

clustering-3

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R Markdown

This is an R Markdown document. Markdown is a simple formatting syntax for authoring HTML, PDF, and MS Word documents. For more details on using R Markdown see <http://rmarkdown.rstudio.com>.

When you click the **Knit** button a document will be generated that includes both content as well as the output of any embedded R code chunks within the document. You can embed an R code chunk like this:

```
summary(cars)
```

```
##      speed          dist
##  Min.   :4.0   Min.   : 2.00
##  1st Qu.:12.0  1st Qu.: 26.00
##  Median :15.0  Median : 36.00
##  Mean   :15.4  Mean   : 42.98
##  3rd Qu.:19.0  3rd Qu.: 56.00
##  Max.   :25.0  Max.   :120.00
```

Including Plots

You can also embed plots, for example:

```
library(BioBase)
```

```
## Loading required package: BiocGenerics

##
## Attaching package: 'BiocGenerics'

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

## The following objects are masked from 'package:base':
## 
##     anyDuplicated, aperm, append, as.data.frame, basename, cbind,
##     colnames, dirname, do.call, duplicated, eval, evalq, Filter, Find,
##     get, grep, grepl, intersect, is.unsorted, lapply, 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, which.max, which.min
```

```

## Welcome to Bioconductor
##
##      Vignettes contain introductory material; view with
##      'browseVignettes()'. To cite Bioconductor, see
##      'citation("Biobase")', and for packages 'citation("pkgname")'.

library(dendextend)

##
## -----
## Welcome to dendextend version 1.17.1
## Type citation('dendextend') for how to cite the package.
##
## Type browseVignettes(package = 'dendextend') for the package vignette.
## The github page is: https://github.com/talgalili/dendextend/
##
## Suggestions and bug-reports can be submitted at: https://github.com/talgalili/dendextend/issues
## You may ask questions at stackoverflow, use the r and dendextend tags:
##   https://stackoverflow.com/questions/tagged/dendextend
##
## To suppress this message use: suppressPackageStartupMessages(library(dendextend))
## -----


##
## Attaching package: 'dendextend'

## The following object is masked from 'package:stats':
##
##     cutree

```

Loading data

```

## [1] "con"          "edata"        "fdata"        "montpick.eset"
## [5] "pdata"

```

Clustering-3

```

edata3 = log2(edata + 1)

dist3 = dist(t(edata3))
dist3

```

```

##           NA06985   NA06986   NA06994   NA07000   NA07037   NA07051   NA07346
## NA06986  93.19999
## NA06994  93.76137  95.74995
## NA07000 103.12867 107.73710 103.42584
## NA07037 121.58682 116.93695 117.89046 108.95138
## NA07051 107.40334  98.90786  98.01909 110.12445 119.24930
## NA07346 102.09264 104.54698  99.51901 102.98811 118.65114 106.60946

