reproducible research wk2 project

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21 November 2018

```
getwd()
```

```
## [1] "C:/Users/Million/Desktop/myfolder"
```

Loading and preprocessing the data

Clear the workspace

```
rm(list=ls())
```

Loading the raw activity data

```
activity_data <- read.csv("C:/Users/Million/Desktop/myfolder/activity.csv",
header = TRUE, sep = ',')
```

Transforming the data into a format suitable for analysis

Transforming the date attribute to an actual date format

```
activity_data$date <- as.POSIXct(activity_data$date, format="%Y-%m-%d")
```

Computing the weekdays from the date attribute

```
activity_data <- data.frame(date=activity_data$date,
                            weekday=tolower(weekdays(activity_data$date)),
                            steps=activity_data$steps,
                            interval=activity_data$interval)
```

Compute the day type (weekend or weekday)

```
activity_data <- cbind(activity_data,
                      daytype=ifelse(activity_data$weekday == "saturday" | 
                                       activity_data$weekday == "sunday", "w
eekend", 
                                     "weekday"))
```

Create the final data.frame

```
activity <- data.frame(date=activity_data$date, 
                       weekday=activity_data$weekday, 
                       daytype=activity_data$daytype, 
                       interval=activity_data$interval,
                       steps=activity_data$steps)
```

Clear the workspace

```
rm(activity_data)
```

We display the first few rows of the activity data frame:

```
  head(activity)
```

```
##         date weekday daytype interval steps
## 1 2012-10-01  monday weekday        0    NA
## 2 2012-10-01  monday weekday        5    NA
## 3 2012-10-01  monday weekday       10    NA
## 4 2012-10-01  monday weekday       15    NA
## 5 2012-10-01  monday weekday       20    NA
## 6 2012-10-01  monday weekday       25    NA
```

What is the mean total number of steps taken per day?

Making a histogram of the total number of steps taken each day

Computing the total number of steps each day (NA values

removed)

```
sum_data <- aggregate(activity$steps, by=list(activity$date), FUN=sum, na.rm
=TRUE)
```

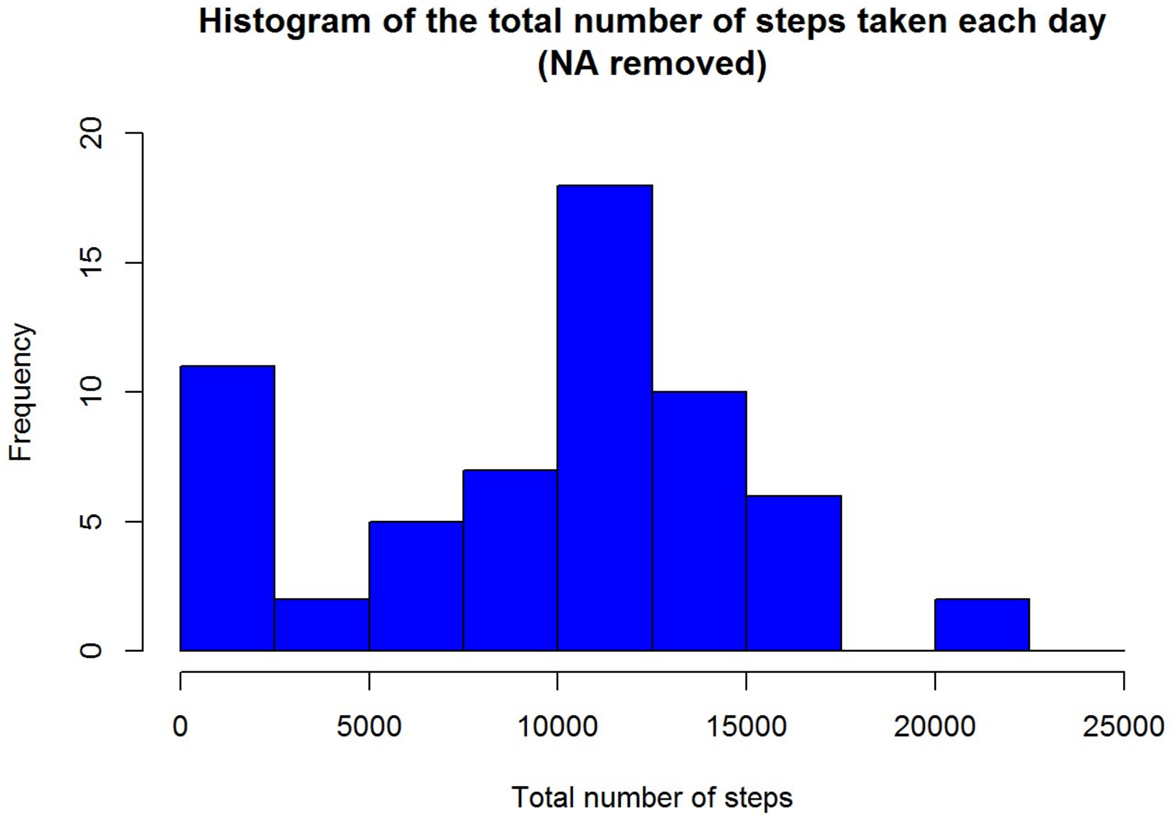
Rename the attributes and displaying the first few rows.

```
names(sum_data) <- c("date", "total")
head(sum_data)
```

```
##         date total
## 1 2012-10-01     0
## 2 2012-10-02   126
## 3 2012-10-03 11352
## 4 2012-10-04 12116
## 5 2012-10-05 13294
## 6 2012-10-06 15420
```

