Gen Statistics

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```
library("lattice")
library("parallel")
library("corrplot")
```

```
cor.clavage.gen <- function(df, Type.segment, threshold, left.b = 0, right.b = 1) {
  df_length = length(df)
  v.df <- lapply(df, function(x) { droplevels(subset(x, x$Type == Type.segment)) })
  v.df_true <- lapply(v.df, function(x) droplevels(subset(x, x$Clavage)))

  #t_full <- lapply(v.df, function(x) { table(x$subject_id)})
  t_full <- lapply(v.df, function(x) { unlist(by(x, x$subject_id, function(y) sum(y$abundance), simplify
  #t_full <- t_full[-(length(t_full) - 2)]
  #t_true <- lapply(v.df_true, function(x) table(x$subject_id))
  t_true <- lapply(v.df_true, function(x) { unlist(by(x, x$subject_id, function(y) sum(y$abundance), si
  #t_true <- t_true[-(length(t_true) - 2)]

  #ind <- lapply(t_true, function(x) which(x > threshold))
  #t_full <- mapply(function(x, i) { x[i] }, t_full, ind, SIMPLIFY = FALSE)
  t_true <- lapply(t_true, function(x) { x[x > threshold] })
  t_full <- mapply(function(x, y) { x[names(y)] }, t_full, t_true, SIMPLIFY = FALSE)
  #mapply(function(x, y) { sort(x / y) }, t_true, t_full)

  intersectSeveral <- function(...) { Reduce(function(x, y) { intersect(x, y) }, list(...)[[1]]) }
  t_full_intersected <- lapply(t_full, function(x) x[intersectSeveral(lapply(t_true, names))])
  t_true_intersected <- lapply(t_true, function(x) x[intersectSeveral(lapply(t_true, names))])
  #print(t_full_intersected)
  #mapply(function(x, y) sort(x / y), t_true_intersected, t_full_intersected, SIMPLIFY = FALSE)

  p_clavage <- mapply(function(x, y) x / y, t_true_intersected, t_full_intersected, SIMPLIFY = FALSE)
  #apply(simplify2array(p_clavage), 1, mean)
  #apply(simplify2array(p_clavage), 1, sd)

  s2a_p_clavage <- simplify2array(p_clavage)
  s2a_p_clavage
}

cor.clavage.gen.all <- function(df, threshold = 1000) {
  df <- mclapply(df, function(x) {x$Clavage <- toupper(x$Clavage); x }, mc.cores = detectCores())
  df <- mclapply(df, function(x) {x$Clavage <- as.logical(x$Clavage); x}, mc.cores = detectCores())
  df <- mclapply(df, function(x) {x$subject_id <- as.factor(x$subject_id); x}, mc.cores = detectCores()
  df <- mclapply(df, function(x) {x$Type <- as.factor(x$Type); x}, mc.cores = detectCores())

  #df <- mclapply(df, function(x) {x[rep(row.names(x), x$abundance),]}, mc.cores = detectCores())
  list("V"       = cor.clavage.gen(df, "V", threshold = threshold),
       "D left"  = cor.clavage.gen(df, "D left", left.b = 0.5, threshold = threshold),
       "D right" = cor.clavage.gen(df, "D right", left.b = 0.5, threshold = threshold),
       "J"       = cor.clavage.gen(df, "J", left.b = 0.8, threshold = threshold)
```

```
  )
}

pairs.plots <- function(barcodes) {
  print(pairs(barcodes[["V"]], xlim = c(0, 1), ylim = c(0, 1), main = "V"))
  print(pairs(barcodes[["D left"]], xlim = c(0.5, 1), ylim = c(0.5, 1), main = "D left"))
  print(pairs(barcodes[["D right"]], xlim = c(0.5, 1), ylim = c(0.5, 1), main = "D right"))
  print(pairs(barcodes[["J"]], xlim = c(0.8, 1), ylim = c(0.8, 1), main = "J"))
}
```

```
df <- lapply((1:9)[-5], function(i) read.csv(paste("../", i, ".csv", sep = ""), header = T, sep = "\t"))
#df <- append(df, list(read.csv("../1_SAM13306969.csv", header = T, sep = "\t")))#, read.csv("2_SAM1330

cleaned.barcodes <- cor.clavage.gen.all(df)
cleaned.barcodes
```

```
## $V
##                 [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
## IGHV1-18   0.5545276 0.4499637 0.5208570 0.5254257 0.5471148 0.5558050
## IGHV1-2    0.5499559 0.5558145 0.5763202 0.1710295 0.1947875 0.5052846
## IGHV1-24   0.7520679 0.7085881 0.7455380 0.7440432 0.7863873 0.8276444
## IGHV1-3    0.6765743 0.5416315 0.5439164 0.6467109 0.6340521 0.5867726
## IGHV1-46   0.5394857 0.4351663 0.5882455 0.6146287 0.5633409 0.5961830
## IGHV1-69   0.6812566 0.5522143 0.6623111 0.6235462 0.7096680 0.3690133
## IGHV1-8    0.5912681 0.6965747 0.5326846 0.5402059 0.5437202 0.5652277
## IGHV2-26   0.8181818 0.7938911 0.8147197 0.7849234 0.8497348 0.8110368
## IGHV2-5    0.7721848 0.7902457 0.7672313 0.8238938 0.7368610 0.7641326
## IGHV3-11   0.6122462 0.5795386 0.4855405 0.6011370 0.6135169 0.5832470
## IGHV3-15   0.6425676 0.7421415 0.6133580 0.5388774 0.5713241 0.5990685
## IGHV3-21   0.4864637 0.5305328 0.5148388 0.5037884 0.4469188 0.5075402
## IGHV3-23   0.6502080 0.6409932 0.6075035 0.6189041 0.6692755 0.6303928
## IGHV3-30   0.4968516 0.4899615 0.4670571 0.5216672 0.4625794 0.4489363
## IGHV3-30-3 0.2181935 0.2113497 0.1893479 0.3065472 0.2025384 0.2487617
## IGHV3-33   0.4007042 0.4082138 0.3400796 0.3950167 0.3861414 0.3964741
## IGHV3-48   0.5525260 0.5690843 0.7261568 0.5651540 0.5920471 0.5466641
## IGHV3-49   0.5512551 0.6750460 0.7801487 0.6292627 0.6643195 0.7214318
## IGHV3-53   0.6283774 0.7615128 0.7040301 0.4870155 0.2815676 0.2674110
## IGHV3-7    0.5796014 0.6960330 0.7049914 0.5285797 0.5602986 0.5808830
## IGHV3-74   0.5396882 0.7247495 0.6085106 0.6340745 0.6886674 0.6153685
## IGHV3-9    0.7165704 0.7669039 0.7260665 0.6696203 0.7158546 0.7423984
## IGHV4-30-2 0.8928691 0.8233510 0.9038305 0.8361225 0.7639809 0.7786514
## IGHV4-30-4 0.6935722 0.6435019 0.6576726 0.7088675 0.7284357 0.6884822
## IGHV4-31   0.6592795 0.5674841 0.7597911 0.6582247 0.7788782 0.5996857
## IGHV4-34   0.4700056 0.5270433 0.5776499 0.5215827 0.4876334 0.5146846
## IGHV4-4    0.5449218 0.6865451 0.6719006 0.7546522 0.8057276 0.6696180
## IGHV4-59   0.7079330 0.6627914 0.6316537 0.7027367 0.7733265 0.6908427
## IGHV5-51   0.6466264 0.7163465 0.6530289 0.7068140 0.6728530 0.5148776
## IGHV6-1    0.6147063 0.4792804 0.6702953 0.6164017 0.5693836 0.6295211
##                 [,7]      [,8]
## IGHV1-18   0.5410756 0.5409450
## IGHV1-2    0.1149752 0.1477103
## IGHV1-24   0.7445038 0.7998245
## IGHV1-3    0.6478548 0.6351860
```

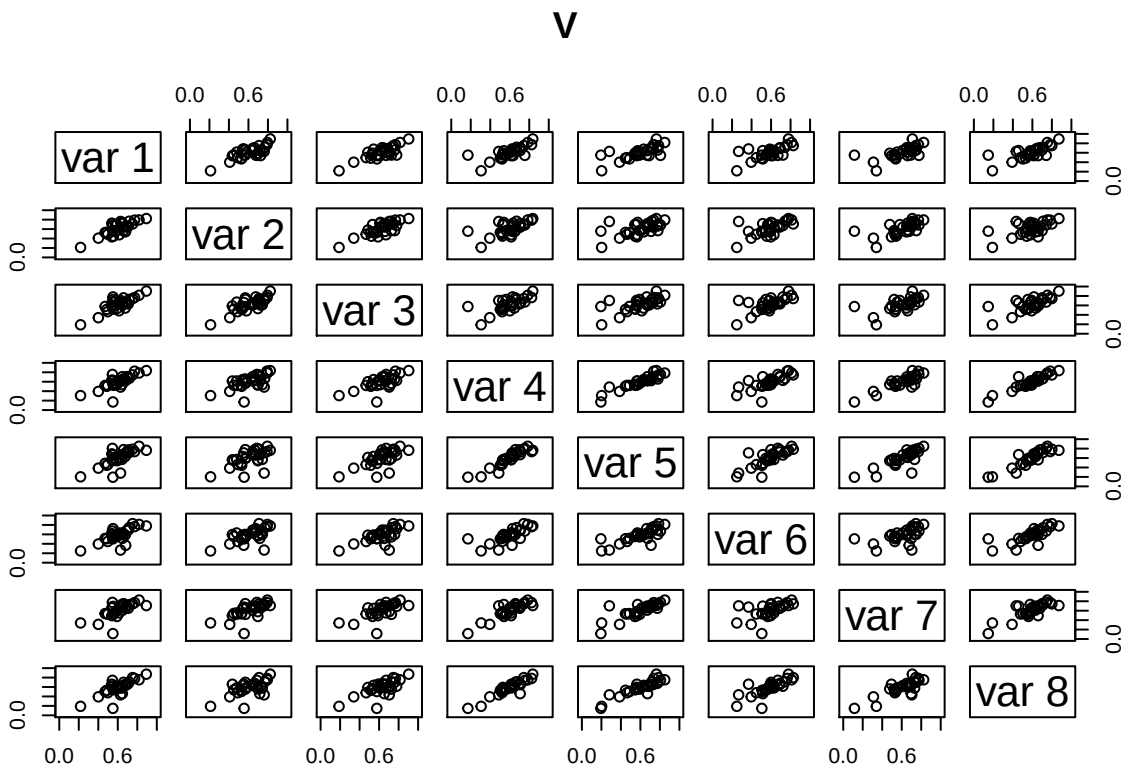
```
## IGHV1-46   0.4947624 0.6587041
## IGHV1-69   0.6761645 0.6592088
## IGHV1-8    0.4775886 0.5595198
## IGHV2-26   0.8247470 0.7535193
## IGHV2-5    0.7713236 0.7823237
## IGHV3-11   0.6600892 0.5919192
## IGHV3-15   0.7324508 0.5773696
## IGHV3-21   0.5360467 0.5312042
## IGHV3-23   0.6114332 0.6312812
## IGHV3-30   0.5298154 0.4784748
## IGHV3-30-3 0.3400515 0.1905280
## IGHV3-33   0.3101006 0.3920429
## IGHV3-48   0.5223061 0.5551956
## IGHV3-49   0.6917573 0.6166756
## IGHV3-53   0.7030798 0.4344660
## IGHV3-7    0.5806315 0.5928144
## IGHV3-74   0.6599058 0.6133538
## IGHV3-9    0.7271032 0.7095766
## IGHV4-30-2 0.7089630 0.8721346
## IGHV4-30-4 0.7001950 0.6504038
## IGHV4-31   0.7492967 0.6996226
## IGHV4-34   0.5389329 0.5040339
## IGHV4-4    0.7764124 0.7422095
## IGHV4-59   0.6517702 0.6774008
## IGHV5-51   0.6974856 0.4593975
## IGHV6-1    0.5532557 0.5808712
##
## $`D left`
##                    [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
## IGHD1-1       0.6801319 0.7672347 0.8309768 0.7653214 0.7095427 0.7222746
## IGHD1-14      1.0000000 0.9799447 1.0000000 0.9950890 0.9981459 0.9861049
## IGHD1-20      0.9555513 0.9353199 0.9873309 0.9549481 0.9730496 0.9713328
## IGHD1-26      0.9572039 0.9693673 0.9617483 0.9560486 0.9733164 0.9607869
## IGHD1-7       0.9491243 0.9306658 0.9641589 0.9168291 0.9453205 0.9122718
## IGHD1/OR15-1b 0.9936414 1.0000000 0.9954853 0.9515829 1.0000000 0.9774075
## IGHD2-15      0.9115469 0.9285092 0.9331715 0.9225357 0.9077738 0.9250330
## IGHD2-2       0.8928145 0.8801841 0.9240558 0.9195719 0.9108394 0.8883855
## IGHD2-21      0.9571418 0.9760379 0.9782349 0.9320130 0.9194441 0.9562419
## IGHD2-8       0.9616781 0.9529489 0.9686969 0.9430001 0.9508692 0.9642101
## IGHD2/OR15-2b 0.9129070 0.9167906 0.8843884 0.8434903 0.8343996 0.8803337
## IGHD3-10      0.9304299 0.9252147 0.9323140 0.9136869 0.8984354 0.9126332
## IGHD3-16      0.9668762 0.9788508 0.9881485 0.9673762 0.9739127 0.9659080
## IGHD3-22      0.8511826 0.8783467 0.8881298 0.8350763 0.8423345 0.8938446
## IGHD3-3       0.8641511 0.9066476 0.8788204 0.8689037 0.8820342 0.8858243
## IGHD3-9       0.8987635 0.9242530 0.9330758 0.8689376 0.8688127 0.9111058
## IGHD3/OR15-3b 0.9982211 0.9971133 1.0000000 0.9976387 0.9927410 0.9989564
## IGHD4-11      0.8242868 0.8877158 0.8871634 0.7986779 0.8479504 0.8269310
## IGHD4-17      0.8065706 0.8407109 0.8598038 0.8195399 0.8260668 0.8396467
## IGHD4-23      0.9596867 0.9799638 0.9599350 0.9302242 0.9405881 0.9303516
## IGHD4/OR15-4b 0.7670087 0.9757351 0.7482569 0.8935299 0.9099437 0.8943173
## IGHD5-12      0.8695085 0.9359108 0.9203784 0.8808838 0.8984146 0.9162109
## IGHD5-24      0.8793036 0.9210184 0.9163504 0.8706572 0.8587340 0.9372137
## IGHD5-5       0.7357924 0.7228246 0.7775680 0.7631177 0.7534266 0.7968374
## IGHD5/OR15-5b 1.0000000 1.0000000 1.0000000 0.9113999 1.0000000 1.0000000
```

```
## IGHD6-13      0.9364467 0.9146075 0.9287218 0.9216681 0.9350588 0.9219230
## IGHD6-19      0.9056982 0.8681856 0.9345824 0.9033812 0.9139507 0.9072741
## IGHD6-25      0.9625737 0.9261142 0.9756604 0.9622442 0.9469427 0.9403891
## IGHD6-6       0.8905328 0.8529002 0.9049656 0.8659692 0.8499330 0.8627585
## IGHD7-27      0.9447132 0.8317823 0.8673413 0.9526436 0.9270187 0.9049755
##                    [,7]      [,8]
## IGHD1-1       0.6020975 0.6228997
## IGHD1-14      0.9934237 0.9920219
## IGHD1-20      0.9644120 0.9652394
## IGHD1-26      0.9590794 0.9460582
## IGHD1-7       0.9184690 0.9009004
## IGHD1/OR15-1b 0.9790769 0.9671897
## IGHD2-15      0.9351240 0.8889085
## IGHD2-2       0.8722522 0.8848197
## IGHD2-21      0.9375022 0.9623968
## IGHD2-8       0.9754963 0.9014697
## IGHD2/OR15-2b 0.9075779 0.9155886
## IGHD3-10      0.9162886 0.8887440
## IGHD3-16      0.9858933 0.9486061
## IGHD3-22      0.8717732 0.8455926
## IGHD3-3       0.8957259 0.8322855
## IGHD3-9       0.9005900 0.8333038
## IGHD3/OR15-3b 0.9972437 1.0000000
## IGHD4-11      0.8332083 0.8379660
## IGHD4-17      0.8525796 0.8274171
## IGHD4-23      0.9645582 0.9393693
## IGHD4/OR15-4b 0.9201751 0.8385861
## IGHD5-12      0.9259785 0.9065433
## IGHD5-24      0.8657131 0.8991597
## IGHD5-5       0.6430131 0.7386692
## IGHD5/OR15-5b 1.0000000 0.9969207
## IGHD6-13      0.9137636 0.9066068
## IGHD6-19      0.9165414 0.8882720
## IGHD6-25      0.9538567 0.9392824
## IGHD6-6       0.8936928 0.8348312
## IGHD7-27      0.9344989 0.9166667
##
## $`D right`
##                    [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
## IGHD1-1       0.8587524 0.8857475 0.9254119 0.7476831 0.8003641 0.8811769
## IGHD1-14      0.7779579 0.8706777 0.8374046 0.8216697 0.7011743 0.7292130
## IGHD1-20      0.4401578 0.3968584 0.4152888 0.3267527 0.2841608 0.4136737
## IGHD1-26      0.8974467 0.8727151 0.8897341 0.8818693 0.8519138 0.8982458
## IGHD1-7       0.6361127 0.5163487 0.6130768 0.4884433 0.5844005 0.5930903
## IGHD2-15      0.8953988 0.9115867 0.9295684 0.8792082 0.8748097 0.8957163
## IGHD2-2       0.9342216 0.9489148 0.9607235 0.9614999 0.9550201 0.9515781
## IGHD2-21      0.9216250 0.9419996 0.9524635 0.9157401 0.8983657 0.9381893
## IGHD2-8       0.9792932 0.9879719 0.9966777 0.9856160 0.9788360 0.9903088
## IGHD2/OR15-2b 0.9738648 0.9819038 0.9796458 0.9825880 0.9668948 0.9899904
## IGHD3-10      0.9749728 0.9655881 0.9753638 0.9801433 0.9690973 0.9751189
## IGHD3-16      0.9896789 0.9834213 0.9895532 0.9929882 0.9786675 0.9845558
## IGHD3-22      0.8667463 0.8890285 0.8519827 0.8733205 0.8576482 0.8695455
## IGHD3-3       0.9810627 0.9861815 0.9788741 0.9845244 0.9822229 0.9877390
## IGHD3-9       0.9881587 0.9935772 0.9989752 0.9870413 0.9942386 0.9949492
```

```
## IGHD3/OR15-3b 1.0000000 0.9837435 0.9764950 0.9968516 1.0000000 1.0000000
## IGHD4-11      0.7491585 0.7555444 0.6639482 0.7159522 0.6644883 0.7338029
## IGHD4-17      0.5179688 0.4438650 0.4678305 0.4943978 0.4361324 0.4665539
## IGHD4-23      0.8238409 0.3982747 0.7263671 0.7702242 0.7570492 0.8279592
## IGHD5-12      0.9424742 0.9189253 0.9070424 0.9392839 0.9287620 0.9502397
## IGHD5-24      0.9161168 0.8945579 0.9276624 0.9348577 0.8913858 0.8877130
## IGHD5-5       0.8165003 0.8116446 0.7868956 0.8254724 0.8145076 0.8028600
## IGHD5/OR15-5b 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 0.9944452
## IGHD6-13      0.6909174 0.6740338 0.7056542 0.6940122 0.6430593 0.6799270
## IGHD6-19      0.7240472 0.7603881 0.7524085 0.7194638 0.7334500 0.7541648
## IGHD6-25      0.8640520 0.7483711 0.7747106 0.7821101 0.7589777 0.6401928
## IGHD6-6       0.7043603 0.7095982 0.7120606 0.7261689 0.7154110 0.7277236
## IGHD7-27      0.4691955 0.4866550 0.4769089 0.6260408 0.5033049 0.5456192
##                    [,7]      [,8]
## IGHD1-1       0.8593461 0.7726287
## IGHD1-14      0.8736548 0.7193982
## IGHD1-20      0.5218833 0.2795763
## IGHD1-26      0.8617624 0.8610976
## IGHD1-7       0.6696841 0.4712218
## IGHD2-15      0.8412932 0.8965957
## IGHD2-2       0.9545590 0.9583645
## IGHD2-21      0.8924968 0.9150866
## IGHD2-8       0.9924604 0.9806866
## IGHD2/OR15-2b 0.9972557 0.9956339
## IGHD3-10      0.9766633 0.9689354
## IGHD3-16      0.9698158 0.9841943
## IGHD3-22      0.8825922 0.8650436
## IGHD3-3       0.9835000 0.9769840
## IGHD3-9       0.9978287 0.9871391
## IGHD3/OR15-3b 0.9972437 1.0000000
## IGHD4-11      0.6864043 0.6397695
## IGHD4-17      0.5022792 0.4103731
## IGHD4-23      0.8313210 0.8243661
## IGHD5-12      0.9296835 0.9296053
## IGHD5-24      0.9139215 0.9320329
## IGHD5-5       0.8521349 0.8249294
## IGHD5/OR15-5b 1.0000000 0.9961509
## IGHD6-13      0.7133047 0.6814279
## IGHD6-19      0.7314599 0.6958181
## IGHD6-25      0.8356749 0.5766636
## IGHD6-6       0.6912213 0.6873913
## IGHD7-27      0.4703865 0.6460031
##
## $J
##            [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
## IGHJ1 0.9533258 0.9065159 0.9142743 0.8765882 0.9019588 0.8992466
## IGHJ2 0.9026760 0.7991560 0.8937085 0.8685936 0.8627862 0.9192151
## IGHJ4 0.9001489 0.8886792 0.8771062 0.8813177 0.8830571 0.8887726
## IGHJ5 0.9261453 0.9152800 0.9268642 0.9046174 0.8954844 0.9156541
## IGHJ6 0.9576270 0.9578468 0.9558093 0.9549989 0.9449632 0.9624135
##            [,7]      [,8]
## IGHJ1 0.9026142 0.8389553
## IGHJ2 0.8824302 0.8372649
## IGHJ4 0.8959509 0.8881644
```

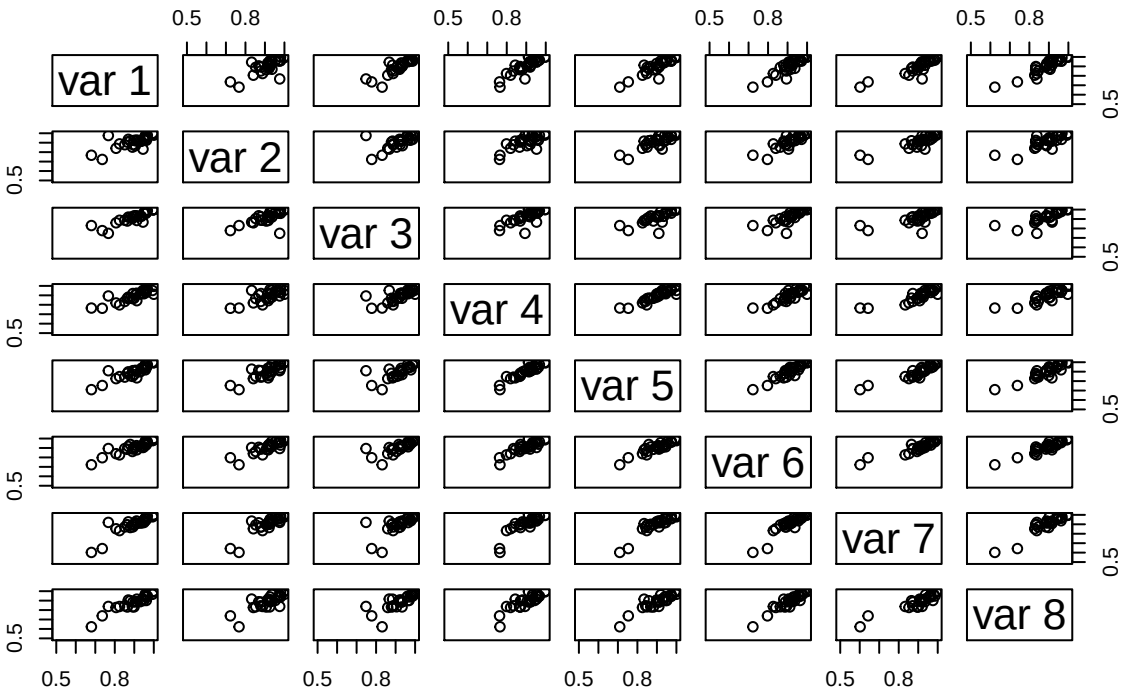
```
## IGHJ5 0.9176387 0.8910945
## IGHJ6 0.9615707 0.9490520
```

