Assignment 4

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2025-03-10

Assignment 4

For this assignment you will write a new Quartro document based on the analysis of power required for different *possible_cars* from looping.RMD; You will

Load Function

```
library(here)
```

```
## here() starts at C:/Users/sneha/Documents/ESM262/ESM262
```

```
source("~/ESM262/ESM262/autopower.R")
```

Add an additional super light car with mass 5,000 kg and a surface area 10m2

```
possible_cars <- data.frame(name=c("A","B","C","New"), mass=c(10000,65000,38000,5000), area=c(22,30,22,
possible_cars$power=autopower(V=28, A=possible_cars$area, m=possible_cars$mass)
print(possible_cars)
```

```
##   name  mass area    power
## 1    A 10000   22 128089.9
## 2    B 65000   30 386080.8
## 3    C 38000   22 243337.9
## 4  New  5000   10  60093.6
```

Compute the mean and maximum power for Cars A, B, C and for your new car, assuming that average highway speed is 80 km/hr with a standard deviation of 10km/hr

```
nsample = 200
meanspeed_meters = 80*0.277
speeds = rnorm(mean=meanspeed_meters, sd=10, nsample)
summary(speeds)
```

```
##    Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
## -0.4436 14.4400 20.3980 21.0659 26.8407 56.5629
```

The mean speed is 22.812 km/hr and the max speed is 53.933 km/hr.

```
possible_cars$maxpower = autopower(V=summary(speeds)['Max.'], A=possible_cars$area, m=possible_cars$mass
possible_cars$meanpower = autopower(V=summary(speeds)['Mean'], A=possible_cars$area, m=possible_cars$mas
print(possible_cars)
```

```
##   name  mass area    power  maxpower meanpower
## 1    A 10000   22 128089.9  799768.8  67986.71
## 2    B 65000   30 386080.8 1517669.2 251766.20
## 3    C 38000   22 243337.9 1032581.6 154693.91
## 4  New  5000   10  60093.6  367310.7  32310.63
```

Use 2 different methods to compute the mean and maximum power for each car type a) **FOR** loop

```
df_forloop <- as.data.frame(matrix(nrow=length(speeds), ncol=nrow(possible_cars)))
library(dplyr)
```

```
##
## Attaching package: 'dplyr'

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
df_forloop <- df_forloop |>
  rename(A=V1, B=V2, C=V3, New=V4)

for (i in 1:ncol(df_forloop)) {
  df_forloop[,i] = autopower(A=possible_cars$area[i], m=possible_cars$mass[i], V=speeds)
}

View(df_forloop)
```

```
meanvalues_forloop <- sapply(df_forloop, mean)
maxvalues_forloop <- sapply(df_forloop,max)
print(meanvalues_forloop)
```

```
##         A         B         C       New
##  95258.39 288954.86 181965.60  44706.85
```

```
print(maxvalues_forloop)
```

```
##         A         B         C       New
##  799768.8 1517669.2 1032581.6  367310.7
```

b) the **pmap** function from **purr**

```r
library(purrr)
```

```
## Warning: package 'purrr' was built under R version 4.4.2
```

```r
df_pmap <- as.data.frame(pmap(list(A = possible_cars$area, m=possible_cars$mass), autopower, V=speeds))

colnames(df_pmap) <- c("A", "B", "C", "New")

View(df_pmap)

meanvalues_pmap <- sapply(df_pmap, mean)
maxvalues_pmap <- sapply(df_pmap,max)
print(meanvalues_pmap)
```

```
##         A         B         C       New
##  95258.39 288954.86 181965.60  44706.85
```

```r
print(maxvalues_pmap)
```

```
##         A         B         C       New
##  799768.8 1517669.2 1032581.6  367310.7
```

Create two boxplots (one for each method (**FOR** and **pmap**)) that show the range of power consumption (across sampled speeds) for each car type.

```r
library(tidyverse)
```

```
## Warning: package 'lubridate' was built under R version 4.4.2
```

```
## -- Attaching core tidyverse packages ------------------------ tidyverse 2.0.0 --
## v forcats   1.0.0     v stringr   1.5.1
## v ggplot2   3.5.1     v tibble    3.2.1
## v lubridate 1.9.4     v tidyr     1.3.1
## v readr     2.1.5
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
## i Use the conflicted package (<http://conflicted.r-lib.org/>) to force all conflicts to become errors
```

```r
forlooppivot <- df_forloop |>
  pivot_longer(cols = everything(), names_to = "type", values_to = "power")
forlooppivot
```

```
## # A tibble: 800 x 2
##    type    power
##    <chr>   <dbl>
##  1 A      35184.
##  2 B     160812.
##  3 C      96694.
```

```
##  4 New    16991.
##  5 A     164460.
##  6 B     458864.
##  7 C     292349.
##  8 New    76831.
##  9 A      77306.
## 10 B     274414.
## # i 790 more rows
```

```
pmappivot <- df_pmap |>
  pivot_longer(cols = everything(), names_to = "type", values_to = "power")
pmappivot
```

```
## # A tibble: 800 x 2
##    type    power
##    <chr>   <dbl>
##  1 A      35184.
##  2 B     160812.
##  3 C      96694.
##  4 New    16991.
##  5 A     164460.
##  6 B     458864.
##  7 C     292349.
##  8 New    76831.
##  9 A      77306.
## 10 B     274414.
## # i 790 more rows
```