Computing the histogram of the total number of steps each day

```
  hist(sum_data$total,
       breaks=seq(from=0, to=25000, by=2500),
       col="blue",
       xlab="Total number of steps",
       ylim=c(0, 20),
       main="Histogram of the total number of steps taken each day\n(NA remo
ved)")
```



2.Calculating and reporting the mean and median total number of steps taken per day.

The mean and median are computed like

```
mean(sum_data$total)
```

```
## [1] 9354.23
```

```
median(sum_data$total)
```

```
## [1] 10395
```

These formulas gives a mean and median of 9354 and 10395 respectively.

What is the average daily activity pattern?

1.Making a time series plot (i.e. type = “l”) of the 5-minute interval (x-axis) and the average number of steps taken, averaged across all days (y-axis) ## Clear the workspace rm(sum_data)

Computing the means of steps accross all days for each interval

```
mean_data <- aggregate(activity$steps,
                       by=list(activity$interval),
                       FUN=mean,
                       na.rm=TRUE)
```

Rename the attributes and displaying the first few rows

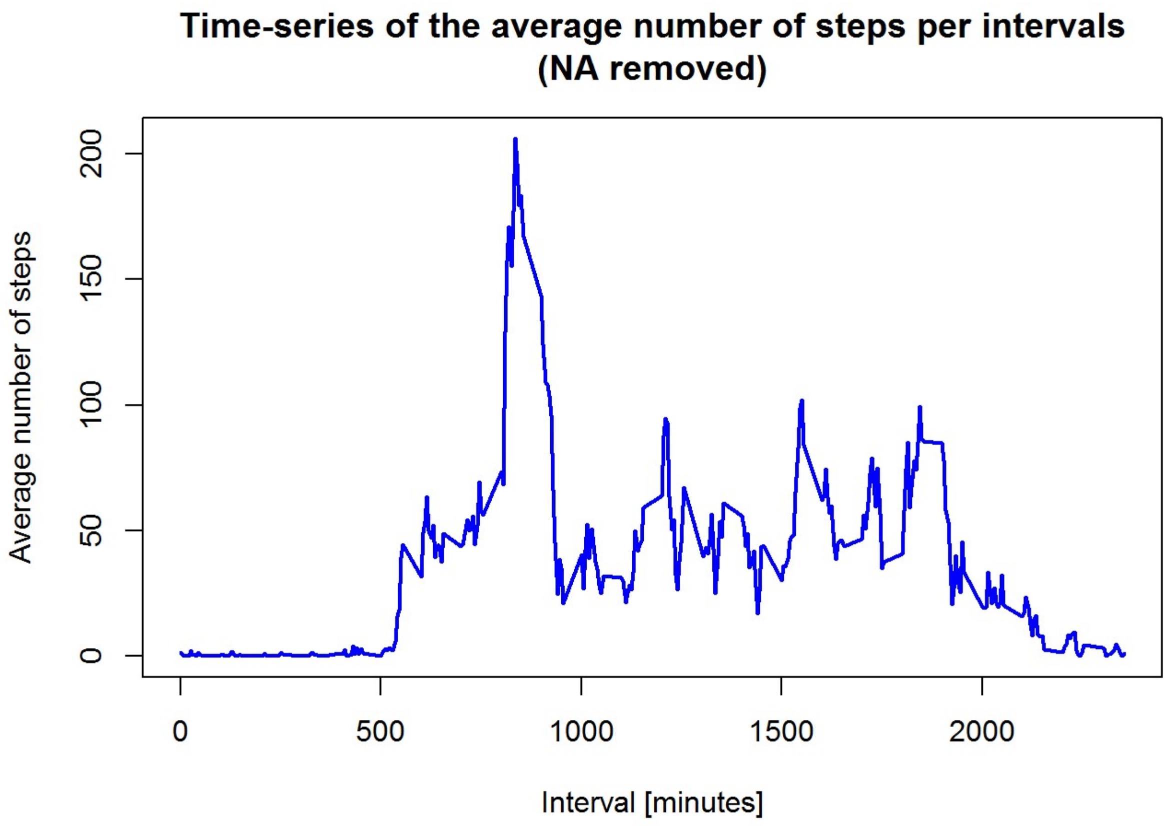
```
names(mean_data) <- c("interval", "mean")
head(mean_data)
```

```
##   interval      mean
## 1        0 1.7169811
## 2        5 0.3396226
## 3       10 0.1320755
## 4       15 0.1509434
## 5       20 0.0754717
## 6       25 2.0943396
```