```
pairs.plots(cleaned.barcodes)
```



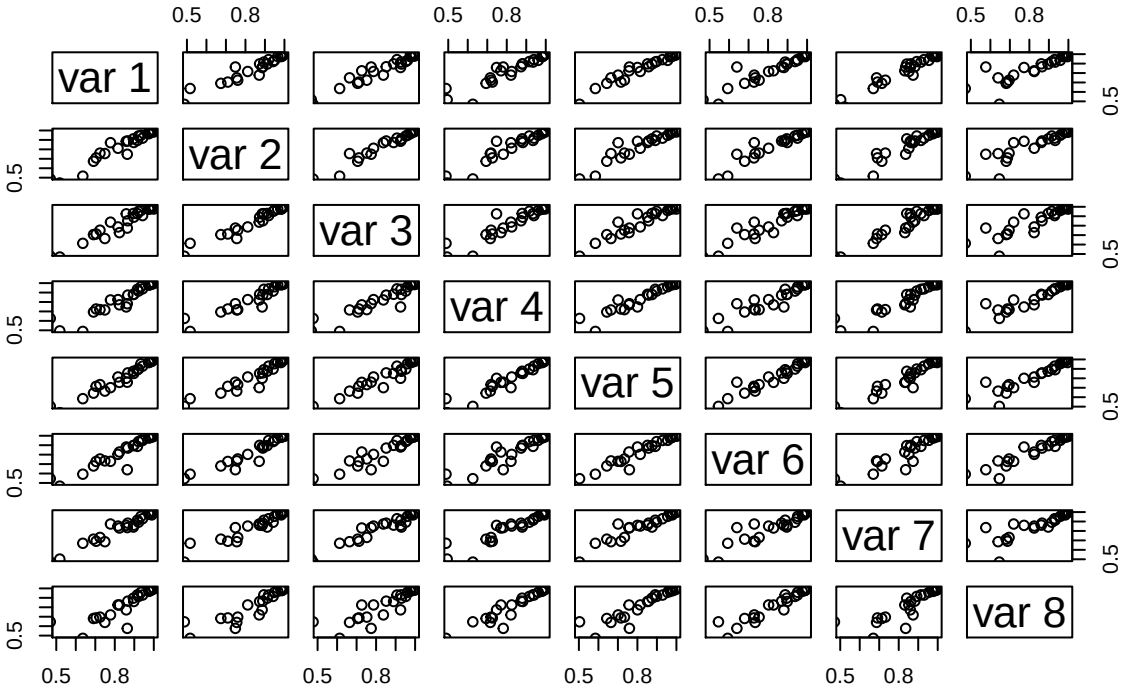

```
## NULL
```

D left

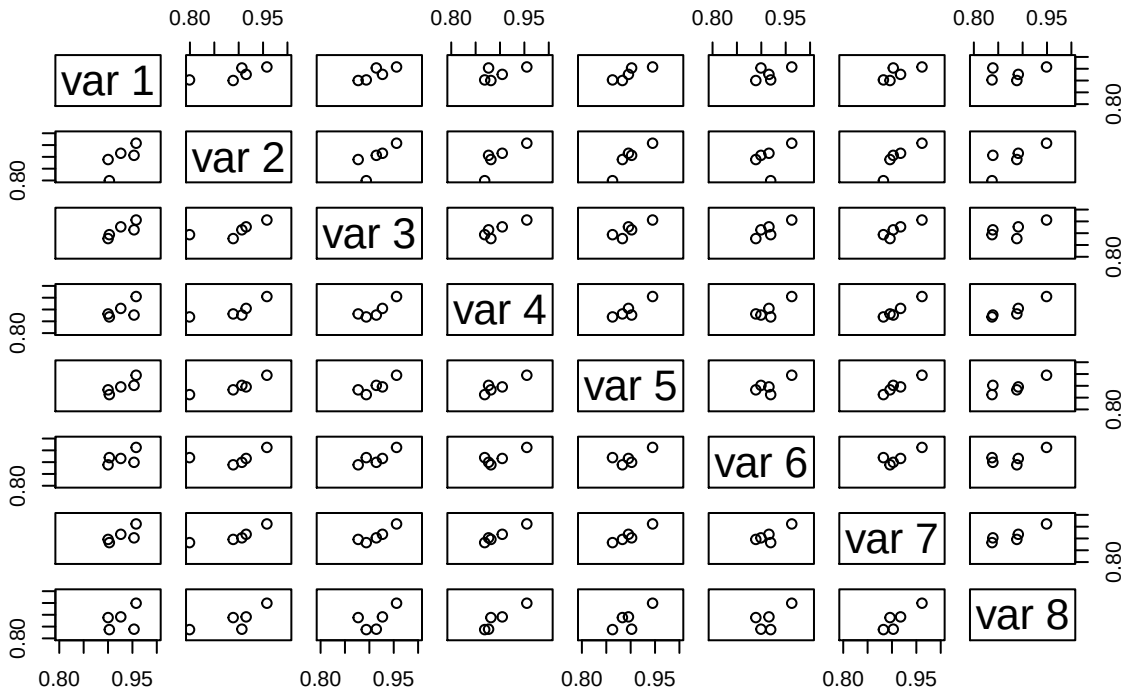



```
## NULL
```

D right



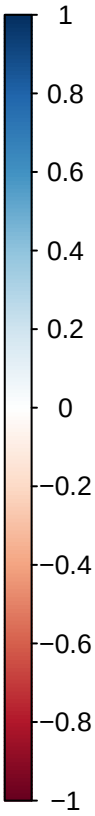

```
## NULL
```




```
## NULL
```

```
corr <- lapply(cleaned.barcodes, cor)
lapply(corr, corrplot, method="number")
```

	1	2	3	4	5	6	7	8
1	1	0.78	0.82	0.75	0.72	0.7	0.68	0.76
2	0.78	1	0.79	0.62	0.58	0.61	0.68	0.6
3	0.82	0.79	1	0.69	0.67	0.68	0.66	0.71
4	0.75	0.62	0.69	1	0.92	0.73	0.87	0.93
5	0.72	0.58	0.67	0.92	1	0.79	0.81	0.91
6	0.7	0.61	0.68	0.73	0.79	1	0.55	0.78
7	0.68	0.68	0.66	0.87	0.81	0.55	1	0.81
8	0.76	0.6	0.71	0.93	0.91	0.78	0.81	1



	1	2	3	4	5
1	1	0.75	0.89	0.87	0.89
2	0.75	1	0.68	0.74	0.84
3	0.89	0.68	1	0.74	0.77
4	0.87	0.74	0.74	1	0.93
5	0.89	0.84	0.77	0.93	1
6	0.9	0.86	0.79	0.88	0.93
7	0.89	0.87	0.72	0.86	0.92
8	0.93	0.81	0.78	0.85	0.91

	1	2	3	4	5	6	7	8
1	1	0.89	0.97	0.95	0.98	0.96	0.98	0.91
2	0.89	1	0.94	0.9	0.9	0.88	0.88	0.85
3	0.97	0.94	1	0.95	0.97	0.96	0.97	0.93
4	0.95	0.9	0.95	1	0.97	0.95	0.93	0.97
5	0.98	0.9	0.97	0.97	1	0.98	0.95	0.96
6	0.96	0.88	0.96	0.95	0.98	1	0.94	0.97
7	0.98	0.88	0.97	0.93	0.95	0.94	1	0.9
8	0.91	0.85	0.93	0.97	0.96	0.97	0.9	1

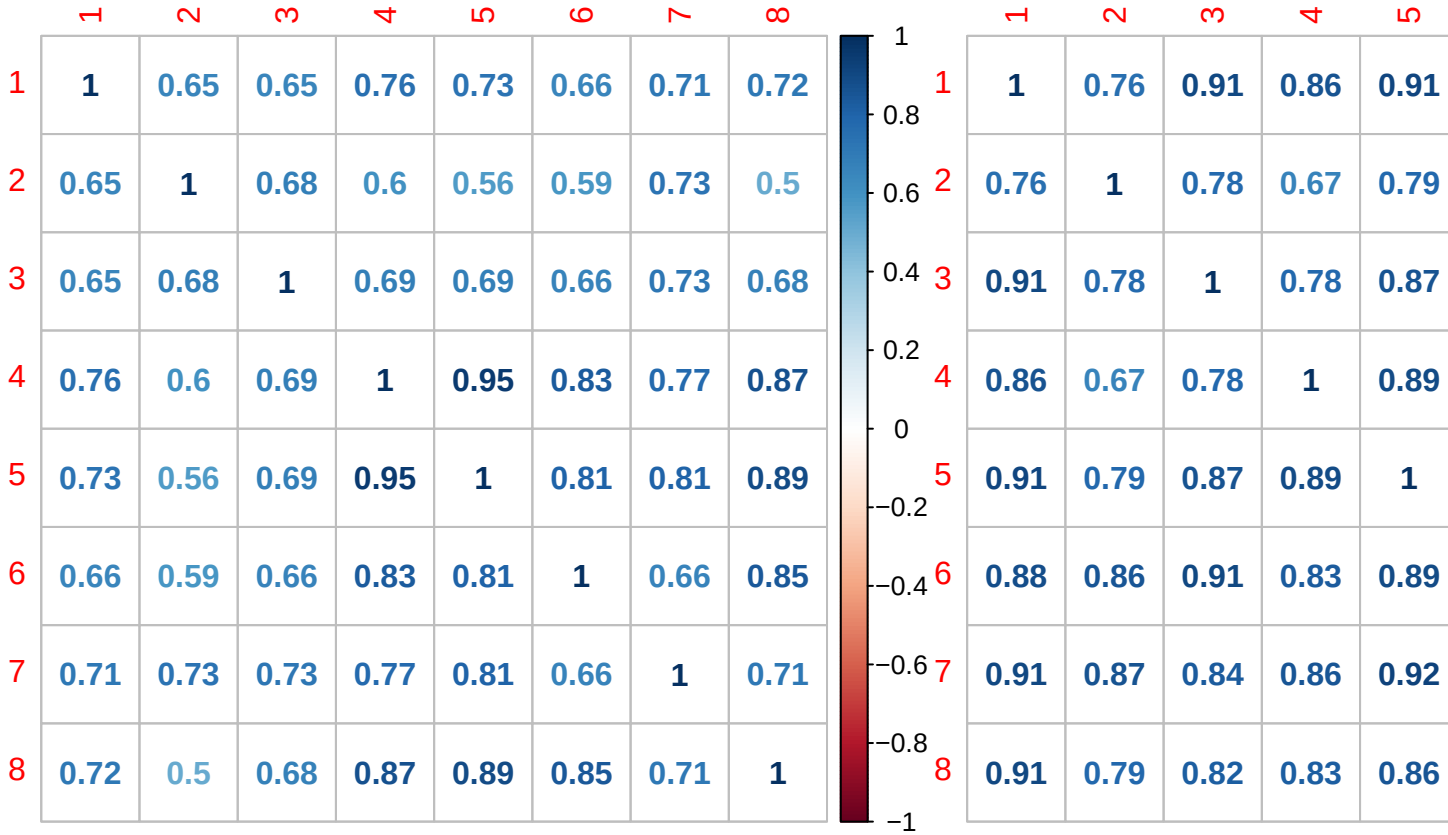
	1	2	3	4	5
1	1	0.74	0.84	0.62	0.85
2	0.74	1	0.71	0.78	0.9
3	0.84	0.71	1	0.87	0.87
4	0.62	0.78	0.87	1	0.91
5	0.85	0.9	0.87	0.91	1
6	0.53	0.39	0.84	0.85	0.7
7	0.73	0.85	0.9	0.99	0.96
8	0.37	0.76	0.64	0.93	0.79

```
## $V
```

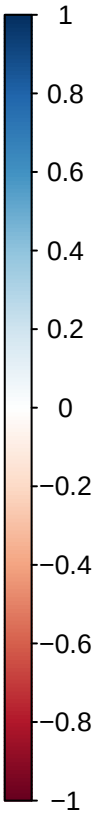
```
##           1         2         3         4         5         6         7
## 1 1.0000000 0.7808167 0.8193162 0.7526654 0.7222875 0.7029092 0.6758442
## 2 0.7808167 1.0000000 0.7900207 0.6221682 0.5816025 0.6112247 0.6783413
## 3 0.8193162 0.7900207 1.0000000 0.6892451 0.6697794 0.6763204 0.6612369
## 4 0.7526654 0.6221682 0.6892451 1.0000000 0.9248277 0.7347513 0.8724737
## 5 0.7222875 0.5816025 0.6697794 0.9248277 1.0000000 0.7879542 0.8125033
## 6 0.7029092 0.6112247 0.6763204 0.7347513 0.7879542 1.0000000 0.5519610
## 7 0.6758442 0.6783413 0.6612369 0.8724737 0.8125033 0.5519610 1.0000000
## 8 0.7588262 0.6011837 0.7118826 0.9262460 0.9087905 0.7773698 0.8138674
##           8
## 1 0.7588262
## 2 0.6011837
## 3 0.7118826
## 4 0.9262460
## 5 0.9087905
## 6 0.7773698
## 7 0.8138674
## 8 1.0000000
##
## $`D left`
##           1         2         3         4         5         6         7
## 1 1.0000000 0.7468751 0.8896625 0.8737702 0.8914265 0.9043319 0.8868540
## 2 0.7468751 1.0000000 0.6835282 0.7438023 0.8355098 0.8624593 0.8670823
## 3 0.8896625 0.6835282 1.0000000 0.7427741 0.7669053 0.7920764 0.7153320
## 4 0.8737702 0.7438023 0.7427741 1.0000000 0.9301237 0.8804529 0.8593031
## 5 0.8914265 0.8355098 0.7669053 0.9301237 1.0000000 0.9293234 0.9154132
## 6 0.9043319 0.8624593 0.7920764 0.8804529 0.9293234 1.0000000 0.9165539
## 7 0.8868540 0.8670823 0.7153320 0.8593031 0.9154132 0.9165539 1.0000000
## 8 0.9267302 0.8142317 0.7815869 0.8523512 0.9100607 0.9394902 0.9165312
##           8
## 1 0.9267302
## 2 0.8142317
## 3 0.7815869
## 4 0.8523512
## 5 0.9100607
## 6 0.9394902
## 7 0.9165312
## 8 1.0000000
##
## $`D right`
##           1         2         3         4         5         6         7
## 1 1.0000000 0.8905080 0.9742811 0.9494808 0.9784261 0.9577249 0.9784851
## 2 0.8905080 1.0000000 0.9373155 0.9014438 0.9015336 0.8846997 0.8806625
## 3 0.9742811 0.9373155 1.0000000 0.9453688 0.9707518 0.9635589 0.9686151
## 4 0.9494808 0.9014438 0.9453688 1.0000000 0.9745137 0.9508893 0.9281139
## 5 0.9784261 0.9015336 0.9707518 0.9745137 1.0000000 0.9766262 0.9546102
## 6 0.9577249 0.8846997 0.9635589 0.9508893 0.9766262 1.0000000 0.9383100
## 7 0.9784851 0.8806625 0.9686151 0.9281139 0.9546102 0.9383100 1.0000000
## 8 0.9140048 0.8512876 0.9256588 0.9711724 0.9607040 0.9722933 0.8972969
##           8
## 1 0.9140048
## 2 0.8512876
## 3 0.9256588
## 4 0.9711724
```

```
## 5 0.9607040
## 6 0.9722933
## 7 0.8972969
## 8 1.0000000
##
## $J
##           1         2         3         4         5         6         7
## 1 1.0000000 0.7433990 0.8394826 0.6180154 0.8514129 0.5325200 0.7317654
## 2 0.7433990 1.0000000 0.7127707 0.7801124 0.9016459 0.3920497 0.8495050
## 3 0.8394826 0.7127707 1.0000000 0.8650515 0.8669765 0.8391165 0.9019379
## 4 0.6180154 0.7801124 0.8650515 1.0000000 0.9082976 0.8532762 0.9863565
## 5 0.8514129 0.9016459 0.8669765 0.9082976 1.0000000 0.7033369 0.9616642
## 6 0.5325200 0.3920497 0.8391165 0.8532762 0.7033369 1.0000000 0.8144924
## 7 0.7317654 0.8495050 0.9019379 0.9863565 0.9616642 0.8144924 1.0000000
## 8 0.3689929 0.7559483 0.6421116 0.9343655 0.7938727 0.6791621 0.8929092
##           8
## 1 0.3689929
## 2 0.7559483
## 3 0.6421116
## 4 0.9343655
## 5 0.7938727
## 6 0.6791621
## 7 0.8929092
## 8 1.0000000
```

```
corr <- lapply(cleaned.barcodes, cor, method = "spearman")
lapply(corr, corrplot, method="number")
```



	1	2	3	4	5	6	7	8
1	1	0.95	0.96	0.98	0.99	0.96	0.95	0.95
2	0.95	1	0.97	0.95	0.96	0.95	0.95	0.94
3	0.96	0.97	1	0.96	0.96	0.96	0.96	0.95
4	0.98	0.95	0.96	1	0.98	0.96	0.96	0.97
5	0.99	0.96	0.96	0.98	1	0.97	0.96	0.97
6	0.96	0.95	0.96	0.96	0.97	1	0.95	0.97
7	0.95	0.95	0.96	0.96	0.96	0.95	1	0.96
8	0.95	0.94	0.95	0.97	0.97	0.97	0.96	1



	1	2	3	4	5
1	1	0.8	0.9	0.5	0.9
2	0.8	1	0.9	0.9	0.9
3	0.9	0.9	1	0.7	0.8
4	0.5	0.9	0.7	1	0.7
5	0.9	0.9	0.8	0.7	1
6	0.6	0.4	0.7	0.3	0.3
7	0.8	1	0.9	0.9	0.9
8	0.5	0.9	0.7	1	0.7

```
## $V
##           1         2         3         4         5         6         7
## 1 1.0000000 0.6547275 0.6525028 0.7557286 0.7303671 0.6582870 0.7107898
## 2 0.6547275 1.0000000 0.6809789 0.6031146 0.5626251 0.5866518 0.7312570
## 3 0.6525028 0.6809789 1.0000000 0.6858732 0.6867631 0.6618465 0.7268076
## 4 0.7557286 0.6031146 0.6858732 1.0000000 0.9501669 0.8327030 0.7708565
## 5 0.7303671 0.5626251 0.6867631 0.9501669 1.0000000 0.8095662 0.8082314
## 6 0.6582870 0.5866518 0.6618465 0.8327030 0.8095662 1.0000000 0.6631813
## 7 0.7107898 0.7312570 0.7268076 0.7708565 0.8082314 0.6631813 1.0000000
## 8 0.7187987 0.5003337 0.6765295 0.8740823 0.8927697 0.8464961 0.7130145
##           8
## 1 0.7187987
## 2 0.5003337
## 3 0.6765295
## 4 0.8740823
## 5 0.8927697
## 6 0.8464961
## 7 0.7130145
## 8 1.0000000
##
## $`D left`
##           1         2         3         4         5         6         7
## 1 1.0000000 0.7571206 0.9084029 0.8601624 0.9106587 0.8821893 0.9057737
## 2 0.7571206 1.0000000 0.7792989 0.6697074 0.7894971 0.8579375 0.8666148
## 3 0.9084029 0.7792989 1.0000000 0.7809927 0.8656650 0.9056311 0.8388605
## 4 0.8601624 0.6697074 0.7809927 1.0000000 0.8913116 0.8309232 0.8585095
## 5 0.9106587 0.7894971 0.8656650 0.8913116 1.0000000 0.8904216 0.9200134
```

```
## 6 0.8821893 0.8579375 0.9056311 0.8309232 0.8904216 1.0000000 0.9003337
## 7 0.9057737 0.8666148 0.8388605 0.8585095 0.9200134 0.9003337 1.0000000
## 8 0.9059962 0.7874068 0.8219453 0.8264739 0.8577150 0.8869855 0.8852058
##           8
## 1 0.9059962
## 2 0.7874068
## 3 0.8219453
## 4 0.8264739
## 5 0.8577150
## 6 0.8869855
## 7 0.8852058
## 8 1.0000000
##
## $`D right`
##           1         2         3         4         5         6         7
## 1 1.0000000 0.9464897 0.9568907 0.9845354 0.9857651 0.9640071 0.9549747
## 2 0.9464897 1.0000000 0.9737274 0.9496442 0.9601752 0.9501916 0.9512863
## 3 0.9568907 0.9737274 1.0000000 0.9605911 0.9640071 0.9556650 0.9605911
## 4 0.9845354 0.9496442 0.9605911 1.0000000 0.9812509 0.9578544 0.9644226
## 5 0.9857651 0.9601752 0.9640071 0.9812509 1.0000000 0.9733133 0.9577118
## 6 0.9640071 0.9501916 0.9556650 0.9578544 0.9733133 1.0000000 0.9485495
## 7 0.9549747 0.9512863 0.9605911 0.9644226 0.9577118 0.9485495 1.0000000
## 8 0.9500479 0.9365079 0.9512863 0.9704433 0.9664705 0.9737274 0.9551177
##           8
## 1 0.9500479
## 2 0.9365079
## 3 0.9512863
## 4 0.9704433
## 5 0.9664705
## 6 0.9737274
## 7 0.9551177
## 8 1.0000000
##
## $J
##     1   2   3   4   5   6   7   8
## 1 1.0 0.8 0.9 0.5 0.9 0.6 0.8 0.5
## 2 0.8 1.0 0.9 0.9 0.9 0.4 1.0 0.9
## 3 0.9 0.9 1.0 0.7 0.8 0.7 0.9 0.7
## 4 0.5 0.9 0.7 1.0 0.7 0.3 0.9 1.0
## 5 0.9 0.9 0.8 0.7 1.0 0.3 0.9 0.7
## 6 0.6 0.4 0.7 0.3 0.3 1.0 0.4 0.3
## 7 0.8 1.0 0.9 0.9 0.9 0.4 1.0 0.9
## 8 0.5 0.9 0.7 1.0 0.7 0.3 0.9 1.0
```

