Homework 2

Due Wednesday Sep 16

Tsering Dolkar

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Problem 1

I finished the Primers titled "Work with Data" and "Tidy Your Data" on Rstudio cloud.

Problem 2

Rmarkdown of this HW is opened.

Problem 3

In the lecture, there were two links to StackOverflow questions on why one should use version control. In your own words, summarize your thoughts (2-3 sentences) on version control in your future work. No penalties here if you say, useless!

Problem 4

a.

We are looking for sensory data from five operators from Wu and Hamada's book: http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/Sensory.dat

First of all, we will get the data from the link above:

```r
## getting http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/Sensory.dat

url <- "http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/Sensory.dat"
sensorydata_raw<- fread(url, data.table = FALSE, fill = TRUE, skip = 2, header = FALSE)
saveRDS(sensorydata_raw, "sensorydata_raw.RDS")
#Saves the object in it's native format without the name: When importing, it is easier for us.
sensorydata_raw <- readRDS("sensorydata_raw.RDS")
```

Need to tidy the data, basic issue is we need items, operators and each of their sensory data on the 10 items are columns.

```r
#if the first condition is T, return the index value
Na <- which(is.na(sensorydata_raw$V6),arr.ind=T)
df <- cbind(rep(1:10, each = 2), sensorydata_raw[Na,])
df$V6 <- NULL
#create a clone data frame of the raw data, to get a better aligned raw data
# and not change the original raw data.
new_sensorydata_raw <- sensorydata_raw
new_sensorydata_raw[Na,] <- df
colnames(new_sensorydata_raw) <- c("Item","Operator1","Operator2","Operator3","Operator4","Operator5")
as.data.frame(head(new_sensorydata_raw))
```

```
##   Item Operator1 Operator2 Operator3 Operator4 Operator5
## 1    1       4.3       4.9       3.3       5.3       4.4
## 2    1       4.3       4.5       4.0       5.5       3.3
## 3    1       4.1       5.3       3.4       5.7       4.7
## 4    2       6.0       5.3       4.5       5.9       4.7
## 5    2       4.9       6.3       4.2       5.5       4.9
## 6    2       6.0       5.9       4.7       6.3       4.6
```

```r
Operator <- stack(new_sensorydata_raw[,2:6])
sensorydata_tidy_br <- data.frame(Item=rep(new_sensorydata_raw$Item, 5),
                                  as.character(Operator[,2]), as.numeric(Operator[,1]))
colnames(sensorydata_tidy_br) <- c('Item', "Operator", "sensorydata")



head(sensorydata_tidy_br)
```

```
##   Item  Operator sensorydata
## 1    1 Operator1         4.3
## 2    1 Operator1         4.3
## 3    1 Operator1         4.1
## 4    2 Operator1         6.0
## 5    2 Operator1         4.9
## 6    2 Operator1         6.0
```

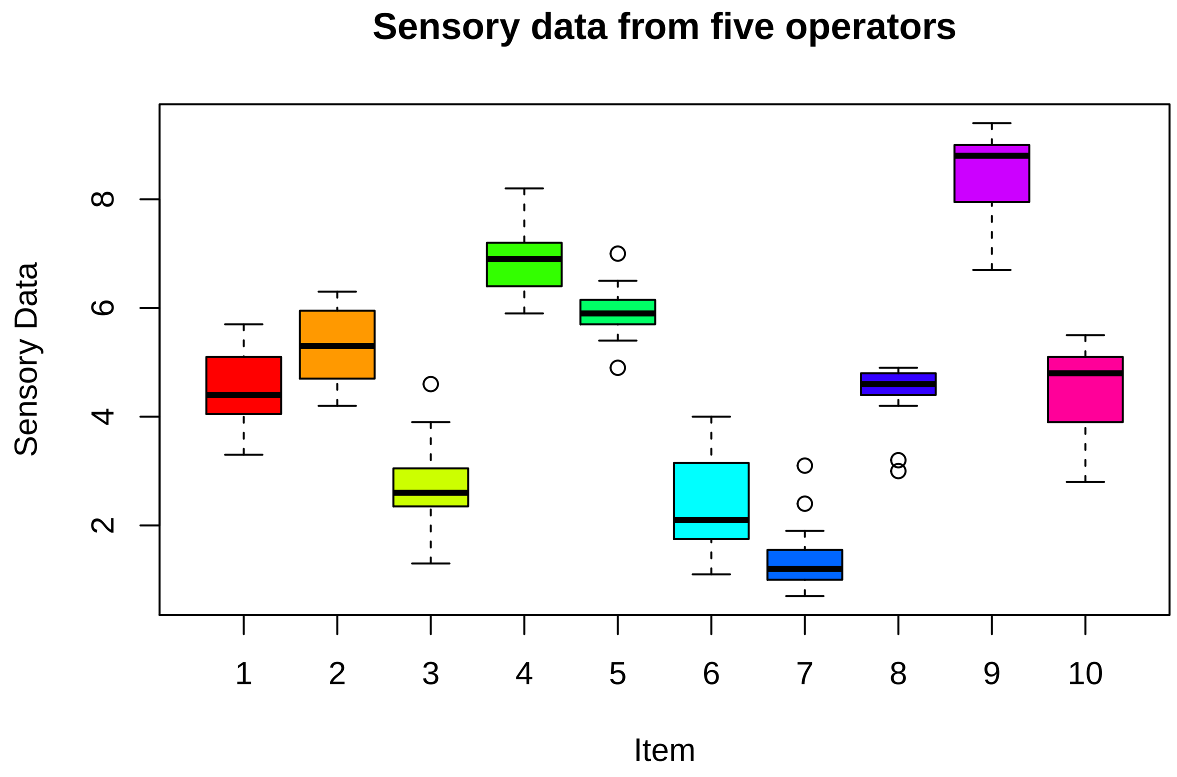
We have converted the dataframes to tidy dataframes using the base functions. Here is a summary of the data:

Item	Operator1	Operator2	Operator3	Operator4	Operator5
Min. : 1.0	Min. :0.900	Min. :1.500	Min. :0.800	Min. :0.900	Min. :0.700
1st Qu.: 3.0	1st Qu.:2.850	1st Qu.:3.450	1st Qu.:2.650	1st Qu.:3.925	1st Qu.:2.250
Median : 5.5	Median :4.550	Median :4.950	Median :4.150	Median :5.400	Median :4.600
Mean : 5.5	Mean :4.593	Mean :5.063	Mean :4.167	Mean :5.193	Mean :4.267
3rd Qu.: 8.0	3rd Qu.:5.950	3rd Qu.:6.225	3rd Qu.:5.400	3rd Qu.:6.275	3rd Qu.:5.800
Max. :10.0	Max. :9.000	Max. :9.200	Max. :9.000	Max. :9.400	Max. :8.800

Item	Operator	sensorydata
Min. : 1.0	Length:150	Min. :0.700
1st Qu.: 3.0	Class :character	1st Qu.:3.025
Median : 5.5	Mode :character	Median :4.700
Mean : 5.5	NA	Mean :4.657
3rd Qu.: 8.0	NA	3rd Qu.:6.000

Item	Operator	sensorydata
Max. :10.0	NA	Max. :9.400

Then our boxplot of Item to sensorydata is:



```
## null device
##           1
```

```
#if the first condition is T, return the index value
Na <- which(is.na(sensorydata_raw$V6),arr.ind=T)
df <- cbind(rep(1:10, each = 2), sensorydata_raw[Na,])
df$V6 <- NULL
#create a clone data frame of the raw data, to get a better aligned raw data and not
# change the original raw data.
new_sensorydata_raw <- sensorydata_raw
new_sensorydata_raw[Na,] <- df
colnames(new_sensorydata_raw) <- c("Item","Operator1","Operator2","Operator3","Operator4","Operator5")
as.data.frame(head(new_sensorydata_raw))
```

```
##   Item Operator1 Operator2 Operator3 Operator4 Operator5
## 1    1       4.3       4.9       3.3       5.3       4.4
## 2    1       4.3       4.5       4.0       5.5       3.3
## 3    1       4.1       5.3       3.4       5.7       4.7
## 4    2       6.0       5.3       4.5       5.9       4.7
## 5    2       4.9       6.3       4.2       5.5       4.9
## 6    2       6.0       5.9       4.7       6.3       4.6
```

```
 sensorydata_tidy_tv <-
  new_sensorydata_raw %>%
   gather(key = "Operators", value = "sensorydata", Operator1, Operator2, Operator3, Operator4,
        Operator5)


head(sensorydata_tidy_tv)
```

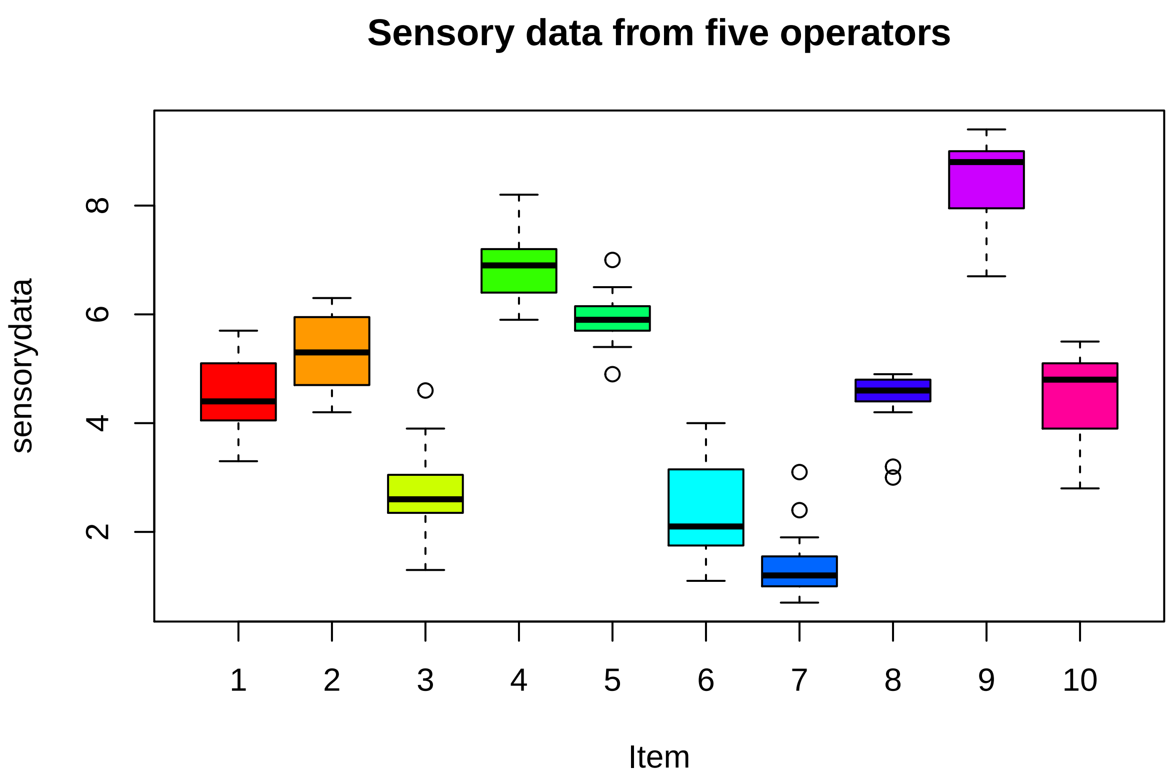
```
##   Item Operators sensorydata
## 1    1 Operator1         4.3
## 2    1 Operator1         4.3
## 3    1 Operator1         4.1
## 4    2 Operator1         6.0
## 5    2 Operator1         4.9
## 6    2 Operator1         6.0
```

