945 74.2596050 #67CC5CFF
## 78  74.2596050 75.2240154 #6DCD59FF
## 79  75.2240154 76.1884259 #73D056FF
## 80  76.1884259 77.1528364 #78D152FF
## 81  77.1528364 78.1172468 #7FD34EFF
## 82  78.1172468 79.0816573 #85D54AFF
## 83  79.0816573 80.0460677 #8CD646FF
## 84  80.0460677 81.0104782 #92D741FF
```

```
## 85  81.0104782 81.9748886 #99D83DFF
## 86  81.9748886 82.9392991 #A0DA39FF
## 87  82.9392991 83.9037095 #A7DB35FF
## 88  83.9037095 84.8681200 #ADDC30FF
## 89  84.8681200 85.8325304 #B4DE2CFF
## 90  85.8325304 86.7969409 #BBDE28FF
## 91  86.7969409 87.7613514 #C2DF23FF
## 92  87.7613514 88.7257618 #C9E020FF
## 93  88.7257618 89.6901723 #D0E11CFF
## 94  89.6901723 90.6545827 #D7E219FF
## 95  90.6545827 91.6189932 #DDE318FF
## 96  91.6189932 92.5834036 #E4E419FF
## 97  92.5834036 93.5478141 #EBE51AFF
## 98  93.5478141 94.5122245 #F1E51DFF
## 99  94.5122245 95.4766350 #F7E620FF
## 100 95.4766350 96.4410454 #FDE725FF
##
## $layout
## $layout$lmat
##      [,1] [,2]
## [1,]    4    3
## [2,]    2    1
##
## $layout$lhei
## [1] 0.7 4.0
##
## $layout$lwid
## [1] 0.7 4.0
```

```
mouse_graphed <- graph_generation("All mouse genes")
```

```
## $rowInd
##  [1] 19 20 18 25 24 26 21 22 15 23 17 16 29  9 11  5 13  1  7  6  3 12 10
## [24]  2 27 14  8 30  4 28
##
## $colInd
##  [1] 19 20 18 25 24 26 21 22 15 23 17 16 29  9 11  5 13  1  7  6  3 12 10
## [24]  2 27 14  8 30  4 28
##
## $call
## heatmap.2(x = mat, Rowv = TRUE, Colv = TRUE, dendrogram = "both",
##     col = viridis(100), trace = "none", margins = c(18, 18),
##     cexRow = 1.5, cexCol = 1.5, keysize = 0.7, density.info = "none")
##
## $carpet
##                     HU1007 mock d8 b HU1007 mock d8 c HU1007 mock d8 a
## HU1007 mock d8 b            0.00000         30.11152         32.17829
## HU1007 mock d8 c           30.11152          0.00000         30.82403
## HU1007 mock d8 a           32.17829         30.82403          0.00000
## HU1007 HBV d8 b            31.13870         30.48956         30.33157
## HU1007 HBV d8 a            31.37793         30.71155         29.87880
## HU1007 HBV d8 c            30.32764         30.75547         30.53466
## HU1007 HBV d28 a           37.72633         34.95516         34.57042
## HU1007 HBV d28 b           41.65601         38.80152         37.74518
## HU1007 mock d28 a          47.69786         44.68164         43.29562
```

