Reproducible Research: Peer Assessment 1

Loading and preprocessing the data

Loading and preprocessing the data, just make sure it exists and unzip if needed:

```
if (!file.exists("activity.zip")) {
  stop("File Activity.zip does not exist")
}
if (!file.exists("activity.csv")) {
  unzip("activity.zip")
}
activity <- read.csv("activity.csv", na.strings="NA")
#it will be needed to use weekday/weekend function:
activity$date <- as.Date(activity$date, format="%Y-%m-%d")
```

What is mean total number of steps taken per day?

For calculating the average total number of steps taken per day we ignore the missing values in the dataset.

Histogram of the total number of steps taken each day Then I draw a histogram of the total number of steps taken each day.

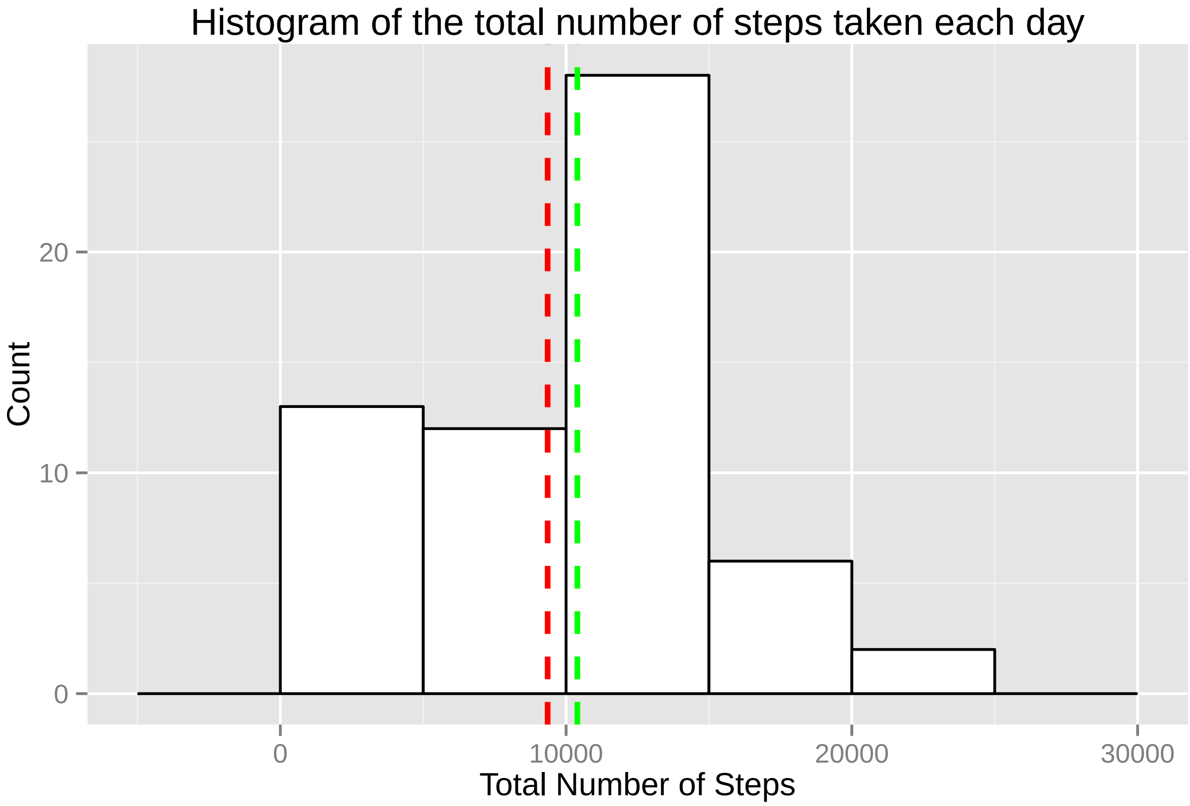
```
require(plyr) # required for ddply
```

```
## Loading required package: plyr
```

```
require(ggplot2)
```

```
## Loading required package: ggplot2
```

```
sum_steps_by_date <- ddply(activity, .(date), summarize, total_steps=sum(steps, na.rm=T))
ggplot(sum_steps_by_date, aes(x=total_steps)) + geom_histogram(binwidth=5000, colour="black", fill="whi
```



Mean and Median Then I calculate and the mean and median of the total number of steps taken per day:

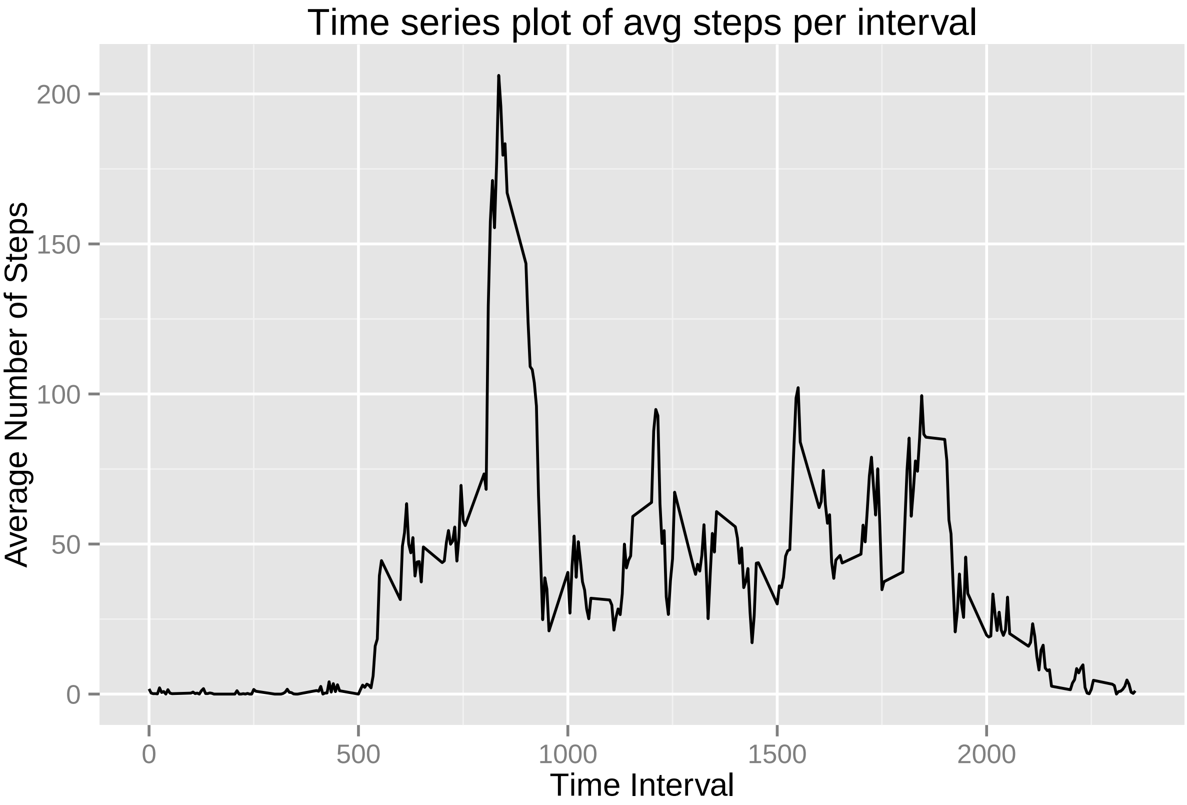
```
steps_mean <- mean(sum_steps_by_date$total_steps, na.rm=T)
steps_median <- median(sum_steps_by_date$total_steps, na.rm=T)
```

The mean and median of the total number of steps taken per day are **9354 steps** and **10395 steps** respectively.

What is the average daily activity pattern?

The below is a time series plot of the 5-minute interval (x-axis) and the average number of steps taken, averaged across all days (y-axis):

```
sum_steps_by_interval <- ddply(activity, .(interval), summarize, avg_steps=mean(steps, na.rm=T))
ggplot(sum_steps_by_interval, aes(interval, avg_steps)) + geom_line() + xlab("Time Interval") + ylab("A
```



Interval containing the maximum number of steps Then I determine which 5-minute interval, on average across all the days in the dataset, contains the maximum number of steps:

```
interval_with_max_steps <- sum_steps_by_interval[sum_steps_by_interval$avg_steps==max(sum_steps_by_inte
print (interval_with_max_steps)
```

```
## [1] 835
```

The interval 835 contains the maximum number of steps.