```

```

## NA07347 100.83150 97.59923 101.34975 92.51646 109.86914 103.64360 99.71184
## NA07357 97.32154 97.54991 98.00660 111.44670 125.75115 100.84981 108.04235
## NA10847 101.32197 101.33088 90.96334 90.95736 105.46068 101.54746 96.08374
## NA10851 95.56939 92.62654 92.06177 94.51520 112.07995 97.55724 98.59246
## NA11829 114.10679 109.75441 108.01753 124.68143 126.87948 108.84619 118.45777
## NA11830 104.04948 105.46369 99.97791 96.89765 109.21394 99.96192 104.16902
## NA11831 122.59570 119.66792 122.39917 113.02338 136.19591 116.44754 130.63163
## NA11832 141.78717 135.84761 150.73128 125.38650 154.24290 136.97338 152.56231
## NA11840 135.11909 132.04330 147.88914 117.25155 146.02305 141.80405 146.41467
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## NA11894 124.75393 117.67157 120.51218 119.29345 131.63059 122.67252 127.04209
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## NA11931 141.88155 135.00437 151.81599 142.62046 170.86328 141.73520 156.80323
## NA11992 133.18918 128.15223 141.42350 122.38520 149.49287 141.25435 146.42238
## NA11993 140.10218 144.47512 138.24993 136.54009 146.06579 151.92621 142.09706
## NA11994 123.73779 119.31164 130.62836 104.10833 137.80221 123.48312 133.05210
## NA11995 125.04575 120.29665 132.86741 116.44030 138.48061 128.93591 133.48907
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## NA12005 146.01182 138.75406 144.08684 146.70200 160.47485 145.50366 151.73511
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## NA12043 131.55613 123.08525 139.27986 116.65295 143.91852 130.20089 143.00857
## NA12044 126.53670 125.19407 143.51578 131.11491 159.48609 139.26393 149.81341
## NA12045 170.75273 164.62961 180.45312 151.60267 182.40933 167.38831 170.69855
## NA12144 103.01246 99.89185 90.88469 98.89607 116.51497 100.14817 101.54950
## NA12154 154.58721 146.30040 163.54949 148.23825 172.16680 154.65376 166.03399
## NA12155 117.71032 114.18760 126.30050 102.10087 134.08529 120.24148 128.65350
## NA12156 90.04482 93.11878 91.79416 93.62457 119.29939 93.49647 97.62171
## NA12234 115.96730 109.91250 117.58927 101.30344 128.77047 111.72909 125.24551
## NA12249 120.02105 114.18543 124.74898 112.27830 138.65433 122.19669 131.35958
## NA12287 119.85489 110.22132 125.12416 111.09359 126.54109 106.01705 121.97085
## NA12414 136.59738 133.96600 144.62706 127.60805 149.09386 128.42149 141.70637
## NA12489 118.63146 112.95860 116.18592 118.81531 142.82956 117.81152 120.97345
## NA12716 117.15222 117.66026 127.28157 116.72706 139.54654 129.11718 128.09651
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## NA12760 125.38508 118.73389 132.06734 110.97109 139.25149 127.38868 136.37586
## NA12761 128.06206 125.93441 128.15845 116.19501 125.96663 132.17166 129.84483
## NA12762 128.60298 132.92234 114.55328 128.04030 133.84332 132.07045 123.27425
## NA12763 100.01179 100.46525 100.88876 97.01904 126.31514 110.72826 113.81858
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## NA12828 115.97078 107.01342 124.06523 118.71643 143.69973 117.57478 130.77228
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## NA12873 132.95176 128.36183 134.48187 136.09772 145.98117 132.20489 141.97590
## NA12874 171.94163 167.41192 177.83306 161.36923 192.13716 176.36861 172.44958
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## NA18486 147.80187 142.60402 155.46439 141.42702 162.25893 155.59476 155.53134

```

```

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## NA18502 159.47462 149.29493 169.12787 158.39222 183.72835 161.72825 174.96613
## NA18504 131.08399 122.32636 137.03046 133.46489 158.82458 132.41731 140.70073
## NA18505 161.87395 154.78465 168.84078 148.56863 181.48053 162.18846 173.02283
## NA18507 181.50416 171.63505 193.18692 166.43046 192.02778 179.68975 189.62047
## NA18508 171.20136 162.81227 182.47415 156.95774 185.36043 170.76906 180.31007
## NA18510 141.19529 131.36578 145.91215 128.19030 152.07106 138.42109 148.43234
## NA18511 184.44906 175.69998 197.48797 173.95956 201.34317 185.08930 197.31768
## NA18516 139.41557 134.37331 147.13234 123.55891 151.76723 142.41223 143.12758
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## NA18519 168.40800 158.66802 180.12656 169.67067 191.43759 172.57772 185.21220
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## NA18522 181.19399 169.00168 193.01634 162.90610 191.36335 179.94411 190.02979
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```