```
## HU1007 HBV d28 c           46.06081         41.72611         39.08754
## HU1007 mock d28 c          42.86610         39.03789         36.87416
## HU1007 mock d28 b          44.98762         41.90051         39.57583
## HU1016 HBV d28             65.18431         68.40014         65.96977
## HU1020 mock d28            58.32558         63.13805         63.71215
## HU1020 HBV d28             58.93569         62.73424         61.54709
## HU1019 coinf d28 b         61.47110         64.76831         63.67274
## HU1020 coinf d28           60.40336         64.65094         64.23186
## HU1019 mock d28            61.74114         65.72782         64.04572
## HU1019 coinf d8 a          57.75049         57.24795         57.06022
## HU1019 coinf d28           61.31964         63.22403         63.20235
## HU1019 HBV d28             51.53805         52.87025         51.14013
## HU1020 HBV d8              49.44706         55.12905         55.41224
## HU1020 mock d8             53.09543         57.98078         59.04790
## HU1019 mock d8             56.15981         60.10860         58.90619
## HU1016 coinf d28           55.29473         58.93438         56.57628
## HU1020 coinf d8            53.98785         57.07146         55.84487
## HU1019 coinf d8            55.78673         58.05655         56.42779
## HU1016 HBV d8              55.25466         58.41438         55.33216
## HU1019 HBV d8              55.83798         59.82479         58.00306
## HU1016 coinf d8            56.65398         59.66175         58.01998
##                     HU1007 HBV d8 b HU1007 HBV d8 a HU1007 HBV d8 c
## HU1007 mock d8 b           31.13870        31.37793        30.32764
## HU1007 mock d8 c           30.48956        30.71155        30.75547
## HU1007 mock d8 a           30.33157        29.87880        30.53466
## HU1007 HBV d8 b             0.00000        26.96565        27.44448
## HU1007 HBV d8 a            26.96565         0.00000        26.23218
## HU1007 HBV d8 c            27.44448        26.23218         0.00000
## HU1007 HBV d28 a           33.54491        32.89854        34.22920
## HU1007 HBV d28 b           37.71786        37.06084        37.99799
## HU1007 mock d28 a          44.34814        42.47985        44.94789
## HU1007 HBV d28 c           40.02933        38.66528        41.30919
## HU1007 mock d28 c          39.08623        36.65053        39.33324
## HU1007 mock d28 b          41.09696        39.30033        41.75265
## HU1016 HBV d28             66.84771        64.94120        66.11565
## HU1020 mock d28            61.92053        61.11584        61.29507
## HU1020 HBV d28             60.52587        59.31556        60.37006
## HU1019 coinf d28 b         63.03480        61.49536        62.59551
## HU1020 coinf d28           62.94169        61.73225        62.36994
## HU1019 mock d28            63.28419        62.52869        63.21381
## HU1019 coinf d8 a          58.44436        55.31405        57.55922
## HU1019 coinf d28           63.69185        61.74268        63.73161
## HU1019 HBV d28             51.41297        50.31700        51.33148
## HU1020 HBV d8              53.65207        53.01162        53.33494
## HU1020 mock d8             57.47463        56.62088        56.97982
## HU1019 mock d8             58.85359        57.29773        58.62897
## HU1016 coinf d28           57.29896        55.93739        56.73529
## HU1020 coinf d8            56.33407        54.09113        55.56250
## HU1019 coinf d8            57.02789        55.28910        57.03858
## HU1016 HBV d8              56.19297        54.07141        55.84362
## HU1019 HBV d8              58.83072        57.29611        58.64597
## HU1016 coinf d8            58.64076        56.90294        58.55174
##                     HU1007 HBV d28 a HU1007 HBV d28 b HU1007 mock d28 a
## HU1007 mock d8 b           37.72633         41.65601          47.69786
```

```
## HU1007 mock d8 c           34.95516         38.80152          44.68164
## HU1007 mock d8 a           34.57042         37.74518          43.29562
## HU1007 HBV d8 b            33.54491         37.71786          44.34814
## HU1007 HBV d8 a            32.89854         37.06084          42.47985
## HU1007 HBV d8 c            34.22920         37.99799          44.94789
## HU1007 HBV d28 a            0.00000         32.52338          36.85765
## HU1007 HBV d28 b           32.52338          0.00000          40.14447
## HU1007 mock d28 a          36.85765         40.14447           0.00000
## HU1007 HBV d28 c           35.90100         38.40042          35.01669
## HU1007 mock d28 c          33.12078         35.85783          31.15248
## HU1007 mock d28 b          33.33471         36.70105          32.06445
## HU1016 HBV d28             70.94687         73.21241          72.92222
## HU1020 mock d28            67.72032         71.02115          73.74130
## HU1020 HBV d28             65.78715         69.12030          70.23764
## HU1019 coinf d28 b         67.94805         70.67123          71.46516
## HU1020 coinf d28           67.27051         70.74273          71.63590
## HU1019 mock d28            68.94493         71.57402          72.33812
## HU1019 coinf d8 a          61.48800         63.37642          64.00059
## HU1019 coinf d28           66.97908         69.64609          68.87525
## HU1019 HBV d28             56.83722         59.22792          60.56251
## HU1020 HBV d8              60.04391         63.55659          64.98711
## HU1020 mock d8             62.96738         66.32643          68.36460
## HU1019 mock d8             63.48865         66.32559          66.14279
## HU1016 coinf d28           62.84588         65.34322          65.41813
## HU1020 coinf d8            61.22849         63.69415          63.63816
## HU1019 coinf d8            61.57927         63.77246          62.21035
## HU1016 HBV d8              61.04613         63.10411          61.02131
## HU1019 HBV d8              63.35530         65.84395          64.14303
## HU1016 coinf d8            62.89015         65.28815          62.95452
##                    HU1007 HBV d28 c HU1007 mock d28 c HU1007 mock d28 b
## HU1007 mock d8 b           46.06081          42.86610          44.98762
## HU1007 mock d8 c           41.72611          39.03789          41.90051
## HU1007 mock d8 a           39.08754          36.87416          39.57583
## HU1007 HBV d8 b            40.02933          39.08623          41.09696
## HU1007 HBV d8 a            38.66528          36.65053          39.30033
## HU1007 HBV d8 c            41.30919          39.33324          41.75265
## HU1007 HBV d28 a           35.90100          33.12078          33.33471
## HU1007 HBV d28 b           38.40042          35.85783          36.70105
## HU1007 mock d28 a          35.01669          31.15248          32.06445
## HU1007 HBV d28 c            0.00000          29.70283          31.98386
## HU1007 mock d28 c          29.70283           0.00000          28.08568
## HU1007 mock d28 b          31.98386          28.08568           0.00000
## HU1016 HBV d28             70.94584          69.31511          71.03294
## HU1020 mock d28            73.40017          71.45807          72.61134
## HU1020 HBV d28             68.92538          67.49977          68.68068
## HU1019 coinf d28 b         70.22631          68.54653          70.32333
## HU1020 coinf d28           71.55147          69.46900          70.63860
## HU1019 mock d28            71.09746          69.89743          71.11831
## HU1019 coinf d8 a          61.22542          58.81611          62.18896
## HU1019 coinf d28           67.88704          65.87285          67.48830
## HU1019 HBV d28             57.29650          56.02995          59.00286
## HU1020 HBV d8              64.56750          62.25207          63.85376
## HU1020 mock d8             68.22945          65.67466          67.34571
## HU1019 mock d8             65.42720          63.27519          64.85229
```

