Reproducible Research: Assessment 1

Loading and preprocessing the data

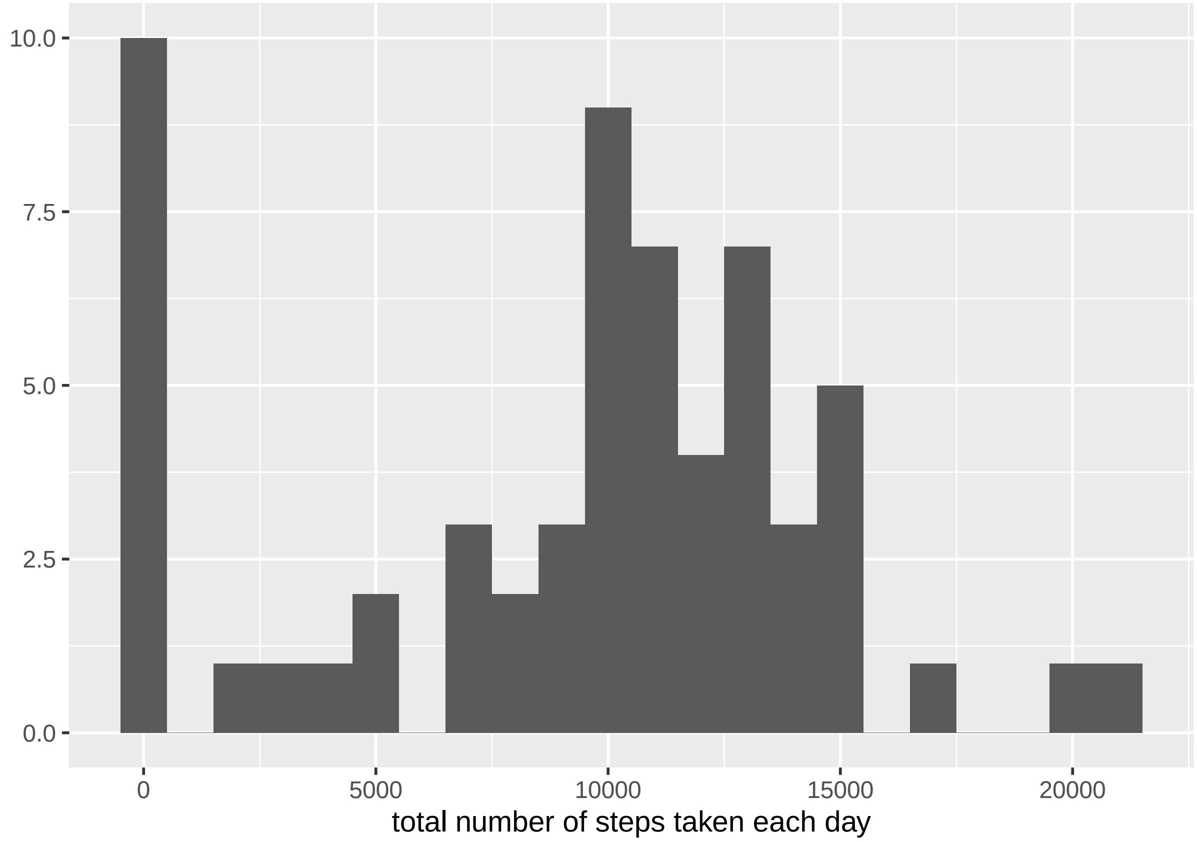
```
unzip(zipfile="activity.zip")
data <- read.csv("activity.csv")
```

What is mean total number of steps taken per day?

```
library(ggplot2)
```

```
## Warning: package 'ggplot2' was built under R version 3.6.3
```

```
total.steps <- tapply(data$steps, data$date, FUN=sum, na.rm=TRUE)
qplot(total.steps, binwidth=1000, xlab="total number of steps taken each day")
```



```
mean(total.steps, na.rm=TRUE)
```

