assignment 2

Oyedayo Oyelowo

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Exercise 1

a) Create folder "assignment2" and set it as your working directory through R-console

b) Download file puudata_20.xls from Moodle and open it in MS Excel. Column name LPM stands for diameter, ELAVALARAJA stands for the lower limit of living canopy and LATVUSLEV stands for width of the canopy.

c) Save the data to your working directory as a text file and name it treedata.txt: save as other formats text tab limited (tab as a column delimiter).

d) Read the file in R and name it properly.

e) Check that the data appears right in R (columns, decimal separators, column names)

f) Find out what are the mean diameter and mean height of the trees in the data.

```
#clear memory list
rm(list=ls())
#set working directory
setwd("C:/Users/oyeda/Desktop/R_COURSE/assignment2")
#get working directory
getwd()
```

```
## [1] "C:/Users/oyeda/Desktop/R_COURSE/assignment2"
```

```
#read the first table
data<-read.table("puudata_20.txt", header = TRUE, sep="\t")
summary(data) #summary of the data
```

```
##     TUNNISTE         KOEALA          PUUNRO          SUUNTA
##  Min.   : 1.00   Min.   :764.0   Min.   : 1.00   Min.   : 13.0
##  1st Qu.: 5.75   1st Qu.:764.0   1st Qu.: 3.00   1st Qu.: 36.0
##  Median :10.50   Median :865.0   Median : 5.50   Median :100.5
##  Mean   :10.50   Mean   :834.7   Mean   : 6.30   Mean   :137.2
##  3rd Qu.:15.25   3rd Qu.:865.0   3rd Qu.: 9.25   3rd Qu.:259.2
##  Max.   :20.00   Max.   :865.0   Max.   :14.00   Max.   :355.0
##
##     ETAISYYS        PUULAJI      LATVKERROS        LPM
##  Min.   :261.0   Min.   :2.0   Min.   :1.00   Min.   : 5.50
##  1st Qu.:570.8   1st Qu.:2.0   1st Qu.:1.00   1st Qu.:13.40
##  Median :727.0   Median :2.0   Median :1.00   Median :26.60
##  Mean   :712.0   Mean   :2.8   Mean   :1.15   Mean   :22.35
##  3rd Qu.:903.8   3rd Qu.:2.0   3rd Qu.:1.00   3rd Qu.:29.43
##  Max.   :976.0   Max.   :6.0   Max.   :2.00   Max.   :35.00
##
##      PITUUS       ELAVALARAJA       LATVUSLEV       X
##  Min.   : 4.40   Min.   : 1.400   Min.   :1.00   Mode:logical
##  1st Qu.:12.95   1st Qu.: 4.925   1st Qu.:1.80   NA's:20
##  Median :23.55   Median : 8.350   Median :2.50
##  Mean   :18.83   Mean   : 7.265   Mean   :2.34
##  3rd Qu.:24.45   3rd Qu.: 9.575   3rd Qu.:2.70
##  Max.   :26.40   Max.   :12.100   Max.   :3.50
```

```
##
##       X.1             X.2
##  Min.   :22.35   Min.   : 27.33
##  1st Qu.:22.35   1st Qu.:443.03
##  Median :22.35   Median :593.66
##  Mean   :22.35   Mean   :533.33
##  3rd Qu.:22.35   3rd Qu.:667.36
##  Max.   :22.35   Max.   :891.52
##  NA's   :19      NA's   :13
```

```
#calculate the mean diameter of the trees
meanDiameter <- mean(data$LPM)
meanDiameter
```

```
## [1] 22.35
```

```
#calulate the mean height of the trees
meanHeight <- mean(data$PITUUS)
meanHeight
```

```
## [1] 18.83
```