```

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## NA19225 157.60345 149.04012 167.74202 147.12953 174.26701 156.52341 169.67939
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## NA19239 178.99117 170.50960 185.71087 160.91720 191.32179 173.84015 183.76337
## NA19257 163.32217 156.52274 174.86857 149.09669 175.55919 161.12576 173.13340
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## NA06986
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## NA07347
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## NA11881 114.78745 117.44487 112.27674 114.38834 125.73788 107.74158 123.59165
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## NA12144 92.42520 100.14660 94.70367 94.64172 111.46616 92.75269 107.28017
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## NA12155 103.54454 111.71729 117.00192 105.64805 137.45908 110.34929 99.19002
## NA12156 94.36885 89.75531 91.14768 84.46935 110.35753 91.38217 101.12647
## NA12234 101.06415 106.86407 110.39801 103.01405 125.59837 105.68955 82.55692
## NA12249 113.77430 116.30016 120.06882 110.74742 134.55386 113.97065 110.06389
## NA12287 104.33679 119.48724 121.19105 114.27196 137.06151 116.52460 112.92776
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```

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## NA12489 116.26310 119.19650 115.56617 103.41021 136.82905 125.16508 129.80791
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## NA12717 140.95440 136.56015 142.62681 139.60654 150.33331 147.67743 157.99372
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## NA12776 136.80874 136.34904 146.80326 129.82340 156.29359 147.09989 125.70707
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## NA12813 102.47261 115.03522 107.76399 109.03339 138.92042 113.19160 111.88624
## NA12814 143.40377 149.26624 159.95472 143.45900 166.29726 152.44113 127.03829
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## NA12828 116.12213 116.09974 124.77641 106.94670 140.76495 125.65446 113.27152
## NA12872 143.64781 153.00285 158.11030 147.74727 173.67047 155.56505 131.01614
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## NA12892 121.88048 122.21991 108.75401 112.47763 137.93823 127.82898 145.20975
## NA18486 133.27922 144.63212 145.15400 133.74079 159.91313 144.78339 135.33550
## NA18498 176.65893 186.71674 197.56401 177.88900 209.65453 192.35393 160.18750
## NA18499 154.18638 153.09687 166.65322 151.01047 173.35800 163.74406 134.66747
## NA18501 125.27854 146.64244 140.02423 132.95424 170.05414 148.71806 129.95027
## NA18502 153.70735 153.98119 164.18443 145.34122 174.63227 165.04407 140.76766
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## NA18505 150.53575 157.89179 162.12646 148.68384 180.25102 164.36490 134.86514
## NA18507 162.25999 171.89744 180.75228 166.78276 192.06592 174.51104 145.01922
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## NA18511 170.90656 174.06967 188.59694 171.27355 196.11325 179.86499 148.47437
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## NA18519 164.69274 160.88388 176.04794 157.05111 180.23943 173.88223 147.08583
## NA18520 151.20605 166.12218 172.39118 158.82047 181.07300 165.65008 142.77846
## NA18522 160.94610 176.90440 181.26298 167.59242 198.41941 180.67964 153.83422
## NA18523 112.04039 126.96688 130.23465 119.84389 142.13057 125.52841 119.07793
## NA18852 140.74421 147.64866 157.27638 143.16342 163.56176 153.24534 129.27357
## NA18853 162.99070 174.31923 171.93801 165.91290 189.47848 172.27310 163.23941
## NA18855 140.12620 144.53894 150.11865 138.31988 158.03329 146.28980 125.40021
## NA18856 109.75816 125.54507 112.40837 115.00248 147.29614 126.15818 127.20433
## NA18858 149.66766 161.01666 164.65077 149.80525 177.09289 161.05071 137.69632
## NA18861 147.55888 161.01224 166.59460 156.09609 184.59157 166.22089 132.74018
## NA18862 154.35817 159.11854 169.98087 155.06697 178.78153 168.38448 141.59665
## NA18870 133.60150 145.21707 150.05711 138.60098 160.37198 140.32328 122.34643
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## NA18909 166.07646 171.96849 184.61770 170.65614 193.99083 176.75071 144.50997
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## NA19152
## NA19153
## NA19159
## NA19160
## NA19171
## NA19172
## NA19190
## NA19192
## NA19193
## NA19200
## NA19201
## NA19203 102.67935
## NA19204 95.35258 117.95762
## NA19209 88.50137 116.73778 102.86304
## NA19210 123.70133 133.19518 126.96669 116.17747
## NA19222 108.42487 118.91590 112.15972 115.08980 107.39091
## NA19225 99.39836 110.23886 110.83445 102.86344 115.41259 102.78730
## NA19238 98.49667 110.06881 105.36453 106.39035 119.12573 90.95791 98.58136
## NA19239 104.29390 114.48628 110.06301 108.96878 109.35075 87.45397 103.46045
## NA19257 106.97922 117.55742 115.85143 108.63558 114.26250 103.28031 80.44143
## NA19238 NA19239
## NA06986
## NA06994
## NA07000
## NA07037
## NA07051
## NA07346

