

# Reproducible Research: Peer Assessment 1

## Software Environment

```
## R version 3.2.3 (2015-12-10)
## Platform: x86_64-w64-mingw32/x64 (64-bit)
## Running under: Windows 10 x64 (build 10586)
##
## locale:
## [1] LC_COLLATE=English_United States.1252
## [2] LC_CTYPE=English_United States.1252
## [3] LC_MONETARY=English_United States.1252
## [4] LC_NUMERIC=C
## [5] LC_TIME=English_United States.1252
##
## attached base packages:
## [1] stats      graphics  grDevices  utils      datasets  methods    base
##
## loaded via a namespace (and not attached):
## [1] magrittr_1.5      formatR_1.2.1    tools_3.2.3      htmltools_0.3
## [5] yaml_2.1.13       stringi_1.0-1    rmarkdown_0.9.2  knitr_1.12.3
## [9] stringr_1.0.0     digest_0.6.9     evaluate_0.8
```

## Loading and preprocessing the data

First of all, needed library are loaded. Then, activities data are retrieved from activity.csv file. And finally, the date on string format are converted in Date class.

```
library(dplyr)
library(lattice)

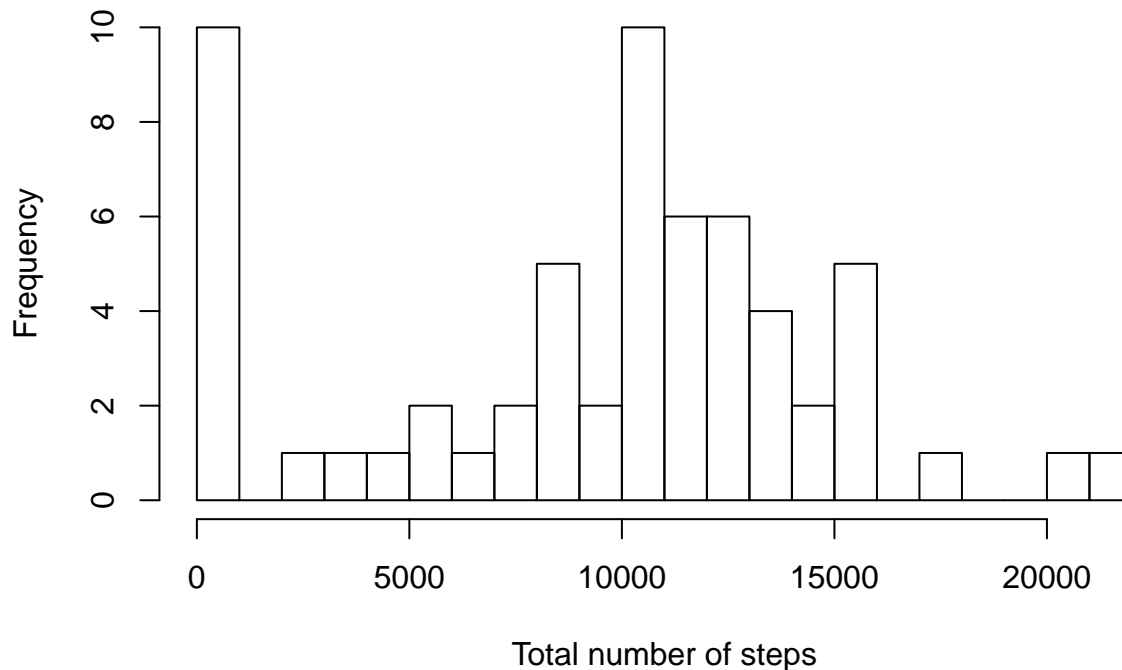
activities <- read.csv("activity.csv", stringsAsFactors = FALSE)
activities$date <- as.Date(activities$date)
```

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

The data previously obtained are grouped by date, then, for each day, the sum of step of each interval is calculated. The histogram of the total number of steps can now be drawn.

```
totalNumberStepsPerDay <- activities %>%
  group_by(date) %>%
  summarise(daily = sum(steps, na.rm = TRUE))
hist(totalNumberStepsPerDay$daily, breaks=20,
  main = "Histogram of total number of steps taken per day",
  xlab = "Total number of steps")
```