The time series plot is created by the following lines of code

Computing the time series plot

```
plot(mean_data$interval,
     mean_data$mean,
     type="l",
     col="blue",
     lwd=2,
     xlab="Interval [minutes]",
     ylab="Average number of steps",
     main="Time-series of the average number of steps per intervals\n(NA rem
oved)")
```



2.Which 5-minute interval, on average across all the days in the dataset, contains the maximum number of steps?

finding the position of the maximum mean

```
  max_pos <- which(mean_data$mean == max(mean_data$mean))
```

We lookup the value of interval at this position

```
max_interval <- mean_data[max_pos, 1]
```

Clear the workspace

```
rm(max_pos, mean_data)
```

The 5-minute interval that contains the maximum of steps, on average across all days, is 835.

Inputing the missing values

1.Calculating and reporting the total number of missing values in the dataset (i.e. the total number of rows with NA's)

Clear the workspace

```
rm(max_interval)
```

using the trick that a TRUE boolean value is equivalent to 1 and a FALSE to 0.

```
NA_count <- sum(is.na(activity$steps))
```

The number of NA's is 2304.

2.Devising a strategy for filling in all of the missing values in the dataset. For example, using the mean/median for that day, or the mean for that 5-minute interval, etc.

Clear the workspace

```
rm(NA_count)
```

Finding the NA positions

```
na_pos <- which(is.na(activity$steps))
```

Creating a vector of means

```
mean_vec <- rep(mean(activity$steps, na.rm=TRUE), times=length(na_pos))
```

using the strategy to remplace each NA value by the mean of the steps attribute.

3.Creating a new dataset that is equal to the original dataset but with the missing data filled in.

Replace the NAs by the means

```
activity[na_pos, "steps"] <- mean_vec
```

Clearing the workspace and displaying the first few rows.

```
rm(mean_vec, na_pos)
head(activity)
```

```
##         date weekday daytype interval   steps
## 1 2012-10-01  monday weekday        0 37.3826
## 2 2012-10-01  monday weekday        5 37.3826
## 3 2012-10-01  monday weekday       10 37.3826
## 4 2012-10-01  monday weekday       15 37.3826
## 5 2012-10-01  monday weekday       20 37.3826
## 6 2012-10-01  monday weekday       25 37.3826
```

4.Making a histogram of the total number of steps taken each day and calculate and report the mean and median total number of steps taken per day. Do these values differ from the estimates from the first part of the assignment? What is the impact of imputing missing data on the estimates of the total daily number of steps?

