

# WGCNA Demo

*Shaurya Jauhari (Email: shauryajauhari@gzhmu.edu.cn)*

*2019-10-24*

Installing the package and setting up the options.

```
install.packages("BiocManager",
                 repos='http://cran.us.r-project.org',
                 dependencies = TRUE)

## Installing package into 'C:/Users/rajni/Documents/R/win-library/3.6'
## (as 'lib' is unspecified)

## Warning: dependency 'BiocStyle' is not available
##
##   There is a binary version available but the source version is
##   later:
##           binary source needs_compilation
## BiocManager 1.30.8 1.30.9                FALSE
## installing the source package 'BiocManager'
BiocManager::install("WGCNA")

## Bioconductor version 3.9 (BiocManager 1.30.9), R 3.6.0 (2019-04-26)
## Installing package(s) 'WGCNA'
## package 'WGCNA' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
## C:\Users\rajni\AppData\Local\Temp\RtmpYvzLdm\downloaded_packages
## Installation path not writeable, unable to update packages: boot, cluster,
##   foreign, KernSmooth, mgcv, nlme
## Old packages: 'covr', 'data.table', 'DescTools', 'digest', 'lava',
##   'limma', 'markdown', 'modelr', 'pkgbuild', 'pkgconfig', 'promises',
##   'purrr', 'Rcpp', 'recipes', 'reticulate', 'rmarkdown', 'RSQLite',
##   'S4Vectors', 'shiny', 'sys', 'tensorflow', 'testthat', 'tidyr',
##   'tinytex', 'whisker', 'xfun', 'xml2'
install.packages("ggdendro",
                 repos='http://cran.us.r-project.org',
                 dependencies = TRUE)

## Installing package into 'C:/Users/rajni/Documents/R/win-library/3.6'
## (as 'lib' is unspecified)
## package 'ggdendro' successfully unpacked and MD5 sums checked
##
## The downloaded binary packages are in
## C:\Users\rajni\AppData\Local\Temp\RtmpYvzLdm\downloaded_packages
## Setting options

options(stringsAsFactors = FALSE)
```

```
#enableWGCNAThreads() ## Enabling multi-threads in processing.
```

```
library(WGCNA)
```

```
## Warning: package 'WGCNA' was built under R version 3.6.1
```

```
## Loading required package: dynamicTreeCut
```

```
## Loading required package: fastcluster
```

```
##
```

```
## Attaching package: 'fastcluster'
```

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

```
##
```

```
##      hclust
```

```
##
```

```
##
```

```
## Attaching package: 'WGCNA'
```

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

```
##
```

```
##      cor
```

```
library(ggdendro)
```

```
## Warning: package 'ggdendro' was built under R version 3.6.1
```

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.6.1
```

Importing data files from female and male liver tissues from mice, and exploring them.

```
mydataf <- read.csv("./FemaleLiver-Data/LiverFemale3600.csv", header = TRUE)
```

```
colnames(mydataf)
```

```
##      [1] "substanceBXH"  "gene_symbol"  "LocusLinkID"  "ProteomeID"
##      [5] "cytogeneticLoc" "CHROMOSOME"   "StartPosition" "EndPosition"
##      [9] "F2_2"          "F2_3"         "F2_14"        "F2_15"
##     [13] "F2_19"         "F2_20"        "F2_23"        "F2_24"
##     [17] "F2_26"         "F2_37"        "F2_42"        "F2_43"
##     [21] "F2_45"         "F2_46"        "F2_47"        "F2_48"
##     [25] "F2_51"         "F2_52"        "F2_54"        "F2_63"
##     [29] "F2_65"         "F2_66"        "F2_68"        "F2_69"
##     [33] "F2_70"         "F2_71"        "F2_72"        "F2_78"
##     [37] "F2_79"         "F2_80"        "F2_81"        "F2_83"
##     [41] "F2_86"         "F2_87"        "F2_88"        "F2_89"
##     [45] "F2_107"        "F2_108"       "F2_109"       "F2_110"
##     [49] "F2_111"        "F2_112"       "F2_117"       "F2_119"
##     [53] "F2_125"        "F2_126"       "F2_127"       "F2_141"
##     [57] "F2_142"        "F2_143"       "F2_144"       "F2_145"
##     [61] "F2_154"        "F2_155"       "F2_156"       "F2_157"
##     [65] "F2_162"        "F2_163"       "F2_164"       "F2_165"
##     [69] "F2_166"        "F2_167"       "F2_169"       "F2_180"
##     [73] "F2_181"        "F2_182"       "F2_187"       "F2_188"
##     [77] "F2_189"        "F2_190"       "F2_191"       "F2_192"
```