## Histogram of total number of steps taken per day



With this list of total number of steps for each day, the mean and median can now be easily retrieved.

```
meanStep <- as.integer(mean(totalNumberStepsPerDay$daily, na.rm = TRUE))
medianStep <- as.integer(median(totalNumberStepsPerDay$daily, na.rm = TRUE))
```

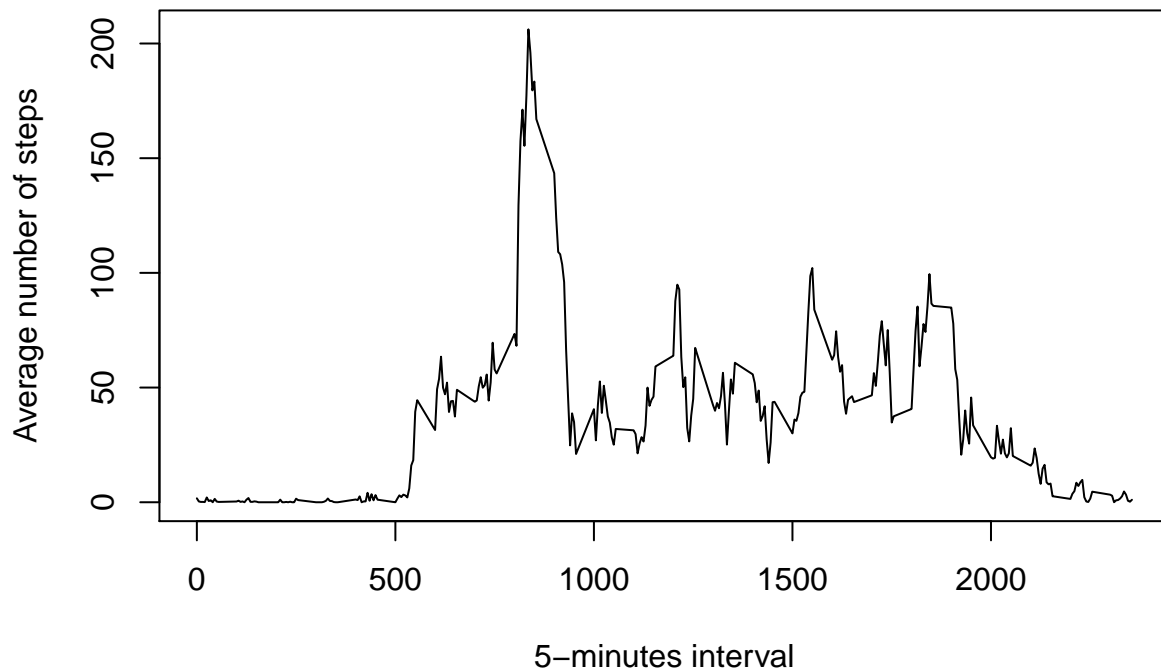
The integer value of mean of total step is 9354. The median of total step is 10395.

## What is the average daily activity pattern?

Again, The data previously obtained are used, but now grouped by interval, then, for each interval, the mean of step calculated across all days values. The time series plot can now be drawn.

```
averageStepsPerInterval <- activities %>%
  group_by(interval) %>%
  summarise(averageInterval = mean(steps, na.rm = TRUE))
plot(as.numeric(averageStepsPerInterval$interval),
     averageStepsPerInterval$averageInterval,
     type="l", main = "Time series plot",
     xlab = "5-minutes interval", ylab = "Average number of steps")
```

## Time series plot



```
maxInterval <- averageStepsPerInterval[which.max(averageStepsPerInterval$averageInterval),  
                                         "interval"][[1]]
```

The 5-minute interval, on average across all the days in the dataset, containing the maximum number of step is 835.