Imputing missing values

First, I calculate and the total number of missing values in the dataset:

```
activity_missing_values <- activity[is.na(activity$steps) | is.na(activity$date) | is.na(activity$inter
nrow(activity_missing_values)
```

```
## [1] 2304
```

the total number of rows with NAs is 2304

Strategy for imputing missing data

I use the following strategy for filling in all of the missing values in the dataset: replace NA with the mean for that day rounded to an integer value, or *mean of means* (also rounded to an integer value) if all values for a date are missing.

```
steps_by_date <- ddply(activity, .(date), summarize, avg_steps=mean(steps, na.rm=T))
steps_by_date$avg_steps <- as.integer(steps_by_date$avg_steps)
mean_of_mean <- as.integer(mean(steps_by_date$avg_steps, na.rm=TRUE))
dates_with_na <- is.na(steps_by_date$avg_steps)
steps_by_date[dates_with_na,]$avg_steps <- rep(mean_of_mean, nrow(steps_by_date[dates_with_na,]))
```

Then I created a new dataset *m* that is equal to the original dataset but with the missing data filled in.

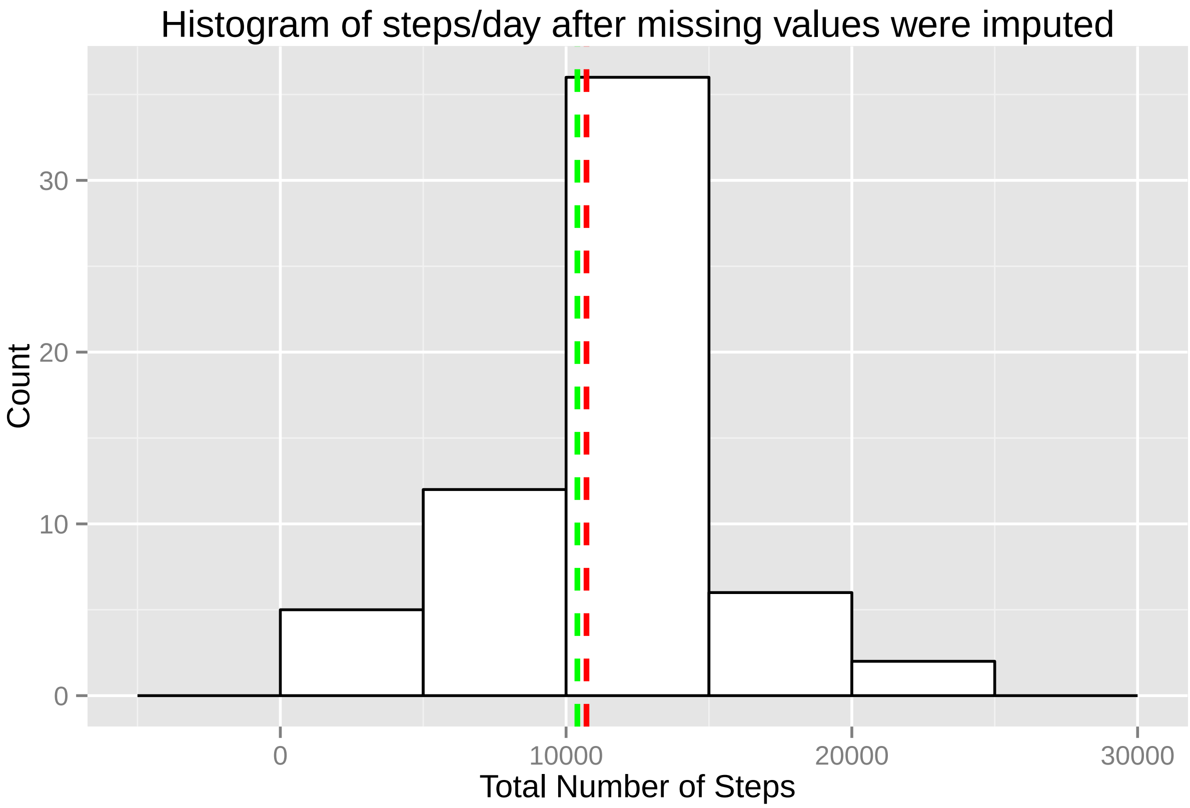
```
m <- merge(activity, steps_by_date, by.x=c("date"), by.y=c("date"))
m$steps <- ifelse(is.na(m$steps), m$avg_steps, m$steps)
m$avg_steps <- NULL
head(m)
```

```
##         date steps interval
## 1 2012-10-01    36        0
## 2 2012-10-01    36        5
## 3 2012-10-01    36       10
## 4 2012-10-01    36       15
## 5 2012-10-01    36       20
## 6 2012-10-01    36       25
```

Histogram of steps/day after missing values were imputed

The below is the histogram of the total number of steps taken each day based on the dataset after missing values were imputed.

```
total_by_date <- ddply(m, .(date), summarize, total_steps=sum(steps, na.rm=T))
ggplot(total_by_date, aes(x=total_steps)) + geom_histogram(binwidth=5000, colour="black", fill="white")
```