```
## [81] "F2_194"      "F2_195"      "F2_200"      "F2_201"
## [85] "F2_212"      "F2_213"      "F2_214"      "F2_215"
## [89] "F2_221"      "F2_222"      "F2_223"      "F2_224"
## [93] "F2_225"      "F2_226"      "F2_227"      "F2_228"
## [97] "F2_241"      "F2_242"      "F2_243"      "F2_244"
## [101] "F2_245"      "F2_247"      "F2_248"      "F2_261"
## [105] "F2_263"      "F2_264"      "F2_270"      "F2_271"
## [109] "F2_272"      "F2_278"      "F2_287"      "F2_288"
## [113] "F2_289"      "F2_290"      "F2_291"      "F2_296"
## [117] "F2_298"      "F2_299"      "F2_300"      "F2_302"
## [121] "F2_303"      "F2_304"      "F2_305"      "F2_306"
## [125] "F2_307"      "F2_308"      "F2_309"      "F2_310"
## [129] "F2_311"      "F2_312"      "F2_320"      "F2_321"
## [133] "F2_323"      "F2_324"      "F2_325"      "F2_326"
## [137] "F2_327"      "F2_328"      "F2_329"      "F2_330"
## [141] "F2_332"      "F2_355"      "F2_357"
```

```
head(mydataf)
```

```
## substanceBXH gene_symbol LocusLinkID ProteomeID cytogeneticLoc
## 1 MMT000000044 1700007N18Rik 69339 286025 0
## 2 MMT000000046 Mast2 17776 157466 0
## 3 MMT000000051 Ankrd32 105377 321939 0
## 4 MMT000000076 0 383154 0 0
## 5 MMT000000080 Ldb2 16826 157383 0
## 6 MMT000000102 Rdhs 216453 0 10_70.0_cM
## CHROMOSOME StartPosition EndPosition F2_2 F2_3 F2_14 F2_15
## 1 16 50911260 50912491 -0.01810 0.0642 6.44e-05 -0.05800
## 2 4 115215318 115372404 -0.07730 -0.0297 1.12e-01 -0.05890
## 3 13 74940309 74982847 -0.02260 0.0617 -1.29e-01 0.08710
## 4 16 49345114 49477048 -0.00924 -0.1450 2.87e-02 -0.04390
## 5 5 43546124 43613704 -0.04870 0.0582 -4.83e-02 -0.03710
## 6 10 1337265 1347607 0.17600 -0.1890 -6.50e-02 -0.00846
## F2_19 F2_20 F2_23 F2_24 F2_26 F2_37 F2_42
## 1 0.04830 -0.15197410 -0.00129 -0.23600 -0.0307 -0.02610 0.073705890
## 2 0.04430 -0.09380000 0.09340 0.02690 -0.1330 0.07570 -0.009193803
## 3 -0.11500 -0.06502607 0.00249 -0.10200 0.1420 -0.10200 0.064289290
## 4 0.00425 -0.23610000 -0.06900 0.01440 0.0363 -0.01820 0.477874600
## 5 0.02510 0.08504274 0.04450 0.00167 -0.0680 0.00567 -0.075348680
## 6 -0.00574 -0.01807182 -0.12500 -0.06820 0.1250 0.00998 -0.037366600
## F2_43 F2_45 F2_46 F2_47 F2_48 F2_51 F2_52 F2_54
## 1 -0.0466 -0.00673 -0.0193 0.09040 0.0290 0.0356 -0.0388 -0.0360
## 2 -0.0075 0.01700 0.0722 -0.08390 0.0273 -0.0784 -0.0178 0.1120
## 3 0.0169 -0.01590 -0.1430 -0.00492 -0.0735 0.0657 -0.0197 -0.1290
## 4 0.1440 0.11100 0.0113 0.11900 0.0225 0.0932 0.1430 0.2640
## 5 -0.0673 -0.04720 0.0701 -0.08790 -0.0180 -0.1290 -0.0469 -0.0352
## 6 -0.0402 -0.02190 0.0269 0.13300 0.0732 0.1070 -0.0362 -0.0696
## F2_63 F2_65 F2_66 F2_68 F2_69 F2_70 F2_71 F2_72
## 1 -0.05600 0.009840 -0.0261 0.00856 -0.01180 -0.03350 -0.08310 -0.0471
## 2 0.12300 0.051700 0.0731 0.08670 0.05710 0.00693 -0.00606 -0.0390
## 3 -0.14300 -0.061600 0.0419 -0.29000 -0.10800 -0.09950 -0.00315 0.0975
## 4 -0.09280 -0.000635 -0.0126 0.06910 0.02260 -0.08630 -0.22900 0.0178
## 5 -0.00166 0.058700 -0.0206 -0.13000 0.00392 0.05450 -0.11200 0.1070
## 6 -0.19400 -0.117000 -0.0400 0.06890 0.04320 -0.00338 -0.05270 -0.0416
## F2_78 F2_79 F2_80 F2_81 F2_83 F2_86 F2_87 F2_88
```