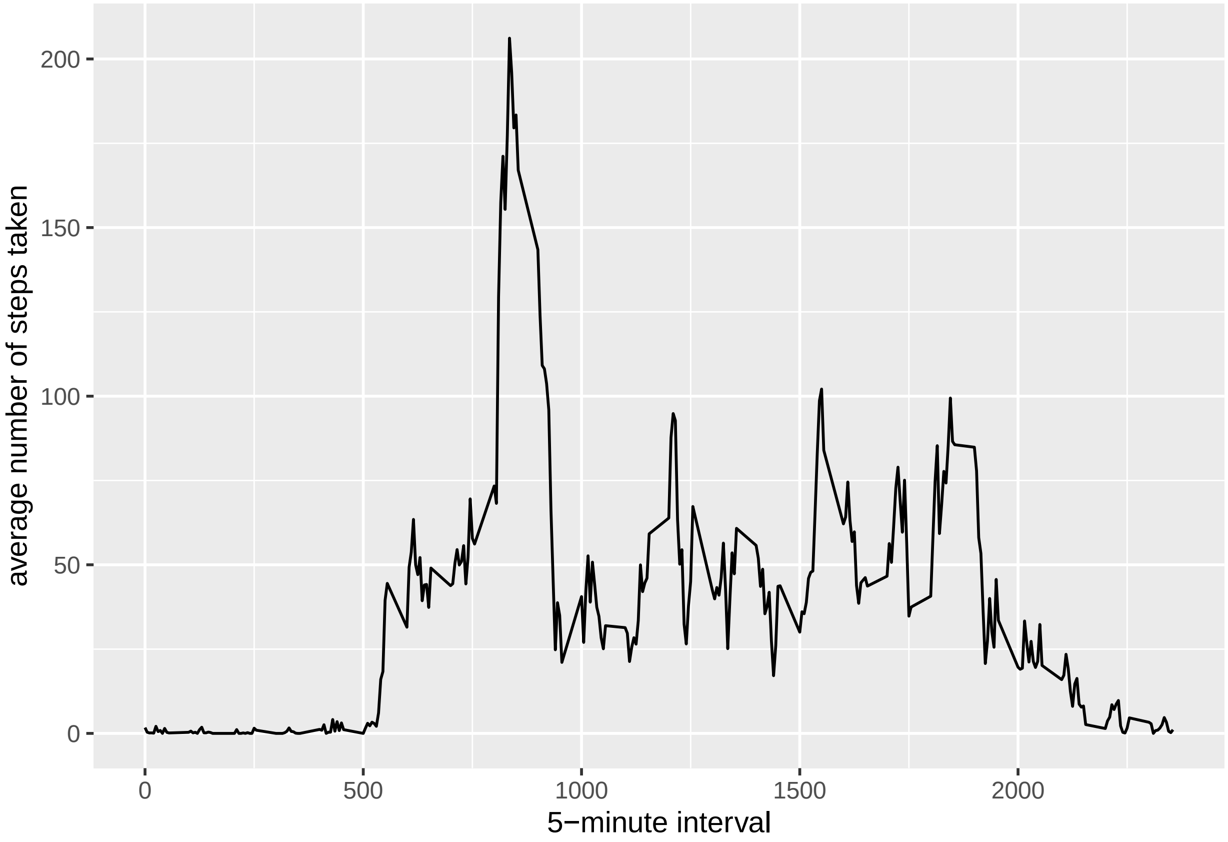
```
## [1] 9354.23
```

```
median(total.steps, na.rm=TRUE)
```

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

What is the average daily activity pattern?

```
library(ggplot2)
averages <- aggregate(x=list(steps=data$steps), by=list(interval=data$interval),
                      FUN=mean, na.rm=TRUE)
ggplot(data=averages, aes(x=interval, y=steps)) +
    geom_line() +
    xlab("5-minute interval") +
    ylab("average number of steps taken")
```



Across all the days in the dataset, the 5-minute interval contains the maximum number of steps by average.