- Create a matrix from treedata columns LPM-, PITUUS- and PUULAJI.
- DBH is diameter, h is height and s is the species

```
dbh <- data$LPM
h <- data$PITUUS
s <- data$PUULAJI
mat <- matrix(c(dbh, h, s), nrow=length(dbh))
mat
```

```
##       [,1] [,2] [,3]
##  [1,] 29.3 23.1    2
##  [2,] 33.7 25.5    2
##  [3,] 28.5 24.6    2
##  [4,] 29.8 24.7    2
##  [5,] 27.5 23.6    2
##  [6,] 19.3 19.9    2
##  [7,]  5.9  4.4    2
##  [8,] 27.5 23.6    2
##  [9,] 35.0 25.9    2
## [10,] 25.7 23.5    2
## [11,] 23.3 23.9    2
## [12,] 29.3 24.4    2
## [13,] 31.0 23.8    2
## [14,] 32.5 26.4    2
## [15,] 10.4  8.7    2
## [16,] 13.1 10.1    2
## [17,] 13.5 13.9    6
## [18,]  5.7  6.5    6
## [19,] 20.5 15.2    6
## [20,]  5.5  4.9    6
```

```
#Calculate basal area (BA) for every tree and
#add the results in the matrix as a new column. BA is basal area.
data$BA <- with(data, (pi*h^2)/4)
```

```r
#joining the BA column to the matrix created earlier
mat <- cbind(mat, data$BA)

#create column names
colnames(mat) <- c("DBH", "H", "S", "BA")
mat
```

```
##        DBH    H S        BA
##  [1,] 29.3 23.1 2 419.09631
##  [2,] 33.7 25.5 2 510.70516
##  [3,] 28.5 24.6 2 475.29155
##  [4,] 29.8 24.7 2 479.16357
##  [5,] 27.5 23.6 2 437.43536
##  [6,] 19.3 19.9 2 311.02553
##  [7,]  5.9  4.4 2  15.20531
##  [8,] 27.5 23.6 2 437.43536
##  [9,] 35.0 25.9 2 526.85294
## [10,] 25.7 23.5 2 433.73614
## [11,] 23.3 23.9 2 448.62728
## [12,] 29.3 24.4 2 467.59465
## [13,] 31.0 23.8 2 444.88094
## [14,] 32.5 26.4 2 547.39110
## [15,] 10.4  8.7 2  59.44679
## [16,] 13.1 10.1 2  80.11847
## [17,] 13.5 13.9 6 151.74678
## [18,]  5.7  6.5 6  33.18307
## [19,] 20.5 15.2 6 181.45839
## [20,]  5.5  4.9 6  18.85741
```

```r
#save the data
#?write.table
write.table(mat, file = "treeData20.txt", sep="\t", col.names = TRUE, row.names = FALSE)
```

Exercise 3

a) Download file puudata_300.txt from Moodle, read it into R and name it.

b) Cross tabulate the data by latvuskerros (crown layer) and puulaji (tree species) with function xtabs()

c) Which is the most common tree species in crown layer 1? How many trees of this species can be found in the whole data set?

d) Which tree species' relative portion in second crown layer is the highest (amount in 2.layer/amount in layer 1 and 2)? Consider only those species that are present in both crown layers.

```r
#load the data "puudata_300.txt" from the directory.
data300 <- read.table("puudata_300.txt", sep = "\t", header = TRUE)
#?xtabs

#s.tab<-table(data300$LATVKERROS, data300$PUULAJI)
layerSpp <-xtabs(~LATVKERROS+PUULAJI, data300)
layerSpp
```

```
##           PUULAJI
## LATVKERROS  1  2  3  4  5  6  8 11 12
##          1 91 79 21 32  3  6  1  0  1
##          2  0 48  3 11  0  3  0  1  0
```

- **Which is the most common tree species in crown layer 1?**
- answer: the most common tree species in the crown layer 1 is species 1

- **How many trees of this species can be found in the whole data set?**
- Answer: there are 91 of these trees in the whole data set.

d) Which tree species' relative portion in second crown layeris the highest (amount in 2.layer/amount in layer 1 and 2)?

- divide the total in layer 2 by the sum of the total in layer 1 and 2. Consider only those species that are present in both crown layers.

```
highSpp2 <- layerSpp[2,] / (layerSpp[2,] + layerSpp[1,])
highSpp2
```

```
##         1         2         3         4         5         6         8
## 0.0000000 0.3779528 0.1250000 0.2558140 0.0000000 0.3333333 0.0000000
##        11        12
## 1.0000000 0.0000000
```

- answer: species 2 has the highest relative portion of crown layer2 in layers 1 and 2 crown layers, considering those that have both layers present.

