Reproducible Research:Peer Assessment 1

```
#setwd("D:/git_repo/RepData_PeerAssessment1")
library(dplyr); library(lubridate); library(stringr);
library(chron); library(ggplot2)
par(mfrow=c(1,1))
```

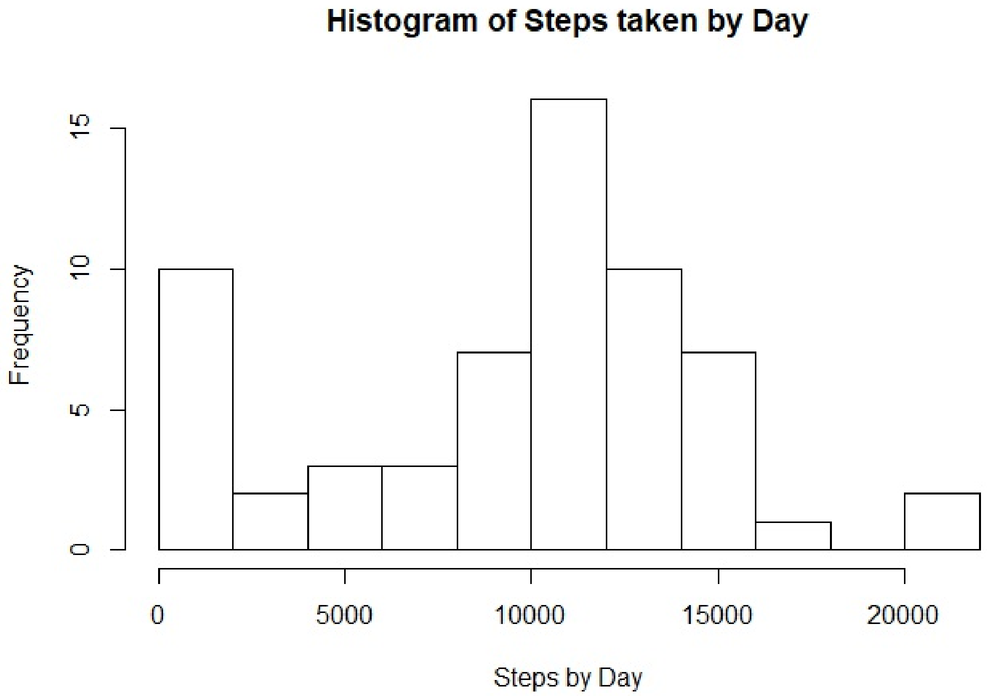
Loading and preprocessing the data

```
act <- read.csv("activity.csv", stringsAsFactors = FALSE)
act <- mutate(act,date =ymd(act$date))
```

What is mean total number of steps taken per day?

- Calculate the total number of steps taken per day
- Make a histogram of the total number of steps taken each day
- Calculate and report the mean and median of the total number of steps taken per day

```
steps_by_day <- act %>% group_by(date) %>%
    summarize(tot = sum(steps, na.rm=T))
# there was no instruction to remove the days with 0 steps, so I left these days
# steps_by_day <- filter(steps_by_day, tot != 0)
hist(steps_by_day$tot, breaks = 10,
     xlab="Steps by Day", main ="Histogram of Steps taken by Day")
```