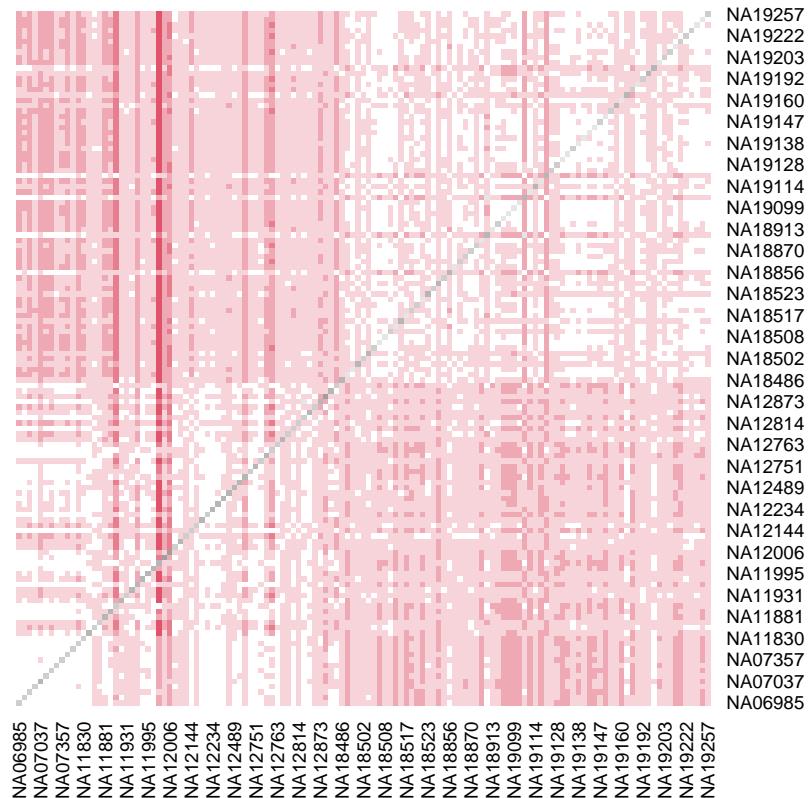
```

```
## NA07347
## NA07357
## NA10847
## NA10851
## NA11829
## NA11830
## NA11831
## NA11832
## NA11840
## NA11881
## NA11894
## NA11918
## NA11920
## NA11931
## NA11992
## NA11993
## NA11994
## NA11995
## NA12003
## NA12004
## NA12005
## NA12006
## NA12043
## NA12044
## NA12045
## NA12144
## NA12154
## NA12155
## NA12156
## NA12234
## NA12249
## NA12287
## NA12414
## NA12489
## NA12716
## NA12717
## NA12750
## NA12751
## NA12760
## NA12761
## NA12762
## NA12763
## NA12776
## NA12812
## NA12813
## NA12814
## NA12815
## NA12828
## NA12872
## NA12873
## NA12874
## NA12891
## NA12892
## NA18486
```