```
## HU1016 coinf d28          63.15528          61.36569          63.59802
## HU1020 coinf d8           61.97880          59.52190          62.03361
## HU1019 coinf d8           60.37351          58.50773          60.77049
## HU1016 HBV d8             59.24129          57.31159          59.50034
## HU1019 HBV d8             63.26775          60.82271          62.58807
## HU1016 coinf d8           61.99430          59.68865          61.61686
##                    HU1016 HBV d28  HU1020 mock d28  HU1020 HBV d28
## HU1007 mock d8 b         65.18431         58.32558        58.93569
## HU1007 mock d8 c         68.40014         63.13805        62.73424
## HU1007 mock d8 a         65.96977         63.71215        61.54709
## HU1007 HBV d8 b          66.84771         61.92053        60.52587
## HU1007 HBV d8 a          64.94120         61.11584        59.31556
## HU1007 HBV d8 c          66.11565         61.29507        60.37006
## HU1007 HBV d28 a         70.94687         67.72032        65.78715
## HU1007 HBV d28 b         73.21241         71.02115        69.12030
## HU1007 mock d28 a        72.92222         73.74130        70.23764
## HU1007 HBV d28 c         70.94584         73.40017        68.92538
## HU1007 mock d28 c        69.31511         71.45807        67.49977
## HU1007 mock d28 b        71.03294         72.61134        68.68068
## HU1016 HBV d28            0.00000         44.93118        38.34801
## HU1020 mock d28          44.93118          0.00000        24.96514
## HU1020 HBV d28           38.34801         24.96514         0.00000
## HU1019 coinf d28 b       40.34443         31.57756        26.48184
## HU1020 coinf d28         40.06326         30.49018        29.64629
## HU1019 mock d28          37.68635         34.21026        30.69074
## HU1019 coinf d8 a        49.10917         50.97299        48.19043
## HU1019 coinf d28         48.85439         38.73143        38.70140
## HU1019 HBV d28           41.77377         46.25516        42.37101
## HU1020 HBV d8            42.27855         28.28958        30.25296
## HU1020 mock d8           44.58996         29.76316        32.86834
## HU1019 mock d8           39.38373         33.10941        29.96754
## HU1016 coinf d28         31.07928         38.09472        32.79107
## HU1020 coinf d8          40.12518         39.12554        37.49930
## HU1019 coinf d8          40.46619         42.22075        37.66198
## HU1016 HBV d8            38.01101         42.03685        34.67673
## HU1019 HBV d8            37.04957         38.27668        33.79326
## HU1016 coinf d8          39.85157         40.41410        35.91015
##                    HU1019 coinf d28 b HU1020 coinf d28  HU1019 mock d28
## HU1007 mock d8 b             61.47110          60.40336         61.74114
## HU1007 mock d8 c             64.76831          64.65094         65.72782
## HU1007 mock d8 a             63.67274          64.23186         64.04572
## HU1007 HBV d8 b              63.03480          62.94169         63.28419
## HU1007 HBV d8 a              61.49536          61.73225         62.52869
## HU1007 HBV d8 c              62.59551          62.36994         63.21381
## HU1007 HBV d28 a             67.94805          67.27051         68.94493
## HU1007 HBV d28 b             70.67123          70.74273         71.57402
## HU1007 mock d28 a            71.46516          71.63590         72.33812
## HU1007 HBV d28 c             70.22631          71.55147         71.09746
## HU1007 mock d28 c            68.54653          69.46900         69.89743
## HU1007 mock d28 b            70.32333          70.63860         71.11831
## HU1016 HBV d28               40.34443          40.06326         37.68635
## HU1020 mock d28              31.57756          30.49018         34.21026
## HU1020 HBV d28               26.48184          29.64629         30.69074
## HU1019 coinf d28 b            0.00000          33.30954         31.97561
```