## Imputing missing values

First of all, calculate the sum of the NA values.

```
naNumber <- sum(is.na(activities))
```

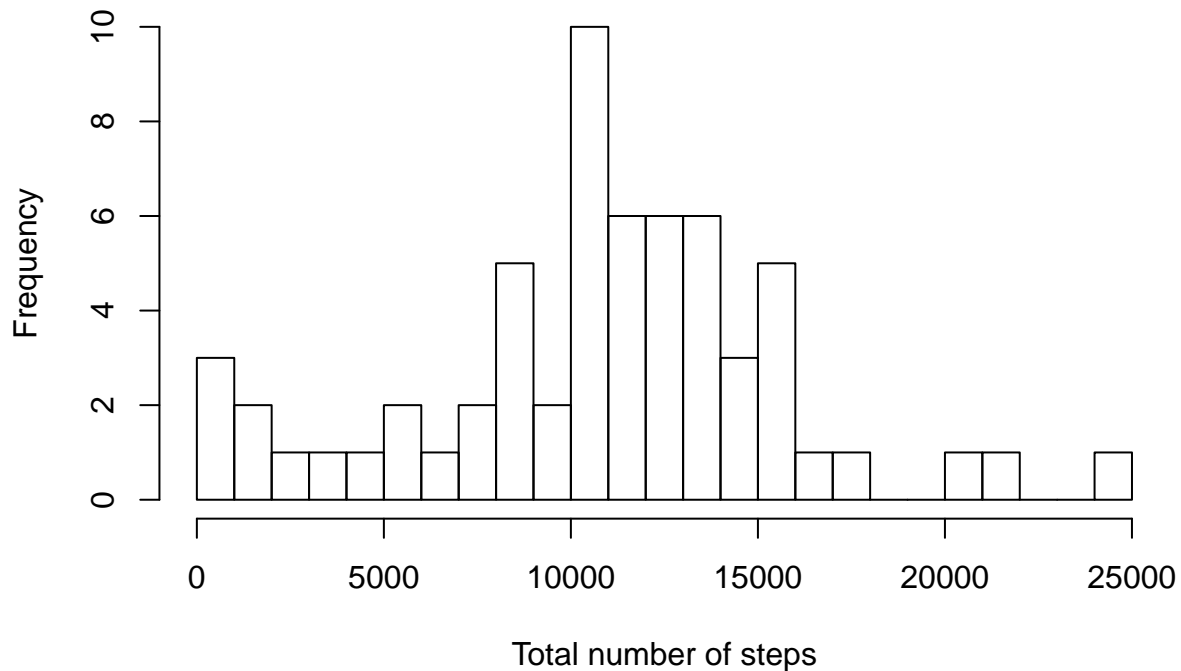
The total number of missing values in the dataset is 2304. As the average daily activity has been previously calculated, each NA value will be replaced by the mean of the corresponding interval.

```
emptyIndexes <- which(is.na(activities$steps))  
completeActivities <- activities  
completeActivities[emptyIndexes,]$steps <-  
  merge(completeActivities[emptyIndexes,], averageStepsPerInterval)$averageInterval
```

Now, we have completed the dataset, we will build again the histogram :

```
totalNumberStepsPerDay <- completeActivities %>%
  group_by(date) %>%
  summarise(daily = sum(steps, na.rm = TRUE))
hist(totalNumberStepsPerDay$daily, breaks=20,
  main = "Histogram of total number of steps taken per day",
  xlab = "Total number of steps")
```

## Histogram of total number of steps taken per day



With this list of total number of steps for each day, the mean and median can be retrieved again.

```
meanStep <- as.integer(mean(totalNumberStepsPerDay$daily, na.rm = TRUE))
medianStep <- as.integer(median(totalNumberStepsPerDay$daily, na.rm = TRUE))
```

The integer value of mean of total step is 10766. The median of total step is 11015.

So, with complete data, the mean and median of the total daily number of steps is higher than with original data with NA value.