```
## NA18498
## NA18499
## NA18501
## NA18502
## NA18504
## NA18505
## NA18507
## NA18508
## NA18510
## NA18511
## NA18516
## NA18517
## NA18519
## NA18520
## NA18522
## NA18523
## NA18852
## NA18853
## NA18855
## NA18856
## NA18858
## NA18861
## NA18862
## NA18870
## NA18871
## NA18909
## NA18912
## NA18913
## NA18916
## NA19093
## NA19098
## NA19099
## NA19101
## NA19102
## NA19108
## NA19114
## NA19116
## NA19119
## NA19127
## NA19128
## NA19130
## NA19131
## NA19137
## NA19138
## NA19140
## NA19143
## NA19144
## NA19147
## NA19152
## NA19153
## NA19159
## NA19160
## NA19171
## NA19172
```

```
## NA19190
## NA19192
## NA19193
## NA19200
## NA19201
## NA19203
## NA19204
## NA19209
## NA19210
## NA19222
## NA19225
## NA19238
## NA19239 82.47305
## NA19257 106.65242 104.07779
```

```
#Buat heatmap
colramp = colorRampPalette(c(8,"white",18))(9)
heatmap(as.matrix(dist3),col=colramp,Colv=NA,Rowv=NA)
```

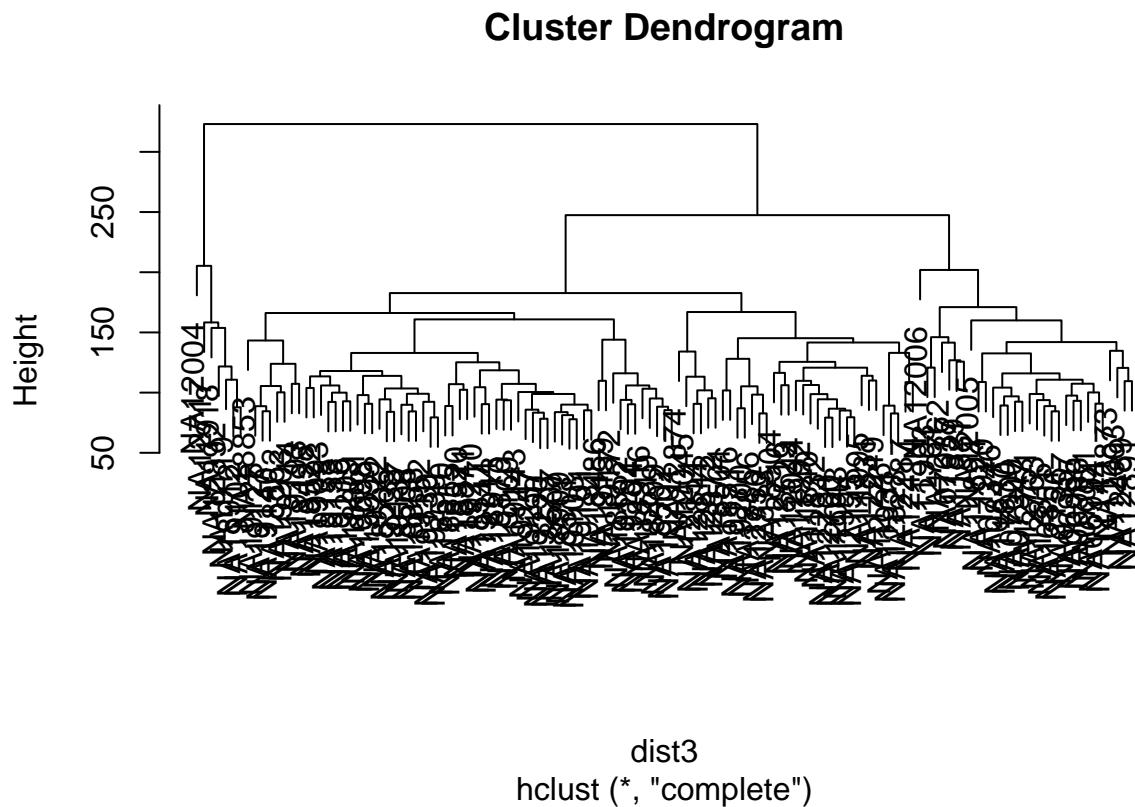