```
## HU1020 coinf d28            33.30954          0.00000         30.77881
## HU1019 mock d28             31.97561         30.77881          0.00000
## HU1019 coinf d8 a           46.31528         49.95285         52.18651
## HU1019 coinf d28            41.33420         42.62340         45.73590
## HU1019 HBV d28              42.72944         43.75678         42.98595
## HU1020 HBV d8               35.13407         33.26294         35.69777
## HU1020 mock d8              31.79084         33.42494         37.75604
## HU1019 mock d8              28.13657         31.29623         33.34133
## HU1016 coinf d28            33.90054         33.82124         30.92569
## HU1020 coinf d8             38.42524         37.67635         39.63383
## HU1019 coinf d8             37.19780         38.15502         38.49598
## HU1016 HBV d8               35.18873         38.37534         37.69060
## HU1019 HBV d8               34.11595         37.56706         36.87855
## HU1016 coinf d8             34.53649         39.32306         39.27338
##                    HU1019 coinf d8 a HU1019 coinf d28  HU1019 HBV d28
## HU1007 mock d8 b           57.75049          61.31964        51.53805
## HU1007 mock d8 c           57.24795          63.22403        52.87025
## HU1007 mock d8 a           57.06022          63.20235        51.14013
## HU1007 HBV d8 b            58.44436          63.69185        51.41297
## HU1007 HBV d8 a            55.31405          61.74268        50.31700
## HU1007 HBV d8 c            57.55922          63.73161        51.33148
## HU1007 HBV d28 a           61.48800          66.97908        56.83722
## HU1007 HBV d28 b           63.37642          69.64609        59.22792
## HU1007 mock d28 a          64.00059          68.87525        60.56251
## HU1007 HBV d28 c           61.22542          67.88704        57.29650
## HU1007 mock d28 c          58.81611          65.87285        56.02995
## HU1007 mock d28 b          62.18896          67.48830        59.00286
## HU1016 HBV d28             49.10917          48.85439        41.77377
## HU1020 mock d28            50.97299          38.73143        46.25516
## HU1020 HBV d28             48.19043          38.70140        42.37101
## HU1019 coinf d28 b         46.31528          41.33420        42.72944
## HU1020 coinf d28           49.95285          42.62340        43.75678
## HU1019 mock d28            52.18651          45.73590        42.98595
## HU1019 coinf d8 a           0.00000          39.44028        42.01816
## HU1019 coinf d28           39.44028           0.00000        50.00592
## HU1019 HBV d28             42.01816          50.00592         0.00000
## HU1020 HBV d8              46.67647          41.00590        38.77180
## HU1020 mock d8             44.90131          39.94466        41.73138
## HU1019 mock d8             43.44124          35.53111        41.51259
## HU1016 coinf d28           44.37682          43.36818        34.47940
## HU1020 coinf d8            37.70820          36.64671        39.51698
## HU1019 coinf d8            37.99727          36.11477        39.27386
## HU1016 HBV d8              42.95982          41.38070        37.03436
## HU1019 HBV d8              44.05604          38.38427        38.92874
## HU1016 coinf d8            42.22496          36.91302        40.72428
##                    HU1020 HBV d8  HU1020 mock d8  HU1019 mock d8
## HU1007 mock d8 b         49.44706        53.09543        56.15981
## HU1007 mock d8 c         55.12905        57.98078        60.10860
## HU1007 mock d8 a         55.41224        59.04790        58.90619
## HU1007 HBV d8 b          53.65207        57.47463        58.85359
## HU1007 HBV d8 a          53.01162        56.62088        57.29773
## HU1007 HBV d8 c          53.33494        56.97982        58.62897
## HU1007 HBV d28 a         60.04391        62.96738        63.48865
## HU1007 HBV d28 b         63.55659        66.32643        66.32559
```