```

## 1 -0.02820  0.047264410  0.0296  0.0114  0.0498 -0.0249 -0.00264 -0.02050
## 2  0.01870  0.008471275 -0.0687 -0.0114 -0.0262 -0.0215 -0.09580 -0.01930
## 3  0.01030 -0.134271000  0.1010  0.0521 -0.0607 -0.0285  0.02560 -0.01350
## 4  0.00166  0.064096960  0.0103 -0.0258 -0.0837  0.1880  0.03310 -0.00652
## 5  0.01190  0.008985630 -0.1030 -0.1400 -0.0282 -0.1090  0.02070 -0.01370
## 6 -0.03040  0.025920240  0.0697  0.1150  0.0953  0.0127  0.05490  0.00311
##      F2_89  F2_107  F2_108  F2_109  F2_110  F2_111  F2_112  F2_117
## 1  0.0826 -0.0421  0.0663  0.03620  0.0808 -0.0404  0.0877  0.07240
## 2 -0.1140  0.0815  0.0285  0.00299 -0.0407 -0.0657  0.0643 -0.00022
## 3  0.0796  0.0553 -0.0380  0.12900 -0.0361  0.0441 -0.1640 -0.01420
## 4  0.1550  0.0458  0.0752  0.12200 -0.0104  0.0914 -0.0355  0.06520
## 5 -0.0288 -0.1220  0.1270 -0.09390  0.1200 -0.0850  0.1400  0.00867
## 6  0.0955 -0.1520 -0.0670 -0.00599 -0.0438  0.0634  0.1380 -0.04010
##      F2_119  F2_125  F2_126  F2_127  F2_141  F2_142  F2_143  F2_144
## 1 -0.0210  0.04540 -0.03220 -0.00654  0.03490 -0.0315 -0.02170  0.00370
## 2 -0.0877  0.00167  0.00321 -0.01260 -0.04530 -0.0579  0.05920  0.00239
## 3 -0.0279  0.00677  0.07360  0.01750  0.10900 -0.0216 -0.01250  0.05460
## 4  0.1280  0.05940  0.01630  0.00292  0.00714 -0.0565  0.10200  0.03480
## 5  0.1440  0.08710 -0.03360  0.17300  0.08270  0.0594 -0.00317 -0.06750
## 6  0.1310 -0.12600  0.00484 -0.00256 -0.06800  0.0941 -0.04220  0.12000
##      F2_145      F2_154  F2_155  F2_156  F2_157  F2_162  F2_163  F2_164
## 1  0.0322 -0.02150730 -0.000958 -0.0850  0.00462  0.03990  0.0716 -0.0923
## 2 -0.0383  0.02457782 -0.030300 -0.1260 -0.06670 -0.00637 -0.0161 -0.2340
## 3  0.0403 -0.01674888  0.059900  0.0311 -0.05190  0.01890  0.0207  0.0929
## 4  0.0245  0.06776892  0.016500 -0.0382  0.02120  0.06690  0.0512 -0.2450
## 5  0.0495  0.13520570  0.016500  0.0832  0.04350  0.19300  0.0586 -0.0768
## 6  0.1080 -0.05128296 -0.005590  0.0136  0.09910  0.06770 -0.0520  0.1550
##      F2_165  F2_166  F2_167  F2_169  F2_180      F2_181  F2_182  F2_187
## 1  0.10900  0.0102  0.0337  0.00911  0.03210  0.03144772  0.0543  0.01120
## 2 -0.09610 -0.1290 -0.0109 -0.11300 -0.00677 -0.16704700 -0.0239  0.00304
## 3  0.00917  0.0874 -0.1260 -0.00949 -0.09900  0.02700180 -0.0570 -0.05160
## 4  1.23000 -0.0402 -0.0635  0.06880  0.03790 -0.02058180  0.0227  0.04180
## 5  0.04600  0.0484  0.2810  0.07210 -0.00630  0.37074790  0.0618  0.10800
## 6  0.07890  0.0336  0.0648  0.14400  0.02770  0.09297908  0.0601  0.02960
##      F2_188  F2_189  F2_190  F2_191  F2_192  F2_194  F2_195  F2_200
## 1  0.01060  0.1130 -0.03960 -0.0504  0.0877 -0.0563 -0.00557 -0.0484
## 2 -0.03580 -0.1330 -0.01830 -0.0623 -0.0648 -0.0652  0.05020 -0.0912
## 3 -0.04970  0.1660  0.05000  0.0498  0.0431 -0.0224 -0.10700  0.0715
## 4  0.01010  0.2170  0.00206 -0.0155  0.6550  0.2820 -0.01310 -0.0387
## 5  0.12100  0.0237  0.02960  0.1130  0.0839  0.1050  0.15500  0.0823
## 6  0.00198  0.0251  0.00059 -0.0282  0.0429  0.0697  0.04930  0.0414
##      F2_201      F2_212  F2_213  F2_214  F2_215  F2_221  F2_222  F2_223
## 1 -0.0273 -0.10816380 -0.0183 -0.0132 -0.00432 -0.6630  0.01440  0.0310
## 2 -0.0180  0.05682362 -0.0238  0.0721  0.03910  0.1070  0.00923 -0.0397
## 3  0.0432 -0.13217820  0.0205 -0.0411  0.07670 -0.0783 -0.06860 -0.0254
## 4 -0.0667 -0.32395020 -0.0245  0.0865  0.06470 -2.0000  0.00874  0.0847
## 5  0.1140  0.03542023 -0.2020  0.0822  0.04260  0.1030 -0.10100  0.1630
## 6 -0.0708 -0.10881230  0.0359 -0.0678 -0.11000 -0.1420  0.08430 -0.0610
##      F2_224  F2_225  F2_226  F2_227  F2_228  F2_241  F2_242  F2_243
## 1  0.00818 -0.00892 -0.08710  0.0129  0.0937  0.0313  0.0821  0.00621
## 2 -0.06400  0.06300 -0.00152  0.0555  0.0947 -0.0387  0.0592 -0.00636
## 3 -0.05680 -0.13300 -0.07560 -0.0557 -0.0890 -0.1460 -0.0739 -0.01120
## 4 -0.09720  0.00746 -0.55200  0.0415  0.0733  0.0815  0.1100  0.21400
## 5  0.07410 -0.01640  0.08700 -0.0557 -0.1910  0.0219  0.0913  0.01120

```