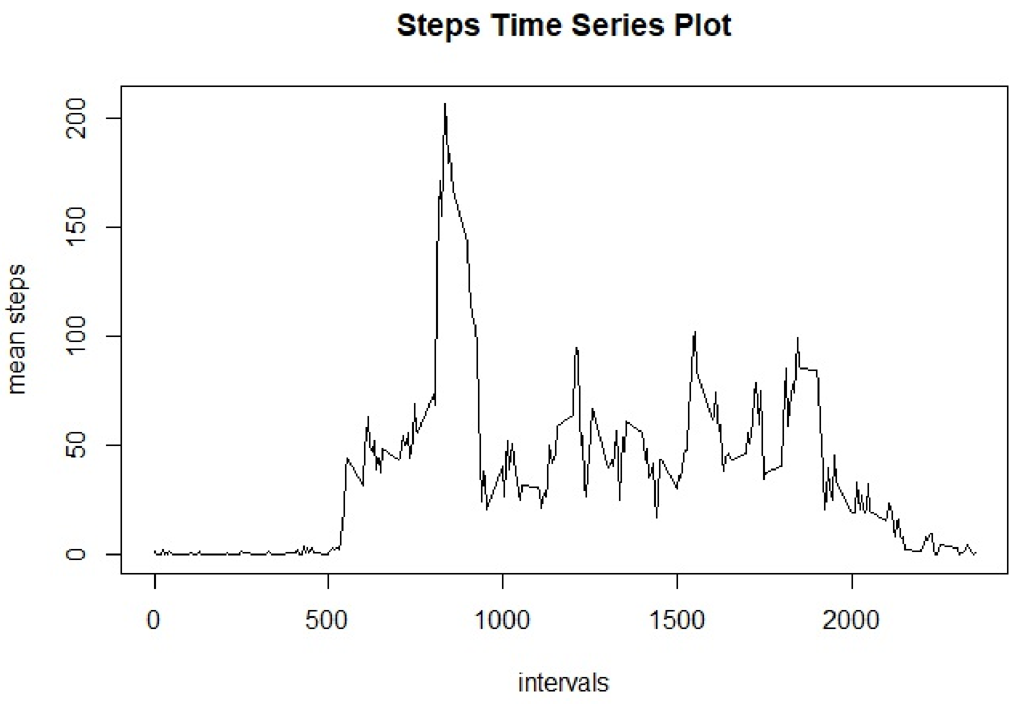
```
mean_steps <- as.integer(mean(steps_by_day$tot))
median_steps <- as.integer(median(steps_by_day$tot))
```

The mean steps per day is **9354** and the median steps per day is **10395**

What is the average daily activity pattern?

- Make a time series plot (type="l") of the 5-minute interval (x-axis) and the average number of steps taken, averaged across all days (y-axis)
- Which 5-minute interval, on average across all the days in the dataset, contains the maximum number of steps?

```
steps_by_int_mean <- act %>% group_by(interval) %>%
    summarize(int_mean = mean(steps, na.rm=T))
with(steps_by_int_mean, plot(x=interval, y=int_mean, type="l",
     xlab="intervals", ylab="mean steps", main="Steps Time Series Plot"))
```



```
max_int <- which.max(steps_by_int_mean$int_mean)
int_with_max_mean = steps_by_int_mean$interval[max_int]
max_mean = as.integer(steps_by_int_mean$int_mean[max_int])
```

The interval with max mean steps is the **835**, with **206** average steps

Imputing missing values

- Calculate/report the total number of rows with NAs
- Devise a strategy for filling in all of the missing values in the dataset.
- Create a new dataset with the missing data filled in.
- Make a histogram of the total number of steps taken each day
- Calculate and report the mean and median total number of steps taken per day.
- Do these values differ from the estimates calculated before?
- What is the impact of imputing missing data on the estimates of the total daily number of steps?

```
steps_na <- is.na(act$steps)
number_nas <- sum(steps_na)
```