```
## HU1007 mock d28 a        64.98711        68.36460        66.14279
## HU1007 HBV d28 c         64.56750        68.22945        65.42720
## HU1007 mock d28 c        62.25207        65.67466        63.27519
## HU1007 mock d28 b        63.85376        67.34571        64.85229
## HU1016 HBV d28           42.27855        44.58996        39.38373
## HU1020 mock d28          28.28958        29.76316        33.10941
## HU1020 HBV d28           30.25296        32.86834        29.96754
## HU1019 coinf d28 b       35.13407        31.79084        28.13657
## HU1020 coinf d28         33.26294        33.42494        31.29623
## HU1019 mock d28          35.69777        37.75604        33.34133
## HU1019 coinf d8 a        46.67647        44.90131        43.44124
## HU1019 coinf d28         41.00590        39.94466        35.53111
## HU1019 HBV d28           38.77180        41.73138        41.51259
## HU1020 HBV d8             0.00000        27.19955        31.64513
## HU1020 mock d8           27.19955         0.00000        27.53595
## HU1019 mock d8           31.64513        27.53595         0.00000
## HU1016 coinf d28         31.96615        35.58804        30.01984
## HU1020 coinf d8          32.22378        34.04163        31.04302
## HU1019 coinf d8          35.63265        35.69372        29.67677
## HU1016 HBV d8            33.31410        35.87026        28.63988
## HU1019 HBV d8            30.04414        32.40142        27.25690
## HU1016 coinf d8          33.76718        31.70333        27.25912
##                     HU1016 coinf d28  HU1020 coinf d8  HU1019 coinf d8
## HU1007 mock d8 b           55.29473         53.98785         55.78673
## HU1007 mock d8 c           58.93438         57.07146         58.05655
## HU1007 mock d8 a           56.57628         55.84487         56.42779
## HU1007 HBV d8 b            57.29896         56.33407         57.02789
## HU1007 HBV d8 a            55.93739         54.09113         55.28910
## HU1007 HBV d8 c            56.73529         55.56250         57.03858
## HU1007 HBV d28 a           62.84588         61.22849         61.57927
## HU1007 HBV d28 b           65.34322         63.69415         63.77246
## HU1007 mock d28 a          65.41813         63.63816         62.21035
## HU1007 HBV d28 c           63.15528         61.97880         60.37351
## HU1007 mock d28 c          61.36569         59.52190         58.50773
## HU1007 mock d28 b          63.59802         62.03361         60.77049
## HU1016 HBV d28             31.07928         40.12518         40.46619
## HU1020 mock d28            38.09472         39.12554         42.22075
## HU1020 HBV d28             32.79107         37.49930         37.66198
## HU1019 coinf d28 b         33.90054         38.42524         37.19780
## HU1020 coinf d28           33.82124         37.67635         38.15502
## HU1019 mock d28            30.92569         39.63383         38.49598
## HU1019 coinf d8 a          44.37682         37.70820         37.99727
## HU1019 coinf d28           43.36818         36.64671         36.11477
## HU1019 HBV d28             34.47940         39.51698         39.27386
## HU1020 HBV d8              31.96615         32.22378         35.63265
## HU1020 mock d8             35.58804         34.04163         35.69372
## HU1019 mock d8             30.01984         31.04302         29.67677
## HU1016 coinf d28            0.00000         30.30333         31.07084
## HU1020 coinf d8            30.30333          0.00000         26.39663
## HU1019 coinf d8            31.07084         26.39663          0.00000
## HU1016 HBV d8              27.09108         29.33648         26.76971
## HU1019 HBV d8              27.45220         30.19593         29.40535
## HU1016 coinf d8            30.52620         29.79031         28.27420
##                     HU1016 HBV d8  HU1019 HBV d8  HU1016 coinf d8
```