```
df <- lapply((1:9)[-5], function(i) read.csv(paste("../", i, ".csv", sep = ""), header = T, sep = "\t"))
#df <- append(df, list(read.csv("../1_SAM13306969.csv", header = T, sep = "\t")))#, read.csv("2_SAM1330
df <- list(Reduce(function(...) merge(..., all=T), df[1:4]), Reduce(function(...) merge(..., all=T), df

cleaned.barcodes.reduced.eq  <- cor.clavage.gen.all(df)
cleaned.barcodes.reduced.eq
```

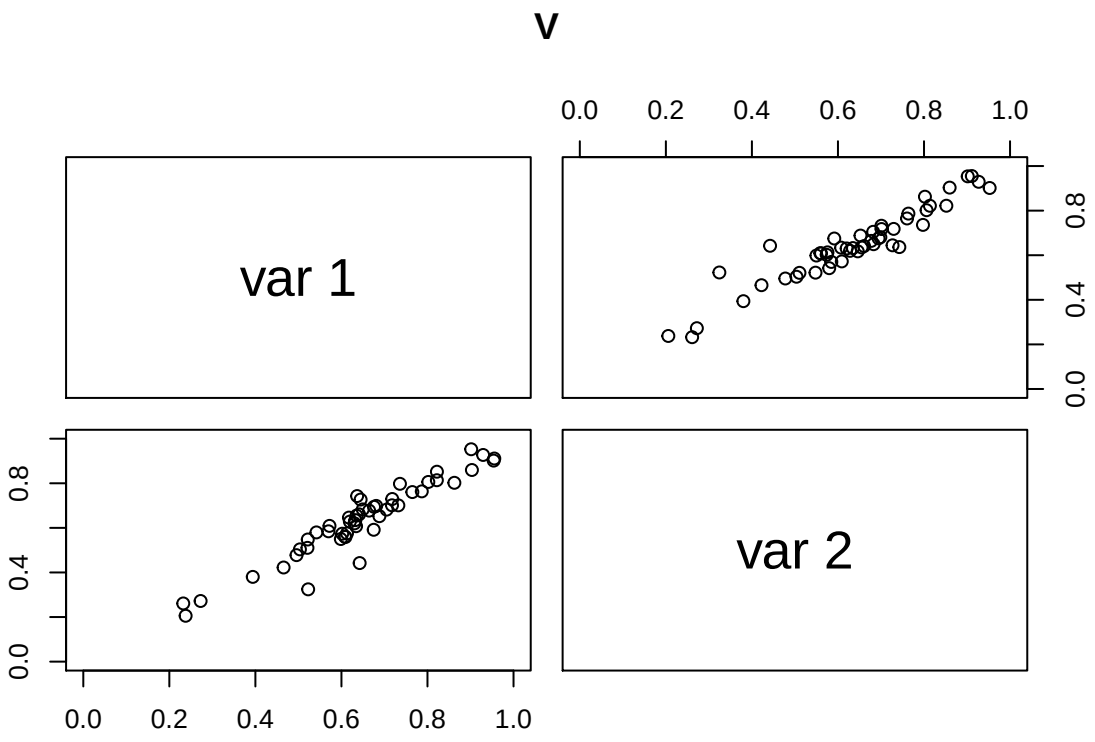
```
## $V
##                 [,1]      [,2]
## IGHV1-18   0.5217496 0.5478121
```

```
## IGHV1-2    0.5226676 0.3243584
## IGHV1-24   0.7360018 0.7975863
## IGHV1-3    0.6196308 0.6281580
## IGHV1-46   0.5418885 0.5796713
## IGHV1-58   0.6081309 0.5606354
## IGHV1-69   0.6350983 0.6548674
## IGHV1-8    0.5986163 0.5499943
## IGHV2-26   0.8019307 0.8059936
## IGHV2-5    0.7867942 0.7637394
## IGHV2-70   0.8219716 0.8519817
## IGHV3-11   0.5722449 0.6089425
## IGHV3-13   0.7050204 0.6818945
## IGHV3-15   0.6303925 0.6202182
## IGHV3-20   0.7323017 0.7010193
## IGHV3-21   0.5035102 0.5036516
## IGHV3-23   0.6322440 0.6347401
## IGHV3-30   0.4955703 0.4776565
## IGHV3-30-3 0.2323391 0.2610534
## IGHV3-33   0.3939453 0.3802088
## IGHV3-43   0.7648331 0.7606164
## IGHV3-43D  0.6445498 0.7269062
## IGHV3-48   0.6093837 0.5590468
## IGHV3-49   0.6643573 0.6773952
## IGHV3-53   0.6423639 0.4421820
## IGHV3-64   0.6410256 0.6606061
## IGHV3-66   0.4655832 0.4222935
## IGHV3-7    0.6129484 0.5755798
## IGHV3-72   0.7175003 0.7012995
## IGHV3-73   0.8218063 0.8137084
## IGHV3-74   0.6174213 0.6460291
## IGHV3-9    0.7180674 0.7295038
## IGHV4-30-2 0.8624973 0.8021948
## IGHV4-30-4 0.6757484 0.6943552
## IGHV4-31   0.6494658 0.6827967
## IGHV4-34   0.5210249 0.5104739
## IGHV4-39   0.6340516 0.6074666
## IGHV4-4    0.6364629 0.7427056
## IGHV4-59   0.6807830 0.6985238
## IGHV4-61   0.6882213 0.6523841
## IGHV4-b    0.2378322 0.2056925
## IGHV5-51   0.6750332 0.5914537
## IGHV5-a    0.2726893 0.2720321
## IGHV6-1    0.5699438 0.5846460
## IGLV1-40   0.9293402 0.9270678
## IGLV2-11   0.9016393 0.9526215
## IGLV2-14   0.9032755 0.8595777
## IGLV2-23   0.9552807 0.9111716
## IGHV3-64D  0.6017952 0.5737647
## IGHV2-70D  0.9538462 0.9016509
##
## $`D left`
##                   [,1]      [,2]
## IGHD1-1       0.7500000 0.6776348
## IGHD1-14      0.9932022 0.9917581
```

```
## IGHD1-20      0.9580387 0.9695935
## IGHD1-26      0.9613023 0.9629971
## IGHD1-7       0.9397352 0.9213901
## IGHD1/OR15-1b 0.9873659 0.9836451
## IGHD2-15      0.9215275 0.9126080
## IGHD2-2       0.8996533 0.8904580
## IGHD2-21      0.9629036 0.9428759
## IGHD2-8       0.9576814 0.9499916
## IGHD2/OR15-2b 0.9004949 0.8783415
## IGHD3-10      0.9262697 0.9040460
## IGHD3-16      0.9735072 0.9682996
## IGHD3-22      0.8594822 0.8632642
## IGHD3-3       0.8791773 0.8736658
## IGHD3-9       0.9065729 0.8815562
## IGHD3/OR15-3b 0.9980388 0.9972004
## IGHD4-11      0.8454383 0.8371628
## IGHD4-17      0.8248285 0.8350922
## IGHD4-23      0.9647809 0.9423739
## IGHD4/OR15-4b 0.8275537 0.8888889
## IGHD5-12      0.9012742 0.9108559
## IGHD5-24      0.8935020 0.8912596
## IGHD5-5       0.7431873 0.7310000
## IGHD5/OR15-5b 0.9856267 0.9995216
## IGHD6-13      0.9245839 0.9198201
## IGHD6-19      0.8972785 0.9074821
## IGHD6-25      0.9541982 0.9445835
## IGHD6-6       0.8750375 0.8580311
## IGHD7-27      0.9058282 0.9179291
##
## $`D right`
##                     [,1]      [,2]
## IGHD1-1       0.8691020 0.8295426
## IGHD1-14      0.8241816 0.7493266
## IGHD1-20      0.4079551 0.3563744
## IGHD1-26      0.8861785 0.8689935
## IGHD1-7       0.5689084 0.5808588
## IGHD1/OR15-1b 0.5271720 0.6729020
## IGHD2-15      0.9023100 0.8812858
## IGHD2-2       0.9473940 0.9550161
## IGHD2-21      0.9329904 0.9136286
## IGHD2-8       0.9858876 0.9859798
## IGHD2/OR15-2b 0.9786116 0.9858277
## IGHD3-10      0.9734174 0.9723790
## IGHD3-16      0.9886169 0.9798413
## IGHD3-22      0.8712362 0.8684803
## IGHD3-3       0.9828623 0.9828743
## IGHD3-9       0.9912339 0.9936038
## IGHD3/OR15-3b 0.9907975 0.9992728
## IGHD4-11      0.7344850 0.6814209
## IGHD4-17      0.4871803 0.4501593
## IGHD4-23      0.6106753 0.8064834
## IGHD4/OR15-4b 0.9133778 0.8442422
## IGHD5-12      0.9284539 0.9361476
## IGHD5-24      0.9148963 0.9012557
```

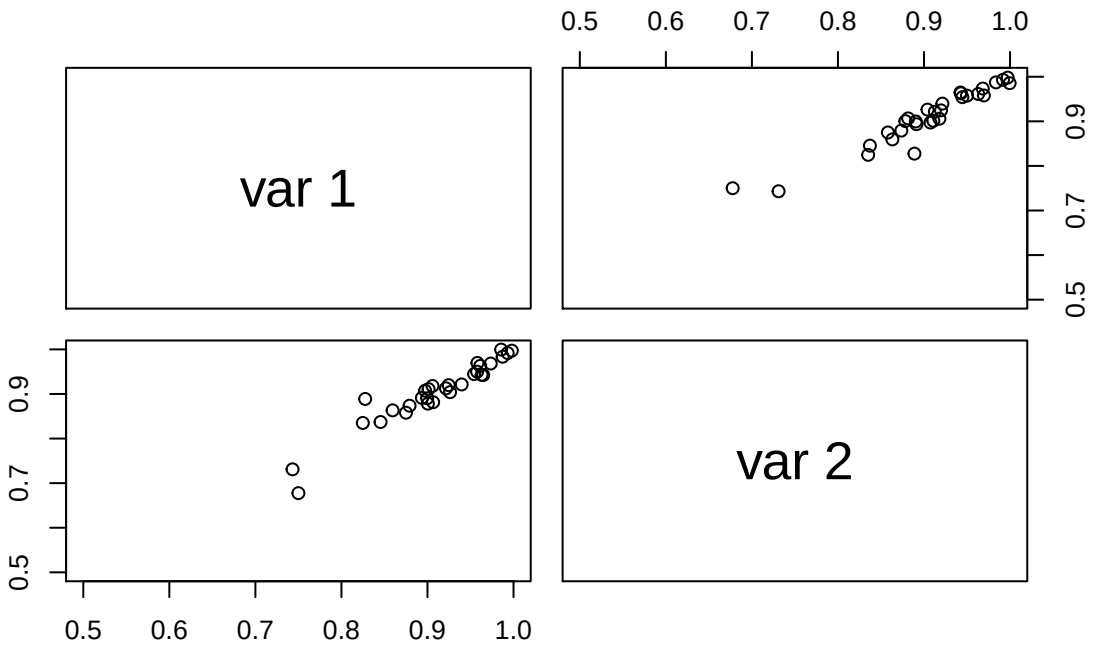
```
## IGHD5-5       0.8128652 0.8236424
## IGHD5/OR15-5b 1.0000000 0.9969505
## IGHD6-13      0.6881080 0.6784938
## IGHD6-19      0.7389074 0.7310964
## IGHD6-25      0.8058088 0.6959312
## IGHD6-6       0.7120708 0.7078788
## IGHD7-27      0.5108742 0.5377550
##
## $J
##            [,1]      [,2]
## IGHJ1 0.9233142 0.8897466
## IGHJ2 0.8710588 0.8818703
## IGHJ3 0.9628717 0.9573361
## IGHJ4 0.8884664 0.8877743
## IGHJ5 0.9190085 0.9047930
## IGHJ6 0.9567058 0.9537425
## IGLJ1 0.5461029 0.5273096
```

```
pairs.plots(cleaned.barcodes.reduced.eq)
```



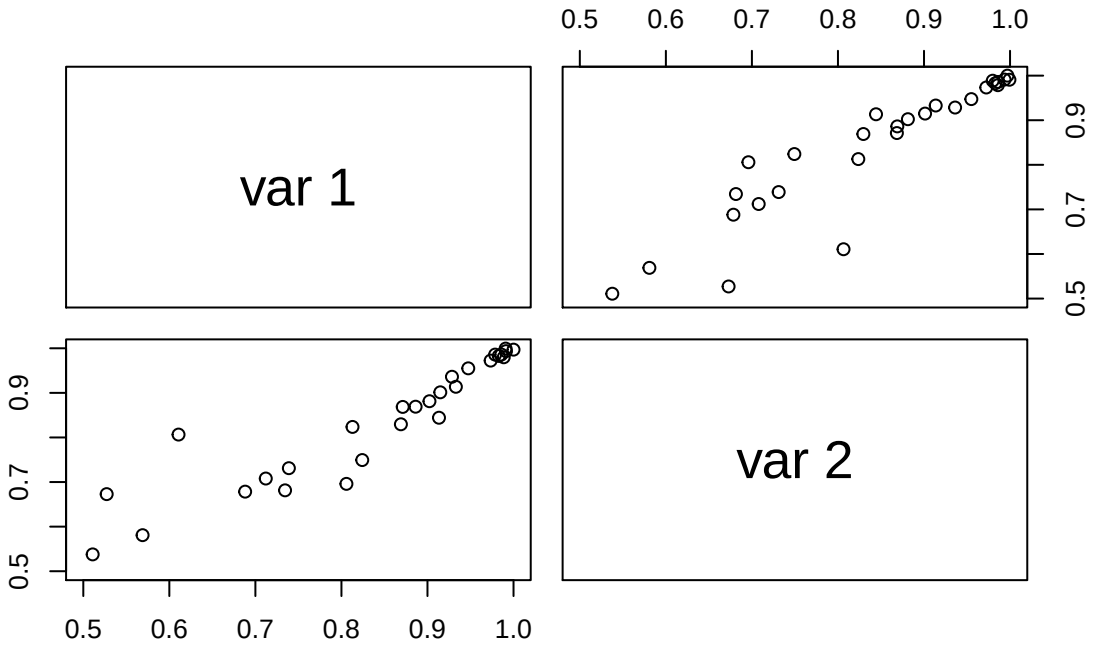

```
## NULL
```

D left

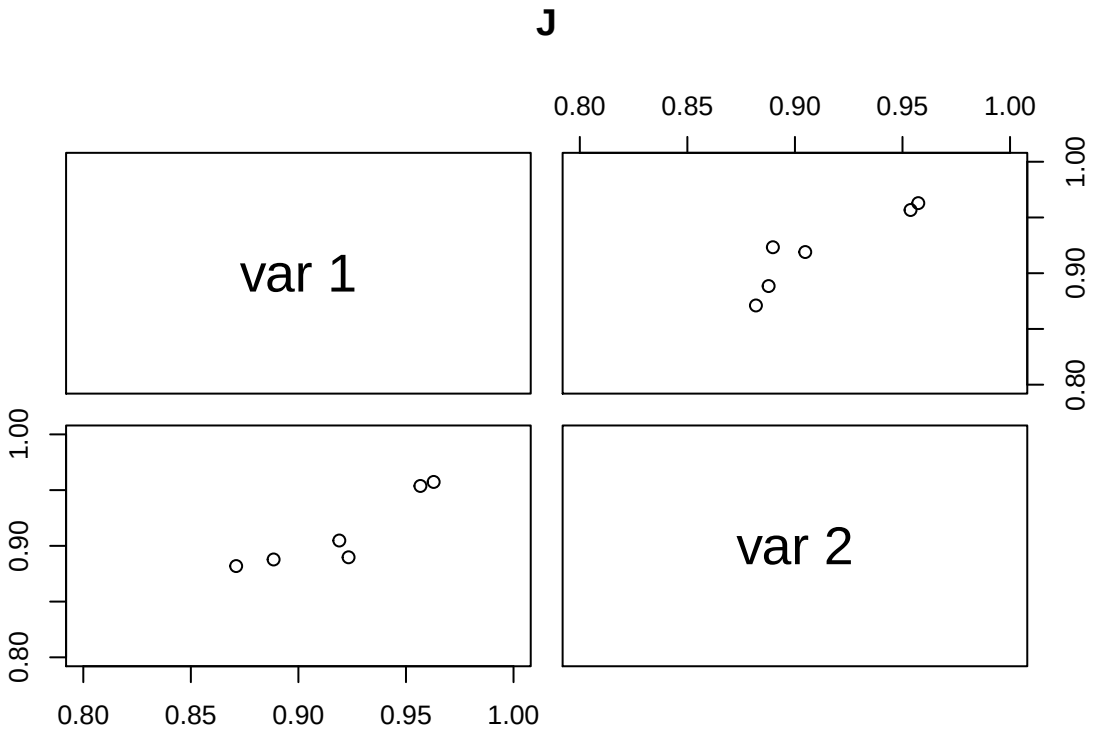



```
## NULL
```

D right

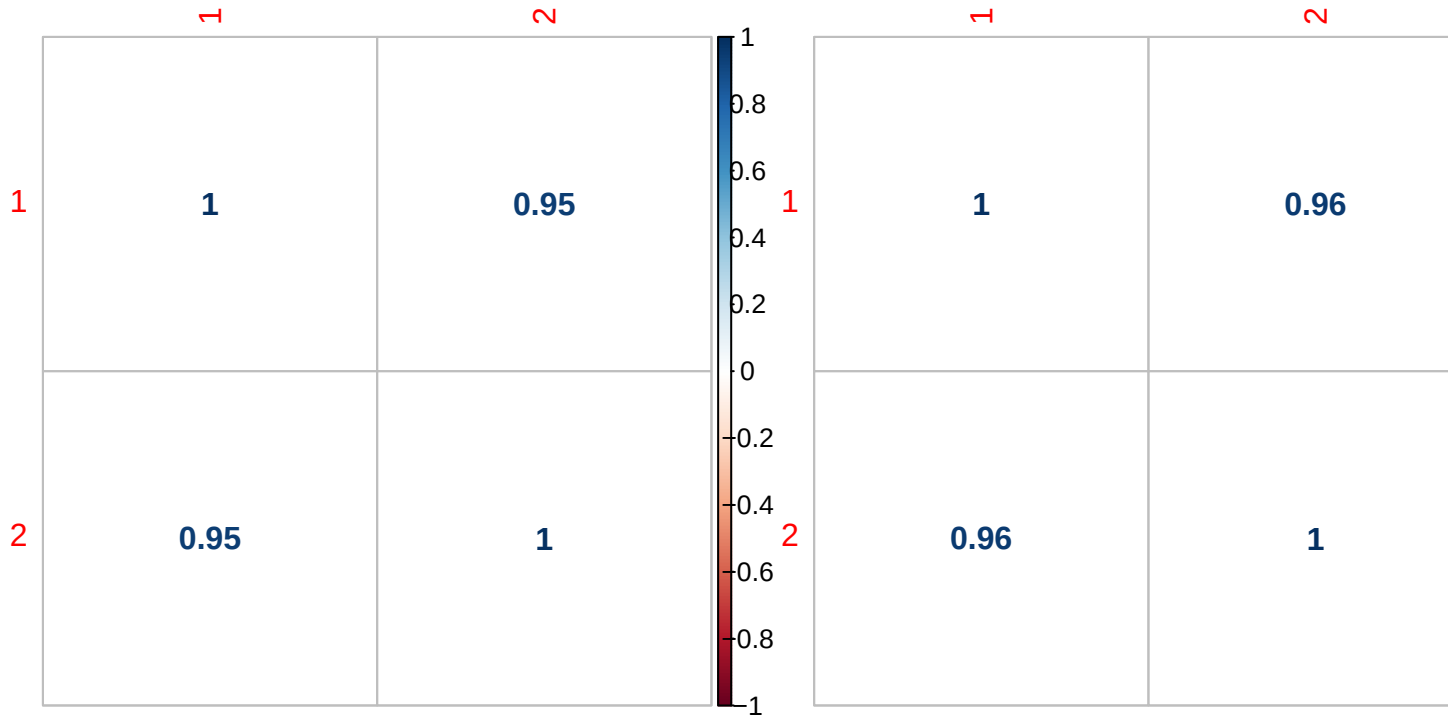


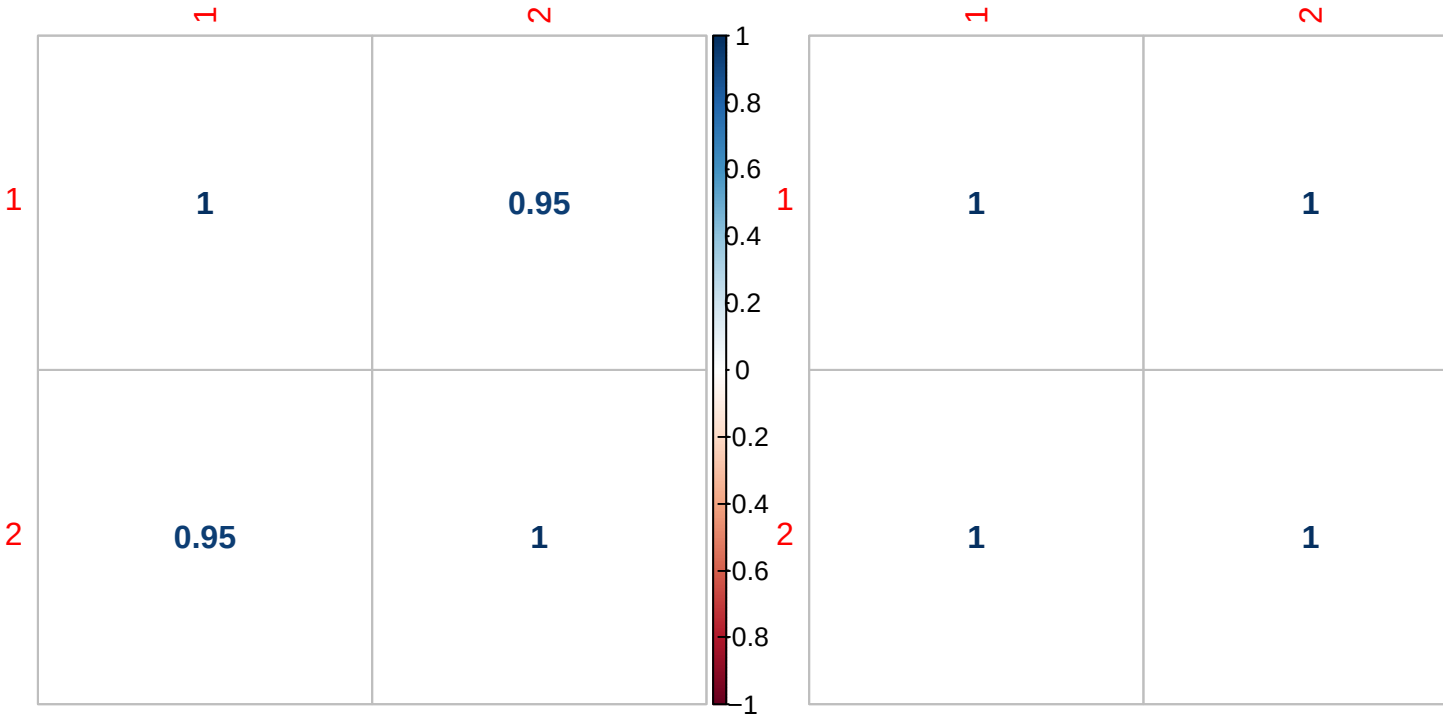

