Reproducible Research Week 2 Project

Set directory

```
setwd("E:/Coursera/Data Science/Reproducible Research/Week 2")
```

Load packages needed

```
library(knitr)
```

Set always to include code when generating output

```
opts_chunk$set(echo = TRUE)
```

Loading and preprocessing the data 1.Load the data (i.e. read.csv()) 2.Process/transform the data (if necessary) into a format suitable for your analysis

```
data <- read.csv("activity.csv", header = TRUE, sep = ',', colClasses = c("nume
ric", "character", "integer"))
str(data)
```

```
## 'data.frame':    17568 obs. of  3 variables:
##  $ steps   : num  NA NA NA NA NA NA NA NA NA NA ...
##  $ date    : chr  "2012-10-01" "2012-10-01" "2012-10-01" "2012-10-01" ...
##  $ interval: int  0 5 10 15 20 25 30 35 40 45 ...
```

```
head(data)
```

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

```
library(lubridate)
```

```
##
## Attaching package: 'lubridate'
```

```
## The following object is masked from 'package:base':
##
##     date
```

```
data$date <- ymd(data$date)
```

What is mean total number of steps taken per day?

```
library(magrittr)
library(lazyeval)
library(tibble)
library(assertthat)
```

```
##
## Attaching package: 'assertthat'
```

```
## The following object is masked from 'package:tibble':
##
##     has_name
```

```
library(DBI)
library(dplyr)
```

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

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

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

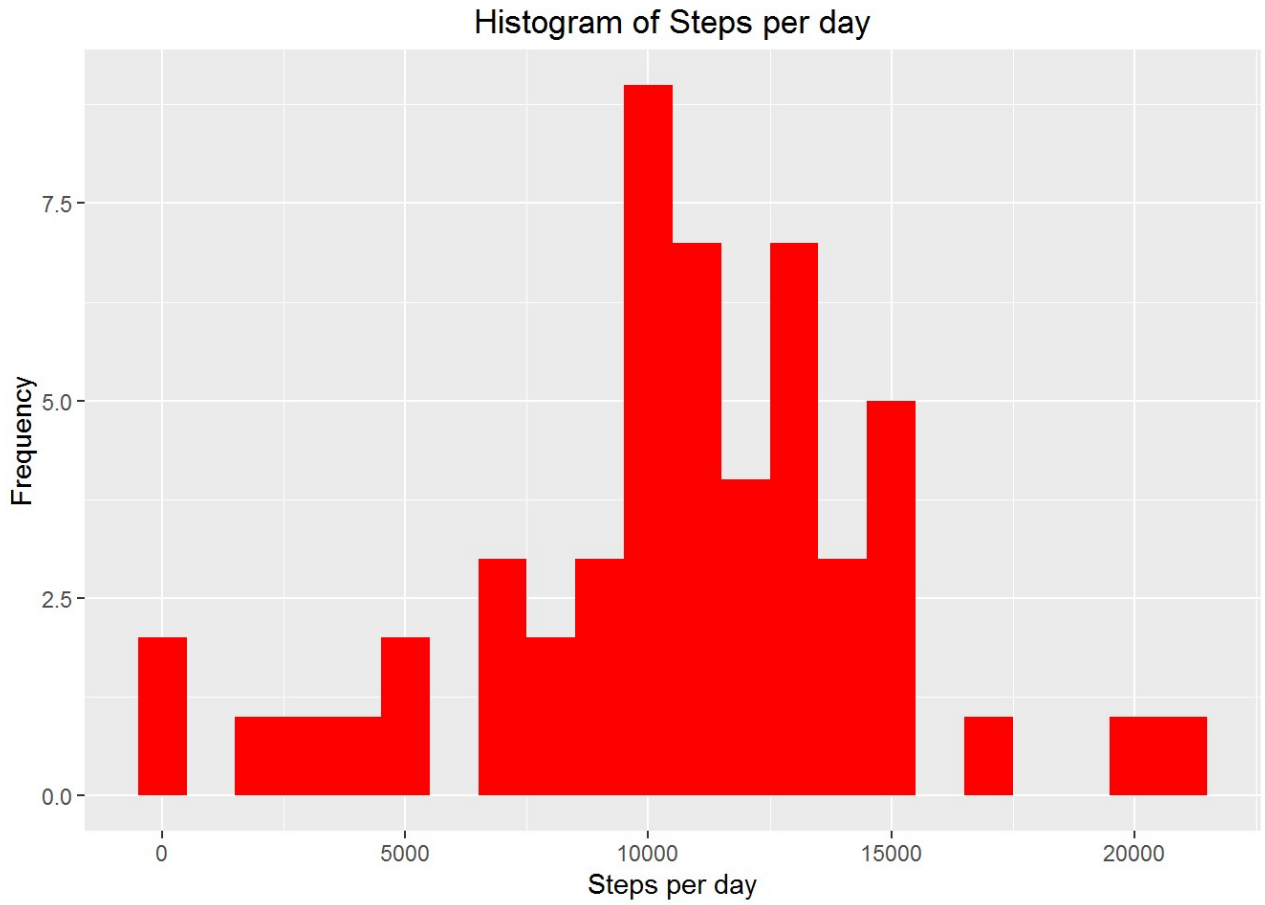
```
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