```
## HU1007 mock d8 b         55.25466       55.83798         56.65398
## HU1007 mock d8 c         58.41438       59.82479         59.66175
## HU1007 mock d8 a         55.33216       58.00306         58.01998
## HU1007 HBV d8 b          56.19297       58.83072         58.64076
## HU1007 HBV d8 a          54.07141       57.29611         56.90294
## HU1007 HBV d8 c          55.84362       58.64597         58.55174
## HU1007 HBV d28 a         61.04613       63.35530         62.89015
## HU1007 HBV d28 b         63.10411       65.84395         65.28815
## HU1007 mock d28 a        61.02131       64.14303         62.95452
## HU1007 HBV d28 c         59.24129       63.26775         61.99430
## HU1007 mock d28 c        57.31159       60.82271         59.68865
## HU1007 mock d28 b        59.50034       62.58807         61.61686
## HU1016 HBV d28           38.01101       37.04957         39.85157
## HU1020 mock d28          42.03685       38.27668         40.41410
## HU1020 HBV d28           34.67673       33.79326         35.91015
## HU1019 coinf d28 b       35.18873       34.11595         34.53649
## HU1020 coinf d28         38.37534       37.56706         39.32306
## HU1019 mock d28          37.69060       36.87855         39.27338
## HU1019 coinf d8 a        42.95982       44.05604         42.22496
## HU1019 coinf d28         41.38070       38.38427         36.91302
## HU1019 HBV d28           37.03436       38.92874         40.72428
## HU1020 HBV d8            33.31410       30.04414         33.76718
## HU1020 mock d8           35.87026       32.40142         31.70333
## HU1019 mock d8           28.63988       27.25690         27.25912
## HU1016 coinf d28         27.09108       27.45220         30.52620
## HU1020 coinf d8          29.33648       30.19593         29.79031
## HU1019 coinf d8          26.76971       29.40535         28.27420
## HU1016 HBV d8             0.00000       25.25778         25.59670
## HU1019 HBV d8            25.25778        0.00000         23.87975
## HU1016 coinf d8          25.59670       23.87975          0.00000
##
## $rowDendrogram
## 'dendrogram' with 2 branches and 30 members total, at height 190.6069
##
## $colDendrogram
## 'dendrogram' with 2 branches and 30 members total, at height 190.6069
##
## $breaks
##   [1]  0.000000  0.737413  1.474826  2.212239  2.949652  3.687065  4.424478
##   [8]  5.161891  5.899304  6.636717  7.374130  8.111543  8.848956  9.586369
##  [15] 10.323782 11.061195 11.798608 12.536021 13.273434 14.010847 14.748260
##  [22] 15.485673 16.223086 16.960499 17.697912 18.435325 19.172738 19.910151
##  [29] 20.647564 21.384977 22.122390 22.859803 23.597216 24.334629 25.072042
##  [36] 25.809455 26.546868 27.284281 28.021694 28.759107 29.496520 30.233933
##  [43] 30.971346 31.708759 32.446172 33.183586 33.920999 34.658412 35.395825
##  [50] 36.133238 36.870651 37.608064 38.345477 39.082890 39.820303 40.557716
##  [57] 41.295129 42.032542 42.769955 43.507368 44.244781 44.982194 45.719607
##  [64] 46.457020 47.194433 47.931846 48.669259 49.406672 50.144085 50.881498
##  [71] 51.618911 52.356324 53.093737 53.831150 54.568563 55.305976 56.043389
##  [78] 56.780802 57.518215 58.255628 58.993041 59.730454 60.467867 61.205280
##  [85] 61.942693 62.680106 63.417519 64.154932 64.892345 65.629758 66.367171
##  [92] 67.104584 67.841997 68.579410 69.316823 70.054236 70.791649 71.529062
##  [99] 72.266475 73.003888 73.741301
##
```

```
## $col
##   [1] "#440154FF" "#450558FF" "#46085CFF" "#470D60FF" "#471063FF"
##   [6] "#481467FF" "#481769FF" "#481B6DFF" "#481E70FF" "#482173FF"
##  [11] "#482576FF" "#482878FF" "#472C7AFF" "#472F7CFF" "#46327EFF"
##  [16] "#453581FF" "#453882FF" "#443B84FF" "#433E85FF" "#424186FF"
##  [21] "#404587FF" "#3F4788FF" "#3E4A89FF" "#3D4D8AFF" "#3C508BFF"
##  [26] "#3B528BFF" "#39558CFF" "#38598CFF" "#375B8DFF" "#355E8DFF"
##  [31] "#34608DFF" "#33638DFF" "#32658EFF" "#31688EFF" "#2F6B8EFF"
##  [36] "#2E6D8EFF" "#2D708EFF" "#2C718EFF" "#2B748EFF" "#2A768EFF"
##  [41] "#29798EFF" "#287C8EFF" "#277E8EFF" "#26818EFF" "#26828EFF"
##  [46] "#25858EFF" "#24878EFF" "#238A8DFF" "#228D8DFF" "#218F8DFF"
##  [51] "#20928CFF" "#20938CFF" "#1F968BFF" "#1F998AFF" "#1E9B8AFF"
##  [56] "#1F9E89FF" "#1FA088FF" "#1FA287FF" "#20A486FF" "#22A785FF"
##  [61] "#24AA83FF" "#25AC82FF" "#28AE80FF" "#2BB07FFF" "#2EB37CFF"
##  [66] "#31B67BFF" "#35B779FF" "#39BA76FF" "#3DBC74FF" "#41BE71FF"
##  [71] "#47C06FFF" "#4CC26CFF" "#51C56AFF" "#56C667FF" "#5BC863FF"
##  [76] "#61CA60FF" "#67CC5CFF" "#6DCD59FF" "#73D056FF" "#78D152FF"
##  [81] "#7FD34EFF" "#85D54AFF" "#8CD646FF" "#92D741FF" "#99D83DFF"
##  [86] "#A0DA39FF" "#A7DB35FF" "#ADDC30FF" "#B4DE2CFF" "#BBDE28FF"
##  [91] "#C2DF23FF" "#C9E020FF" "#D0E11CFF" "#D7E219FF" "#DDE318FF"
##  [96] "#E4E419FF" "#EBE51AFF" "#F1E51DFF" "#F7E620FF" "#FDE725FF"
##
## $colorTable
##           low      high     color
## 1    0.000000  0.737413 #440154FF
## 2    0.737413  1.474826 #450558FF
## 3    1.474826  2.212239 #46085CFF
## 4    2.212239  2.949652 #470D60FF
## 5    2.949652  3.687065 #471063FF
## 6    3.687065  4.424478 #481467FF
## 7    4.424478  5.161891 #481769FF
## 8    5.161891  5.899304 #481B6DFF
## 9    5.899304  6.636717 #481E70FF
## 10   6.636717  7.374130 #482173FF
## 11   7.374130  8.111543 #482576FF
## 12   8.111543  8.848956 #482878FF
## 13   8.848956  9.586369 #472C7AFF
## 14   9.586369 10.323782 #472F7CFF
## 15  10.323782 11.061195 #46327EFF
## 16  11.061195 11.798608 #453581FF
## 17  11.798608 12.536021 #453882FF
## 18  12.536021 13.273434 #443B84FF
## 19  13.273434 14.010847 #433E85FF
## 20  14.010847 14.748260 #424186FF
## 21  14.748260 15.485673 #404587FF
## 22  15.485673 16.223086 #3F4788FF
## 23  16.223086 16.960499 #3E4A89FF
## 24  16.960499 17.697912 #3D4D8AFF
## 25  17.697912 18.435325 #3C508BFF
## 26  18.435325 19.172738 #3B528BFF
## 27  19.172738 19.910151 #39558CFF
## 28  19.910151 20.647564 #38598CFF
## 29  20.647564 21.384977 #375B8DFF
## 30  21.384977 22.122390 #355E8DFF
```