```
hclust3 = hclust(dist3)  
hclust3
```

```
##  
## Call:  
## hclust(d = dist3)
```

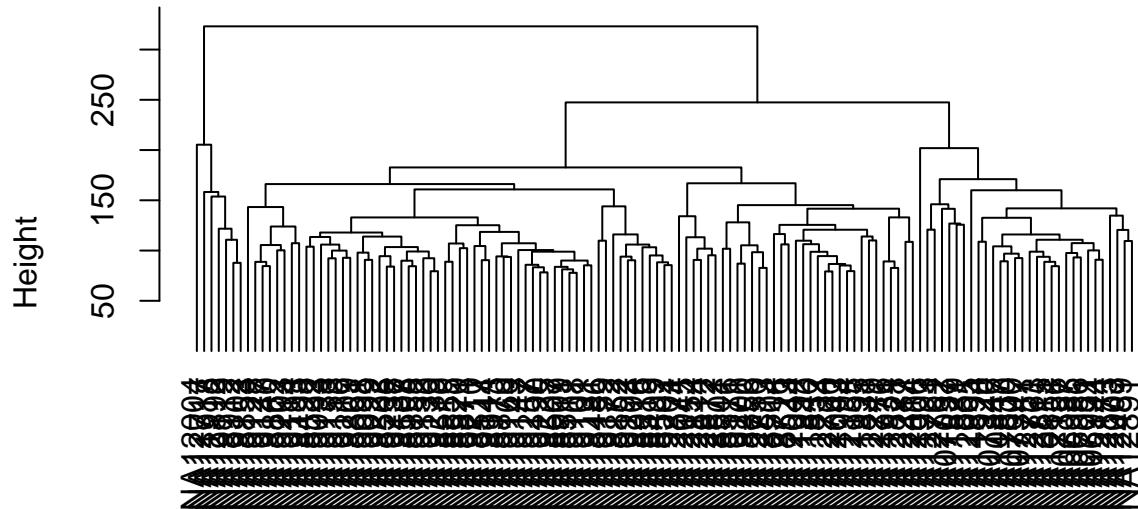
```
##  
## Cluster method : complete  
## Distance       : euclidean  
## Number of objects: 129
```