```
## NULL
```




```
## NULL
```

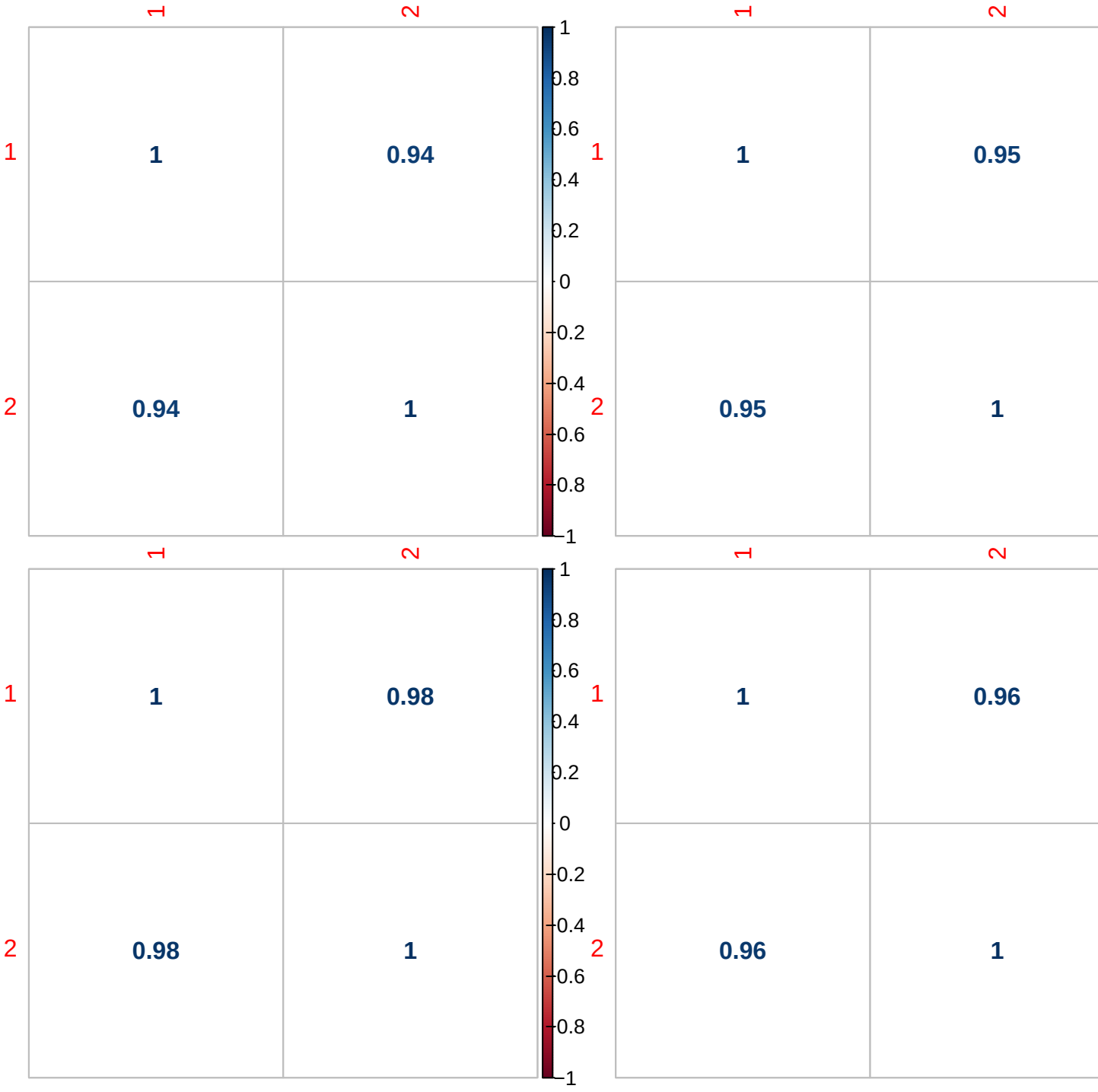
```
corr <- lapply(cleaned.barcodes.reduced.eq, cor)
lapply(corr, corrplot, method="number")
```






```
## $V
##           1         2
## 1 1.0000000 0.9492245
## 2 0.9492245 1.0000000
##
## $`D left`
##           1         2
## 1 1.0000000 0.9572774
## 2 0.9572774 1.0000000
##
## $`D right`
##           1         2
## 1 1.0000000 0.9480318
## 2 0.9480318 1.0000000
##
## $J
##           1         2
## 1 1.0000000 0.9955484
## 2 0.9955484 1.0000000
```

```
corr <- lapply(cleaned.barcodes.reduced.eq, cor, method = "spearman")
lapply(corr, corrplot, method="number")
```




```
## $V
##           1         2
## 1 1.0000000 0.9412245
## 2 0.9412245 1.0000000
##
## $`D left`
##           1         2
## 1 1.0000000 0.9483871
```

```
## 2 0.9483871 1.0000000
##
## $`D right`
##           1         2
## 1 1.0000000 0.9795328
## 2 0.9795328 1.0000000
##
## $J
##           1         2
## 1 1.0000000 0.9642857
## 2 0.9642857 1.0000000
```

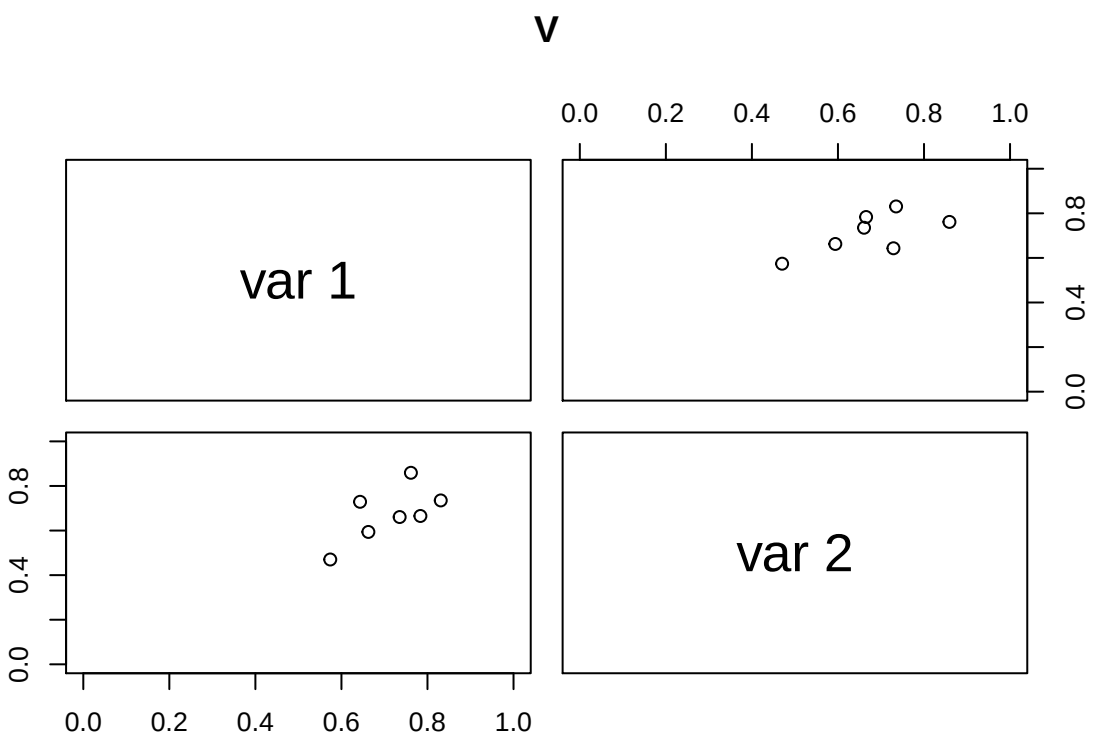
```
#df <- lapply((1:9)[-5], function(i) read.csv(paste("../", i, ".csv", sep = ""), header = T, sep = "\t"
df <- list(read.csv("../1_SAM13306969.csv", header = T, sep = "\t"), read.csv("../2_SAM13306970.csv", he
#df <- list(Reduce(function(...) merge(..., all=T), df[1:4]), Reduce(function(...) merge(..., all=T), d

sam.dataset  <- cor.clavage.gen.all(df)
sam.dataset
```

```
## $V
##                [,1]      [,2]
## IGHV1-18  0.5740185 0.4701835
## IGHV1-69  0.7835545 0.6654052
## IGHV3-53  0.7614691 0.8591205
## IGHV3-7   0.6432709 0.7289902
## IGHV5-51  0.8308350 0.7351218
## IGHV6-1   0.7353137 0.6606389
## IGHV7-4-1 0.6626073 0.5938447
##
## $`D left`
##               [,1]      [,2]
## IGHD1-26 0.9606541 0.9675755
## IGHD2-15 0.9697466 0.9651506
## IGHD2-2  0.9025885 0.9723845
## IGHD2-21 0.9848048 0.9570776
## IGHD3-10 0.9687651 0.9299873
## IGHD3-16 0.9940668 1.0000000
## IGHD3-22 0.9596918 0.9043678
## IGHD3-9  0.9387770 0.8975033
## IGHD5-12 0.9262483 0.9064378
## IGHD6-13 0.9669651 0.8875939
## IGHD6-19 0.9599191 0.9064436
##
## $`D right`
##               [,1]      [,2]
## IGHD1-26 0.9288703 0.9281503
## IGHD2-15 0.9348775 0.9474306
## IGHD2-2  0.9283275 0.9559214
## IGHD3-10 0.9843928 0.9719528
## IGHD3-16 0.9911365 0.9965940
## IGHD3-22 0.8317088 0.9213793
## IGHD3-9  0.9905647 0.9960578
## IGHD5-12 0.9373738 0.9296137
## IGHD6-13 0.7638932 0.5495985
```

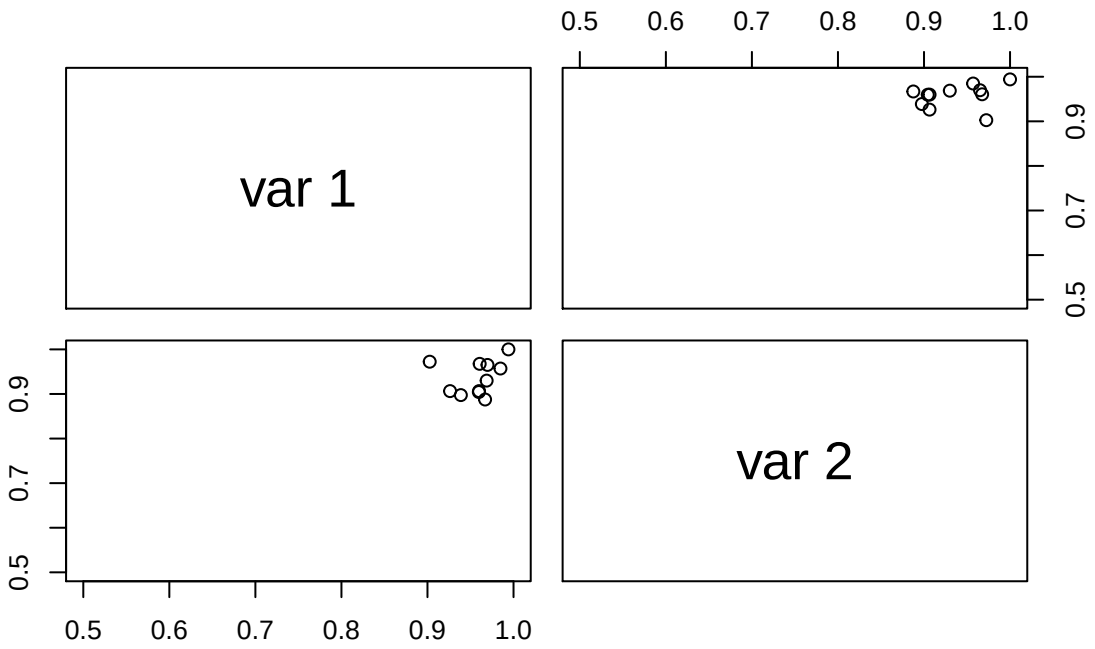
```
## IGHD6-19 0.8261259 0.7534077
##
## $J
##            [,1]      [,2]
## IGHJ1 0.9278804 0.9542386
## IGHJ2 0.9341338 0.8484095
## IGHJ3 0.7611590 0.6729030
## IGHJ4 0.9230592 0.9002743
## IGHJ5 0.9650078 0.9372140
## IGHJ6 0.9893653 0.9542411
```

```
pairs.plots(sam.dataset)
```



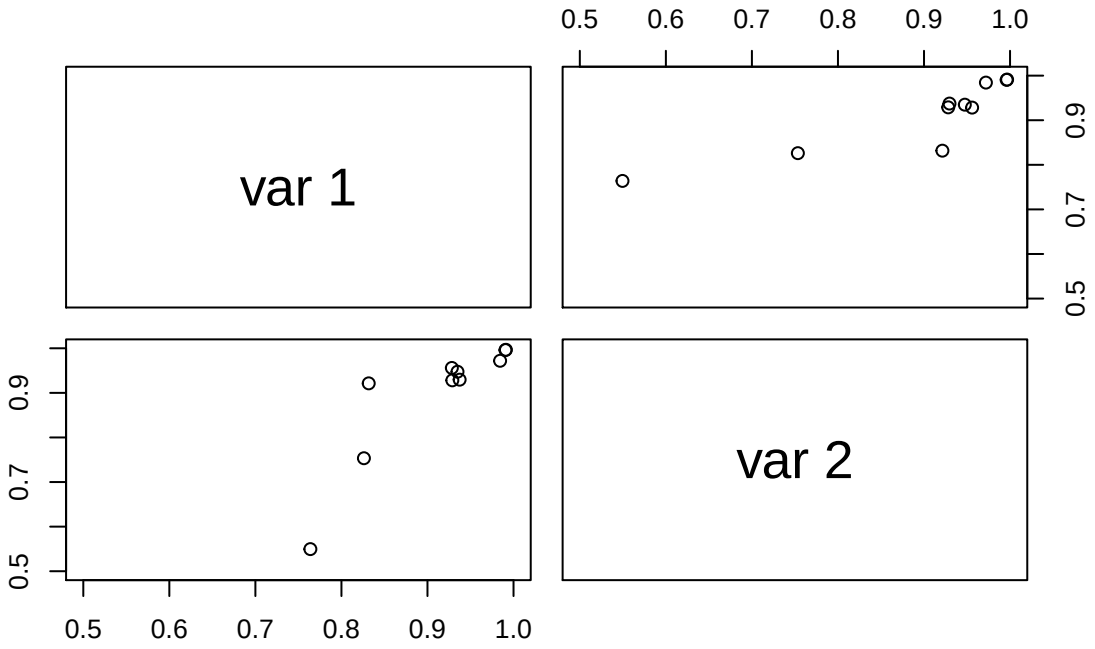

```
## NULL
```

D left

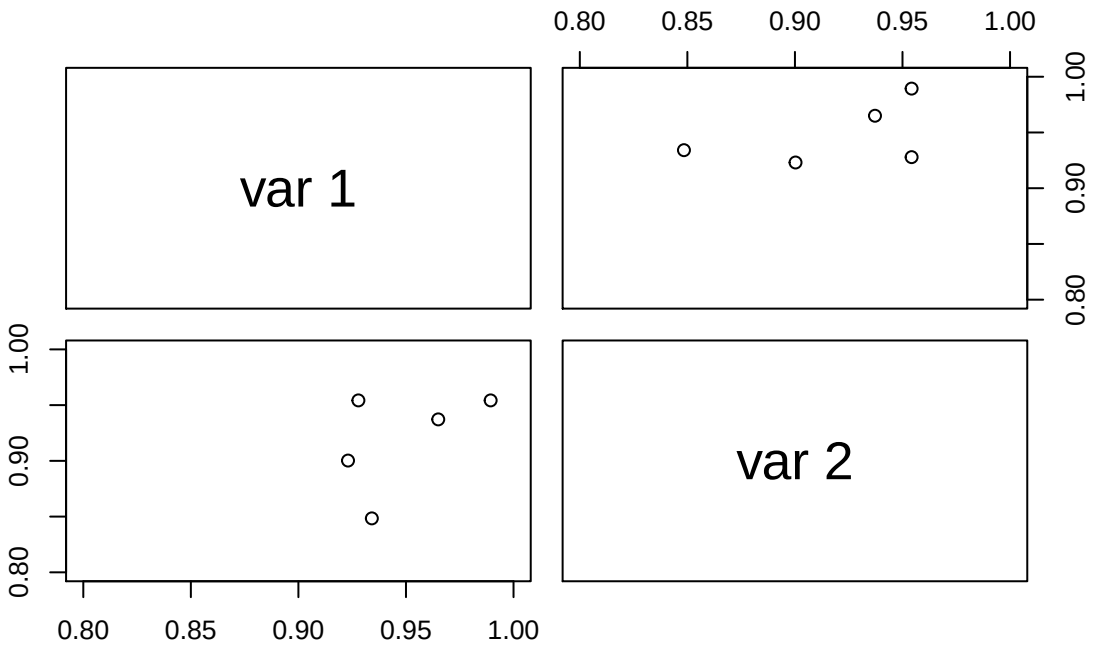



```
## NULL
```

D right




```
## NULL
```

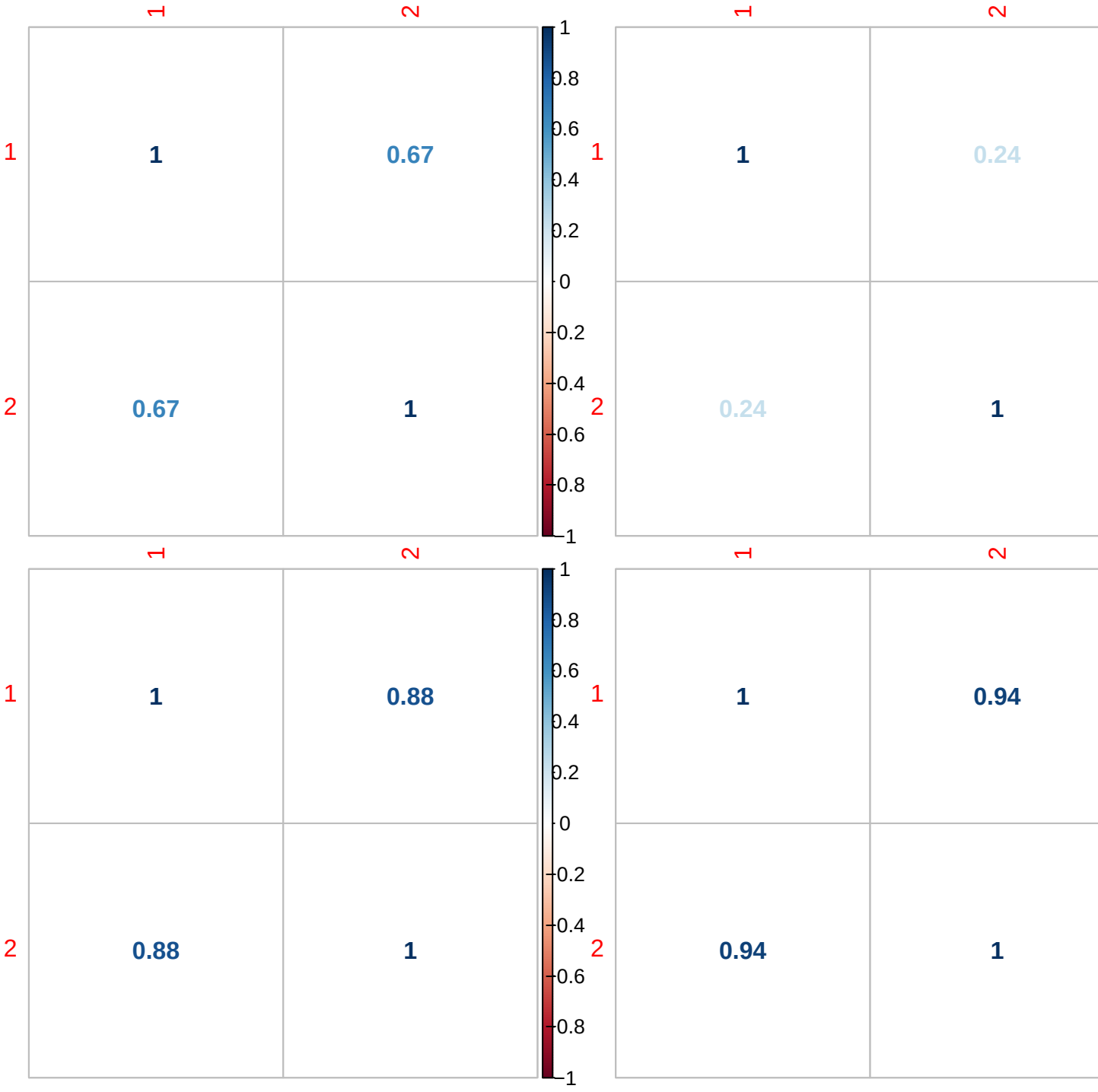



```
## NULL
```

```
corr <- lapply(sam.dataset, cor)
corr
```

```
## $V
##           [,1]      [,2]
## [1,] 1.0000000 0.6662787
## [2,] 0.6662787 1.0000000
##
## $`D left`
##           [,1]      [,2]
## [1,] 1.0000000 0.2381665
## [2,] 0.2381665 1.0000000
##
## $`D right`
##           [,1]      [,2]
## [1,] 1.0000000 0.8786097
## [2,] 0.8786097 1.0000000
##
## $J
##           [,1]      [,2]
## [1,] 1.0000000 0.9379378
## [2,] 0.9379378 1.0000000
```