Then I calculate and the mean and median of the total number of steps taken per day *of the dataset with imputed missing values*:

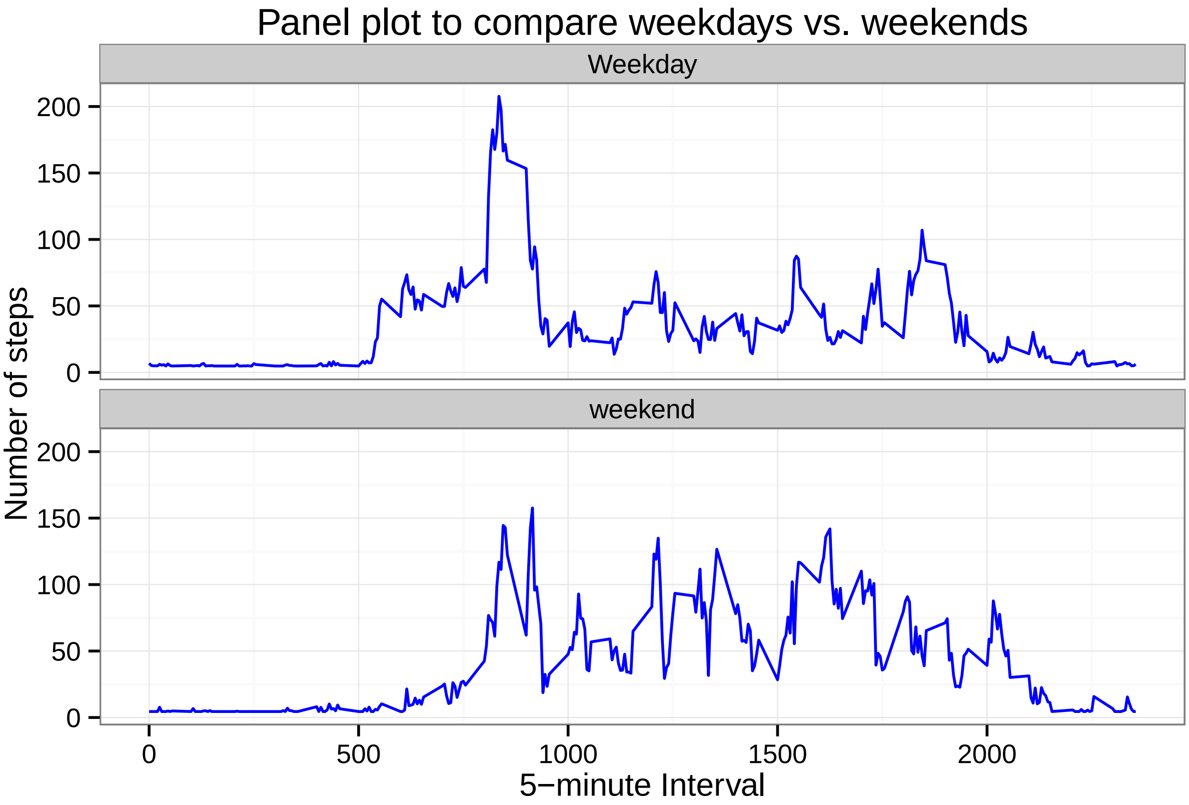
```
imp_steps_mean <- as.integer(mean(total_by_date$total_steps, na.rm=T))
imp_steps_median <- median(total_by_date$total_steps, na.rm=T)
```

The mean and the median of the total number of steps taken per day are **10713 steps** and **10395 steps** respectively. Imputing missing data led to increas of the estimates of the total daily number of steps, howerver the median remains same (as before the missing data were imputed).

Are there differences in activity patterns between weekdays and weekends?

The I use the following *panel plot* in order to compare the average number of steps taken per 5-minute interval across weekdays and weekends:

```
m$wd <- 'Weekday'
m$wd <- ifelse((weekdays(m$date)=='Saturday'|weekdays(m$date)=='Sunday'), 'weekend', m$wd)
steps_by_wd <- ddply(m, .(wd, interval), summarize, avg_steps=mean(steps, na.rm=T))
ggplot(steps_by_wd, aes(x=interval, y=avg_steps)) + geom_line(color="blue") + facet_wrap(~ wd, nrow=2,
```



Compare weekend/weekday activity Weekday activity appeared higher on lower intervals, but the weekend activity is higher (or almost same) on higher intervals.