We have converted the dataframes to tidy dataframes using the tidyverse functions. Here is a summary of the data:

Item	Operator1	Operator2	Operator3	Operator4	Operator5
Min. : 1.0	Min. :0.900	Min. :1.500	Min. :0.800	Min. :0.900	Min. :0.700
1st Qu.: 3.0	1st Qu.:2.850	1st Qu.:3.450	1st Qu.:2.650	1st Qu.:3.925	1st Qu.:2.250
Median : 5.5	Median :4.550	Median :4.950	Median :4.150	Median :5.400	Median :4.600
Mean : 5.5	Mean :4.593	Mean :5.063	Mean :4.167	Mean :5.193	Mean :4.267
3rd Qu.: 8.0	3rd Qu.:5.950	3rd Qu.:6.225	3rd Qu.:5.400	3rd Qu.:6.275	3rd Qu.:5.800
Max. :10.0	Max. :9.000	Max. :9.200	Max. :9.000	Max. :9.400	Max. :8.800

Item	Operators	sensorydata
Min. : 1.0	Length:150	Min. :0.700
1st Qu.: 3.0	Class :character	1st Qu.:3.025
Median : 5.5	Mode :character	Median :4.700
Mean : 5.5	NA	Mean :4.657
3rd Qu.: 8.0	NA	3rd Qu.:6.000
Max. :10.0	NA	Max. :9.400

Then our boxplot of Item to sensorydata is:



```
## null device
##           1
```

b.

We are looking at the Gold Medal performance for Olympic Men's Long Jump, year is coded as 1900=0 from Wu and Hamada's book: http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/LongJumpData.dat

First, we will get the data from the link above:

```
## getting http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/LongJumpData.dat

url <- "http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/LongJumpData.dat"

LongJumpData_raw<- fread(url, header = FALSE, fill = TRUE, skip = 1)
saveRDS(LongJumpData_raw, "LongJumpData_raw.RDS")
#Saves the object in it's native format without the name: When importing, it is easier for us.

LongJumpData_raw <- readRDS("LongJumpData_raw.RDS")
```

Need to tidy the data, basic issues are Year and Longjump are columns, need to push them into column.

```
Year <- c(LongJumpData_raw$'V1', LongJumpData_raw$'V3', LongJumpData_raw$'V5', LongJumpData_raw$'V7')
LongJumpData <- c(LongJumpData_raw$V2, LongJumpData_raw$V4, LongJumpData_raw$V6, LongJumpData_raw$V8)
Year <- as.numeric(Year)
LongJumpData <- as.numeric(LongJumpData)
Year <- Year + 1900
longjump_tidy_br <- cbind(Year, LongJumpData)
longjump_tidy_br <- longjump_tidy_br[1:22,]
longjump_tidy_br <- as.data.frame(longjump_tidy_br)
```

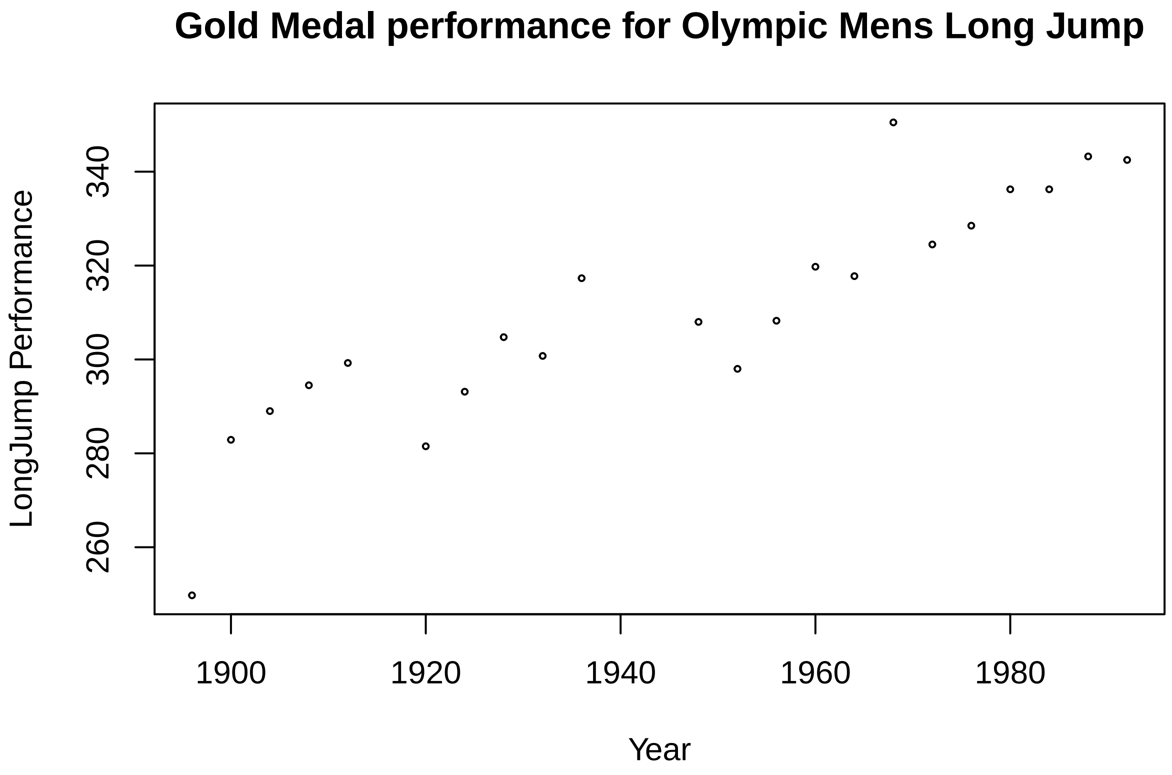
```r
head(longjump_tidy_br)
```

```
##   Year LongJumpData
## 1 1896       249.75
## 2 1900       282.88
## 3 1904       289.00
## 4 1908       294.50
## 5 1912       299.25
## 6 1920       281.50
```