```
lapply(corr, corrplot, method="number")
```



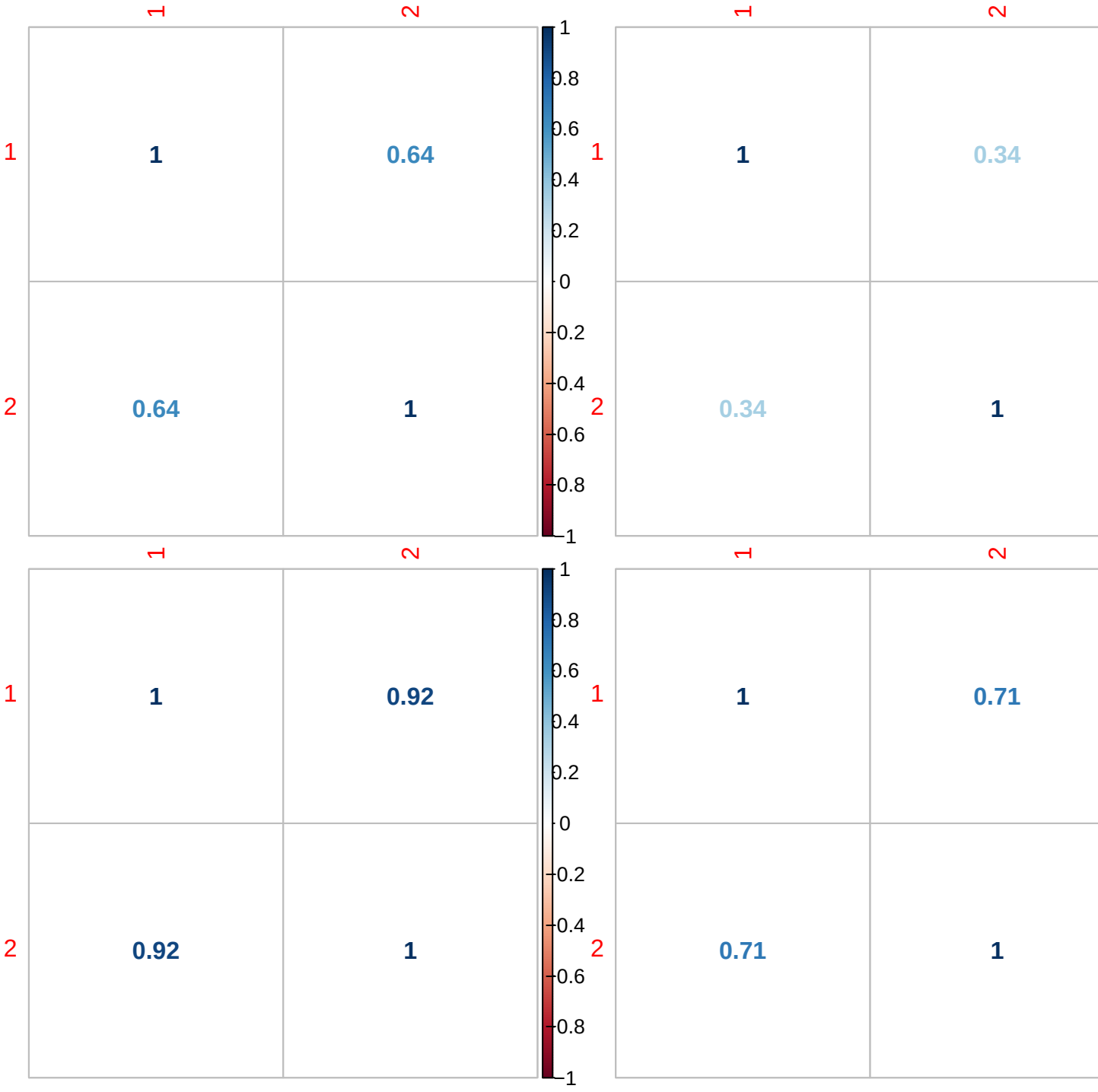

```
## $V
##           1         2
## 1 1.0000000 0.6662787
## 2 0.6662787 1.0000000
##
## $`D left`
##           1         2
## 1 1.0000000 0.2381665
```

```
## 2 0.2381665 1.0000000
##
## $`D right`
##           1         2
## 1 1.0000000 0.8786097
## 2 0.8786097 1.0000000
##
## $J
##           1         2
## 1 1.0000000 0.9379378
## 2 0.9379378 1.0000000
```

```
corr <- lapply(sam.dataset, cor, method = "spearman")
corr
```

```
## $V
##           [,1]      [,2]
## [1,] 1.0000000 0.6428571
## [2,] 0.6428571 1.0000000
##
## $`D left`
##           [,1]      [,2]
## [1,] 1.0000000 0.3363636
## [2,] 0.3363636 1.0000000
##
## $`D right`
##           [,1]      [,2]
## [1,] 1.0000000 0.9151515
## [2,] 0.9151515 1.0000000
##
## $J
##           [,1]      [,2]
## [1,] 1.0000000 0.7142857
## [2,] 0.7142857 1.0000000
```

```
lapply(corr, corrplot, method="number")
```




```
## $V
##           1         2
## 1 1.0000000 0.6428571
## 2 0.6428571 1.0000000
##
## $`D left`
##           1         2
## 1 1.0000000 0.3363636
```

```
## 2 0.3363636 1.0000000
##
## $`D right`
##           1         2
## 1 1.0000000 0.9151515
## 2 0.9151515 1.0000000
##
## $J
##           1         2
## 1 1.0000000 0.7142857
## 2 0.7142857 1.0000000
```

```
df <- lapply((1:9)[-5], function(i) read.csv(paste("../", i, ".csv", sep = ""), header = T, sep = "\t"))
df <- append(df, list(read.csv("../1_SAM13306969.csv", header = T, sep = "\t")))#, read.csv("2_SAM13306
#df <- list(Reduce(function(...) merge(..., all=T), df[1:4]), Reduce(function(...) merge(..., all=T), d

cleaned.sam.datasets  <- cor.clavage.gen.all(df)
cleaned.sam.datasets
```

```
## $V
##                 [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
## IGHV1-18   0.5545276 0.4499637 0.5208570 0.5254257 0.5471148 0.5558050
## IGHV1-2    0.5499559 0.5558145 0.5763202 0.1710295 0.1947875 0.5052846
## IGHV1-24   0.7520679 0.7085881 0.7455380 0.7440432 0.7863873 0.8276444
## IGHV1-3    0.6765743 0.5416315 0.5439164 0.6467109 0.6340521 0.5867726
## IGHV1-46   0.5394857 0.4351663 0.5882455 0.6146287 0.5633409 0.5961830
## IGHV1-69   0.6812566 0.5522143 0.6623111 0.6235462 0.7096680 0.3690133
## IGHV1-8    0.5912681 0.6965747 0.5326846 0.5402059 0.5437202 0.5652277
## IGHV2-5    0.7721848 0.7902457 0.7672313 0.8238938 0.7368610 0.7641326
## IGHV3-11   0.6122462 0.5795386 0.4855405 0.6011370 0.6135169 0.5832470
## IGHV3-15   0.6425676 0.7421415 0.6133580 0.5388774 0.5713241 0.5990685
## IGHV3-21   0.4864637 0.5305328 0.5148388 0.5037884 0.4469188 0.5075402
## IGHV3-23   0.6502080 0.6409932 0.6075035 0.6189041 0.6692755 0.6303928
## IGHV3-30   0.4968516 0.4899615 0.4670571 0.5216672 0.4625794 0.4489363
## IGHV3-30-3 0.2181935 0.2113497 0.1893479 0.3065472 0.2025384 0.2487617
## IGHV3-33   0.4007042 0.4082138 0.3400796 0.3950167 0.3861414 0.3964741
## IGHV3-48   0.5525260 0.5690843 0.7261568 0.5651540 0.5920471 0.5466641
## IGHV3-49   0.5512551 0.6750460 0.7801487 0.6292627 0.6643195 0.7214318
## IGHV3-53   0.6283774 0.7615128 0.7040301 0.4870155 0.2815676 0.2674110
## IGHV3-7    0.5796014 0.6960330 0.7049914 0.5285797 0.5602986 0.5808830
## IGHV3-74   0.5396882 0.7247495 0.6085106 0.6340745 0.6886674 0.6153685
## IGHV3-9    0.7165704 0.7669039 0.7260665 0.6696203 0.7158546 0.7423984
## IGHV4-30-2 0.8928691 0.8233510 0.9038305 0.8361225 0.7639809 0.7786514
## IGHV4-30-4 0.6935722 0.6435019 0.6576726 0.7088675 0.7284357 0.6884822
## IGHV4-31   0.6592795 0.5674841 0.7597911 0.6582247 0.7788782 0.5996857
## IGHV4-34   0.4700056 0.5270433 0.5776499 0.5215827 0.4876334 0.5146846
## IGHV4-4    0.5449218 0.6865451 0.6719006 0.7546522 0.8057276 0.6696180
## IGHV4-59   0.7079330 0.6627914 0.6316537 0.7027367 0.7733265 0.6908427
## IGHV5-51   0.6466264 0.7163465 0.6530289 0.7068140 0.6728530 0.5148776
## IGHV6-1    0.6147063 0.4792804 0.6702953 0.6164017 0.5693836 0.6295211
##                 [,7]      [,8]      [,9]
## IGHV1-18   0.5410756 0.5409450 0.5740185
## IGHV1-2    0.1149752 0.1477103 0.8212809
## IGHV1-24   0.7445038 0.7998245 0.7847757
```

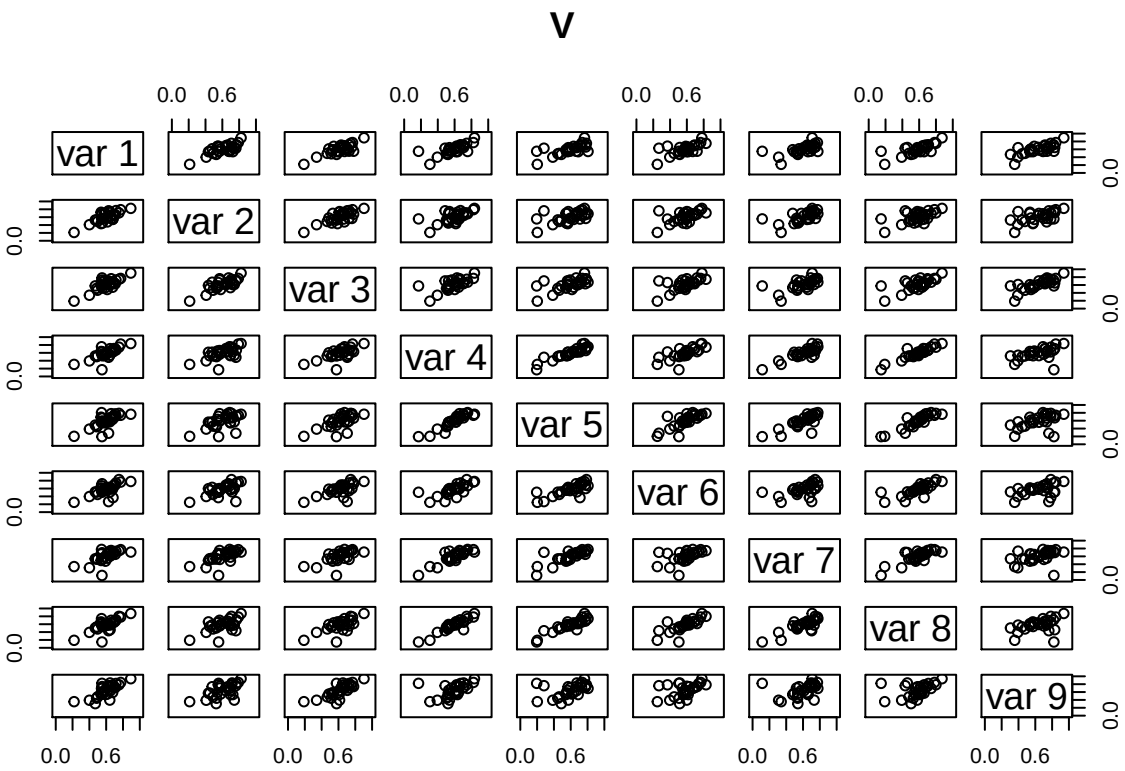
```
## IGHV1-3    0.6478548 0.6351860 0.5878961
## IGHV1-46   0.4947624 0.6587041 0.5714379
## IGHV1-69   0.6761645 0.6592088 0.7835545
## IGHV1-8    0.4775886 0.5595198 0.5358883
## IGHV2-5    0.7713236 0.7823237 0.8439508
## IGHV3-11   0.6600892 0.5919192 0.5490438
## IGHV3-15   0.7324508 0.5773696 0.3953311
## IGHV3-21   0.5360467 0.5312042 0.4433341
## IGHV3-23   0.6114332 0.6312812 0.6341084
## IGHV3-30   0.5298154 0.4784748 0.4770093
## IGHV3-30-3 0.3400515 0.1905280 0.3551762
## IGHV3-33   0.3101006 0.3920429 0.3917941
## IGHV3-48   0.5223061 0.5551956 0.7022438
## IGHV3-49   0.6917573 0.6166756 0.7392257
## IGHV3-53   0.7030798 0.4344660 0.7614691
## IGHV3-7    0.5806315 0.5928144 0.6432709
## IGHV3-74   0.6599058 0.6133538 0.5359834
## IGHV3-9    0.7271032 0.7095766 0.8177475
## IGHV4-30-2 0.7089630 0.8721346 0.9391892
## IGHV4-30-4 0.7001950 0.6504038 0.7187500
## IGHV4-31   0.7492967 0.6996226 0.7465095
## IGHV4-34   0.5389329 0.5040339 0.3050713
## IGHV4-4    0.7764124 0.7422095 0.6918372
## IGHV4-59   0.6517702 0.6774008 0.7143591
## IGHV5-51   0.6974856 0.4593975 0.8308350
## IGHV6-1    0.5532557 0.5808712 0.7353137
##
## $`D left`
##                    [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
## IGHD1-1       0.6801319 0.7672347 0.8309768 0.7653214 0.7095427 0.7222746
## IGHD1-14      1.0000000 0.9799447 1.0000000 0.9950890 0.9981459 0.9861049
## IGHD1-20      0.9555513 0.9353199 0.9873309 0.9549481 0.9730496 0.9713328
## IGHD1-26      0.9572039 0.9693673 0.9617483 0.9560486 0.9733164 0.9607869
## IGHD1-7       0.9491243 0.9306658 0.9641589 0.9168291 0.9453205 0.9122718
## IGHD1/OR15-1b 0.9936414 1.0000000 0.9954853 0.9515829 1.0000000 0.9774075
## IGHD2-15      0.9115469 0.9285092 0.9331715 0.9225357 0.9077738 0.9250330
## IGHD2-2       0.8928145 0.8801841 0.9240558 0.9195719 0.9108394 0.8883855
## IGHD2-21      0.9571418 0.9760379 0.9782349 0.9320130 0.9194441 0.9562419
## IGHD2-8       0.9616781 0.9529489 0.9686969 0.9430001 0.9508692 0.9642101
## IGHD2/OR15-2b 0.9129070 0.9167906 0.8843884 0.8434903 0.8343996 0.8803337
## IGHD3-10      0.9304299 0.9252147 0.9323140 0.9136869 0.8984354 0.9126332
## IGHD3-16      0.9668762 0.9788508 0.9881485 0.9673762 0.9739127 0.9659080
## IGHD3-22      0.8511826 0.8783467 0.8881298 0.8350763 0.8423345 0.8938446
## IGHD3-3       0.8641511 0.9066476 0.8788204 0.8689037 0.8820342 0.8858243
## IGHD3-9       0.8987635 0.9242530 0.9330758 0.8689376 0.8688127 0.9111058
## IGHD3/OR15-3b 0.9982211 0.9971133 1.0000000 0.9976387 0.9927410 0.9989564
## IGHD4-11      0.8242868 0.8877158 0.8871634 0.7986779 0.8479504 0.8269310
## IGHD4-17      0.8065706 0.8407109 0.8598038 0.8195399 0.8260668 0.8396467
## IGHD4-23      0.9596867 0.9799638 0.9599350 0.9302242 0.9405881 0.9303516
## IGHD4/OR15-4b 0.7670087 0.9757351 0.7482569 0.8935299 0.9099437 0.8943173
## IGHD5-12      0.8695085 0.9359108 0.9203784 0.8808838 0.8984146 0.9162109
## IGHD5-24      0.8793036 0.9210184 0.9163504 0.8706572 0.8587340 0.9372137
## IGHD5-5       0.7357924 0.7228246 0.7775680 0.7631177 0.7534266 0.7968374
## IGHD5/OR15-5b 1.0000000 1.0000000 1.0000000 0.9113999 1.0000000 1.0000000
```

```
## IGHD6-13      0.9364467 0.9146075 0.9287218 0.9216681 0.9350588 0.9219230
## IGHD6-19      0.9056982 0.8681856 0.9345824 0.9033812 0.9139507 0.9072741
## IGHD6-25      0.9625737 0.9261142 0.9756604 0.9622442 0.9469427 0.9403891
## IGHD6-6       0.8905328 0.8529002 0.9049656 0.8659692 0.8499330 0.8627585
## IGHD7-27      0.9447132 0.8317823 0.8673413 0.9526436 0.9270187 0.9049755
##                    [,7]      [,8]      [,9]
## IGHD1-1       0.6020975 0.6228997 0.8325719
## IGHD1-14      0.9934237 0.9920219 0.9877142
## IGHD1-20      0.9644120 0.9652394 1.0000000
## IGHD1-26      0.9590794 0.9460582 0.9606541
## IGHD1-7       0.9184690 0.9009004 0.9267315
## IGHD1/OR15-1b 0.9790769 0.9671897 1.0000000
## IGHD2-15      0.9351240 0.8889085 0.9697466
## IGHD2-2       0.8722522 0.8848197 0.9025885
## IGHD2-21      0.9375022 0.9623968 0.9848048
## IGHD2-8       0.9754963 0.9014697 0.9969159
## IGHD2/OR15-2b 0.9075779 0.9155886 0.9627289
## IGHD3-10      0.9162886 0.8887440 0.9687651
## IGHD3-16      0.9858933 0.9486061 0.9940668
## IGHD3-22      0.8717732 0.8455926 0.9596918
## IGHD3-3       0.8957259 0.8322855 0.9272031
## IGHD3-9       0.9005900 0.8333038 0.9387770
## IGHD3/OR15-3b 0.9972437 1.0000000 0.9542570
## IGHD4-11      0.8332083 0.8379660 0.8253968
## IGHD4-17      0.8525796 0.8274171 0.7700048
## IGHD4-23      0.9645582 0.9393693 0.9248705
## IGHD4/OR15-4b 0.9201751 0.8385861 0.8470176
## IGHD5-12      0.9259785 0.9065433 0.9262483
## IGHD5-24      0.8657131 0.8991597 0.9503900
## IGHD5-5       0.6430131 0.7386692 0.7405119
## IGHD5/OR15-5b 1.0000000 0.9969207 1.0000000
## IGHD6-13      0.9137636 0.9066068 0.9669651
## IGHD6-19      0.9165414 0.8882720 0.9599191
## IGHD6-25      0.9538567 0.9392824 0.9933700
## IGHD6-6       0.8936928 0.8348312 0.9383320
## IGHD7-27      0.9344989 0.9166667 0.9549995
##
## $`D right`
##                    [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
## IGHD1-1       0.8587524 0.8857475 0.9254119 0.7476831 0.8003641 0.8811769
## IGHD1-14      0.7779579 0.8706777 0.8374046 0.8216697 0.7011743 0.7292130
## IGHD1-20      0.4401578 0.3968584 0.4152888 0.3267527 0.2841608 0.4136737
## IGHD1-26      0.8974467 0.8727151 0.8897341 0.8818693 0.8519138 0.8982458
## IGHD1-7       0.6361127 0.5163487 0.6130768 0.4884433 0.5844005 0.5930903
## IGHD2-15      0.8953988 0.9115867 0.9295684 0.8792082 0.8748097 0.8957163
## IGHD2-2       0.9342216 0.9489148 0.9607235 0.9614999 0.9550201 0.9515781
## IGHD2-21      0.9216250 0.9419996 0.9524635 0.9157401 0.8983657 0.9381893
## IGHD2-8       0.9792932 0.9879719 0.9966777 0.9856160 0.9788360 0.9903088
## IGHD2/OR15-2b 0.9738648 0.9819038 0.9796458 0.9825880 0.9668948 0.9899904
## IGHD3-10      0.9749728 0.9655881 0.9753638 0.9801433 0.9690973 0.9751189
## IGHD3-16      0.9896789 0.9834213 0.9895532 0.9929882 0.9786675 0.9845558
## IGHD3-22      0.8667463 0.8890285 0.8519827 0.8733205 0.8576482 0.8695455
## IGHD3-3       0.9810627 0.9861815 0.9788741 0.9845244 0.9822229 0.9877390
## IGHD3-9       0.9881587 0.9935772 0.9989752 0.9870413 0.9942386 0.9949492
```

