

# Lab 1

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August 24, 2015  
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## 1. Task 1

```
set.seed(1234)
Var1 <- rnorm(n=100)
Var2 <- rnorm(n=100)
Var3 <- rnorm(n=100)
```

## 2. Task 2

```
print(Var1)
```

```
##      [1] -1.207065749  0.277429242  1.084441177 -2.345697703  0.429124689
##      [6]  0.506055892 -0.574739960 -0.546631856 -0.564451999 -0.890037829
##     [11] -0.477192700 -0.998386445 -0.776253895  0.064458817  0.959494059
##     [16] -0.110285494 -0.511009506 -0.911195417 -0.837171680  2.415835178
##     [21]  0.134088220 -0.490685897 -0.440547872  0.459589441 -0.693720247
##     [26] -1.448204910  0.574755721 -1.023655723 -0.015138300 -0.935948601
##     [31]  1.102297546 -0.475593079 -0.709440038 -0.501258061 -1.629093469
##     [36] -1.167619262 -2.180039649 -1.340993192 -0.294293859 -0.465897540
##     [41]  1.449496265 -1.068642724 -0.855364634 -0.280623002 -0.994340076
##     [46] -0.968514318 -1.107318193 -1.251985886 -0.523828119 -0.496849957
##     [51] -1.806031257 -0.582075925 -1.108889624 -1.014962009 -0.162309524
##     [56]  0.563055819  1.647817473 -0.773353424  1.605909629 -1.157808548
##     [61]  0.656588464  2.548991071 -0.034760390 -0.669633580 -0.007604756
##     [66]  1.777084448 -1.138607737  1.367827179  1.329564791  0.336472797
##     [71]  0.006892838 -0.455468738 -0.366523933  0.648286568  2.070270861
##     [76] -0.153398412 -1.390700947 -0.723581777  0.258261762 -0.317059115
##     [81] -0.177789958 -0.169994077 -1.372301886 -0.173787170  0.850232257
##     [86]  0.697608712  0.549997351 -0.402731975 -0.191593770 -1.194527880
##     [91] -0.053158819  0.255196001  1.705964007  1.001513252 -0.495583443
##     [96]  0.355550297 -1.134608044  0.878203627  0.972916753  2.121117105
```

```
print(Var2)
```

```
##      [1]  0.41452353 -0.47471847  0.06599349 -0.50247778 -0.82599859
##      [6]  0.16698928 -0.89626463  0.16818539  0.35496826 -0.05210512
##     [11] -0.19593462 -0.64906975 -1.10976723  0.84927420  0.02236253
##     [16]  0.83114062 -1.24428785  0.16902641  0.67316631 -0.02627638
##     [21] -0.19139217 -0.78190665  2.05816199  0.75050145  1.82420830
##     [26]  0.08005964 -0.63140930 -1.51328812 -0.63609983  0.22630153
##     [31]  1.01369035  0.25275014 -1.17194831  0.66871433 -1.65010093
##     [36] -0.36585225 -0.31611833 -1.94824605  0.92005752 -0.62287159
##     [41] -0.33403665  1.39514789  0.63667441 -0.10843170  0.51376278
##     [46]  0.39927181  1.66285645  0.27589340  0.50627262  0.34755198
```

```
## [51] -0.37723765  0.09761946  1.63874465 -0.87559247  0.12176000
## [56]  1.36213066 -0.23462109 -1.05338281 -0.86978361 -0.39012703
## [61] -0.84735007 -0.26063939 -0.41441971 -0.18305080  0.40705610
## [66]  0.62463313  1.67820574 -0.06869365 -0.32083991  1.47100572
## [71]  1.70432940  0.04324404 -0.33265732 -1.82223542  1.41126240
## [76] -0.83758243 -1.12376279  3.04376589  0.23502131 -0.03325861
## [81] -2.73221952 -0.09979059  0.97603173  0.41386892  0.91232216
## [86]  1.98373220  1.16910851 -0.50873702  0.70418018 -0.19841627
## [91] -0.53807079 -2.85575866 -0.78964685  0.48781464  2.16803254
## [96]  0.50069461  0.62021020 -0.96590321  0.16265471 -2.07823754
```

```
print(Var3)
```

```
## [1]  0.485226821  0.696768779  0.185513916  0.700733516  0.311681029
## [6]  0.760462362  1.842463626  1.112362841  0.032663958 -1.114448965
## [11]  0.418057822 -0.400235237  1.493493103 -1.607080940 -0.415751788
## [16]  0.422008373 -0.151736537 -0.606151115 -0.304721069  0.629536100
## [21]  0.895171980  0.660212632  2.273483520  1.173497573  0.287709728
## [26] -0.659770094  2.919140131  0.677415500 -0.684320344  0.186492083
## [31] -0.324393300 -0.274704218 -0.933503341  0.116845345  0.319160239
## [36] -1.077542123 -3.233152133 -0.254874653  0.029517830  0.594273774
## [41]  0.059135168  0.413398895 -1.097772175  0.711175257  0.718888730
## [46]  0.251651069  1.357274436  0.404468471  0.264364270  0.268043904
## [51]  0.436930577  1.060123905  0.452190397  0.663198616 -1.136373554
## [56] -0.370497517  1.476969590 -1.223903751  0.258068387  0.405002805
## [61]  0.975803322 -0.348876737  0.158625439 -1.763255067  0.338596047
## [66] -0.666565030 -0.238646624 -1.187765282  0.384935322  0.666579516
## [71] -0.304613889  1.825011064  0.670559371  0.948632573  2.049403002
## [76] -0.651113609  0.808619273  0.986580614 -0.006170796  0.319052358
## [81] -1.011821903  0.470167548 -0.700970332  0.813682863 -0.811430784
## [86]  0.319397487 -0.846522653 -0.245763179 -1.552859011  0.128434033
## [91]  0.985443389  0.183247523 -1.766229213 -0.620533697  1.656043037
## [96]  1.809805386 -1.175036768 -0.366703259  0.353625449  0.319156221
```