We have converted the dataframes to tidy dataframes using the base functions. Here is a summary of the data:

Year	LongJumpData
Min. :1896	Min. :249.8
1st Qu.:1921	1st Qu.:295.4
Median :1950	Median :308.1
Mean :1945	Mean :310.3
3rd Qu.:1971	3rd Qu.:327.5
Max. :1992	Max. :350.5

Then our plot of year to Gold Medal performance for Olympic Men's Long Jump is:



```r
lj_year<-
  LongJumpData_raw %>%
    gather(key = "Vector2", value = "Year", 'V1','V3','V5','V7', convert = TRUE)%>%
    select(Year)%>%
    slice(1:(n()-2))%>% #cuts off the NAs at the end
    mutate(Year = 1900 + Year)
```

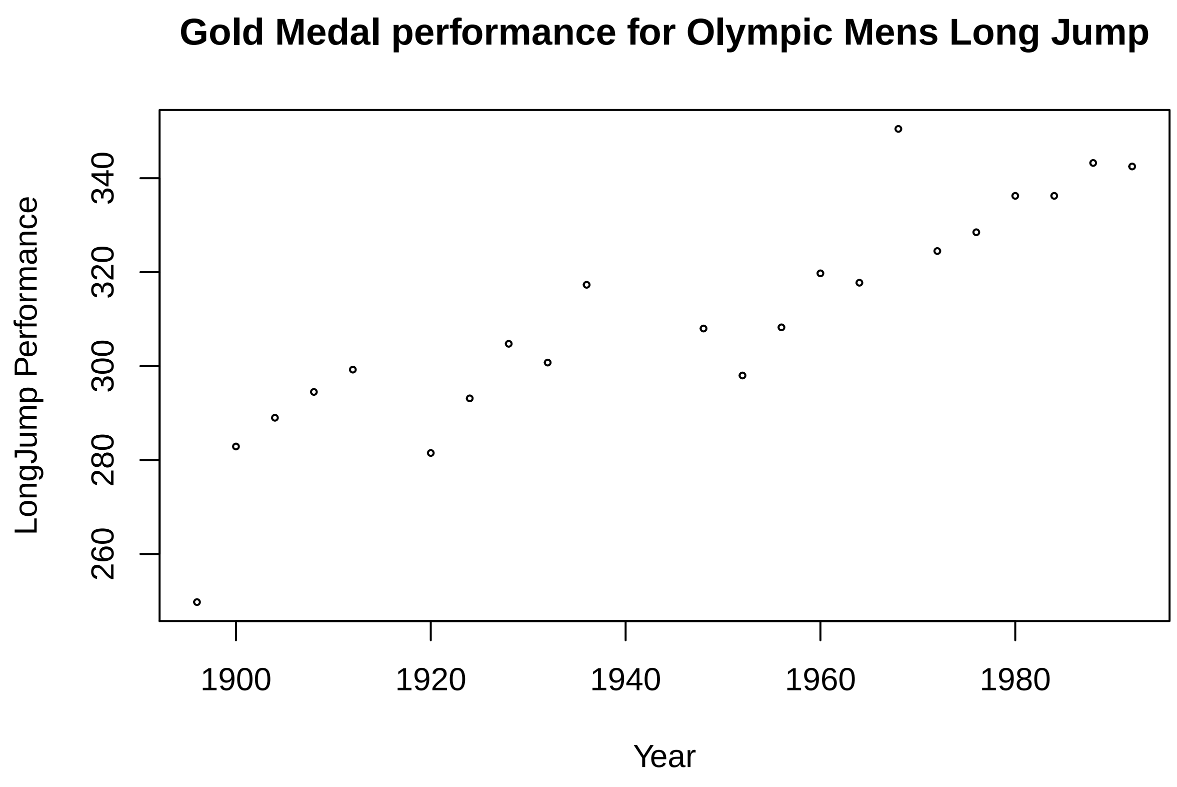
```r
lj_data<-
  LongJumpData_raw %>%
    gather(key = "Vector1", value = "LongJumpData", 'V2','V4','V6','V8', convert = TRUE) %>%
    select(LongJumpData)%>%
    slice(1:(n()-2)) #cuts off the NAs at the end

longjump_tidy_tv <- cbind(lj_year, lj_data)
head(longjump_tidy_tv)
```

```
##   Year LongJumpData
## 1 1896       249.75
## 2 1900       282.88
## 3 1904       289.00
## 4 1908       294.50
## 5 1912       299.25
## 6 1920       281.50
```

We have converted the dataframes to tidy dataframes using the tidyverse functions. Here is a summary of the data:

Year	LongJumpData
Min. :1896	Min. :249.8
1st Qu.:1921	1st Qu.:295.4
Median :1950	Median :308.1
Mean :1945	Mean :310.3
3rd Qu.:1971	3rd Qu.:327.5
Max. :1992	Max. :350.5

Then our plot of year to Gold Medal performance for Olympic Men's Long Jump is:



c.