```
steps <- data %>%
  filter(!is.na(steps)) %>%
  group_by(date) %>%
  summarize(steps = sum(steps)) %>%
  print
```

```
## # A tibble: 53 x 2
##          date steps
##        <date> <dbl>
## 1  2012-10-02   126
## 2  2012-10-03 11352
## 3  2012-10-04 12116
## 4  2012-10-05 13294
## 5  2012-10-06 15420
## 6  2012-10-07 11015
## 7  2012-10-09 12811
## 8  2012-10-10  9900
## 9  2012-10-11 10304
## 10 2012-10-12 17382
## # ... with 43 more rows
```

1.Make a histogram of the total number of steps taken each day

```
library(ggplot2)
ggplot(steps, aes(x = steps)) +
  geom_histogram(fill = "red", binwidth = 1000) +
  labs(title = "Histogram of Steps per day", x = "Steps per day", y = "Frequenc
y")
```



2.Calculate and report the mean and median total number of steps taken per day

```
mean_steps <- mean(steps$steps, na.rm = TRUE)
median_steps <- median(steps$steps, na.rm = TRUE)
mean_steps
```

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

```
median_steps
```

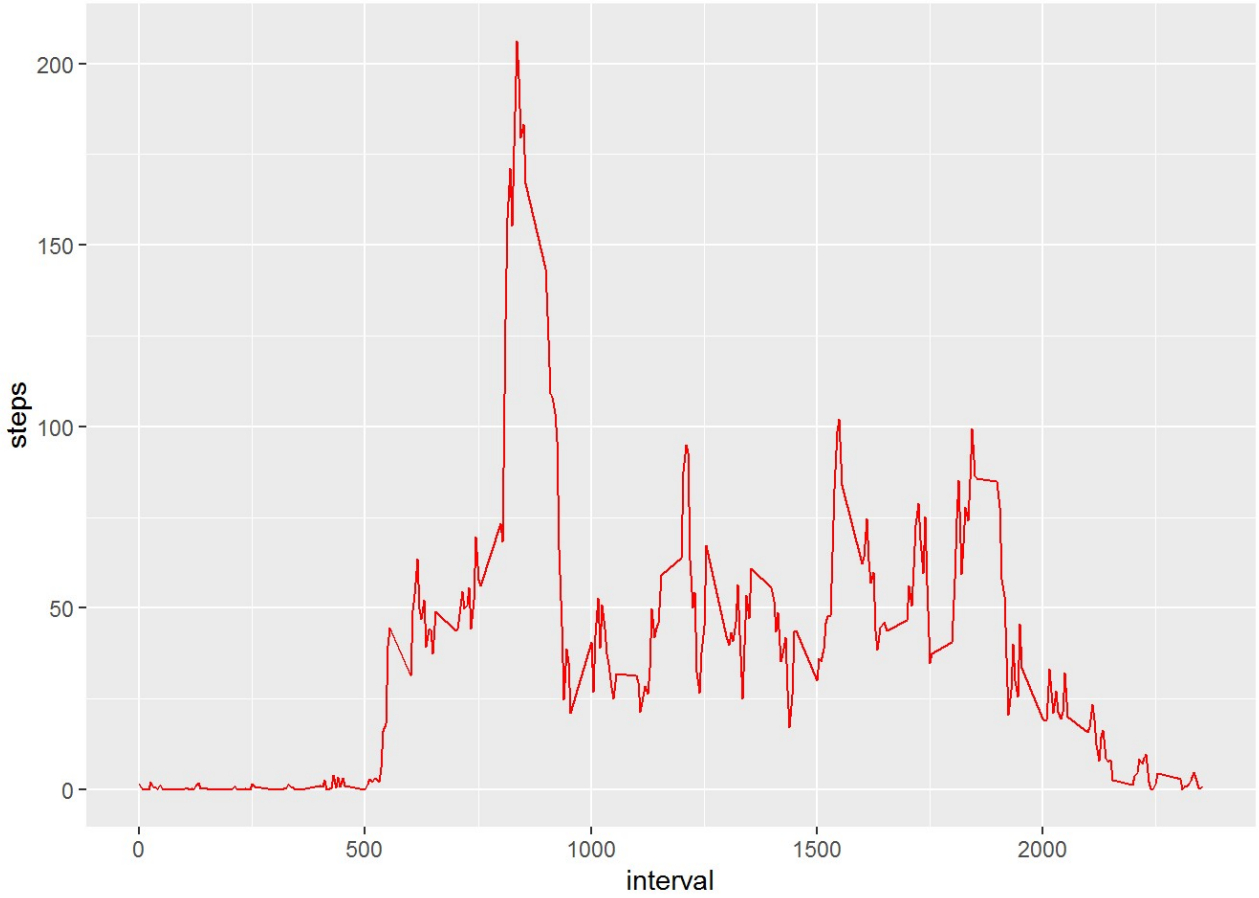
```
## [1] 10765
```

What is the average daily activity pattern?

1.Make 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)