Exercise 4

- Create the following subsets from file puudata_300.txt:
  a) Trees that are measured from plot (KOEALA) 865
  b) Trees that are measured from plots 865 and 490
  c) Those spruce trees (PUULAJI=2) that belong to second crown layer and are over 10 meters tall (the height is given in decimeters)
  d) Those trees in the first crown layer, whose diameter is over 150 mm and that are not pines or spruces (species 1 and 2)

```
#Create the following subsets from file puudata_300.txt:
#a) Trees that are measured from plot (KOEALA) 865
treesA <- subset(data300, data300$KOEALA==865)
head(treesA)
```

```
##   TUNNISTE KOEALA PUUNRO SUUNTA ETAISYYS PUULAJI LATVKERROS LPM PITUUS
## 1        1    865      1     16      750       2          1 293    231
## 2        2    865      2     23      507       2          1 337    255
## 3        3    865      3     81      901       2          1 285    246
## 4        4    865      4     84      480       2          1 298    247
## 5        5    865      5    117      912       2          1 275    236
## 6        6    865      6    147      644       2          1 193    199
##   ELAVALARAJA LATVUSLEV
## 1          72        24
## 2          88        27
## 3         107        25
## 4          89        27
## 5          95        25
## 6          75        21
```

```
#b) Trees that are measured from plots 865 and 490
treesB<- subset(data300, data300$KOEALA==865 | data300$KOEALA==490)
summary(treesB)
```

```
##     TUNNISTE         KOEALA          PUUNRO          SUUNTA
##  Min.   :  1.0   Min.   :490.0   Min.   : 1.00   Min.   : 13.00
##  1st Qu.:174.5   1st Qu.:490.0   1st Qu.: 7.75   1st Qu.: 83.25
##  Median :241.5   Median :490.0   Median :14.50   Median :164.50
##  Mean   :188.2   Mean   :583.8   Mean   :18.43   Mean   :175.23
##  3rd Qu.:255.2   3rd Qu.:583.8   3rd Qu.:28.25   3rd Qu.:259.25
##  Max.   :269.0   Max.   :865.0   Max.   :46.00   Max.   :355.00
##     ETAISYYS         PUULAJI        LATVKERROS         LPM
##  Min.   : 156.0   Min.   :1.000   Min.   :1.000   Min.   : 50.00
##  1st Qu.: 510.0   1st Qu.:1.000   1st Qu.:1.000   1st Qu.: 95.25
##  Median : 741.5   Median :2.000   Median :1.000   Median :220.50
##  Mean   : 712.7   Mean   :1.839   Mean   :1.268   Mean   :200.30
##  3rd Qu.: 890.5   3rd Qu.:2.000   3rd Qu.:2.000   3rd Qu.:275.00
##  Max.   :1434.0   Max.   :4.000   Max.   :2.000   Max.   :350.00
##      PITUUS       ELAVALARAJA       LATVUSLEV
##  Min.   : 42.0   Min.   :  0.00   Min.   :10.00
##  1st Qu.:105.5   1st Qu.: 65.75   1st Qu.:15.75
##  Median :195.5   Median :101.00   Median :19.50
##  Mean   :170.1   Mean   : 92.70   Mean   :20.43
##  3rd Qu.:232.2   3rd Qu.:137.50   3rd Qu.:25.25
##  Max.   :264.0   Max.   :169.00   Max.   :36.00
```

```
#c) Those spruce trees (PUULAJI=2) that belong to second crown layer
#and are over 10 meters tall (the height is given in decimeters).
treesC <- subset(data300, data300$PUULAJI==2 & data300$LATVKERROS==2 & data300$PITUUS>100
)
head(treesC)
```

```
##     TUNNISTE KOEALA PUUNRO SUUNTA ETAISYYS PUULAJI LATVKERROS LPM PITUUS
## 16        16    764      2     29      970       2          2 131    101
## 36        36    764     22    216      729       2          2 117    102
## 293      293    505     24    180      256       2          2 139    104
##     ELAVALARAJA LATVUSLEV
## 16           14        17
## 36           19        18
## 293          10        17
```

```
#d) Those trees in the first crown layer, whose diameter is over 150 mm and
#that are not pines or spruces (species 1 and 2)
treesD<- subset(data300, data300$LATVKERROS==1 & data300$LPM>150 & data300$PUULAJI!=1 & d
ata300$PUULAJI!=2)
head(treesD)
```

```
##    TUNNISTE KOEALA PUUNRO SUUNTA ETAISYYS PUULAJI LATVKERROS LPM PITUUS
## 19       19    764      5     37      726       6          1 205    152
## 21       21    764      7     71      954       3          1 207    197
## 27       27    764     13    139      835       3          1 290    231
## 31       31    764     17    186      598       3          1 162    196
## 34       34    764     20    197      300       3          1 274    247
## 38       38    764     24    226      592       3          1 215    232
##    ELAVALARAJA LATVUSLEV
## 19          52        35
## 21          91        29
## 27          79        40
## 31         101        22
```

```
## 34           81         40
## 38          127         25
```