We are looking at brain weight (g) and body weight (kg) for 62 species from Wu and Hamada's book: http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/BrainandBodyWeight.dat

First, we will get the data from the link above:

```r
## getting http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/BrainandBodyWeight.dat

url <- "http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/BrainandBodyWeight.dat"

brainandbodyweight_raw<- fread(url, header = FALSE, fill = TRUE, skip = 1)
saveRDS(brainandbodyweight_raw, "brainandbodyweight_raw.RDS")
#Saves the object in it's native format without the name: When importing, it is easier for us.

brainandbodyweight_raw <- readRDS("brainandbodyweight_raw.RDS")
```

Need to tidy the data, basic issues are brain weight and body weight are columns, need to push them into column.

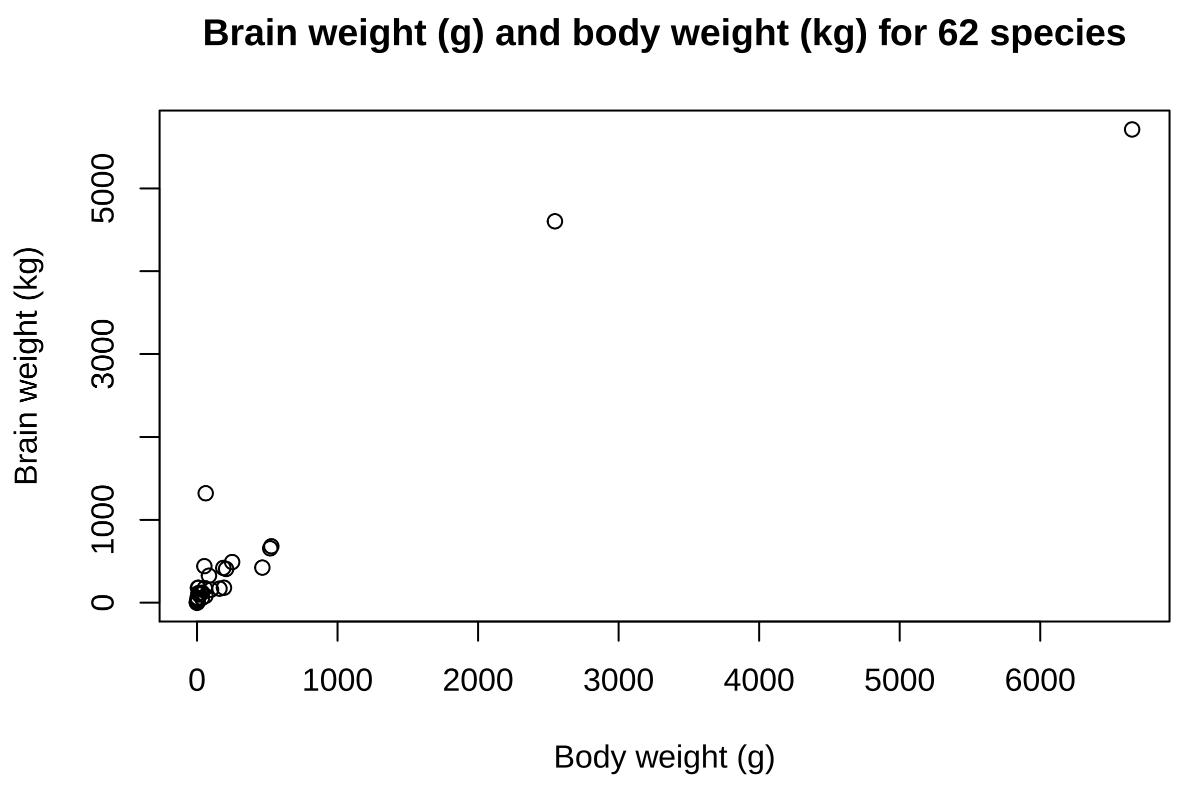
```r
bodyweight <- c(brainandbodyweight_raw$'V1', brainandbodyweight_raw$'V3', brainandbodyweight_raw$'V5')
brainweight <- c(brainandbodyweight_raw$V2, brainandbodyweight_raw$V4, brainandbodyweight_raw$V6)
bodyweight <- as.numeric(bodyweight)
brainweight <- as.numeric(brainweight)
brainandbodyweight_tidy_br <- cbind(bodyweight, brainweight)
brainandbodyweight_tidy_br <- brainandbodyweight_tidy_br[1:62,]
brainandbodyweight_tidy_br <- as.data.frame(brainandbodyweight_tidy_br)

head(brainandbodyweight_tidy_br)
```

```
##   bodyweight brainweight
## 1      3.385        44.5
## 2      0.480        15.5
## 3      1.350         8.1
## 4    465.000       423.0
## 5     36.330       119.5
## 6     27.660       115.0
```

We have converted the dataframes to tidy dataframes using the base functions. Here is a summary of the data:

bodyweight	brainweight
Min. : 0.005	Min. : 0.10
1st Qu.: 0.600	1st Qu.: 4.25
Median : 3.342	Median : 17.25
Mean : 198.790	Mean : 283.13
3rd Qu.: 48.202	3rd Qu.: 166.00
Max. :6654.000	Max. :5712.00

Then our plot of Brain weight (g) and body weight (kg) for 62 species:



```
## null device
##           1
```