Number of Rows with NAs: **2304**

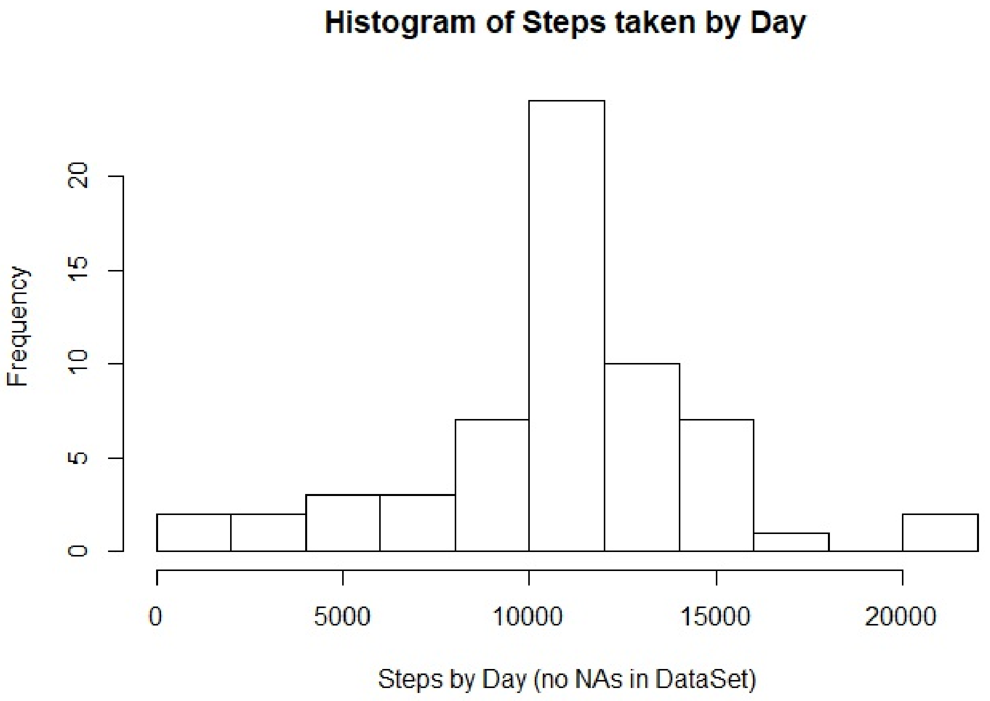
```
#Strategy for filling the NAs: Average of the steps in the same interval
#which it can be obtained from the Data Frame "steps_by_int_mean""

actx = mutate(act,
        hora=as.integer(substr(str_pad(as.character(interval),4,pad="0"),1,2)),
        minuto=as.integer(substr(str_pad(as.character(interval),4,pad="0"),3,4)),
        indice= (hora*12)+(minuto/5)+1)
for (i in 1:nrow(actx)) {
    if (is.na(actx$steps[i])) {
        j = actx$indice[i]
        actx$steps[i] <- steps_by_int_mean$int_mean[j]
    }
}
num_new_nas <- sum(is.na(actx$steps))
```

Strategy for filling the NAs: **Average of the steps in the same interval**

DataFrame **actx** created with all NAs filled with the average steps of that interval

Number of NAs on new DataFrame **actx: 0**

```
steps_by_day <- actx %>% group_by(date) %>% summarize(tot = sum(steps, na.rm=T))
hist(steps_by_day$tot, breaks = 10, xlab="Steps by Day (no NAs in DataSet)",
     main ="Histogram of Steps taken by Day")
```



```
mean_steps2 <- as.integer(mean(steps_by_day$tot))
median_steps2 <- as.integer(median(steps_by_day$tot))
```

With no NAs, the mean steps per day is **10766** and the median steps per day is **10766**

The mean increased from **9354** to **10766** and the median increased from **10395** to **10766**.

There was an impact by filling the NAs. By filling NAs with the steps average of the same interval, the mean and median values increased.

Are there differences in activity patterns between weekdays and weekends?

- Create a new factor with two levels (“weekday” & “weekend”).
- Make a panel with the time series plot of weekdays & weekends (y-axis) and the 5-minute interval (x-axis) and the average number of steps.

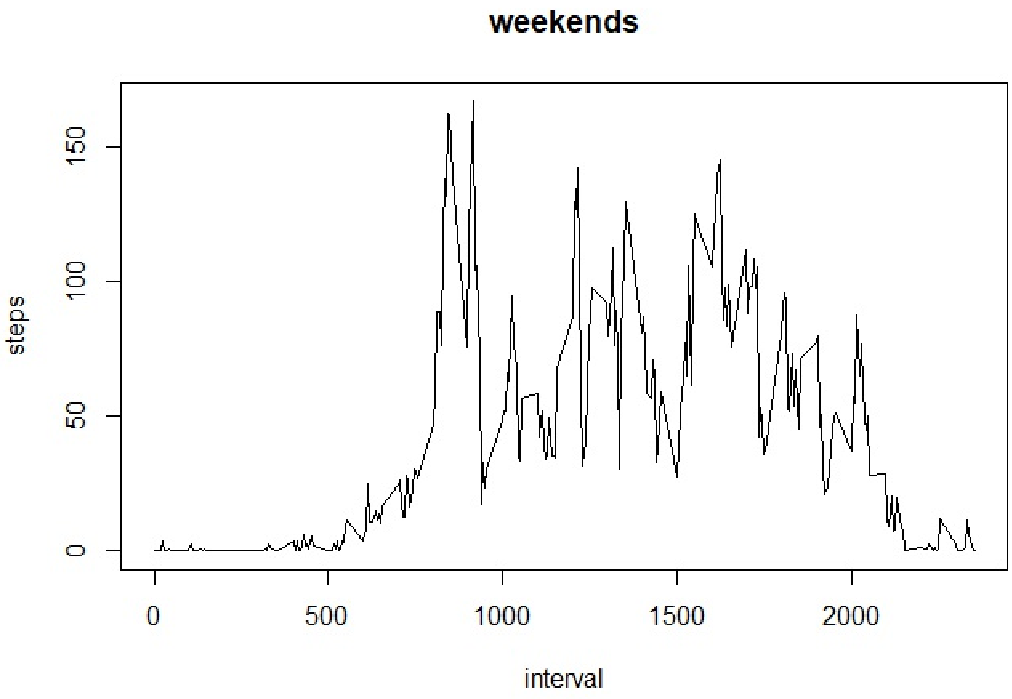
There was no instruction if the dataset to use was the one with NAs or the on without. I decided to use the one without the NAs replaced by the average of steps at the same interval.