```
## 6 0.08760 -0.03960 0.10200 0.0190 -0.1190 0.0687 -0.0525 -0.00716
## F2_244 F2_245 F2_247 F2_248 F2_261 F2_263 F2_264
## 1 0.0307 -0.13700 0.075300 -0.096881950 -0.01670 -0.0928 -0.00957
## 2 0.0614 0.02850 -0.000633 0.001598228 -0.00267 -0.0198 0.16300
## 3 -0.0528 0.05050 0.027700 -0.067933370 -0.02220 -0.0684 -0.04930
## 4 0.0135 -0.13500 -0.003100 0.072318780 0.01030 -0.3150 0.08420
## 5 0.1190 0.00383 0.041700 -0.038618510 0.11800 0.0123 0.03700
## 6 -0.1460 -0.14500 0.029400 0.035281240 -0.05660 0.0917 -0.08080
## F2_270 F2_271 F2_272 F2_278 F2_287 F2_288 F2_289 F2_290
## 1 0.0287 -0.01300 -0.0292 -0.03810 -0.0488 0.17361240 -0.097900 0.0383
## 2 -0.1310 -0.04260 -0.0514 0.07260 -0.0481 -0.16211430 -0.123000 -0.1370
## 3 0.0328 0.00537 -0.0259 -0.14400 0.0170 0.25924220 -0.041400 -0.0229
## 4 0.0351 NA 0.0730 0.00914 0.0556 0.18311140 0.051700 0.1780
## 5 -0.0142 0.00563 -0.0504 -0.05970 -0.0871 0.20897910 -0.000188 -0.0328
## 6 0.0362 0.00790 -0.0246 -0.07330 0.0125 -0.04778892 0.082500 0.1360
## F2_291 F2_296 F2_298 F2_299 F2_300 F2_302 F2_303 F2_304
## 1 0.01850 -0.08937784 0.0230 -0.06250 -0.000142 0.0344 0.0358 -0.0139
## 2 -0.05720 -0.07416870 -0.0688 -0.06540 -0.102000 -0.0780 -0.0820 -0.1830
## 3 -0.00664 -0.05915232 -0.0134 0.09740 0.015500 -0.0934 0.1780 0.0842
## 4 0.05250 -0.21653720 -0.2210 -0.00266 0.545000 0.0127 0.0273 -0.0928
## 5 -0.16600 -0.07897525 0.1410 -0.12900 0.090600 -0.1330 -0.2120 -0.0797
## 6 0.04620 0.03811979 -0.0346 0.04690 -0.034800 0.0110 0.0323 0.1660
## F2_305 F2_306 F2_307 F2_308 F2_309 F2_310 F2_311 F2_312
## 1 0.0134 -0.03145069 0.02780 -0.01190 -0.0744 0.00197 -0.0151 -0.0721
## 2 -0.0270 -0.09822316 -0.07890 -0.05480 -0.1320 -0.11000 -0.1130 -0.0805
## 3 0.0870 0.15520470 0.03410 -0.06830 0.0555 -0.04060 0.0835 0.0514
## 4 0.0469 0.10038160 -2.00000 0.05240 0.1260 0.07280 0.0600 -0.0455
## 5 -0.0191 -0.11958500 0.00294 -0.10600 -0.0518 -0.13200 0.0494 0.0221
## 6 -0.0866 0.05385017 0.09570 -0.00949 0.1120 0.20800 0.0872 -0.0555
## F2_320 F2_321 F2_323 F2_324 F2_325 F2_326 F2_327 F2_328
## 1 -0.0118 0.0200 0.0222 0.047700 -0.0488 0.0168 -0.0309 0.02740
## 2 -0.1200 0.0101 -0.1610 -0.049200 -0.0350 -0.0738 -0.1730 -0.07380
## 3 0.0713 -0.1130 0.0466 0.000612 0.1210 0.0996 0.1090 0.02730
## 4 -0.0464 0.0667 -0.1850 -0.270000 0.0803 0.0424 0.1610 0.05120
## 5 0.0272 -0.0938 0.1020 0.113000 -0.0859 -0.1340 0.0639 0.00731
## 6 0.0748 -0.1420 0.0590 -0.080000 -0.1200 0.1230 0.1870 0.05410
## F2_329 F2_330 F2_332 F2_355 F2_357
## 1 -0.0310 0.0660 -0.0199 -0.0146 0.065000
## 2 -0.2010 -0.0820 -0.0939 0.0192 -0.049900
## 3 0.1200 -0.0629 -0.0395 0.1090 0.000253
## 4 0.2410 0.3890 0.0251 -0.0348 0.114000
## 5 0.1240 -0.0212 0.0870 0.0512 0.024300
## 6 0.0699 0.0708 0.1450 -0.0399 0.037500
```