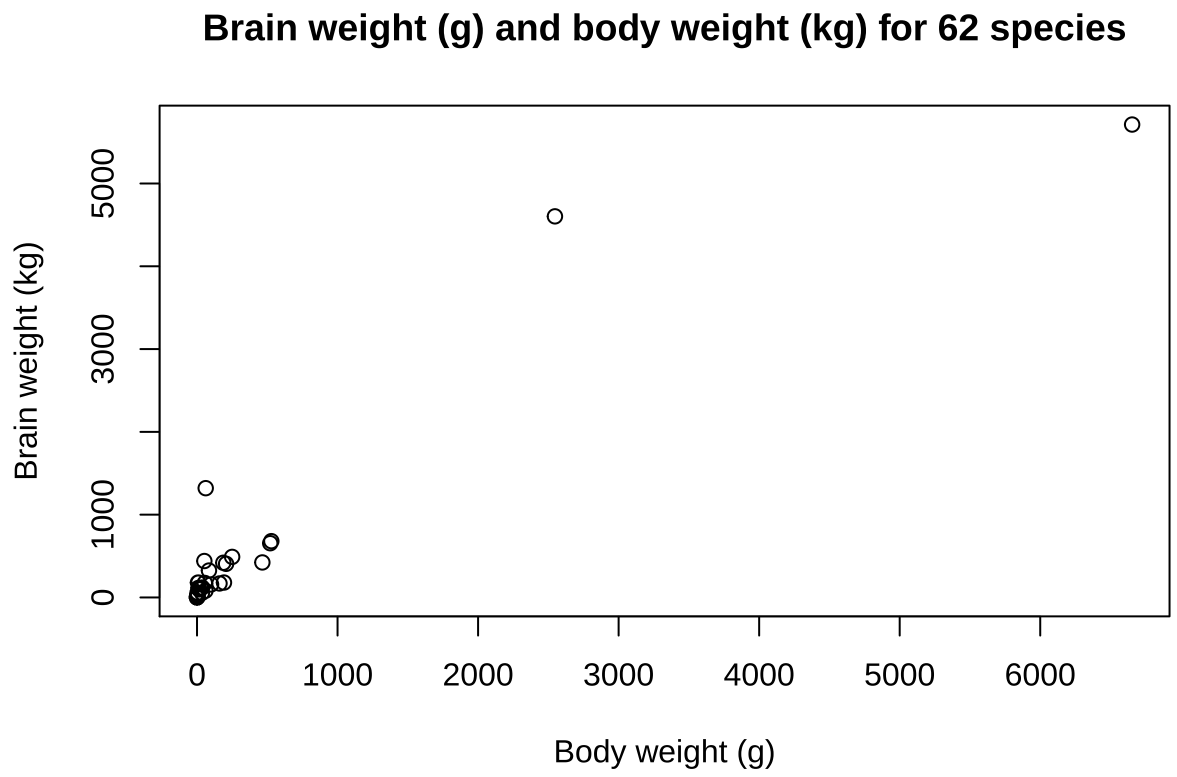
```
bodyweight<-
  brainandbodyweight_raw %>%
    gather(key = "Vector2", value = "bodyweight", V1, V3, V5, convert = TRUE)%>%
    select(bodyweight)%>%
    slice(1:(n()-1)) #cuts off the NAs at the end

brainweight<-
  brainandbodyweight_raw %>%
    gather(key = "Vector1", value = "brainweight", V2, V4, V6, convert = TRUE)%>%
    select(brainweight)%>%
    slice(1:(n()-1)) #cuts off the NAs at the end

brainandbodyweight_tidy_tv <- cbind(bodyweight, brainweight)


head(brainandbodyweight_tidy_tv)
```

```
##   bodyweight brainweight
## 1      3.385        44.5
## 2      0.480        15.5
## 3      1.350         8.1
## 4    465.000       423.0
## 5     36.330       119.5
## 6     27.660       115.0
```

We have converted the dataframes to tidy dataframes using the tidyverse functions. Here is a summary of the data:

bodyweight	brainweight
Min. : 0.005	Min. : 0.10
1st Qu.: 0.600	1st Qu.: 4.25
Median : 3.342	Median : 17.25
Mean : 198.790	Mean : 283.13
3rd Qu.: 48.202	3rd Qu.: 166.00
Max. :6654.000	Max. :5712.00

Then our plot of Brain weight (g) and body weight (kg) for 62 species:



```
## null device
##           1
```

d.

We will look to triplicate measurements of tomato yield for two varieties of tomatos at three planting densities from Wu and Hamada's book: http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/tomato.dat

First, we will get the data from the link above:

```
## getting http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/tomato.dat

url <- "http://www2.isye.gatech.edu/~jeffwu/wuhamadabook/data/tomato.dat"

tomato_raw<- fread(url)
```

```
## Warning in fread(url): Detected 3 column names but the data has 4 columns (i.e.
## invalid file). Added 1 extra default column name for the first column which is
## guessed to be row names or an index. Use setnames() afterwards if this guess
## is not correct, or fix the file write command that created the file to create a
## valid file.
```

```
saveRDS(tomato_raw, "tomato_raw.RDS")
#Saves the object in it's native format without the name: When importing, it is easier for us.

tomato_raw <- readRDS("tomato_raw.RDS")
```