```
## 31  22.122390 22.859803 #34608DFF
## 32  22.859803 23.597216 #33638DFF
## 33  23.597216 24.334629 #32658EFF
## 34  24.334629 25.072042 #31688EFF
## 35  25.072042 25.809455 #2F6B8EFF
## 36  25.809455 26.546868 #2E6D8EFF
## 37  26.546868 27.284281 #2D708EFF
## 38  27.284281 28.021694 #2C718EFF
## 39  28.021694 28.759107 #2B748EFF
## 40  28.759107 29.496520 #2A768EFF
## 41  29.496520 30.233933 #29798EFF
## 42  30.233933 30.971346 #287C8EFF
## 43  30.971346 31.708759 #277E8EFF
## 44  31.708759 32.446172 #26818EFF
## 45  32.446172 33.183586 #26828EFF
## 46  33.183586 33.920999 #25858EFF
## 47  33.920999 34.658412 #24878EFF
## 48  34.658412 35.395825 #238A8DFF
## 49  35.395825 36.133238 #228D8DFF
## 50  36.133238 36.870651 #218F8DFF
## 51  36.870651 37.608064 #20928CFF
## 52  37.608064 38.345477 #20938CFF
## 53  38.345477 39.082890 #1F968BFF
## 54  39.082890 39.820303 #1F998AFF
## 55  39.820303 40.557716 #1E9B8AFF
## 56  40.557716 41.295129 #1F9E89FF
## 57  41.295129 42.032542 #1FA088FF
## 58  42.032542 42.769955 #1FA287FF
## 59  42.769955 43.507368 #20A486FF
## 60  43.507368 44.244781 #22A785FF
## 61  44.244781 44.982194 #24AA83FF
## 62  44.982194 45.719607 #25AC82FF
## 63  45.719607 46.457020 #28AE80FF
## 64  46.457020 47.194433 #2BB07FFF
## 65  47.194433 47.931846 #2EB37CFF
## 66  47.931846 48.669259 #31B67BFF
## 67  48.669259 49.406672 #35B779FF
## 68  49.406672 50.144085 #39BA76FF
## 69  50.144085 50.881498 #3DBC74FF
## 70  50.881498 51.618911 #41BE71FF
## 71  51.618911 52.356324 #47C06FFF
## 72  52.356324 53.093737 #4CC26CFF
## 73  53.093737 53.831150 #51C56AFF
## 74  53.831150 54.568563 #56C667FF
## 75  54.568563 55.305976 #5BC863FF
## 76  55.305976 56.043389 #61CA60FF
## 77  56.043389 56.780802 #67CC5CFF
## 78  56.780802 57.518215 #6DCD59FF
## 79  57.518215 58.255628 #73D056FF
## 80  58.255628 58.993041 #78D152FF
## 81  58.993041 59.730454 #7FD34EFF
## 82  59.730454 60.467867 #85D54AFF
## 83  60.467867 61.205280 #8CD646FF
## 84  61.205280 61.942693 #92D741FF
```