```
interval <- data %>%
  filter(!is.na(steps)) %>%
  group_by(interval) %>%
  summarize(steps = mean(steps))

ggplot(interval, aes(x=interval, y=steps)) +
  geom_line(color = "red")
```



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

```
interval[which.max(interval$steps),]
```

```
## # A tibble: 1 x 2
##   interval    steps
##      <int>    <dbl>
## 1      835 206.1698
```

Imputing missing values

Note that there are a number of days/intervals where there are missing values (coded as NA). The presence of missing days may introduce bias into some calculations or summaries of the data.

1.Calculate and report the total number of missing values in the dataset (i.e. the total number of rows with NAs)

```
sum(is.na(data$steps))
```

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

2.Devise a strategy for filling in all of the missing values in the dataset. The strategy does not need to be sophisticated. For example, you could use the mean/median for that day, or the mean for that 5-minute interval, etc.

```
data_full <- data
nas <- is.na(data_full$steps)
```

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

```
avg_interval <- tapply(data_full$steps, data_full$interval, mean, na.rm=TRUE, s
implify=TRUE)
data_full$steps[nas] <- avg_interval[as.character(data_full$interval[nas])]
sum(is.na(data_full$steps))
```

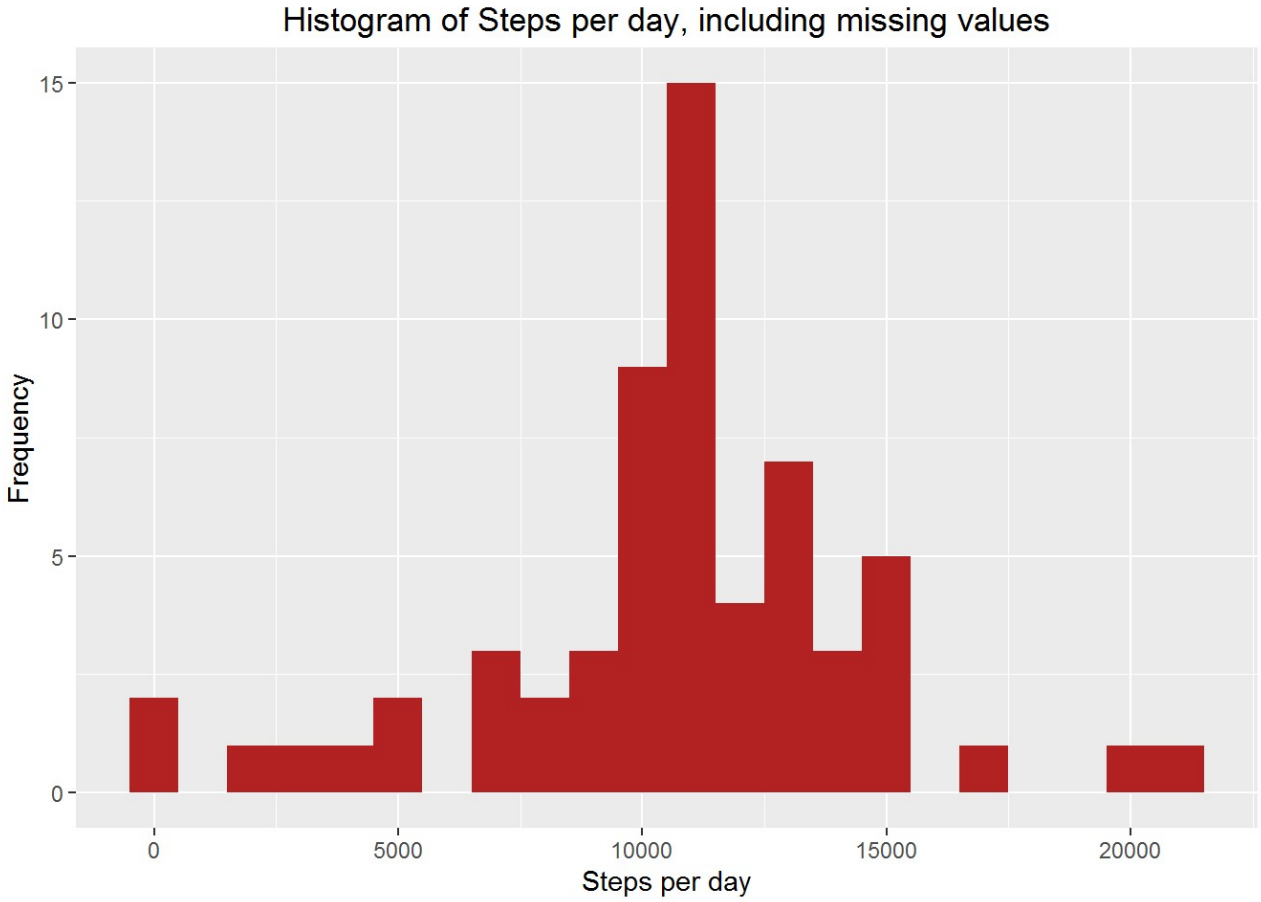
```
## [1] 0
```

4.Make 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?

```
steps_full <- data_full %>%
  filter(!is.na(steps)) %>%
  group_by(date) %>%
  summarize(steps = sum(steps)) %>%
  print
```

```
## # A tibble: 61 x 2
##          date    steps
##        <date>    <dbl>
## 1  2012-10-01 10766.19
## 2  2012-10-02   126.00
## 3  2012-10-03 11352.00
## 4  2012-10-04 12116.00
## 5  2012-10-05 13294.00
## 6  2012-10-06 15420.00
## 7  2012-10-07 11015.00
## 8  2012-10-08 10766.19
## 9  2012-10-09 12811.00
## 10 2012-10-10  9900.00
## # ... with 51 more rows
```

```
ggplot(steps_full, aes(x = steps)) +
  geom_histogram(fill = "firebrick", binwidth = 1000) +
  labs(title = "Histogram of Steps per day, including missing values", x = "Ste
ps per day", y = "Frequency")
```



```
mean_steps_full <- mean(steps_full$steps, na.rm = TRUE)
median_steps_full <- median(steps_full$steps, na.rm = TRUE)
mean_steps_full
```

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