Need to tidy the data, basic issue is we need a column of different densities, two column of measurements for each type of tomato and a column called M number to keep track of which of 3 measurement for each density we are looking at.

```
#create a dataframe called tomato_tidy where there is 3 of the tomatovariety, the string of
# their measurements, and densities.
tomato_tidy_br <- data.frame(TomatoVariety=rep(tomato_raw$V1, 3),
                             stack(tomato_raw[,-1]))
colnames(tomato_tidy_br) <- c("TomatoVariety", "V1", "Density")

# we will now try to separate the string of measurement into individual measurements
M <- data.frame(strsplit(head(tomato_tidy_br$V1), ','))
colnames(M) <- c("1", "2", "3", "4", "5", "6")
rownames(M) <- c("M1", "M2", "M3")
M <- as.data.frame(t(M))

#Separate the measurements into columns of measurements for Tomato type 1 and type 2
Type1 <- as.data.frame(stack(M[c(1,3,5),]))
colnames(Type1) <- c("Ife1", "M_number")
# Since the measurement number is redundant, remove one column out of two M numbers
Type1$M_number <- NULL
Type2 <- as.data.frame(stack(M[c(2,4,6),]))
colnames(Type2) <- c("PusaEarlyDwarf","M_number")
# bind the two types together into one dataframe
df <- as.data.frame(cbind(Type1, Type2))
#change the type of the variables to reflect true type.
df$Ife1 = as.numeric(df$Ife1)
df$PusaEarlyDwarf=as.numeric(df$PusaEarlyDwarf)
df1 <- as.data.frame(subset(df, select = c(Ife1, PusaEarlyDwarf)))
df2 <- as.data.frame(subset(df, select = M_number))

#create a dataframe with column of density values and dataframe with the rest of the information
subset.df = data.frame(Density=rep(c(1000,2000,3000), 3))
subset.df <- as.data.frame(subset.df)
new.df <- data.frame(cbind(df2, df1))

# bind the density, m number, and measurements of the two types of tomatoes and reoder the
# rows of the dataframe to look more like the tidyverse dataframe(since I did that first)
# for easy comparison reason.
tomato_tidy_br <- cbind(subset.df, new.df)
colnames(tomato_tidy_br) <- c("Density", "M number", 'Ife1', "PusaEarlyDwarf")
tomato_tidy1 <- data.frame(tomato_tidy_br[c(1,4,7),])
tomato_tidy2 <- data.frame(tomato_tidy_br[c(2,5,8),])
tomato_tidy3 <- data.frame(tomato_tidy_br[c(3,6,9),])
tomato_tidy_br <- data.frame(rbind(tomato_tidy1,tomato_tidy2,tomato_tidy3))
#the automated row index was showing up as out of order. For aesthetics, I removed it.
rownames(tomato_tidy_br) <- NULL
```

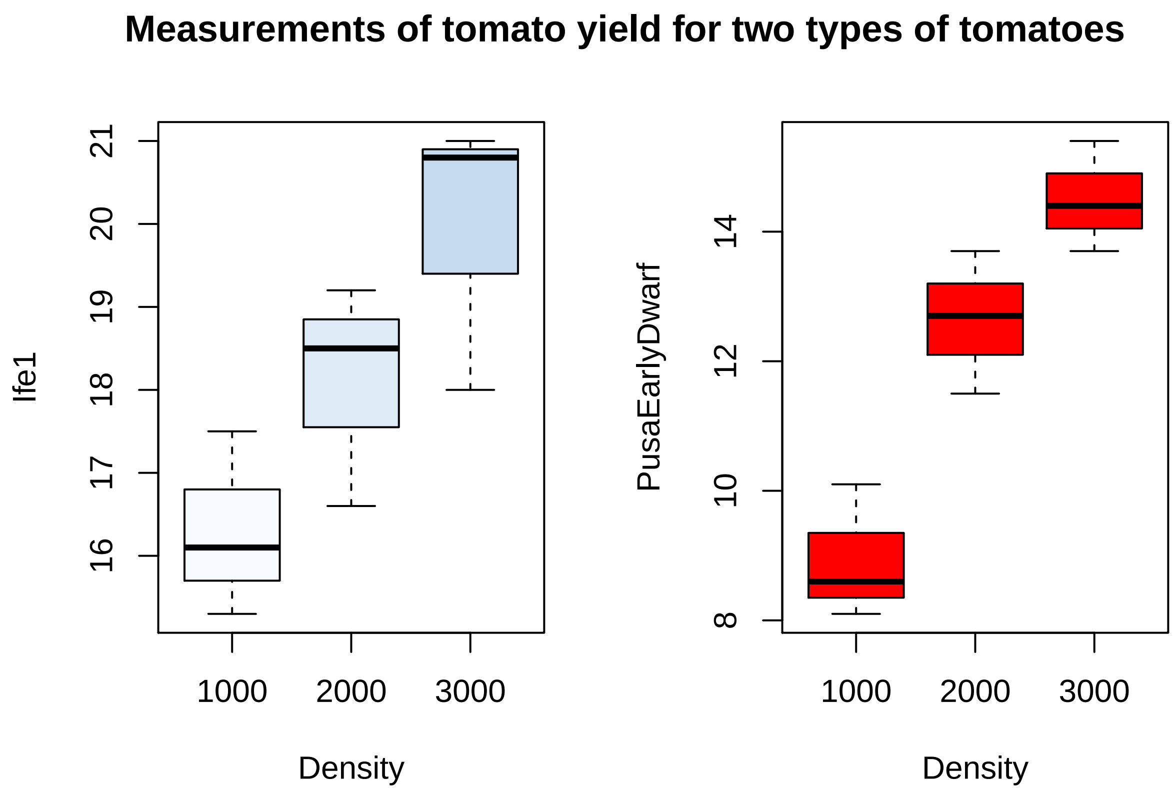
```r
head(tomato_tidy_br)
```

```
##   Density M.number Ife1 PusaEarlyDwarf
## 1    1000       M1 16.1            8.1
## 2    1000       M2 15.3            8.6
## 3    1000       M3 17.5           10.1
## 4    2000       M1 16.6           12.7
## 5    2000       M2 19.2           13.7
## 6    2000       M3 18.5           11.5
```

We have converted the dataframes to tidy dataframes using the base functions. Here is a summary of the data:

Density	M.number	Ife1	PusaEarlyDwarf
Min. :1000	M1:3	Min. :15.30	Min. : 8.10
1st Qu.:1000	M2:3	1st Qu.:16.60	1st Qu.:10.10
Median :2000	M3:3	Median :18.00	Median :12.70
Mean :2000	NA	Mean :18.11	Mean :12.02
3rd Qu.:3000	NA	3rd Qu.:19.20	3rd Qu.:13.70
Max. :3000	NA	Max. :21.00	Max. :15.40