## Are there differences in activity patterns between weekdays and weekends?

Firstly, we create a function that give a new factor with two levels - “weekday” and “weekend” indicating whether a given date is a weekday or weekend day. Secondly, we apply it at complete data and creating a new column for it.

```

getWeekPeriod <- function(d) {
  if(weekdays(d) %in% c("Saturday", "Sunday")) {
    return("weekend")
  }
  else {
    return("weekday")
  }
}

completeActivities <- cbind(completeActivities,
                             weekPeriod = mapply(getWeekPeriod, completeActivities$date))

```

Finally, by grouping it by interval and weekPeriod, we split data to draw the plot for weekday and weekend.

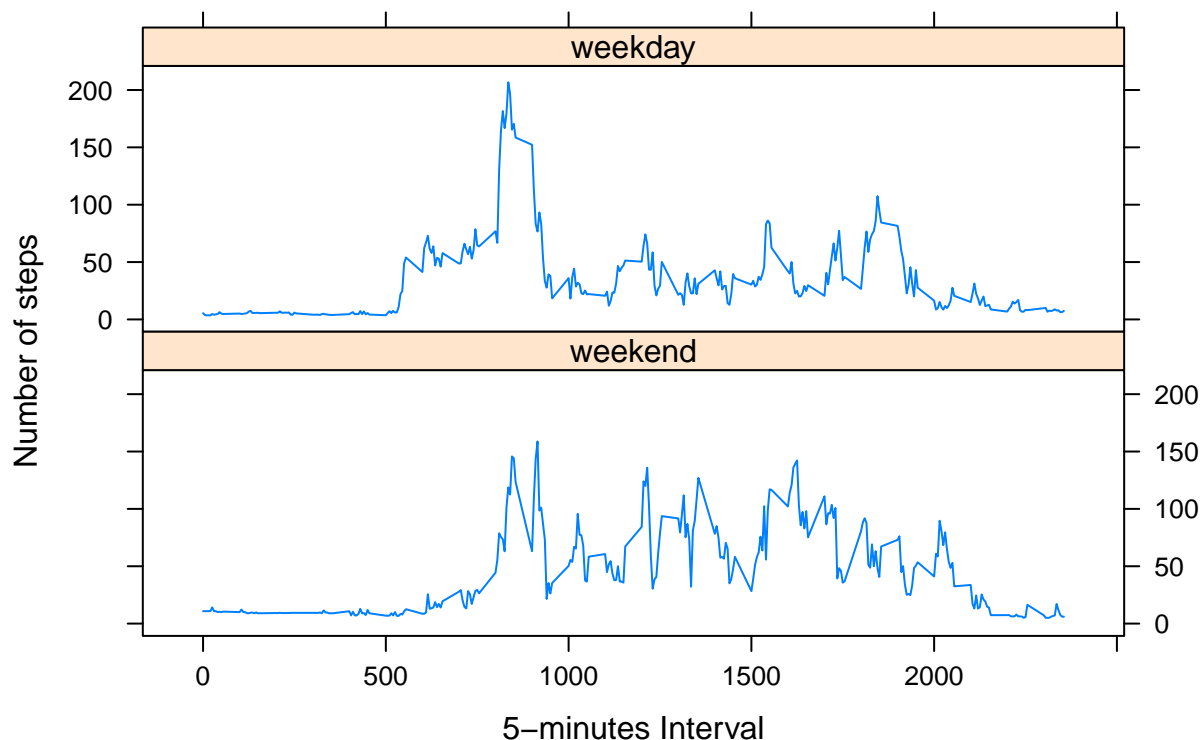
```

completeActivities <- completeActivities %>%
  group_by(interval, weekPeriod) %>%
  summarise(averageInterval = mean(steps, na.rm = TRUE))

xyplot(averageInterval~interval | weekPeriod,
       type="l", layout=c(1, 2),
       data = completeActivities, as.table = TRUE,
       xlab = "5-minutes Interval", ylab = "Number of steps",
       main = "Time serie plot with weekend/weekday split")

```

### Time serie plot with weekend/weekday split



So we can observe, that in weekend, the morning peak around 8h35 AM is not as important as it is during week days.