```
## IGHD3/OR15-3b 1.0000000 0.9837435 0.9764950 0.9968516 1.0000000 1.0000000
## IGHD4-11      0.7491585 0.7555444 0.6639482 0.7159522 0.6644883 0.7338029
## IGHD4-17      0.5179688 0.4438650 0.4678305 0.4943978 0.4361324 0.4665539
## IGHD4-23      0.8238409 0.3982747 0.7263671 0.7702242 0.7570492 0.8279592
## IGHD5-12      0.9424742 0.9189253 0.9070424 0.9392839 0.9287620 0.9502397
## IGHD5-24      0.9161168 0.8945579 0.9276624 0.9348577 0.8913858 0.8877130
## IGHD5-5       0.8165003 0.8116446 0.7868956 0.8254724 0.8145076 0.8028600
## IGHD5/OR15-5b 1.0000000 1.0000000 1.0000000 1.0000000 1.0000000 0.9944452
## IGHD6-13      0.6909174 0.6740338 0.7056542 0.6940122 0.6430593 0.6799270
## IGHD6-19      0.7240472 0.7603881 0.7524085 0.7194638 0.7334500 0.7541648
## IGHD6-25      0.8640520 0.7483711 0.7747106 0.7821101 0.7589777 0.6401928
## IGHD6-6       0.7043603 0.7095982 0.7120606 0.7261689 0.7154110 0.7277236
## IGHD7-27      0.4691955 0.4866550 0.4769089 0.6260408 0.5033049 0.5456192
##                    [,7]      [,8]      [,9]
## IGHD1-1       0.8593461 0.7726287 0.8615963
## IGHD1-14      0.8736548 0.7193982 0.7241013
## IGHD1-20      0.5218833 0.2795763 0.4843059
## IGHD1-26      0.8617624 0.8610976 0.9288703
## IGHD1-7       0.6696841 0.4712218 0.8065710
## IGHD2-15      0.8412932 0.8965957 0.9348775
## IGHD2-2       0.9545590 0.9583645 0.9283275
## IGHD2-21      0.8924968 0.9150866 0.9686256
## IGHD2-8       0.9924604 0.9806866 0.9958879
## IGHD2/OR15-2b 0.9972557 0.9956339 0.9954228
## IGHD3-10      0.9766633 0.9689354 0.9843928
## IGHD3-16      0.9698158 0.9841943 0.9911365
## IGHD3-22      0.8825922 0.8650436 0.8317088
## IGHD3-3       0.9835000 0.9769840 0.9942877
## IGHD3-9       0.9978287 0.9871391 0.9905647
## IGHD3/OR15-3b 0.9972437 1.0000000 1.0000000
## IGHD4-11      0.6864043 0.6397695 0.8904521
## IGHD4-17      0.5022792 0.4103731 0.6460250
## IGHD4-23      0.8313210 0.8243661 0.8863913
## IGHD5-12      0.9296835 0.9296053 0.9373738
## IGHD5-24      0.9139215 0.9320329 0.7357482
## IGHD5-5       0.8521349 0.8249294 0.8582524
## IGHD5/OR15-5b 1.0000000 0.9961509 1.0000000
## IGHD6-13      0.7133047 0.6814279 0.7638932
## IGHD6-19      0.7314599 0.6958181 0.8261259
## IGHD6-25      0.8356749 0.5766636 0.7833118
## IGHD6-6       0.6912213 0.6873913 0.7826678
## IGHD7-27      0.4703865 0.6460031 0.5585556
##
## $J
##            [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
## IGHJ1 0.9533258 0.9065159 0.9142743 0.8765882 0.9019588 0.8992466
## IGHJ2 0.9026760 0.7991560 0.8937085 0.8685936 0.8627862 0.9192151
## IGHJ4 0.9001489 0.8886792 0.8771062 0.8813177 0.8830571 0.8887726
## IGHJ5 0.9261453 0.9152800 0.9268642 0.9046174 0.8954844 0.9156541
## IGHJ6 0.9576270 0.9578468 0.9558093 0.9549989 0.9449632 0.9624135
##            [,7]      [,8]      [,9]
## IGHJ1 0.9026142 0.8389553 0.9278804
## IGHJ2 0.8824302 0.8372649 0.9341338
## IGHJ4 0.8959509 0.8881644 0.9230592
```

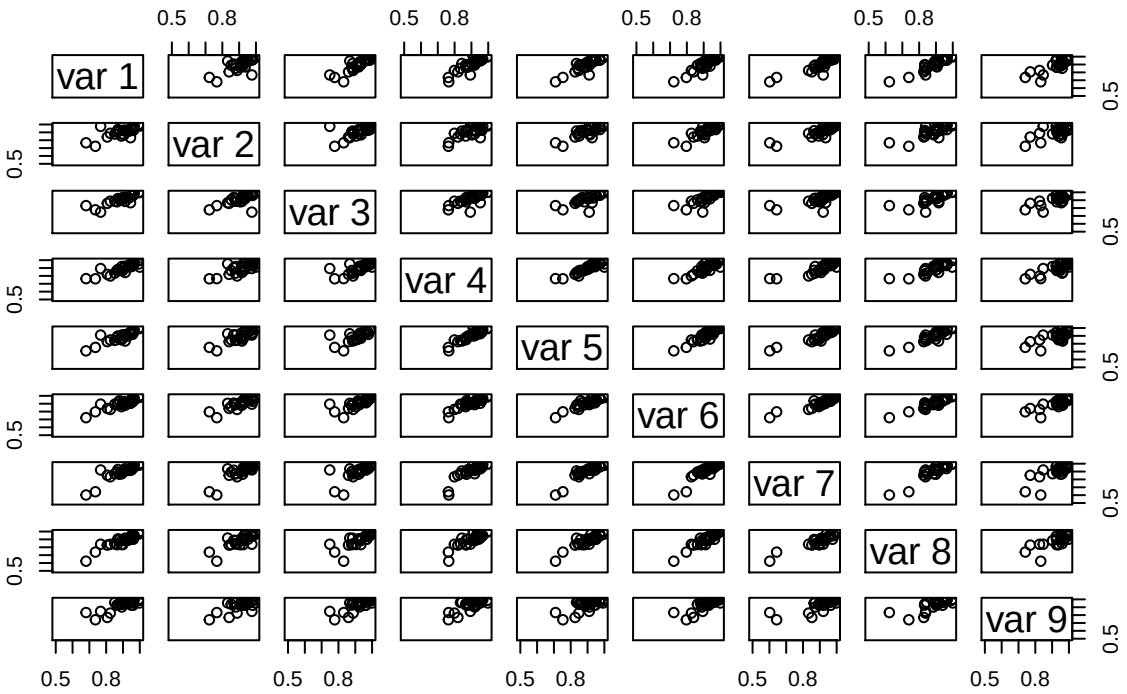
```
## IGHJ5 0.9176387 0.8910945 0.9650078
## IGHJ6 0.9615707 0.9490520 0.9893653
```

```
pairs.plots(cleaned.sam.datasets)
```



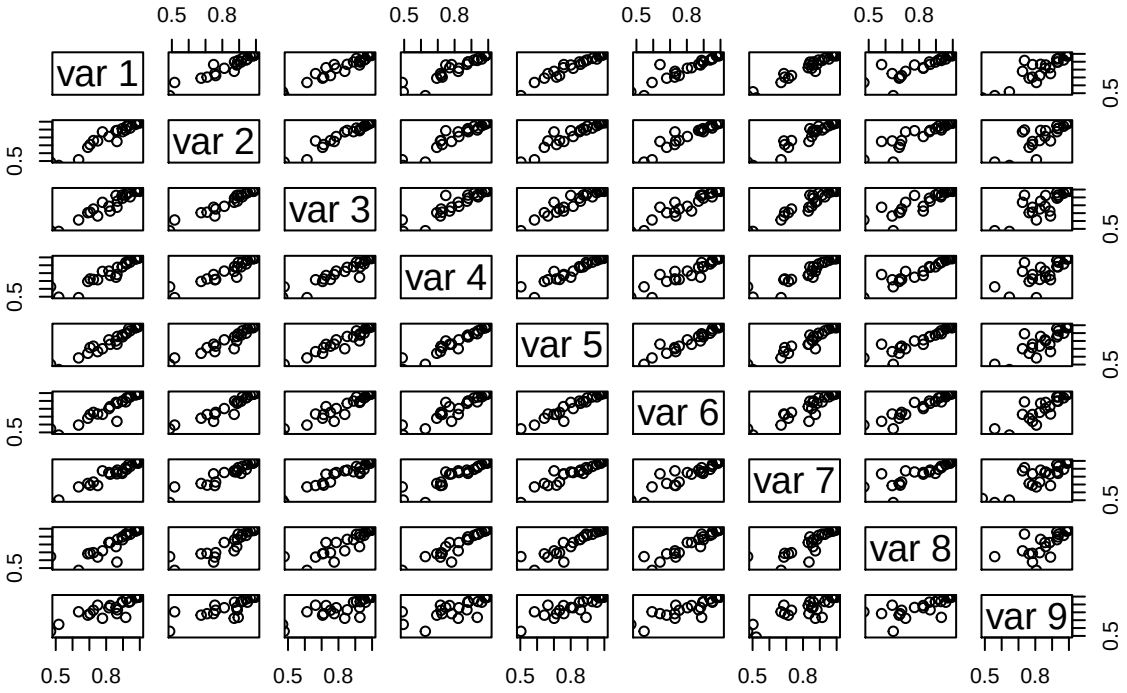

```
## NULL
```

D left

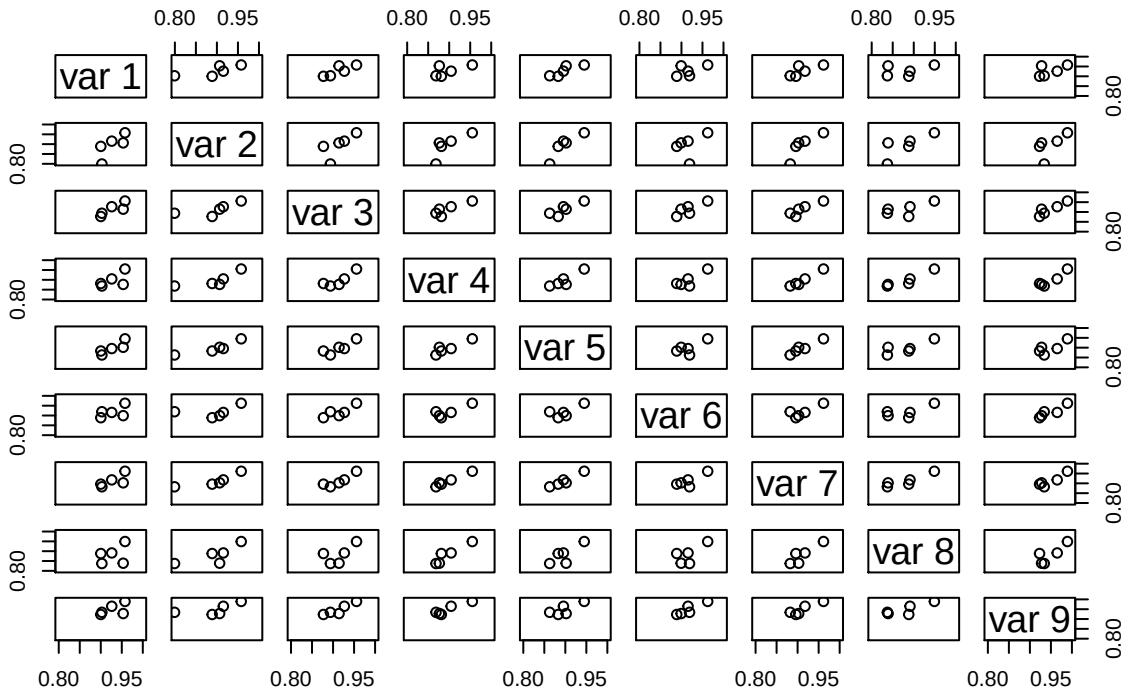



```
## NULL
```

D right




```
## NULL
```




```
## NULL
```

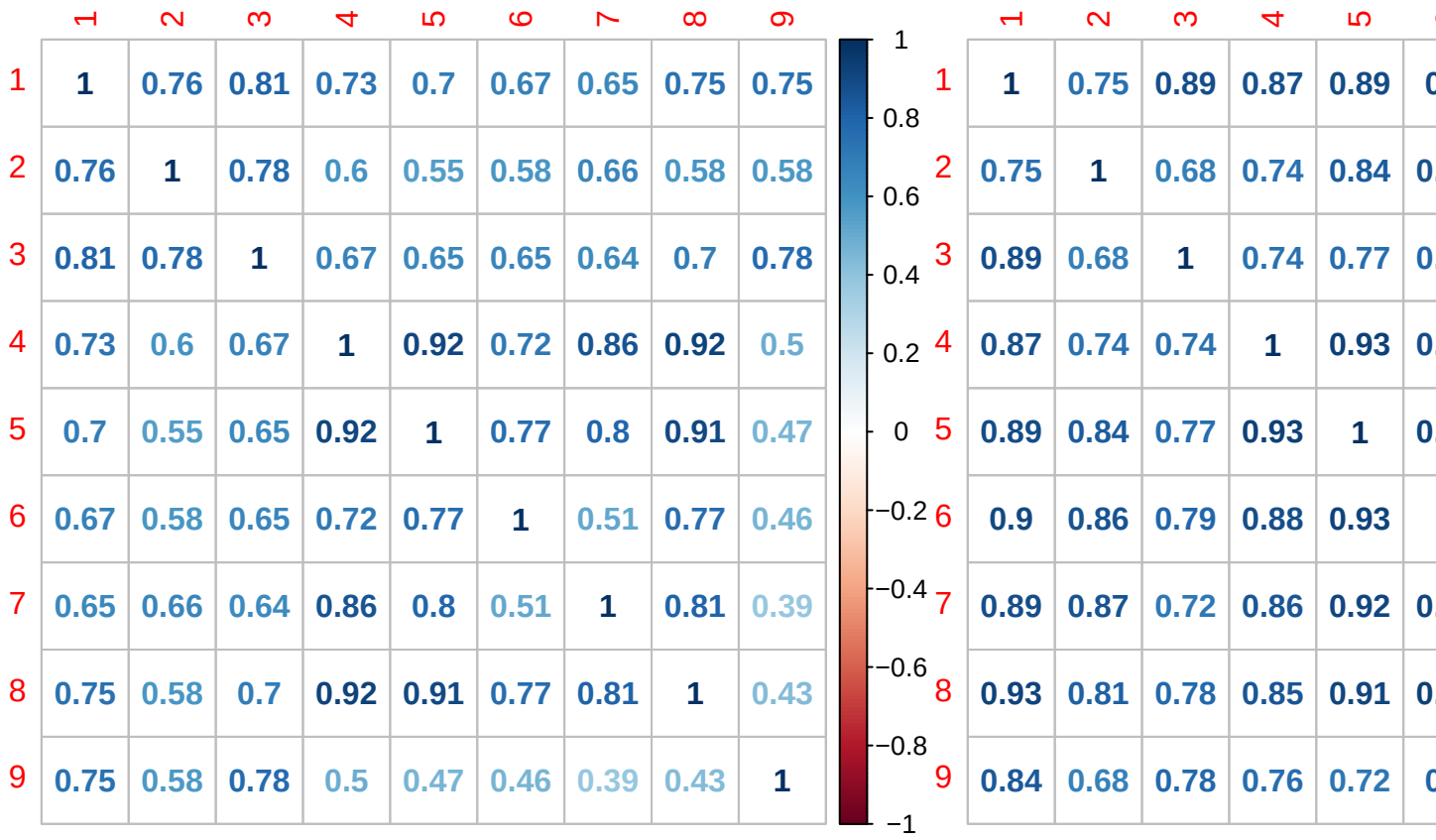
```
corr <- lapply(cleaned.sam.datasets, cor)
corr
```

```
## $V
##             [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
##  [1,] 1.0000000 0.7647135 0.8057026 0.7343413 0.6970553 0.6732087
##  [2,] 0.7647135 1.0000000 0.7762703 0.5981304 0.5515706 0.5816071
##  [3,] 0.8057026 0.7762703 1.0000000 0.6689705 0.6454285 0.6510211
##  [4,] 0.7343413 0.5981304 0.6689705 1.0000000 0.9199332 0.7151722
##  [5,] 0.6970553 0.5515706 0.6454285 0.9199332 1.0000000 0.7692195
##  [6,] 0.6732087 0.5816071 0.6510211 0.7151722 0.7692195 1.0000000
##  [7,] 0.6480768 0.6562539 0.6372733 0.8638890 0.7978622 0.5141968
##  [8,] 0.7482985 0.5816101 0.6979434 0.9236097 0.9066414 0.7677873
##  [9,] 0.7462920 0.5768031 0.7782605 0.4993450 0.4683239 0.4637659
##             [,7]      [,8]      [,9]
##  [1,] 0.6480768 0.7482985 0.7462920
##  [2,] 0.6562539 0.5816101 0.5768031
##  [3,] 0.6372733 0.6979434 0.7782605
##  [4,] 0.8638890 0.9236097 0.4993450
##  [5,] 0.7978622 0.9066414 0.4683239
##  [6,] 0.5141968 0.7677873 0.4637659
##  [7,] 1.0000000 0.8055927 0.3853878
##  [8,] 0.8055927 1.0000000 0.4305411
##  [9,] 0.3853878 0.4305411 1.0000000
##
## $`D left`
##             [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
```

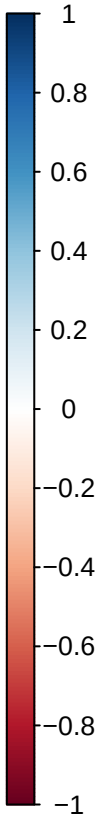
```
##  [1,] 1.0000000 0.7468751 0.8896625 0.8737702 0.8914265 0.9043319
##  [2,] 0.7468751 1.0000000 0.6835282 0.7438023 0.8355098 0.8624593
##  [3,] 0.8896625 0.6835282 1.0000000 0.7427741 0.7669053 0.7920764
##  [4,] 0.8737702 0.7438023 0.7427741 1.0000000 0.9301237 0.8804529
##  [5,] 0.8914265 0.8355098 0.7669053 0.9301237 1.0000000 0.9293234
##  [6,] 0.9043319 0.8624593 0.7920764 0.8804529 0.9293234 1.0000000
##  [7,] 0.8868540 0.8670823 0.7153320 0.8593031 0.9154132 0.9165539
##  [8,] 0.9267302 0.8142317 0.7815869 0.8523512 0.9100607 0.9394902
##  [9,] 0.8432989 0.6786582 0.7841322 0.7615744 0.7241844 0.8018238
##            [,7]      [,8]      [,9]
##  [1,] 0.8868540 0.9267302 0.8432989
##  [2,] 0.8670823 0.8142317 0.6786582
##  [3,] 0.7153320 0.7815869 0.7841322
##  [4,] 0.8593031 0.8523512 0.7615744
##  [5,] 0.9154132 0.9100607 0.7241844
##  [6,] 0.9165539 0.9394902 0.8018238
##  [7,] 1.0000000 0.9165312 0.7713556
##  [8,] 0.9165312 1.0000000 0.7392496
##  [9,] 0.7713556 0.7392496 1.0000000
##
## $`D right`
##            [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
##  [1,] 1.0000000 0.8905080 0.9742811 0.9494808 0.9784261 0.9577249
##  [2,] 0.8905080 1.0000000 0.9373155 0.9014438 0.9015336 0.8846997
##  [3,] 0.9742811 0.9373155 1.0000000 0.9453688 0.9707518 0.9635589
##  [4,] 0.9494808 0.9014438 0.9453688 1.0000000 0.9745137 0.9508893
##  [5,] 0.9784261 0.9015336 0.9707518 0.9745137 1.0000000 0.9766262
##  [6,] 0.9577249 0.8846997 0.9635589 0.9508893 0.9766262 1.0000000
##  [7,] 0.9784851 0.8806625 0.9686151 0.9281139 0.9546102 0.9383100
##  [8,] 0.9140048 0.8512876 0.9256588 0.9711724 0.9607040 0.9722933
##  [9,] 0.9058818 0.7840334 0.8693355 0.8402951 0.9071761 0.9114815
##            [,7]      [,8]      [,9]
##  [1,] 0.9784851 0.9140048 0.9058818
##  [2,] 0.8806625 0.8512876 0.7840334
##  [3,] 0.9686151 0.9256588 0.8693355
##  [4,] 0.9281139 0.9711724 0.8402951
##  [5,] 0.9546102 0.9607040 0.9071761
##  [6,] 0.9383100 0.9722933 0.9114815
##  [7,] 1.0000000 0.8972969 0.8568616
##  [8,] 0.8972969 1.0000000 0.8403870
##  [9,] 0.8568616 0.8403870 1.0000000
##
## $J
##            [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
##  [1,] 1.0000000 0.7433990 0.8394826 0.6180154 0.8514129 0.5325200
##  [2,] 0.7433990 1.0000000 0.7127707 0.7801124 0.9016459 0.3920497
##  [3,] 0.8394826 0.7127707 1.0000000 0.8650515 0.8669765 0.8391165
##  [4,] 0.6180154 0.7801124 0.8650515 1.0000000 0.9082976 0.8532762
##  [5,] 0.8514129 0.9016459 0.8669765 0.9082976 1.0000000 0.7033369
##  [6,] 0.5325200 0.3920497 0.8391165 0.8532762 0.7033369 1.0000000
##  [7,] 0.7317654 0.8495050 0.9019379 0.9863565 0.9616642 0.8144924
##  [8,] 0.3689929 0.7559483 0.6421116 0.9343655 0.7938727 0.6791621
##  [9,] 0.5624287 0.6320265 0.9127439 0.9385913 0.7778224 0.9018812
##            [,7]      [,8]      [,9]
```

```
##  [1,] 0.7317654 0.3689929 0.5624287
##  [2,] 0.8495050 0.7559483 0.6320265
##  [3,] 0.9019379 0.6421116 0.9127439
##  [4,] 0.9863565 0.9343655 0.9385913
##  [5,] 0.9616642 0.7938727 0.7778224
##  [6,] 0.8144924 0.6791621 0.9018812
##  [7,] 1.0000000 0.8929092 0.9102861
##  [8,] 0.8929092 1.0000000 0.8161022
##  [9,] 0.9102861 0.8161022 1.0000000
```

```
lapply(corr, corrplot, method="number")
```



	1	2	3	4	5	6	7	8	9
1	1	0.89	0.97	0.95	0.98	0.96	0.98	0.91	0.91
2	0.89	1	0.94	0.9	0.9	0.88	0.88	0.85	0.78
3	0.97	0.94	1	0.95	0.97	0.96	0.97	0.93	0.87
4	0.95	0.9	0.95	1	0.97	0.95	0.93	0.97	0.84
5	0.98	0.9	0.97	0.97	1	0.98	0.95	0.96	0.91
6	0.96	0.88	0.96	0.95	0.98	1	0.94	0.97	0.91
7	0.98	0.88	0.97	0.93	0.95	0.94	1	0.9	0.86
8	0.91	0.85	0.93	0.97	0.96	0.97	0.9	1	0.84
9	0.91	0.78	0.87	0.84	0.91	0.91	0.86	0.84	1



	1	2	3	4	5
1	1	0.74	0.84	0.62	0.85
2	0.74	1	0.71	0.78	0.9
3	0.84	0.71	1	0.87	0.87
4	0.62	0.78	0.87	1	0.91
5	0.85	0.9	0.87	0.91	1
6	0.53	0.39	0.84	0.85	0.7
7	0.73	0.85	0.9	0.99	0.96
8	0.37	0.76	0.64	0.93	0.79
9	0.56	0.63	0.91	0.94	0.78