Then our plot of density to measurements of tomato yield for two varieties of tomatoes:



```
## [1] "Measurements of tomato yield for two types of tomatoes"
```

```
## null device
##           1
```

```
tomato_tidy_tv <-
  tomato_raw %>%
  gather(key = "Density", value = "Measurements", -V1, convert = TRUE) %>%
  rename(TomatoVariety = V1) %>%
  separate(Measurements, into = c("M1", "M2", "M3"), sep = ',', convert = TRUE) %>%
  gather(key = "M number", value = "Measurements", 3,4,5)%>%
  spread(key = TomatoVariety, value = Measurements)
```

```
## Warning: Expected 3 pieces. Additional pieces discarded in 1 rows [2].
```

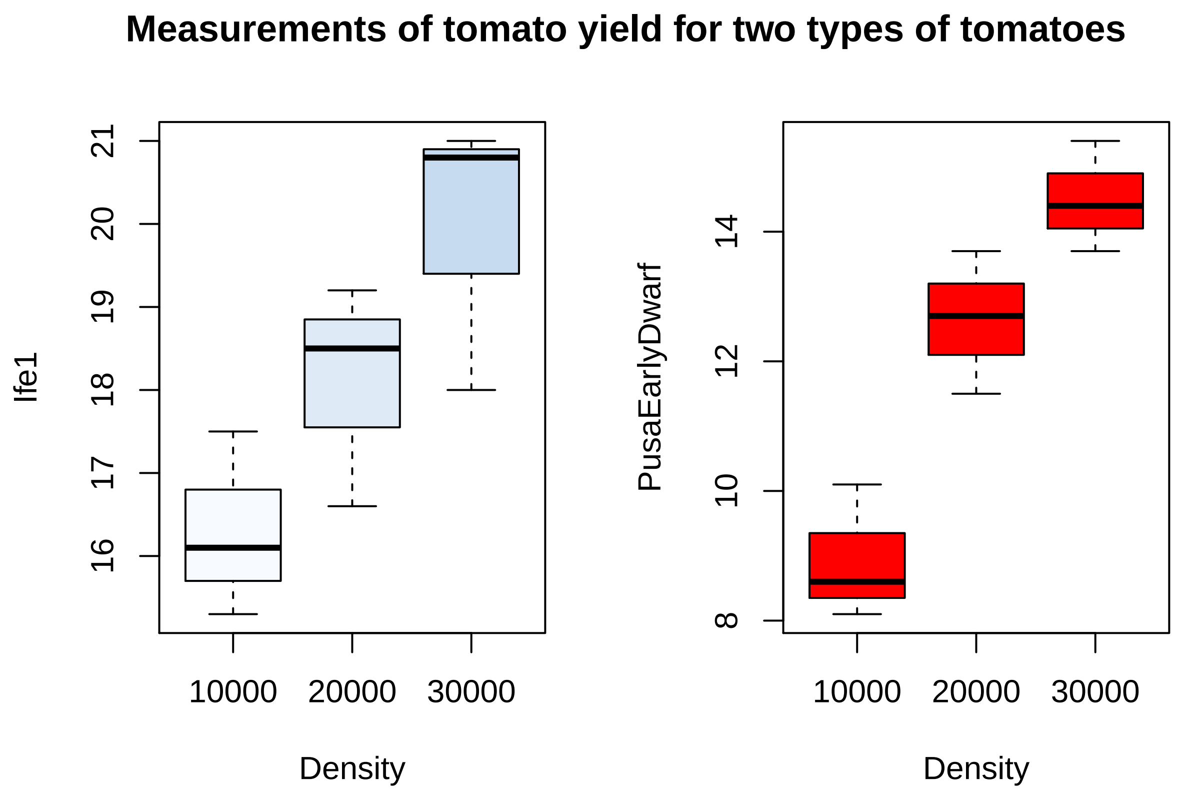
```
colnames(tomato_tidy_tv) <- c('Density', "M.number", "Ife1", "PusaEarlyDwarf")

head(tomato_tidy_tv)
```

```
##   Density M.number Ife1 PusaEarlyDwarf
## 1   10000       M1 16.1            8.1
## 2   10000       M2 15.3            8.6
## 3   10000       M3 17.5           10.1
## 4   20000       M1 16.6           12.7
## 5   20000       M2 19.2           13.7
## 6   20000       M3 18.5           11.5
```

We have converted the dataframes to tidy dataframes using the tidyverse functions.Here is a summary of the data:

Density	M.number	Ife1	PusaEarlyDwarf
Min. :10000	Length:9	Min. :15.30	Min. : 8.10
1st Qu.:10000	Class :character	1st Qu.:16.60	1st Qu.:10.10
Median :20000	Mode :character	Median :18.00	Median :12.70
Mean :20000	NA	Mean :18.11	Mean :12.02
3rd Qu.:30000	NA	3rd Qu.:19.20	3rd Qu.:13.70
Max. :30000	NA	Max. :21.00	Max. :15.40

Then our plot of density to measurements of tomato yield for two varieties of tomatoes:



```
## [1] "Measurements of tomato yield for two types of tomatoes"
```

```
## null device
##           1
```

Problem 5

Finish this homework by pushing your changes to your repo. In general, your workflow for this should be:

1. git pull – to make sure you have the most recent repo
2. In R: do some work
3. git add – this tells git to track new files
4. git commit – make message INFORMATIVE and USEFUL
5. git push – this pushes your local changes to the repo

If you have difficulty with steps 1-5, git is not correctly or completely setup. See me for help.