```
plot(hclust3)
```



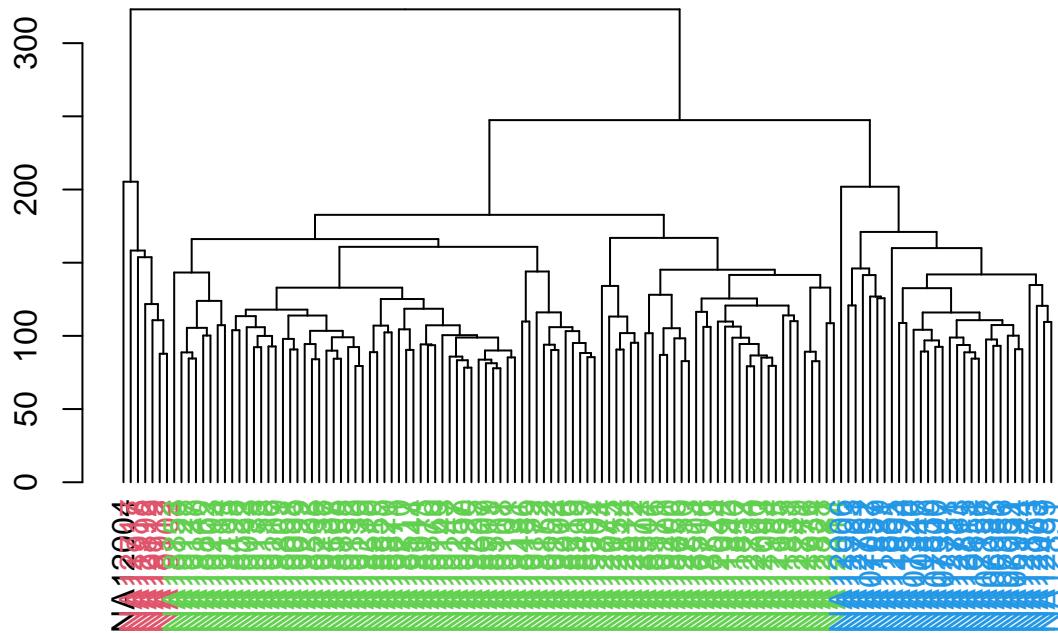
```
plot(hclust3,hang=-1)
```

Cluster Dendrogram

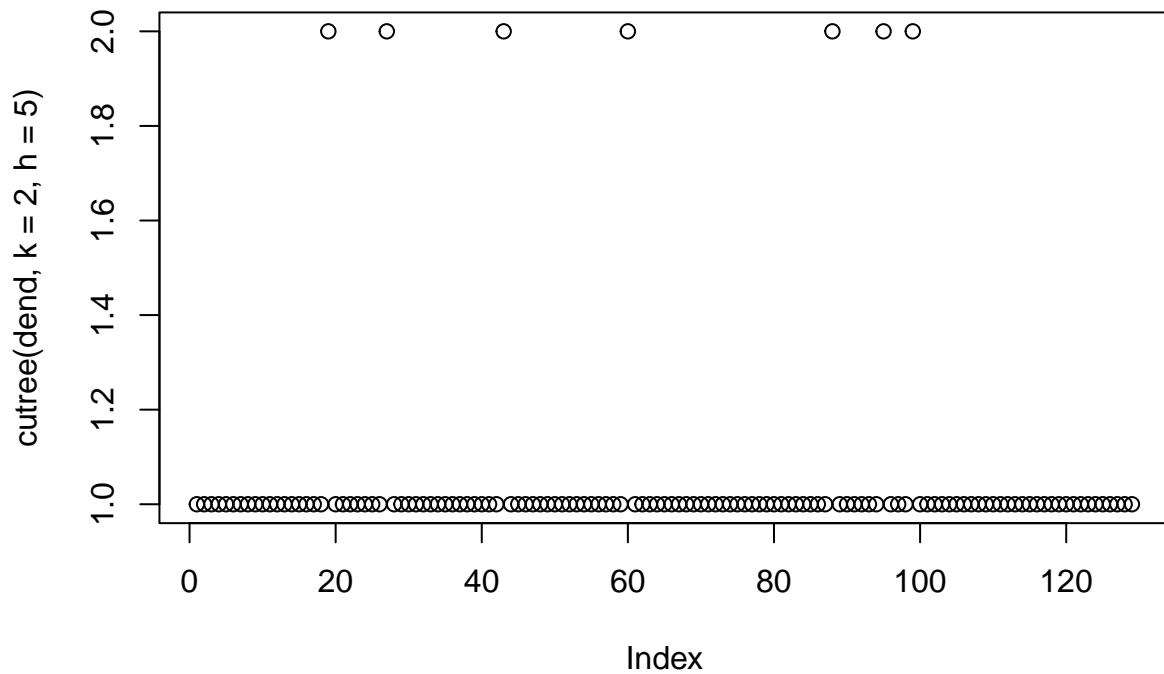


dist3
hclust (*, "complete")