```
mydatam <- read.csv("./LiverMale3600.csv")
head(mydatam)
```

```
## substanceBXH gene_symbol LocusLinkID ProteomeID cytogeneticLoc
## 1 MMT00000044 1700007N18Rik 69339 286025 0
## 2 MMT00000046 Mast2 17776 157466 0
## 3 MMT00000051 Ankrd32 105377 321939 0
## 4 MMT00000076 0 383154 0 0
## 5 MMT00000080 Ldb2 16826 157383 0
## 6 MMT00000102 Rdhs 216453 0 10_70.0_cM
## CHROMOSOME StartPosition EndPosition F2_4 F2_5 F2_6 F2_7
```

## 1	16	50911260	50912491	-0.0444	-0.0179	-0.0431	0.03580		
## 2	4	115215318	115372404	0.1250	0.0507	0.1290	0.13900		
## 3	13	74940309	74982847	-0.1510	-0.0689	-0.0925	0.00353		
## 4	16	49345114	49477048	-0.1650	-0.0285	2.0000	0.04570		
## 5	5	43546124	43613704	-0.0724	-0.0603	-0.0569	0.02610		
## 6	10	1337265	1347607	-0.1430	-0.0663	-0.1570	-0.23700		
##	F2_8	F2_9	F2_10	F2_13	F2_16	F2_17	F2_18	F2_22	
## 1	0.0263	0.15400	0.000109	0.0254	-0.0294	0.1160	0.0431	-0.0267	
## 2	0.2370	-0.00483	0.007490	0.0227	0.0355	0.0836	0.1230	0.1180	
## 3	-0.1610	-0.00932	-0.191000	0.0809	0.0692	-0.1350	-0.0471	-0.0785	
## 4	-0.4550	0.33200	0.043500	0.0944	0.1640	0.0774	0.0169	-0.1030	
## 5	-0.1130	-0.01210	-0.161000	0.0100	-0.1320	-0.1550	-0.1420	-0.0666	
## 6	-0.2090	-0.09170	0.060800	-0.1330	-0.0683	-0.2010	-0.2530	-0.2020	
##	F2_27	F2_28	F2_29	F2_30	F2_33	F2_34	F2_35	F2_39	
## 1	-0.2160	-0.12700	0.0377	-0.07320	-0.0137	0.0434	-0.0277	0.0667	
## 2	0.1200	0.16300	0.1570	0.20600	-0.0102	0.1460	0.1890	0.1170	
## 3	-0.0352	0.00584	-0.1070	-0.07020	-0.0273	0.0426	0.0314	0.0751	
## 4	-0.2080	-0.25600	0.0204	-0.04560	-0.8740	-0.8230	0.2260	0.1750	
## 5	-0.0351	-0.03760	-0.0966	0.00728	-0.0629	0.1210	-0.2050	0.0322	
## 6	-0.1110	-0.12700	-0.0948	-0.19000	-0.1610	-0.1260	-0.1760	-0.1850	
##	F2_40	F2_41	F2_49	F2_50	F2_55	F2_56	F2_57	F2_59	
## 1	0.0283	0.0541	0.0533	-0.06555326	-0.00713	0.0453	0.0256	0.02944015	
## 2	0.2400	0.1560	0.0114	-0.02107601	0.10900	0.1700	0.2540	0.08054645	
## 3	-0.1070	-0.0586	-0.0698	-0.07634149	-0.03310	-0.0901	-0.0965	-0.11589100	
## 4	0.0204	0.0801	-0.0481	-0.17293770	0.13600	0.0427	0.0187	