```
median_steps_full
```

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

Are there differences in activity patterns between weekdays and weekends?

For this part the weekdays() function may be of some help here. Use the dataset with the filled-in missing values for this part.

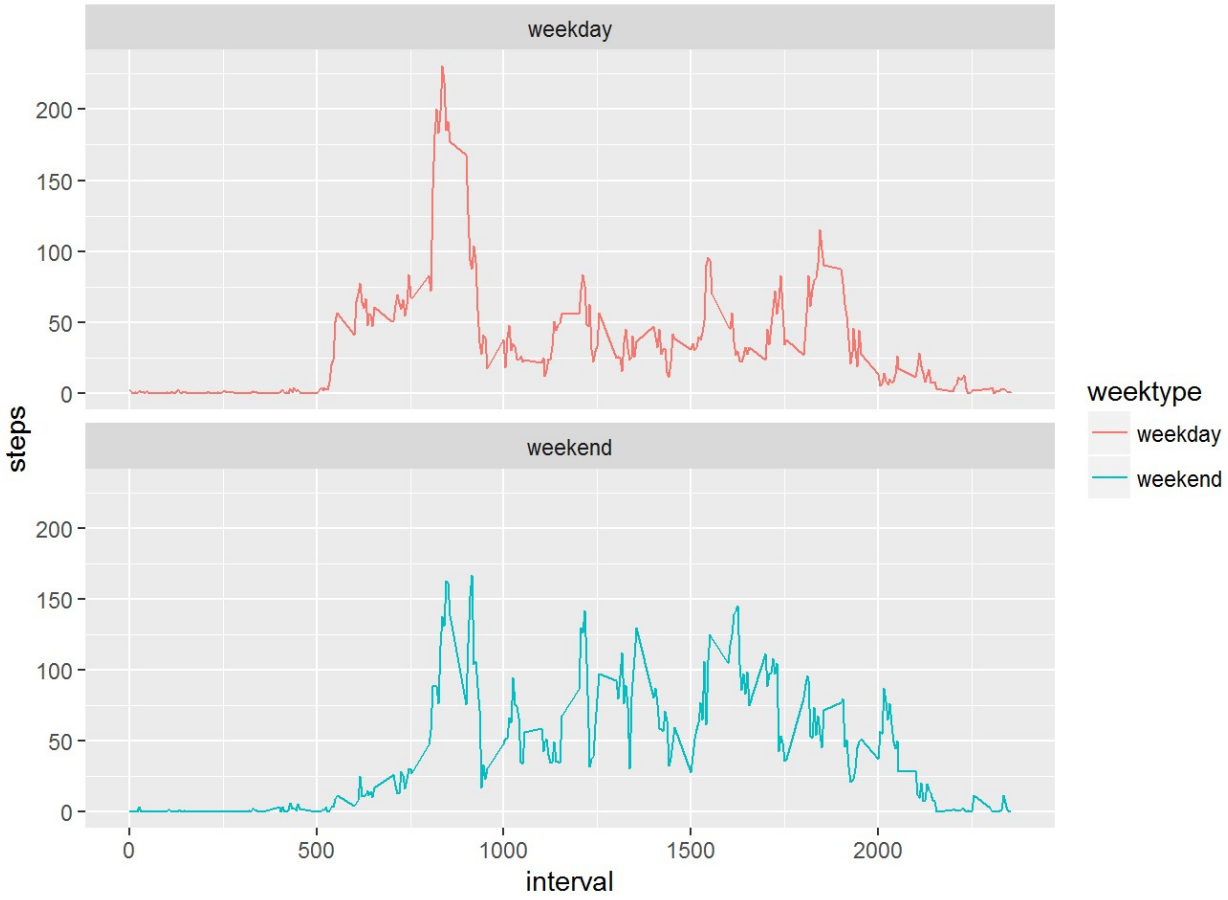
1.Create a new factor variable in the dataset with two levels – “weekday” and “weekend” indicating whether a given date is a weekday or weekend day.

```
data_full <- mutate(data_full, weektype = ifelse(weekdays(data_full$date) == "S
aturday" | weekdays(data_full$date) == "Sunday", "weekend", "weekday"))
data_full$weektype <- as.factor(data_full$weektype)
head(data_full)
```

```
##       steps       date interval weektype
## 1 1.7169811 2012-10-01        0  weekday
## 2 0.3396226 2012-10-01        5  weekday
## 3 0.1320755 2012-10-01       10  weekday
## 4 0.1509434 2012-10-01       15  weekday
## 5 0.0754717 2012-10-01       20  weekday
## 6 2.0943396 2012-10-01       25  weekday
```

2.Make 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).

```
interval_full <- data_full %>%
  group_by(interval, weektype) %>%
  summarise(steps = mean(steps))
weekdayend <- ggplot(interval_full, aes(x=interval, y=steps, color = weektyp
e)) +
  geom_line() +
  facet_wrap(~weektype, ncol = 1, nrow=2)
print(weekdayend)
```


weekday
weekend
steps
interval
0
50
100
150
200
0
500
1000
1500
2000
weektype
weekday
weekend