```
## 85  61.942693 62.680106 #99D83DFF
## 86  62.680106 63.417519 #A0DA39FF
## 87  63.417519 64.154932 #A7DB35FF
## 88  64.154932 64.892345 #ADDC30FF
## 89  64.892345 65.629758 #B4DE2CFF
## 90  65.629758 66.367171 #BBDE28FF
## 91  66.367171 67.104584 #C2DF23FF
## 92  67.104584 67.841997 #C9E020FF
## 93  67.841997 68.579410 #D0E11CFF
## 94  68.579410 69.316823 #D7E219FF
## 95  69.316823 70.054236 #DDE318FF
## 96  70.054236 70.791649 #E4E419FF
## 97  70.791649 71.529062 #EBE51AFF
## 98  71.529062 72.266475 #F1E51DFF
## 99  72.266475 73.003888 #F7E620FF
## 100 73.003888 73.741301 #FDE725FF
##
## $layout
## $layout$lmat
##      [,1] [,2]
## [1,]    4    3
## [2,]    2    1
##
## $layout$lhei
## [1] 0.7 4.0
##
## $layout$lwid
## [1] 0.7 4.0
```

Session Info

```
sessionInfo()
```

```
## R version 3.3.3 (2017-03-06)
## Platform: x86_64-apple-darwin13.4.0 (64-bit)
## Running under: macOS Sierra 10.12.6
##
## locale:
## [1] en_US.UTF-8/en_US.UTF-8/en_US.UTF-8/C/en_US.UTF-8/en_US.UTF-8
##
## attached base packages:
## [1] parallel  stats4    stats     graphics  grDevices utils     datasets
## [8] methods   base
##
## other attached packages:
##  [1] viridis_0.4.0              viridisLite_0.2.0
##  [3] ggrepel_0.6.5              data.table_1.10.0
##  [5] genefilter_1.54.2          RColorBrewer_1.1-2
##  [7] gplots_3.0.1               DESeq2_1.12.4
##  [9] SummarizedExperiment_1.2.3 Biobase_2.32.0
## [11] GenomicRanges_1.24.3       GenomeInfoDb_1.8.7
## [13] IRanges_2.6.1              S4Vectors_0.10.3
## [15] BiocGenerics_0.18.0        openxlsx_4.0.17
## [17] reshape2_1.4.2             ggplot2_2.2.1
## [19] stringr_1.2.0              dplyr_0.7.3
```

```
##
## loaded via a namespace (and not attached):
##  [1] splines_3.3.3        gtools_3.5.0         Formula_1.2-1
##  [4] assertthat_0.2.0     latticeExtra_0.6-28  yaml_2.1.14
##  [7] RSQLite_1.1-2        backports_1.0.5      lattice_0.20-35
## [10] glue_1.1.1           digest_0.6.12        XVector_0.12.1
## [13] checkmate_1.8.2      colorspace_1.3-2     htmltools_0.3.5
## [16] Matrix_1.2-8         plyr_1.8.4           XML_3.98-1.9
## [19] pkgconfig_2.0.1      zlibbioc_1.18.0      xtable_1.8-2
## [22] scales_0.4.1         gdata_2.17.0         BiocParallel_1.6.6
## [25] htmlTable_1.9        tibble_1.3.3         annotate_1.50.1
## [28] nnet_7.3-12          lazyeval_0.2.0       survival_2.41-3
## [31] magrittr_1.5         memoise_1.0.0        evaluate_0.10
## [34] foreign_0.8-67       tools_3.3.3          munsell_0.4.3
## [37] locfit_1.5-9.1       cluster_2.0.6        AnnotationDbi_1.34.4
## [40] bindrcpp_0.2         caTools_1.17.1       rlang_0.1.2
## [43] grid_3.3.3           RCurl_1.95-4.8       htmlwidgets_0.9
## [46] labeling_0.3         bitops_1.0-6         base64enc_0.1-3
## [49] rmarkdown_1.4        gtable_0.2.0         DBI_0.6-1
## [52] R6_2.2.0             gridExtra_2.2.1      knitr_1.16
## [55] bindr_0.1            Hmisc_4.0-2          rprojroot_1.2
## [58] KernSmooth_2.23-15   stringi_1.1.5        Rcpp_0.12.10
## [61] geneplotter_1.50.0   rpart_4.1-10         acepack_1.4.1
```