Computing the total number of steps each day (NA values removed)

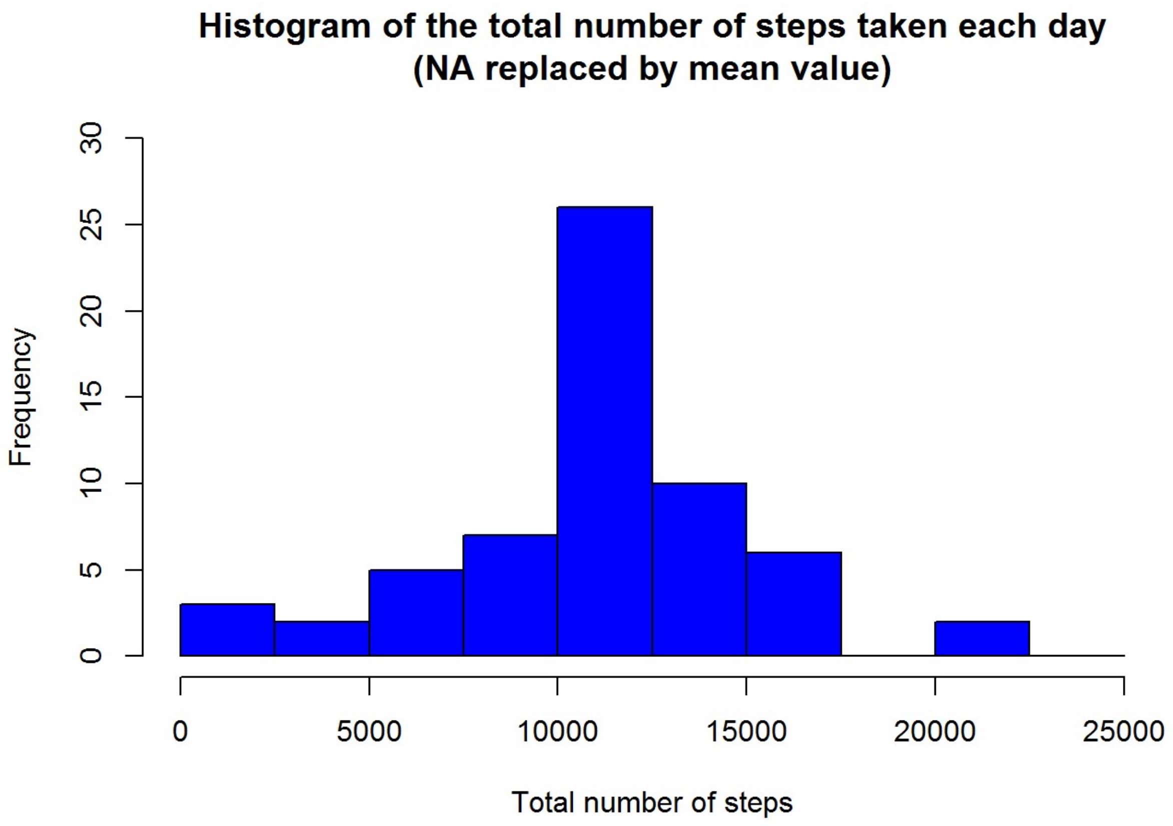
```
  sum_data <- aggregate(activity$steps, by=list(activity$date), FUN=sum)
```

Rename the attributes

```
names(sum_data) <- c("date", "total")
```

Computing the histogram of the total number of steps each day

```
hist(sum_data$total,
     breaks=seq(from=0, to=25000, by=2500),
     col="blue",
     xlab="Total number of steps",
     ylim=c(0, 30),
     main="Histogram of the total number of steps taken each day\n(NA replac
ed by mean value)")
```



The mean and median are computed like

```
mean(sum_data$total)
```

```
## [1] 10766.19
```

```
median(sum_data$total)
```

```
## [1] 10766.19
```

These formulas gives a mean and median of 10766 and 10766 respectively.

These values differ greatly from the estimates from the first part of the assignment. The impact of imputing the missing values is to have more data, hence to obtain a bigger mean and median value.

Are there differences in activity patterns between weekdays and weekends?

Using the dataset with the filled-in missing values for this part.

1.Creating a new factor variable in the dataset with two levels - “weekdays” and “weekend” indicating whether a given date is a weekday or weekend day.

The new factor variable “daytype” was already in the activity data frame

```
head(activity)
```

```
##         date weekday daytype interval   steps
## 1 2012-10-01  monday weekday        0 37.3826
## 2 2012-10-01  monday weekday        5 37.3826
## 3 2012-10-01  monday weekday       10 37.3826
## 4 2012-10-01  monday weekday       15 37.3826
## 5 2012-10-01  monday weekday       20 37.3826
## 6 2012-10-01  monday weekday       25 37.3826
```

2.Making a panel plot containing a time series plot (i.e. type = “l”) of the 5- minute interval (x-axis) and the average number of steps taken, averaged across all weekday days or weekend days (y-axis).