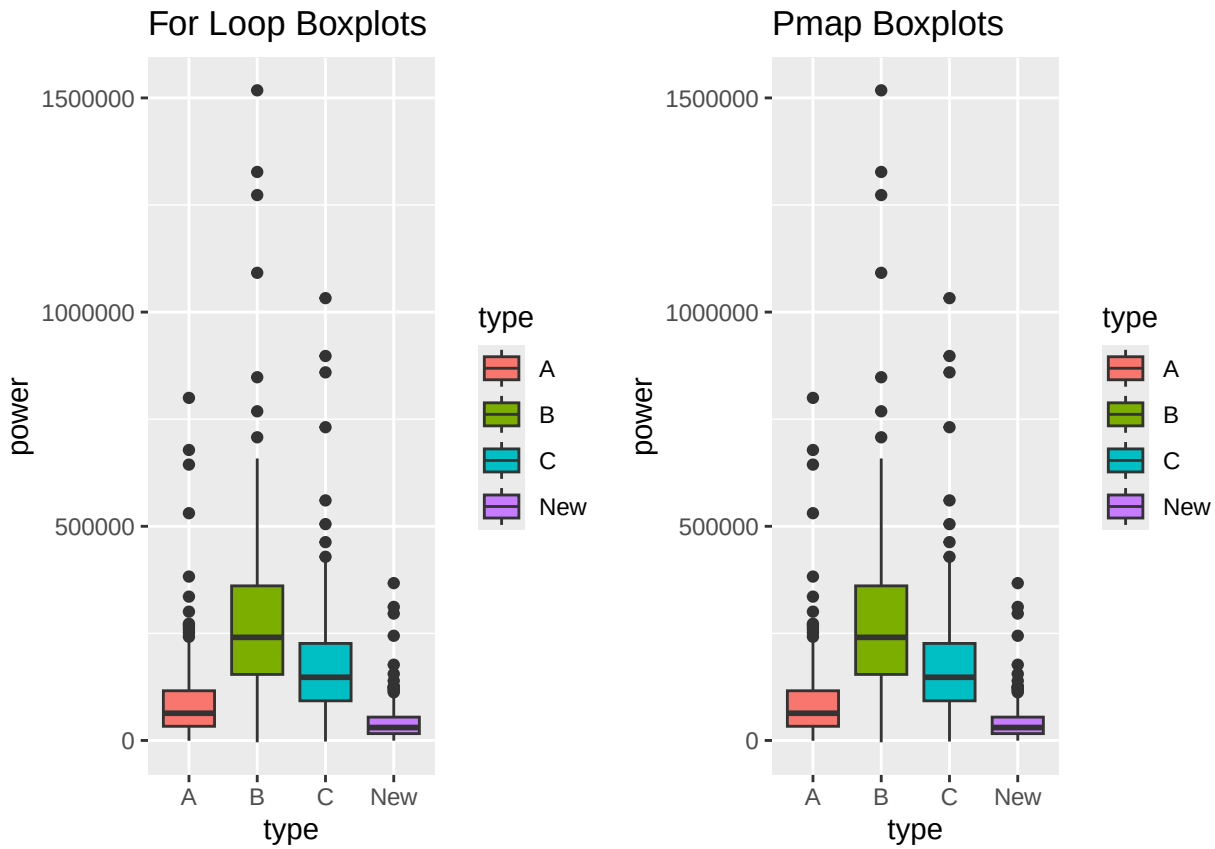
```
library(ggplot2)
plot_forloop <- ggplot(data = forlooppivot) +
  geom_boxplot(aes(type, power, fill=type)) +
  ggtitle("For Loop Boxplots")

plot_pmap <- ggplot(data = pmappivot) +
  geom_boxplot(aes(type, power, fill=type)) +
  ggtitle("Pmap Boxplots")

library(ggpubr)
```

```
## Warning: package 'ggpubr' was built under R version 4.4.3
```

```
ggarrange(plot_forloop, plot_pmap)
```



Put the Quatro in your assignment github and submit a link on Canvas for Assignment 4 when its ready to be graded