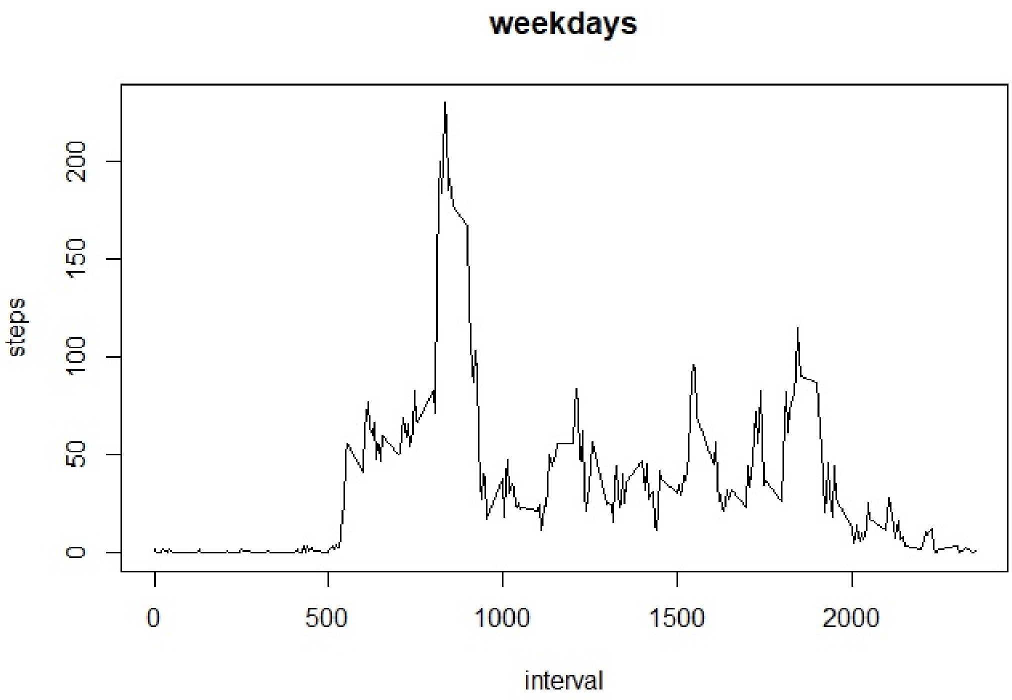
```
actx <- actx %>% mutate(flag = ifelse(is.weekend(actx$date),"weekend","weekday" )) %>%
      mutate(flag = as.factor(flag)) %>% select(steps, interval, flag)

str(actx)
```

```
## 'data.frame':    17568 obs. of  3 variables:
##  $ steps   : num  1.717 0.3396 0.1321 0.1509 0.0755 ...
##  $ interval: int  0 5 10 15 20 25 30 35 40 45 ...
##  $ flag    : Factor w/ 2 levels "weekday","weekend": 1 1 1 1 1 1 1 1 1 1 ...
```

Factor **flag** created: levels: (weekend, weekday)

```
par(mfrow=c(2,1))
steps_weekend <- actx %>% filter(flag == "weekend") %>% group_by(interval) %>%
    summarize(steps = mean(steps))
with(steps_weekend, plot(x=interval, y=steps, type="l", main="weekends"))
steps_weekday <- actx %>% filter(flag == "weekday") %>% group_by(interval) %>%
    summarize(steps = mean(steps))
with(steps_weekday, plot(x=interval, y=steps, type="l", main="weekdays"))
```


weekends
steps
0
50
100
150
interval
0
500
1000
1500
2000


weekdays
steps
0
50
100
150
200
interval
0
500
1000
1500
2000