```
#Buat dendrogram
dend = as.dendrogram(hclust3)
dend = color_labels(hclust3,4,col=1:4)
plot(dend)
```



```
#Cutree  
plot(cutree(dend, k=2, h=5))
```



Clustering dengan kmeans

```

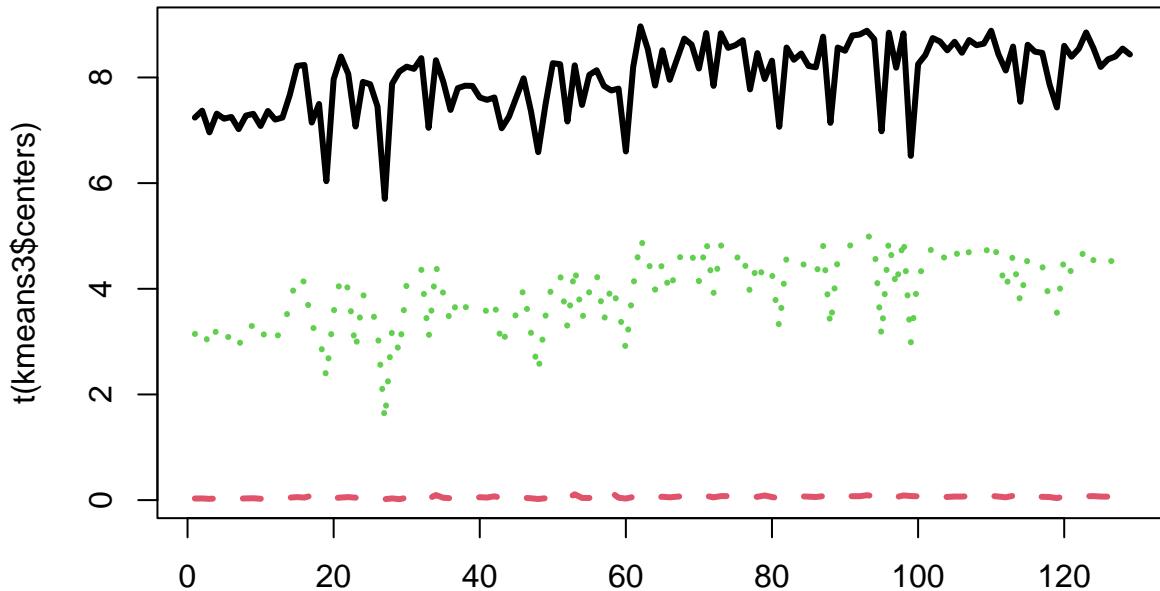
kmeans3 = kmeans(edata3,centers=3)
names(kmeans3)

## [1] "cluster"      "centers"       "totss"        "withinss"     "tot.withinss"
## [6] "betweenss"    "size"          "iter"         "ifault"

####Plot pusat cluster

matplot(t(kmeans3$centers),col=1:3,type="l",lwd=3)

```



```
# cek berapa banyak gen di masing2 cluster
table(kmeans3$cluster)
```

```
##
##      1      2      3
## 3425 45890 3265
```

```
# cek cluster mana yang dikasih ke setiap gen
kmeans3$cluster[1:15]
```

```
## ENSG0000000003 ENSG0000000005 ENSG00000000419 ENSG00000000457 ENSG00000000460
##          2          2          3          3          3
## ENSG0000000938 ENSG0000000971 ENSG00000001036 ENSG00000001084 ENSG00000001167
##          3          2          3          2          1
## ENSG00000001460 ENSG00000001461 ENSG00000001497 ENSG00000001561 ENSG00000001617
##          2          2          3          1          2
```

```
#Heatmap dengan cluster yang sudah disortir
heatmap(as.matrix(edata)[order(kmeans3$cluster),], col=colramp, Colv=NA, Rowv=NA)
```