0.35591750	
## 5	-0.0158	-0.0989	-0.0752	-0.03223757	-0.06150	0.0164	-0.1050	-0.05905863	
## 6	-0.2190	-0.2260	0.0867	-0.08595835	-0.06300	-0.1770	-0.1320	-0.05455500	
##	F2_60	F2_73	F2_74	F2_75	F2_76	F2_84	F2_85	F2_91	F2_92
## 1	-0.0459	0.0338	-0.0458	0.0201	0.0300	-0.0352	-0.1050	0.0259	0.0939
## 2	0.1890	0.1640	0.0728	0.1230	0.1360	0.2380	0.1000	0.2040	0.1950
## 3	-0.0930	-0.0391	0.0406	-0.0223	-0.0397	-0.0299	-0.0903	-0.2060	-0.1140
## 4	0.0437	-0.2150	-0.0366	0.0152	0.0448	0.4910	-0.5400	0.0573	-0.0314
## 5	-0.1030	0.0122	-0.1220	-0.0603	-0.0907	-0.0313	-0.0243	-0.2260	0.0257
## 6	-0.2250	-0.1760	-0.0801	-0.1050	-0.1510	-0.1560	-0.1650	-0.0885	-0.2140
##	F2_93	F2_94	F2_104	F2_105	F2_114	F2_115	F2_116	F2_120	
## 1	0.04060	0.05805066	-0.0118	0.0143	-0.08070	-0.0418	-0.0559	0.00961	
## 2	0.06750	-0.09036969	0.2950	-0.0661	-0.02010	0.0179	0.0837	0.04040	
## 3	-0.01200	-0.04731417	-0.1050	0.0588	0.00895	0.1190	0.0474	-0.08880	
## 4	0.08910	0.03246458	0.0498	0.0764	-0.07570	0.0532	-0.1520	0.14000	
## 5	0.00118	-0.01082061	0.0462	0.0566	0.00530	0.0935	-0.0622	0.05640	
## 6	-0.08690	-0.01983479	-0.2880	-0.0425	-0.10000	-0.1520	-0.1490	-0.03080	
##	F2_121	F2_122	F2_123	F2_124	F2_146	F2_147	F2_148	F2_149	
## 1	0.02130	-0.000128	0.04350	0.01260	0.003750	0.00994	-0.0225	0.0593	
## 2	0.15900	0.004370	0.02910	0.05050	0.049400	0.17200	-0.0412	0.0968	
## 3	-0.13600	0.052000	-0.00612	0.04040	0.008640	0.02550	-0.0475	0.0802	
## 4	-0.03820	-0.041300	0.09380	-0.11600	-0.048700	0.07400	0.0380	0.0568	
## 5	0.00566	-0.000152	0.07480	-0.00657	-0.000285	0.13500	0.1200	-0.0286	
## 6	-0.10200	-0.093200	-0.04530	-0.16100	-0.085200	-0.18200	-0.0417	-0.1450	
##	F2_151	F2_152	F2_153	F2_158	F2_159	F2_160	F2_170	F2_171	
## 1	-0.00857	0.0288	0.0761	0.000479	-0.0189	0.0438	0.0149	0.02290	
## 2	0.04930	-0.0367	-0.1340	0.138000	-0.0126	0.0757	0.0853	0.14800	
## 3	0.04530	0.0184	0.0162	-0.052900	0.0576	-0.0076	-0.0349	-0.03930	
## 4	-0.00238	-0.0396	0.0121	0.026400	0.0114	0.0108	0.0861	0.01890	
## 5	0.15700	-0.0247	0.1090	0.004630	-0.1240	-0.0387	0.0269	0.00419	