```
## $V
##           1         2         3         4         5         6         7
## 1 1.0000000 0.7647135 0.8057026 0.7343413 0.6970553 0.6732087 0.6480768
## 2 0.7647135 1.0000000 0.7762703 0.5981304 0.5515706 0.5816071 0.6562539
## 3 0.8057026 0.7762703 1.0000000 0.6689705 0.6454285 0.6510211 0.6372733
## 4 0.7343413 0.5981304 0.6689705 1.0000000 0.9199332 0.7151722 0.8638890
## 5 0.6970553 0.5515706 0.6454285 0.9199332 1.0000000 0.7692195 0.7978622
## 6 0.6732087 0.5816071 0.6510211 0.7151722 0.7692195 1.0000000 0.5141968
## 7 0.6480768 0.6562539 0.6372733 0.8638890 0.7978622 0.5141968 1.0000000
## 8 0.7482985 0.5816101 0.6979434 0.9236097 0.9066414 0.7677873 0.8055927
## 9 0.7462920 0.5768031 0.7782605 0.4993450 0.4683239 0.4637659 0.3853878
##           8         9
## 1 0.7482985 0.7462920
## 2 0.5816101 0.5768031
## 3 0.6979434 0.7782605
## 4 0.9236097 0.4993450
## 5 0.9066414 0.4683239
## 6 0.7677873 0.4637659
## 7 0.8055927 0.3853878
## 8 1.0000000 0.4305411
## 9 0.4305411 1.0000000
##
## $`D left`
##           1         2         3         4         5         6         7
## 1 1.0000000 0.7468751 0.8896625 0.8737702 0.8914265 0.9043319 0.8868540
## 2 0.7468751 1.0000000 0.6835282 0.7438023 0.8355098 0.8624593 0.8670823
## 3 0.8896625 0.6835282 1.0000000 0.7427741 0.7669053 0.7920764 0.7153320
```

```
## 4 0.8737702 0.7438023 0.7427741 1.0000000 0.9301237 0.8804529 0.8593031
## 5 0.8914265 0.8355098 0.7669053 0.9301237 1.0000000 0.9293234 0.9154132
## 6 0.9043319 0.8624593 0.7920764 0.8804529 0.9293234 1.0000000 0.9165539
## 7 0.8868540 0.8670823 0.7153320 0.8593031 0.9154132 0.9165539 1.0000000
## 8 0.9267302 0.8142317 0.7815869 0.8523512 0.9100607 0.9394902 0.9165312
## 9 0.8432989 0.6786582 0.7841322 0.7615744 0.7241844 0.8018238 0.7713556
##           8         9
## 1 0.9267302 0.8432989
## 2 0.8142317 0.6786582
## 3 0.7815869 0.7841322
## 4 0.8523512 0.7615744
## 5 0.9100607 0.7241844
## 6 0.9394902 0.8018238
## 7 0.9165312 0.7713556
## 8 1.0000000 0.7392496
## 9 0.7392496 1.0000000
##
## $`D right`
##           1         2         3         4         5         6         7
## 1 1.0000000 0.8905080 0.9742811 0.9494808 0.9784261 0.9577249 0.9784851
## 2 0.8905080 1.0000000 0.9373155 0.9014438 0.9015336 0.8846997 0.8806625
## 3 0.9742811 0.9373155 1.0000000 0.9453688 0.9707518 0.9635589 0.9686151
## 4 0.9494808 0.9014438 0.9453688 1.0000000 0.9745137 0.9508893 0.9281139
## 5 0.9784261 0.9015336 0.9707518 0.9745137 1.0000000 0.9766262 0.9546102
## 6 0.9577249 0.8846997 0.9635589 0.9508893 0.9766262 1.0000000 0.9383100
## 7 0.9784851 0.8806625 0.9686151 0.9281139 0.9546102 0.9383100 1.0000000
## 8 0.9140048 0.8512876 0.9256588 0.9711724 0.9607040 0.9722933 0.8972969
## 9 0.9058818 0.7840334 0.8693355 0.8402951 0.9071761 0.9114815 0.8568616
##           8         9
## 1 0.9140048 0.9058818
## 2 0.8512876 0.7840334
## 3 0.9256588 0.8693355
## 4 0.9711724 0.8402951
## 5 0.9607040 0.9071761
## 6 0.9722933 0.9114815
## 7 0.8972969 0.8568616
## 8 1.0000000 0.8403870
## 9 0.8403870 1.0000000
##
## $J
##           1         2         3         4         5         6         7
## 1 1.0000000 0.7433990 0.8394826 0.6180154 0.8514129 0.5325200 0.7317654
## 2 0.7433990 1.0000000 0.7127707 0.7801124 0.9016459 0.3920497 0.8495050
## 3 0.8394826 0.7127707 1.0000000 0.8650515 0.8669765 0.8391165 0.9019379
## 4 0.6180154 0.7801124 0.8650515 1.0000000 0.9082976 0.8532762 0.9863565
## 5 0.8514129 0.9016459 0.8669765 0.9082976 1.0000000 0.7033369 0.9616642
## 6 0.5325200 0.3920497 0.8391165 0.8532762 0.7033369 1.0000000 0.8144924
## 7 0.7317654 0.8495050 0.9019379 0.9863565 0.9616642 0.8144924 1.0000000
## 8 0.3689929 0.7559483 0.6421116 0.9343655 0.7938727 0.6791621 0.8929092
## 9 0.5624287 0.6320265 0.9127439 0.9385913 0.7778224 0.9018812 0.9102861
##           8         9
## 1 0.3689929 0.5624287
## 2 0.7559483 0.6320265
## 3 0.6421116 0.9127439
```

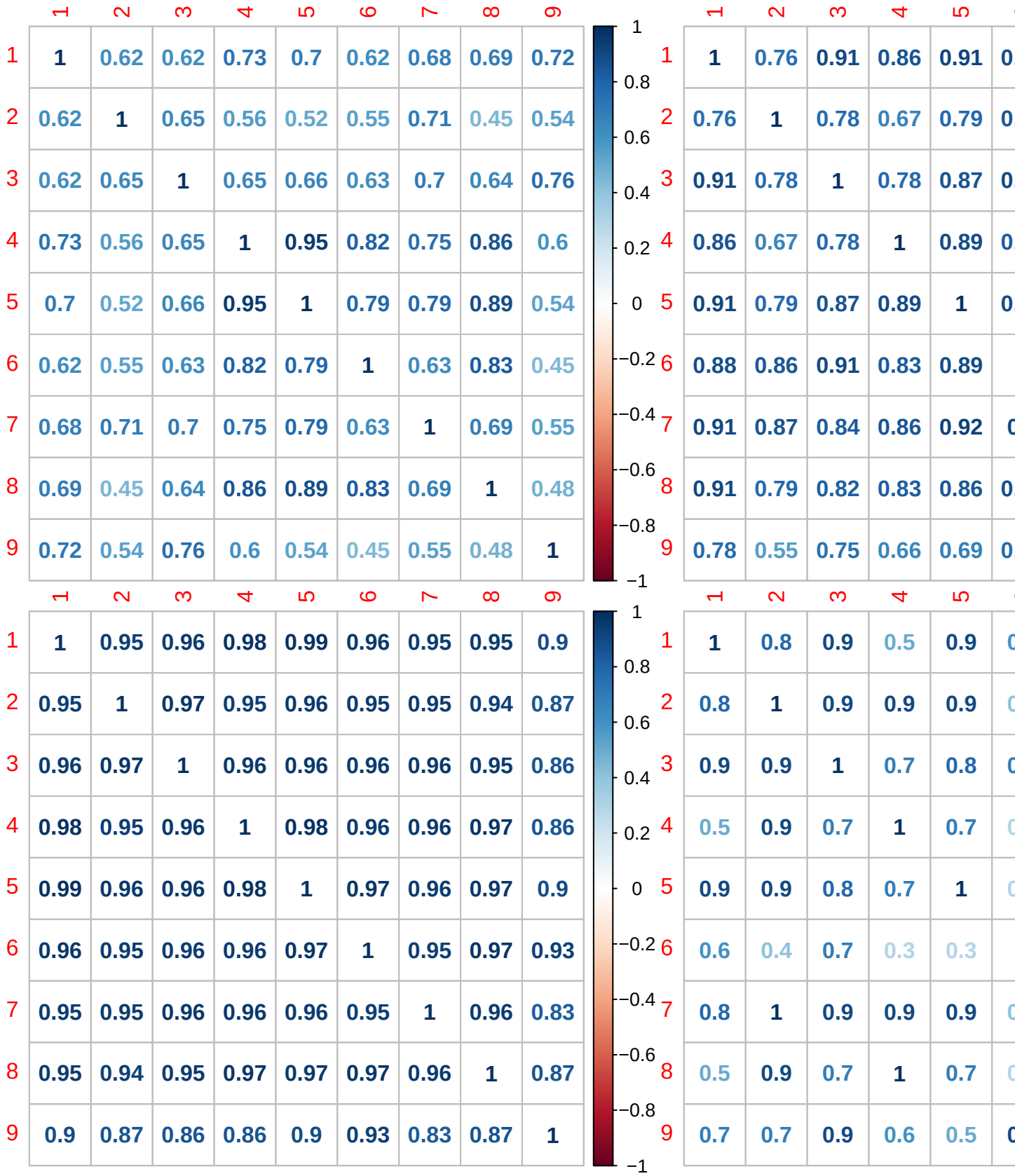
```
## 4 0.9343655 0.9385913
## 5 0.7938727 0.7778224
## 6 0.6791621 0.9018812
## 7 0.8929092 0.9102861
## 8 1.0000000 0.8161022
## 9 0.8161022 1.0000000
```

```
corr <- lapply(cleaned.sam.datasets, cor, method = "spearman")
corr
```

```
## $V
##           [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
##  [1,] 1.0000000 0.6177340 0.6152709 0.7300493 0.7039409 0.6236453
##  [2,] 0.6177340 1.0000000 0.6467980 0.5610837 0.5182266 0.5467980
##  [3,] 0.6152709 0.6467980 1.0000000 0.6532020 0.6556650 0.6285714
##  [4,] 0.7300493 0.5610837 0.6532020 1.0000000 0.9502463 0.8182266
##  [5,] 0.7039409 0.5182266 0.6556650 0.9502463 1.0000000 0.7901478
##  [6,] 0.6236453 0.5467980 0.6285714 0.8182266 0.7901478 1.0000000
##  [7,] 0.6832512 0.7059113 0.7009852 0.7507389 0.7876847 0.6290640
##  [8,] 0.6901478 0.4507389 0.6448276 0.8620690 0.8876847 0.8320197
##  [9,] 0.7221675 0.5428571 0.7600985 0.6034483 0.5389163 0.4453202
##           [,7]      [,8]      [,9]
##  [1,] 0.6832512 0.6901478 0.7221675
##  [2,] 0.7059113 0.4507389 0.5428571
##  [3,] 0.7009852 0.6448276 0.7600985
##  [4,] 0.7507389 0.8620690 0.6034483
##  [5,] 0.7876847 0.8876847 0.5389163
##  [6,] 0.6290640 0.8320197 0.4453202
##  [7,] 1.0000000 0.6886700 0.5472906
##  [8,] 0.6886700 1.0000000 0.4788177
##  [9,] 0.5472906 0.4788177 1.0000000
##
## $`D left`
##           [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
##  [1,] 1.0000000 0.7571206 0.9084029 0.8601624 0.9106587 0.8821893
##  [2,] 0.7571206 1.0000000 0.7792989 0.6697074 0.7894971 0.8579375
##  [3,] 0.9084029 0.7792989 1.0000000 0.7809927 0.8656650 0.9056311
##  [4,] 0.8601624 0.6697074 0.7809927 1.0000000 0.8913116 0.8309232
##  [5,] 0.9106587 0.7894971 0.8656650 0.8913116 1.0000000 0.8904216
##  [6,] 0.8821893 0.8579375 0.9056311 0.8309232 0.8904216 1.0000000
##  [7,] 0.9057737 0.8666148 0.8388605 0.8585095 0.9200134 0.9003337
##  [8,] 0.9059962 0.7874068 0.8219453 0.8264739 0.8577150 0.8869855
##  [9,] 0.7755148 0.5526990 0.7479403 0.6576898 0.6898164 0.7778768
##           [,7]      [,8]      [,9]
##  [1,] 0.9057737 0.9059962 0.7755148
##  [2,] 0.8666148 0.7874068 0.5526990
##  [3,] 0.8388605 0.8219453 0.7479403
##  [4,] 0.8585095 0.8264739 0.6576898
##  [5,] 0.9200134 0.8577150 0.6898164
##  [6,] 0.9003337 0.8869855 0.7778768
##  [7,] 1.0000000 0.8852058 0.7168930
##  [8,] 0.8852058 1.0000000 0.7249055
##  [9,] 0.7168930 0.7249055 1.0000000
##
```

```
## $`D right`
##           [,1]      [,2]      [,3]      [,4]      [,5]      [,6]
##  [1,] 1.0000000 0.9464897 0.9568907 0.9845354 0.9857651 0.9640071
##  [2,] 0.9464897 1.0000000 0.9737274 0.9496442 0.9601752 0.9501916
##  [3,] 0.9568907 0.9737274 1.0000000 0.9605911 0.9640071 0.9556650
##  [4,] 0.9845354 0.9496442 0.9605911 1.0000000 0.9812509 0.9578544
##  [5,] 0.9857651 0.9601752 0.9640071 0.9812509 1.0000000 0.9733133
##  [6,] 0.9640071 0.9501916 0.9556650 0.9578544 0.9733133 1.0000000
##  [7,] 0.9549747 0.9512863 0.9605911 0.9644226 0.9577118 0.9485495
##  [8,] 0.9500479 0.9365079 0.9512863 0.9704433 0.9664705 0.9737274
##  [9,] 0.8987134 0.8671137 0.8649241 0.8641029 0.8965234 0.9306145
##           [,7]      [,8]      [,9]
##  [1,] 0.9549747 0.9500479 0.8987134
##  [2,] 0.9512863 0.9365079 0.8671137
##  [3,] 0.9605911 0.9512863 0.8649241
##  [4,] 0.9644226 0.9704433 0.8641029
##  [5,] 0.9577118 0.9664705 0.8965234
##  [6,] 0.9485495 0.9737274 0.9306145
##  [7,] 1.0000000 0.9551177 0.8339948
##  [8,] 0.9551177 1.0000000 0.8651978
##  [9,] 0.8339948 0.8651978 1.0000000
##
## $J
##      [,1] [,2] [,3] [,4] [,5] [,6] [,7] [,8] [,9]
##  [1,]  1.0  0.8  0.9  0.5  0.9  0.6  0.8  0.5  0.7
##  [2,]  0.8  1.0  0.9  0.9  0.9  0.4  1.0  0.9  0.7
##  [3,]  0.9  0.9  1.0  0.7  0.8  0.7  0.9  0.7  0.9
##  [4,]  0.5  0.9  0.7  1.0  0.7  0.3  0.9  1.0  0.6
##  [5,]  0.9  0.9  0.8  0.7  1.0  0.3  0.9  0.7  0.5
##  [6,]  0.6  0.4  0.7  0.3  0.3  1.0  0.4  0.3  0.9
##  [7,]  0.8  1.0  0.9  0.9  0.9  0.4  1.0  0.9  0.7
##  [8,]  0.5  0.9  0.7  1.0  0.7  0.3  0.9  1.0  0.6
##  [9,]  0.7  0.7  0.9  0.6  0.5  0.9  0.7  0.6  1.0
```

```
lapply(corr, corrplot, method="number")
```


1 2 3 4 5 6 7 8 9
1 1 0.62 0.62 0.73 0.7 0.62 0.68 0.69 0.72
2 0.62 1 0.65 0.56 0.52 0.55 0.71 0.45 0.54
3 0.62 0.65 1 0.65 0.66 0.63 0.7 0.64 0.76
4 0.73 0.56 0.65 1 0.95 0.82 0.75 0.86 0.6
5 0.7 0.52 0.66 0.95 1 0.79 0.79 0.89 0.54
6 0.62 0.55 0.63 0.82 0.79 1 0.63 0.83 0.45
7 0.68 0.71 0.7 0.75 0.79 0.63 1 0.69 0.55
8 0.69 0.45 0.64 0.86 0.89 0.83 0.69 1 0.48
9 0.72 0.54 0.76 0.6 0.54 0.45 0.55 0.48 1
1 0.8 0.6 0.4 0.2 0 −0.2 −0.4 −0.6 −0.8 −1
1 2 3 4 5
1 1 0.76 0.91 0.86 0.91
2 0.76 1 0.78 0.67 0.79
3 0.91 0.78 1 0.78 0.87
4 0.86 0.67 0.78 1 0.89
5 0.91 0.79 0.87 0.89 1
6 0.88 0.86 0.91 0.83 0.89
7 0.91 0.87 0.84 0.86 0.92
8 0.91 0.79 0.82 0.83 0.86
9 0.78 0.55 0.75 0.66 0.69
1 2 3 4 5 6 7 8 9
1 1 0.95 0.96 0.98 0.99 0.96 0.95 0.95 0.9
2 0.95 1 0.97 0.95 0.96 0.95 0.95 0.94 0.87
3 0.96 0.97 1 0.96 0.96 0.96 0.96 0.95 0.86
4 0.98 0.95 0.96 1 0.98 0.96 0.96 0.97 0.86
5 0.99 0.96 0.96 0.98 1 0.97 0.96 0.97 0.9
6 0.96 0.95 0.96 0.96 0.97 1 0.95 0.97 0.93
7 0.95 0.95 0.96 0.96 0.96 0.95 1 0.96 0.83
8 0.95 0.94 0.95 0.97 0.97 0.97 0.96 1 0.87
9 0.9 0.87 0.86 0.86 0.9 0.93 0.83 0.87 1
1 0.8 0.6 0.4 0.2 0 −0.2 −0.4 −0.6 −0.8 −1
1 2 3 4 5
1 1 0.8 0.9 0.5 0.9
2 0.8 1 0.9 0.9 0.9
3 0.9 0.9 1 0.7 0.8
4 0.5 0.9 0.7 1 0.7
5 0.9 0.9 0.8 0.7 1
6 0.6 0.4 0.7 0.3 0.3
7 0.8 1 0.9 0.9 0.9
8 0.5 0.9 0.7 1 0.7
9 0.7 0.7 0.9 0.6 0.5

```
## $V
```

```
##           1         2         3         4         5         6         7
## 1 1.0000000 0.6177340 0.6152709 0.7300493 0.7039409 0.6236453 0.6832512
## 2 0.6177340 1.0000000 0.6467980 0.5610837 0.5182266 0.5467980 0.7059113
## 3 0.6152709 0.6467980 1.0000000 0.6532020 0.6556650 0.6285714 0.7009852
## 4 0.7300493 0.5610837 0.6532020 1.0000000 0.9502463 0.8182266 0.7507389
## 5 0.7039409 0.5182266 0.6556650 0.9502463 1.0000000 0.7901478 0.7876847
## 6 0.6236453 0.5467980 0.6285714 0.8182266 0.7901478 1.0000000 0.6290640
## 7 0.6832512 0.7059113 0.7009852 0.7507389 0.7876847 0.6290640 1.0000000
## 8 0.6901478 0.4507389 0.6448276 0.8620690 0.8876847 0.8320197 0.6886700
## 9 0.7221675 0.5428571 0.7600985 0.6034483 0.5389163 0.4453202 0.5472906
##           8         9
## 1 0.6901478 0.7221675
## 2 0.4507389 0.5428571
## 3 0.6448276 0.7600985
## 4 0.8620690 0.6034483
## 5 0.8876847 0.5389163
## 6 0.8320197 0.4453202
## 7 0.6886700 0.5472906
## 8 1.0000000 0.4788177
## 9 0.4788177 1.0000000
##
## $`D left`
##           1         2         3         4         5         6         7
## 1 1.0000000 0.7571206 0.9084029 0.8601624 0.9106587 0.8821893 0.9057737
## 2 0.7571206 1.0000000 0.7792989 0.6697074 0.7894971 0.8579375 0.8666148
## 3 0.9084029 0.7792989 1.0000000 0.7809927 0.8656650 0.9056311 0.8388605
## 4 0.8601624 0.6697074 0.7809927 1.0000000 0.8913116 0.8309232 0.8585095
## 5 0.9106587 0.7894971 0.8656650 0.8913116 1.0000000 0.8904216 0.9200134
## 6 0.8821893 0.8579375 0.9056311 0.8309232 0.8904216 1.0000000 0.9003337
## 7 0.9057737 0.8666148 0.8388605 0.8585095 0.9200134 0.9003337 1.0000000
## 8 0.9059962 0.7874068 0.8219453 0.8264739 0.8577150 0.8869855 0.8852058
## 9 0.7755148 0.5526990 0.7479403 0.6576898 0.6898164 0.7778768 0.7168930
##           8         9
## 1 0.9059962 0.7755148
## 2 0.7874068 0.5526990
## 3 0.8219453 0.7479403
## 4 0.8264739 0.6576898
## 5 0.8577150 0.6898164
## 6 0.8869855 0.7778768
## 7 0.8852058 0.7168930
## 8 1.0000000 0.7249055
## 9 0.7249055 1.0000000
##
## $`D right`
##           1         2         3         4         5         6         7
## 1 1.0000000 0.9464897 0.9568907 0.9845354 0.9857651 0.9640071 0.9549747
## 2 0.9464897 1.0000000 0.9737274 0.9496442 0.9601752 0.9501916 0.9512863
## 3 0.9568907 0.9737274 1.0000000 0.9605911 0.9640071 0.9556650 0.9605911
## 4 0.9845354 0.9496442 0.9605911 1.0000000 0.9812509 0.9578544 0.9644226
## 5 0.9857651 0.9601752 0.9640071 0.9812509 1.0000000 0.9733133 0.9577118
## 6 0.9640071 0.9501916 0.9556650 0.9578544 0.9733133 1.0000000 0.9485495
## 7 0.9549747 0.9512863 0.9605911 0.9644226 0.9577118 0.9485495 1.0000000
## 8 0.9500479 0.9365079 0.9512863 0.9704433 0.9664705 0.9737274 0.9551177
## 9 0.8987134 0.8671137 0.8649241 0.8641029 0.8965234 0.9306145 0.8339948
```