Clearing the workspace and loading the lattice graphical library

```
rm(sum_data)
library(lattice)
```

```
## Warning: package 'lattice' was built under R version 3.4.4
```

Computing the average number of steps taken, averaged across all daytype variable

```
mean_data <- aggregate(activity$steps,
                       by=list(activity$daytype,
                               activity$weekday, activity$interval), mean)
```

Rename the attributes and displaying the first few rows.

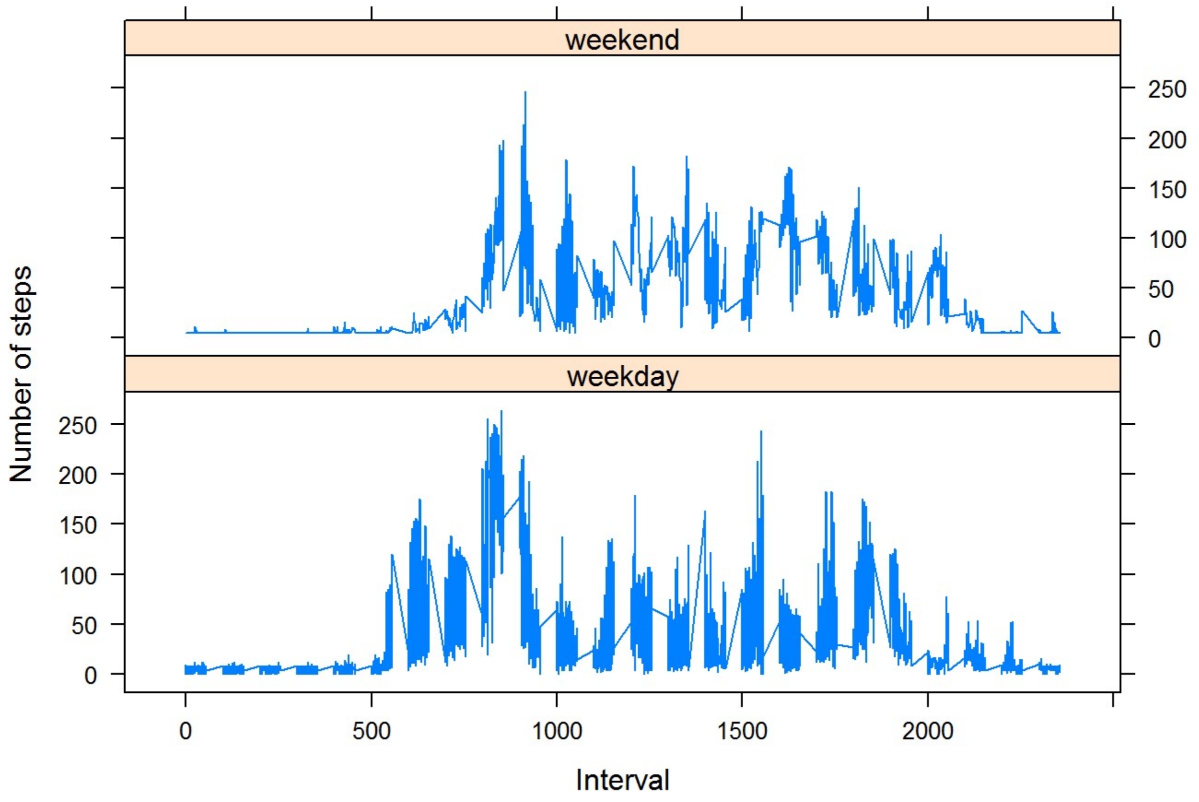
```
names(mean_data) <- c("daytype", "weekday", "interval", "mean")
head(mean_data)
```

```
##   daytype  weekday interval     mean
## 1 weekday   friday        0 8.307244
## 2 weekday   monday        0 9.418355
## 3 weekend saturday        0 4.672825
## 4 weekend   sunday        0 4.672825
## 5 weekday thursday        0 9.375844
## 6 weekday  tuesday        0 0.000000
```

The time series plot take the following form:

Compute the time serie plot

```
  xyplot(mean ~ interval | daytype, mean_data,
         type="l",
         lwd=1,
         xlab="Interval",
         ylab="Number of steps",
         layout=c(1,2))
```



Clear the workspace

```
rm(mean_data)
```