```

## 6 -0.04530 -0.0119 0.0662 -0.063400 0.0423 -0.0895 -0.1090 -0.11600
##      F2_172 F2_173 F2_174 F2_176 F2_178 F2_179 F2_183 F2_184
## 1 0.0812 -0.0100 0.0492 0.03220 0.07230 -0.0196 -0.05150 0.00377
## 2 -0.0538 0.1300 0.1850 0.02230 0.00528 0.0265 0.03850 0.19300
## 3 0.0696 0.0564 -0.0620 0.02440 0.00459 -0.0327 0.00872 -0.04460
## 4 0.0772 0.0169 0.0694 0.00808 0.15500 -0.1810 -0.03080 -0.01700
## 5 -0.0258 -0.1100 0.0790 0.08090 -0.02610 -0.0216 -0.08210 0.03000
## 6 0.0621 -0.1820 -0.1480 -0.09400 0.00701 -0.0180 0.06090 -0.18000
##      F2_185      F2_186      F2_197      F2_198      F2_199      F2_207      F2_208      F2_209
## 1 0.03590 0.02331811 0.08710 0.00320 -0.0152 0.0919 0.0745 -0.07960
## 2 0.06140 0.05443614 -0.09730 0.02270 0.0731 0.1870 0.1540 0.14400
## 3 -0.07370 -0.16528400 0.00276 0.00964 -0.0403 -0.0760 -0.0429 -0.12000
## 4 -0.12100 -0.04767130 -0.06740 0.00838 0.0253 0.2100 -0.3510 0.09110
## 5 0.00615 0.05199314 0.04700 0.04130 -0.0335 0.1610 0.1570 0.00777
## 6 0.00157 -0.05937405 -0.04100 -0.04790 -0.1440 -0.2910 -0.2530 -0.11300
##      F2_210      F2_216      F2_217      F2_218      F2_219      F2_220      F2_230      F2_231
## 1 0.0848 -0.093800 -0.0898 0.0472 0.00513 0.0578 0.05616089 0.1470
## 2 0.0594 0.109000 0.0791 0.2110 0.08110 0.1580 0.19241050 0.1410
## 3 -0.0627 -0.029200 0.1090 -0.0459 -0.06390 -0.1700 -0.09710876 -0.0163
## 4 0.0349 -0.024900 -0.0165 0.7450 0.04310 0.0427 0.38320980 0.1750
## 5 0.0935 0.000275 -0.0371 0.0980 0.07460 0.2250 -0.11742250 -0.0112
## 6 -0.0358 -0.042800 -0.1930 -0.1750 -0.02980 -0.1190 -0.15757000 -0.0319
##      F2_232      F2_233      F2_234      F2_235      F2_236      F2_237      F2_238      F2_239
## 1 0.018600 0.0976 0.0160 0.05150205 0.0394 0.00542 0.000242 -0.01540
## 2 0.056600 0.2570 0.2590 0.14049010 0.0965 0.04190 0.009570 0.11900
## 3 -0.000807 -0.1110 -0.1750 -0.09649123 0.0154 -0.00482 0.014500 -0.00822
## 4 -0.040400 0.0284 -0.1630 0.02090355 0.0610 0.04090 0.004970 0.19500
## 5 0.007410 0.2130 0.0578 0.06377663 -0.0739 -0.03110 0.019900 -0.02510
## 6 -0.046300 -0.2130 -0.2990 -0.10599170 -0.0209 -0.14300 0.069700 -0.08810
##      F2_249      F2_250      F2_251      F2_252      F2_254      F2_256      F2_257
## 1 -0.02430 -0.1010 0.0626 -0.060100 0.11600 0.03889860 0.07270702
## 2 0.08050 0.1460 0.0296 0.243000 0.18900 0.13016450 0.03534575
## 3 0.00863 -0.0533 -0.0225 0.011700 -0.19800 -0.06286667 -0.13364770
## 4 0.04790 -0.2420 0.1500 -0.000738 0.21100 0.06825731 0.04275748
## 5 0.03110 -0.0222      NA 0.133000 -0.00411 -0.08267811 0.08027854
## 6 -0.13200 -0.1830 -0.1090 -0.237000 -0.19800 -0.15300000 0.00877483
##      F2_265      F2_266      F2_268      F2_274      F2_275      F2_276      F2_279      F2_280
## 1 -0.0290 0.0550 -0.0312 -0.02870776 0.05570 -0.0859 0.01570 0.1010
## 2 0.0221 0.1020 0.1030 0.07293987 0.00983 0.0640 0.05220 0.2420
## 3 -0.0235 -0.0451 -0.0247 -0.68900000 0.02710 -0.0721 0.00623 -0.1590
## 4 0.2240 0.1280 0.0340 0.12850620 -0.09060 0.3490 -0.04130 0.0187
## 5 -0.0183 -0.0851 -0.0846 -0.19800000 -0.02600 -0.1410 0.00820 -0.0193
## 6 -0.0432 -0.0188 -0.1010 0.03046819 -0.05890 -0.0467 -0.10800 -0.2750
##      F2_281      F2_282      F2_284      F2_285      F2_286      F2_292      F2_294
## 1 -0.02040 -0.00133 0.0414 0.020115580 -0.00453 0.1898726 0.04873549
## 2 -0.01090 0.04050 0.0824 0.013043140 0.12100 0.0674650 -0.02203408
## 3 0.00717 0.03830 0.0193 0.007803106 -0.06740 0.1602482 -0.03922225
## 4 0.01140 0.05380 1.9100 -0.088830460 -0.00285 0.1820795 -0.14910580
## 5 -0.12600 -0.06070 -0.0211 0.206402900 -0.01670 0.1148936 -0.02899761
## 6 0.00944 -0.04300 -0.1100 -0.099250960 -0.12500 -0.1783375 -0.08796206
##      F2_295      F2_313      F2_314      F2_315      F2_316      F2_317      F2_318      F2_343
## 1 0.01950 0.00240 -0.09950 -0.0872 -0.103662100 0.0242 0.00536 0.1340
## 2 -0.01470 0.19700 0.09810 0.0618 0.098719220 0.0104 0.09670 -0.0248
## 3 0.11700 -0.00744 0.00862 0.0130 -0.002592110 0.0946 0.01590 -0.0934

```