```
##           8         9
## 1 0.9500479 0.8987134
## 2 0.9365079 0.8671137
## 3 0.9512863 0.8649241
## 4 0.9704433 0.8641029
## 5 0.9664705 0.8965234
## 6 0.9737274 0.9306145
## 7 0.9551177 0.8339948
## 8 1.0000000 0.8651978
## 9 0.8651978 1.0000000
##
## $J
##     1   2   3   4   5   6   7   8   9
## 1 1.0 0.8 0.9 0.5 0.9 0.6 0.8 0.5 0.7
## 2 0.8 1.0 0.9 0.9 0.9 0.4 1.0 0.9 0.7
## 3 0.9 0.9 1.0 0.7 0.8 0.7 0.9 0.7 0.9
## 4 0.5 0.9 0.7 1.0 0.7 0.3 0.9 1.0 0.6
## 5 0.9 0.9 0.8 0.7 1.0 0.3 0.9 0.7 0.5
## 6 0.6 0.4 0.7 0.3 0.3 1.0 0.4 0.3 0.9
## 7 0.8 1.0 0.9 0.9 0.9 0.4 1.0 0.9 0.7
## 8 0.5 0.9 0.7 1.0 0.7 0.3 0.9 1.0 0.6
## 9 0.7 0.7 0.9 0.6 0.5 0.9 0.7 0.6 1.0
```

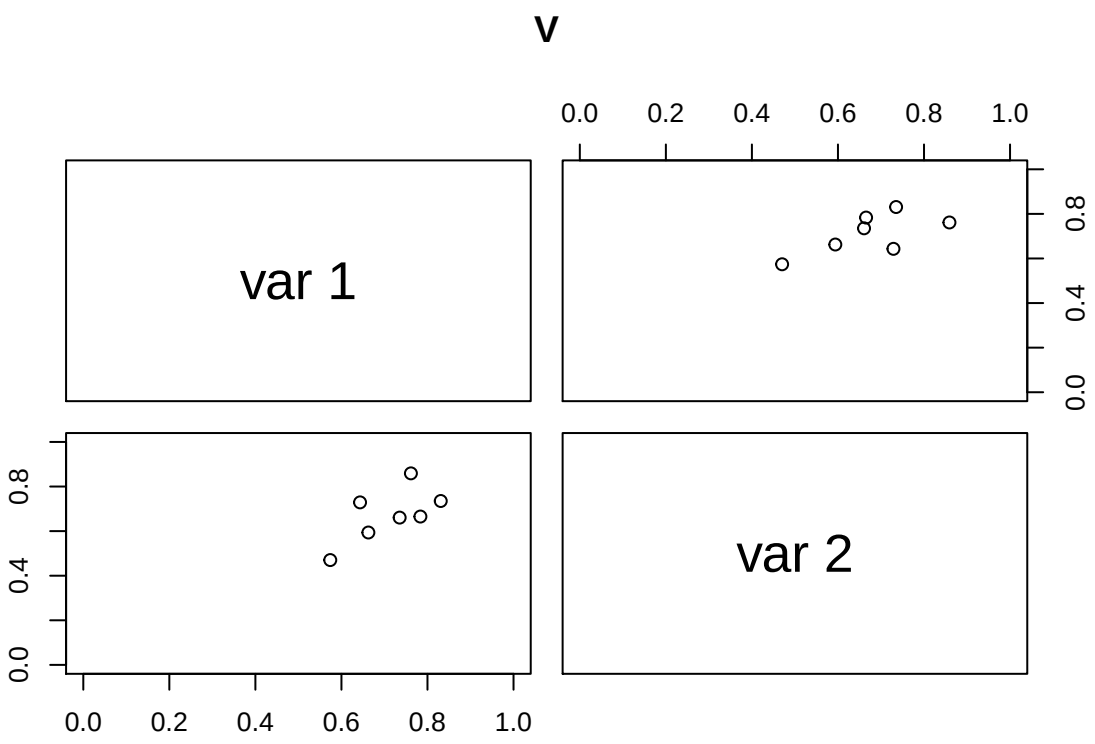
```
df <- lapply((1:9)[-5], function(i) read.csv(paste("../", i, ".csv", sep = ""), header = T, sep = "\t"))
df <- append(df, list(read.csv("../1_SAM13306969.csv", header = T, sep = "\t")))#, read.csv("2_SAM13306
df <- list(Reduce(function(...) merge(..., all=T), df[1:4]), Reduce(function(...) merge(..., all=T), df
```

```
sam.dataset
```

```
## $V
##                [,1]      [,2]
## IGHV1-18  0.5740185 0.4701835
## IGHV1-69  0.7835545 0.6654052
## IGHV3-53  0.7614691 0.8591205
## IGHV3-7   0.6432709 0.7289902
## IGHV5-51  0.8308350 0.7351218
## IGHV6-1   0.7353137 0.6606389
## IGHV7-4-1 0.6626073 0.5938447
##
## $`D left`
##               [,1]      [,2]
## IGHD1-26 0.9606541 0.9675755
## IGHD2-15 0.9697466 0.9651506
## IGHD2-2  0.9025885 0.9723845
## IGHD2-21 0.9848048 0.9570776
## IGHD3-10 0.9687651 0.9299873
## IGHD3-16 0.9940668 1.0000000
## IGHD3-22 0.9596918 0.9043678
## IGHD3-9  0.9387770 0.8975033
## IGHD5-12 0.9262483 0.9064378
## IGHD6-13 0.9669651 0.8875939
## IGHD6-19 0.9599191 0.9064436
```

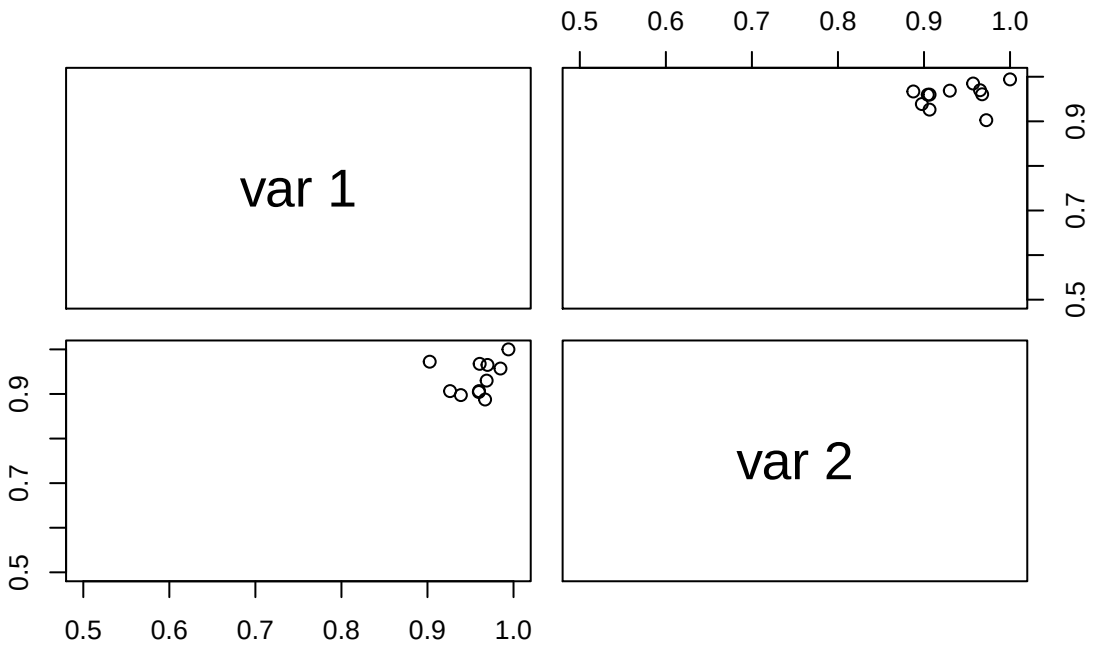
```
##
## $`D right`
##                [,1]      [,2]
## IGHD1-26 0.9288703 0.9281503
## IGHD2-15 0.9348775 0.9474306
## IGHD2-2  0.9283275 0.9559214
## IGHD3-10 0.9843928 0.9719528
## IGHD3-16 0.9911365 0.9965940
## IGHD3-22 0.8317088 0.9213793
## IGHD3-9  0.9905647 0.9960578
## IGHD5-12 0.9373738 0.9296137
## IGHD6-13 0.7638932 0.5495985
## IGHD6-19 0.8261259 0.7534077
##
## $J
##            [,1]      [,2]
## IGHJ1 0.9278804 0.9542386
## IGHJ2 0.9341338 0.8484095
## IGHJ3 0.7611590 0.6729030
## IGHJ4 0.9230592 0.9002743
## IGHJ5 0.9650078 0.9372140
## IGHJ6 0.9893653 0.9542411
```

```
pairs.plots(sam.dataset)
```



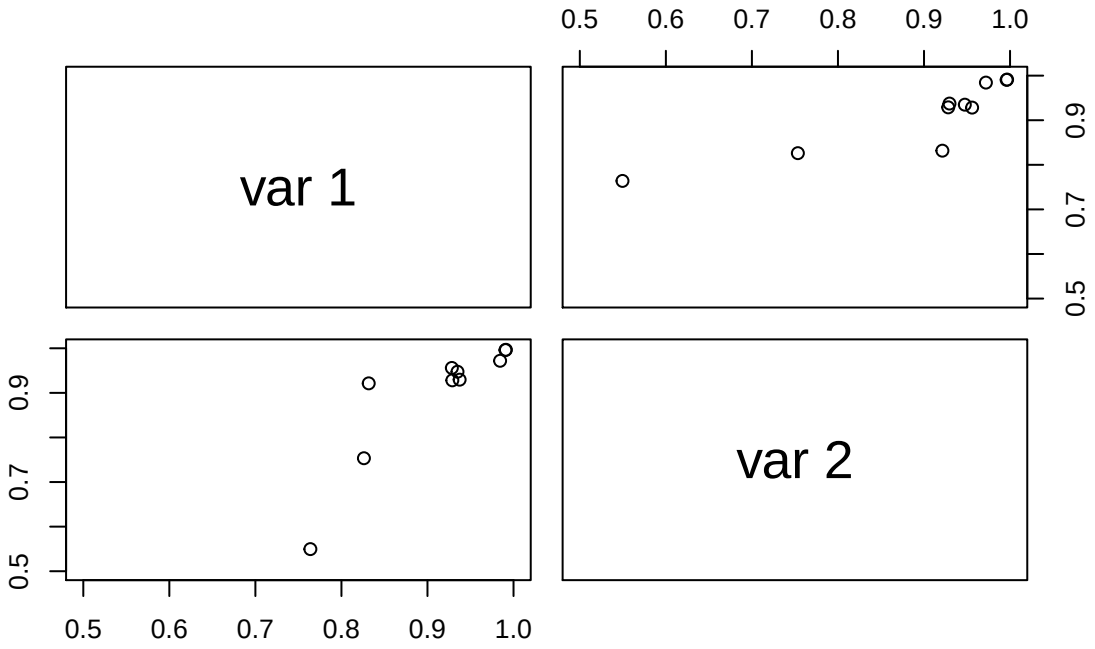

```
## NULL
```

D left

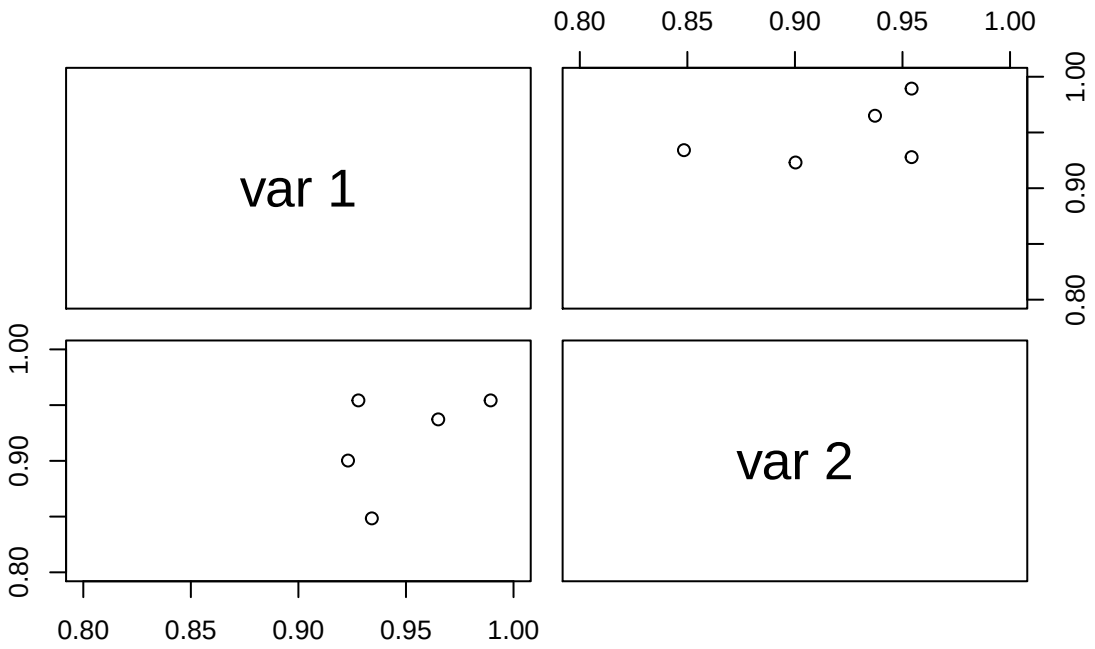



```
## NULL
```

D right




```
## NULL
```

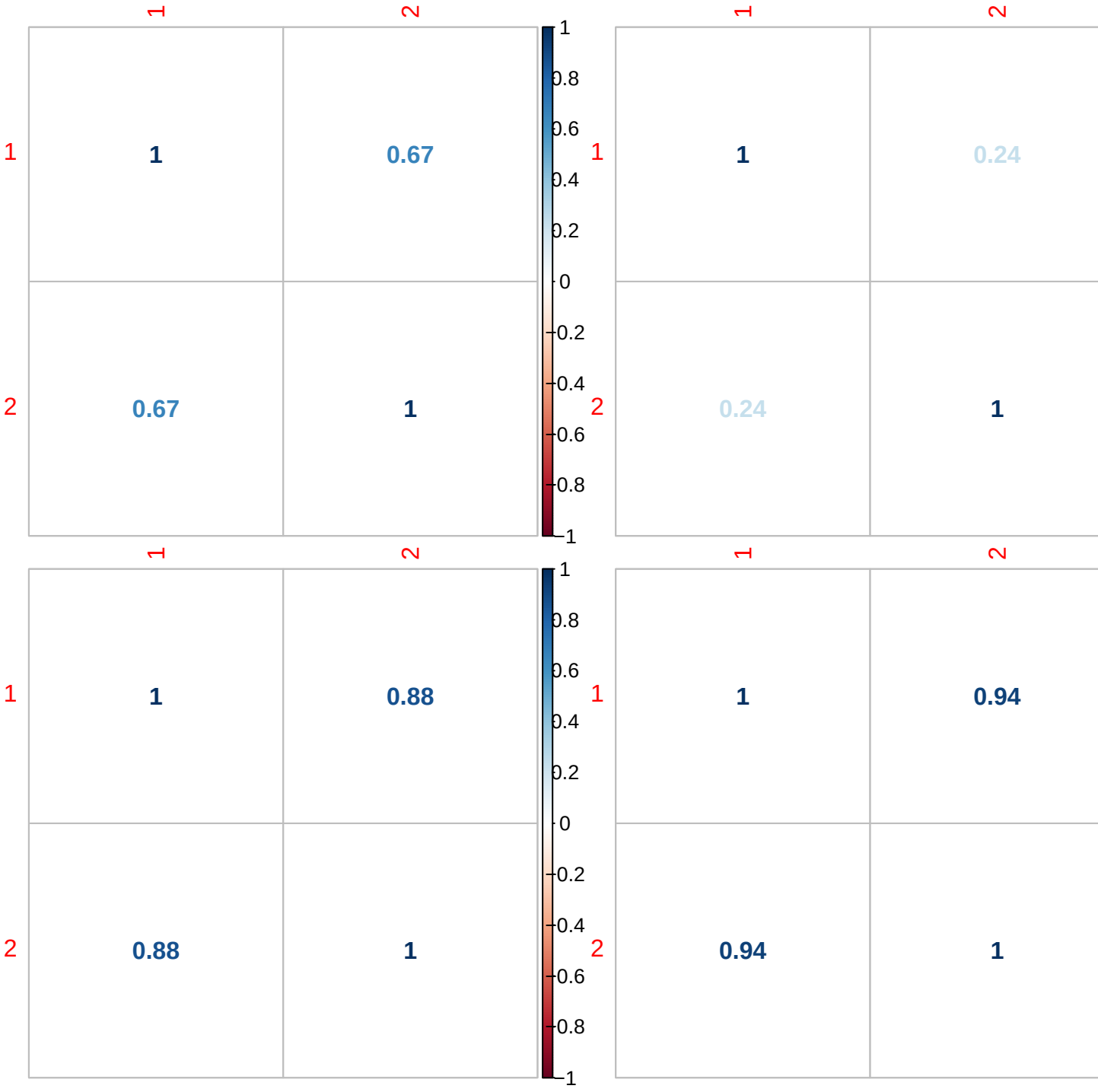



```
## NULL
```

```
corr <- lapply(sam.dataset, cor)
corr
```

```
## $V
##           [,1]      [,2]
## [1,] 1.0000000 0.6662787
## [2,] 0.6662787 1.0000000
##
## $`D left`
##           [,1]      [,2]
## [1,] 1.0000000 0.2381665
## [2,] 0.2381665 1.0000000
##
## $`D right`
##           [,1]      [,2]
## [1,] 1.0000000 0.8786097
## [2,] 0.8786097 1.0000000
##
## $J
##           [,1]      [,2]
## [1,] 1.0000000 0.9379378
## [2,] 0.9379378 1.0000000
```

```
lapply(corr, corrplot, method="number")
```



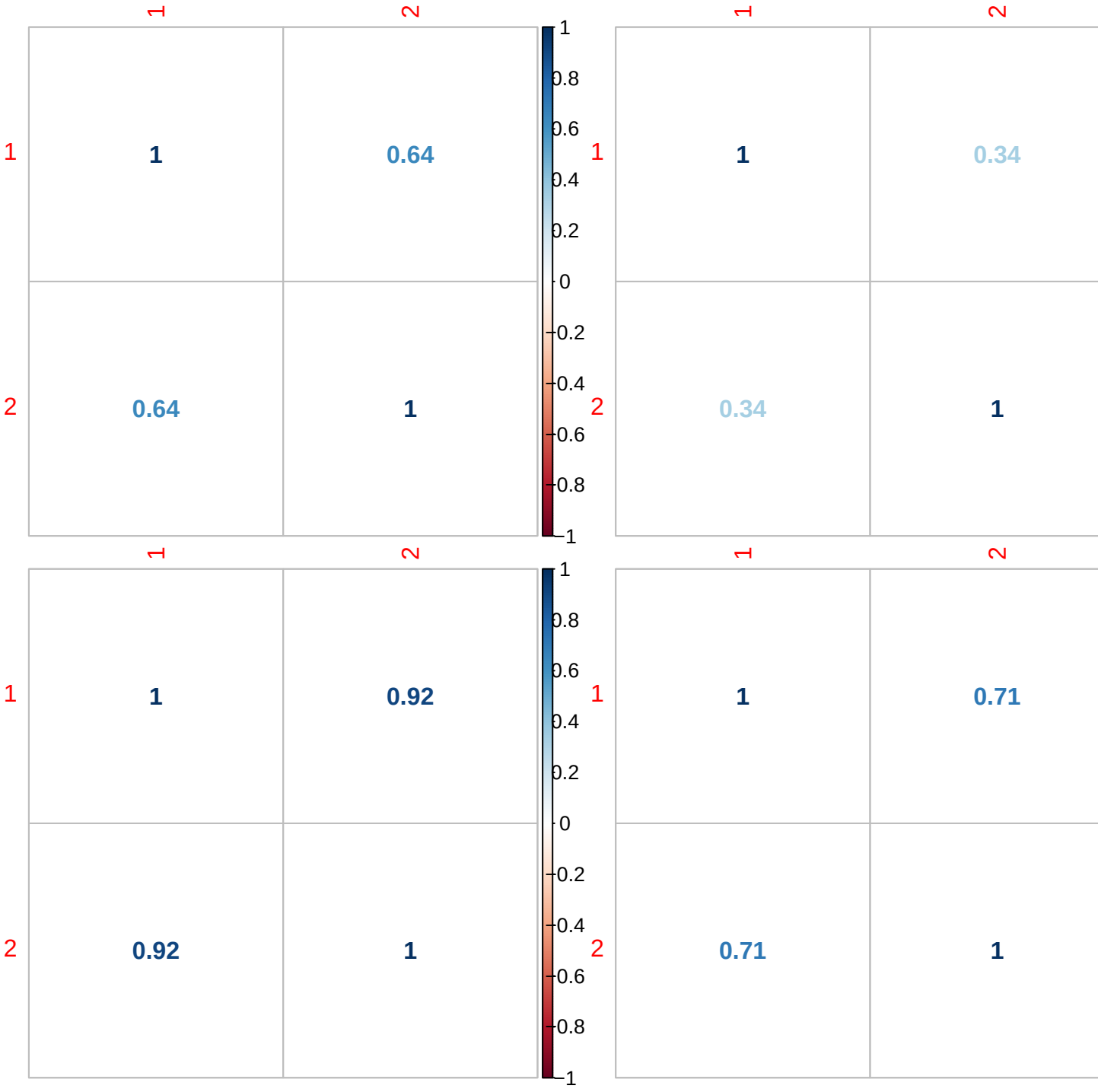

```
## $V
##           1         2
## 1 1.0000000 0.6662787
## 2 0.6662787 1.0000000
##
## $`D left`
##           1         2
## 1 1.0000000 0.2381665
```

```
## 2 0.2381665 1.0000000
##
## $`D right`
##           1         2
## 1 1.0000000 0.8786097
## 2 0.8786097 1.0000000
##
## $J
##           1         2
## 1 1.0000000 0.9379378
## 2 0.9379378 1.0000000
```

```
corr <- lapply(sam.dataset, cor, method = "spearman")
corr
```

```
## $V
##           [,1]      [,2]
## [1,] 1.0000000 0.6428571
## [2,] 0.6428571 1.0000000
##
## $`D left`
##           [,1]      [,2]
## [1,] 1.0000000 0.3363636
## [2,] 0.3363636 1.0000000
##
## $`D right`
##           [,1]      [,2]
## [1,] 1.0000000 0.9151515
## [2,] 0.9151515 1.0000000
##
## $J
##           [,1]      [,2]
## [1,] 1.0000000 0.7142857
## [2,] 0.7142857 1.0000000
```

```
lapply(corr, corrplot, method="number")
```




```
## $V
##           1         2
## 1 1.0000000 0.6428571
## 2 0.6428571 1.0000000
##
## $`D left`
##           1         2
## 1 1.0000000 0.3363636
```

```
## 2 0.3363636 1.0000000
##
## $`D right`
##           1         2
## 1 1.0000000 0.9151515
## 2 0.9151515 1.0000000
##
## $J
##           1         2
## 1 1.0000000 0.7142857
## 2 0.7142857 1.0000000
```