### 3. Task 3

```
myMatrix <- matrix(Var1, 10, 10)
```

### 4. Task 4

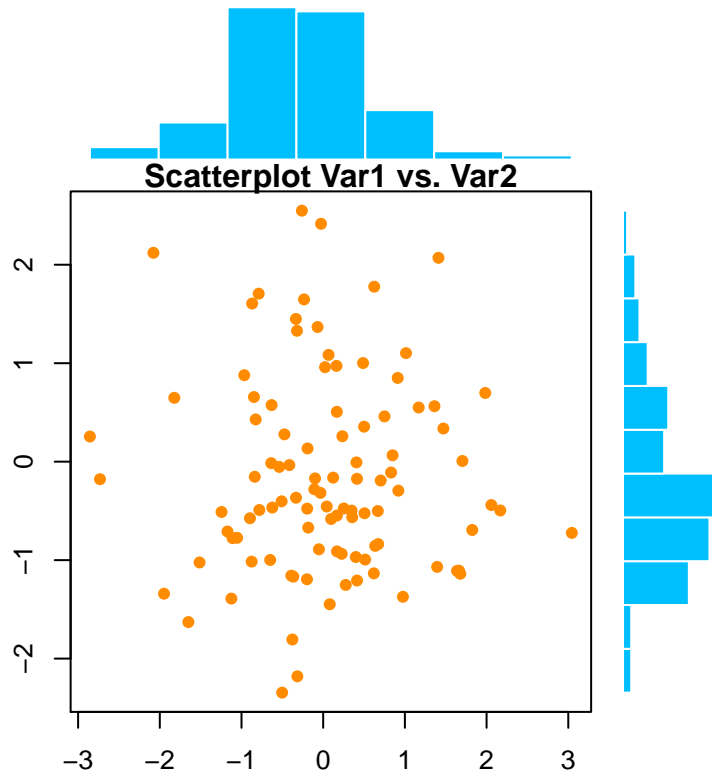
```
# reference: help document of function layout

old.par <- par(no.readonly = TRUE) # save default, for resetting
nf <- layout(matrix(c(2, 0, 1, 3), 2, 2, byrow=TRUE), widths=c(3,1), heights=c(1,3), respect=TRUE)
par(mar=c(3,3,1,1))
# scatter plot of Var1 vs. Var2
plot(x=Var2, y=Var1, pch=16, cex=1, col="darkorange", main='Scatterplot Var1 vs. Var2')
# histograms
xhist <- hist(Var2, plot=FALSE)
yhist <- hist(Var1, plot=FALSE)
top <- max(c(xhist$counts, yhist$counts))
par(mar=c(0,3,2,1))
```

```

barplot(xhist$counts, axes=FALSE, ylim=c(0,top), space=0, col="deepskyblue", border="white")
par(mar=c(3,0,1,2))
barplot(yhist$counts, axes=FALSE, xlim=c(0,top), space=0, col="deepskyblue", border="white", horiz=TRUE)

```



```

par(old.par) # reset to default

```

## 5. Task 5

```

taskFunction <- function(nameVector, ...) {

  #
  # Input
  # nameVector: a vector of length p containing the names of the vectors
  # ...: p vectors that need to get combined
  #
  # Output
  # a pdf file that contains boxplot
  # the mean value of the result vector
  #

  # combine vectors into dataframe
  df <- data.frame(...)
  p <- ncol(df)

```

```

if (length(nameVector) != p) {
  print("Length of nameVector does not equal to p...")
  return(FALSE)
}

colnames(df) <- nameVector
# get row wise maximum
rowMax <- apply(df, 1, max)
# and store it
save(rowMax, file="row_max_vector.RData")
# plot boxplot and store to pdf
pdf("Xu_Hong_Solutions_myPlot.pdf")
boxplot(rowMax, col="lightgray", main="Boxplot of row-wise max")
dev.off()
# return mean
return(mean(rowMax))
}
taskFunction(c("Var1", "Var2"), Var1, Var2)

```

```
## [1] 0.5183706
```