```
## 4  0.14100  0.04860 -0.03720  0.7800  0.280451100 -0.0560  0.02180  0.2100
## 5  0.00608  0.05360 -0.04540 -0.1290  0.001011547  0.0877 -0.07280 -0.0284
## 6 -0.02930 -0.17800 -0.09560 -0.0600 -0.067627370 -0.0127 -0.07340  0.0180
##      F2_353
## 1  0.15584910
## 2  0.11533460
## 3 -0.13519600
## 4  0.24050990
## 5 -0.13719800
## 6 -0.06457439
```

```
## LocusLinkID and ProteomeID are annotations from the said databases
## http://www.ncbi.nlm.nih.gov/LocusLink/
```

Moving on, we extract expression data from the master dataframe. Recall that the rows represent genes and the columns represent different samples (mice) in the original data. WGCNA requires that genes be given in columns.

```
exprdata = as.data.frame(t(mydataf[, -c(1:8)]))
names(exprdata) = mydataf$substanceBXH
rownames(exprdata) = names(mydataf)[-c(1:8)]
```

```
## Let us consider a subset of data for this demonstration. We'll use first 500 features.
```

```
exprdata <- exprdata[,1:500]
```

```
gsg = goodSamplesGenes(exprdata, verbose = 3)
```

```
## Flagging genes and samples with too many missing values...
## ..step 1
```

```
gsg$allOK
```

```
## [1] TRUE
```

A scale free network topology is the one where all nodes's degree distribution is in abidance to power law ,i.e.  $P(k) \sim k^{-\gamma}$ . If any nodes have to be added to this connected network, the degrees are accordingly adjusted.

```
trial_powers <- c(c(1:10), seq(from=12, to=20, by=2))
```

```
sample_tree <- as.dendrogram(hclust(dist(exprdata), method = "average"))
```

```
dplot <- gg dendrogram(data= sample_tree, rotate = FALSE)+
  theme_dendro()+
  ggtitle("Sample clustering to detect outliers")+
  theme(plot.title = element_text(hjust = 0.5))+
  xlab("Samples")
```

```
print(dplot)
```



## Sample clustering to detect outliers