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

```
##     interval    steps
## 104      835 206.1698
```

Inputing missing values

There are several observations where there are missing values. The presence of these null values may distort the calculations to be performed in the data.

```
missing <- is.na(data$steps)
# How many missing
table(missing)
```

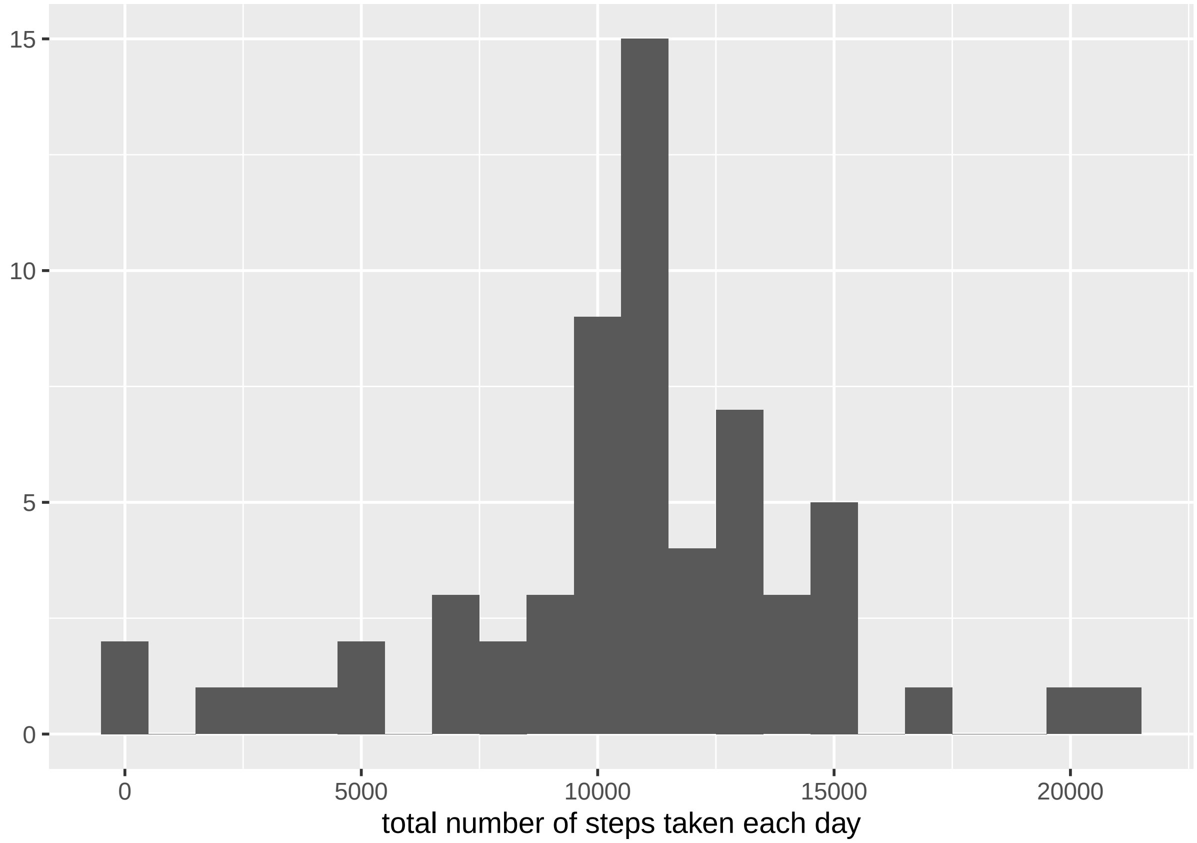
```
## missing
## FALSE  TRUE
## 15264  2304
```

All of the missing values are replaced with the mean value of the 5-minute interval.

```
# Replace each missing value with the mean value of its 5-minute interval
fill.value <- function(steps, interval) {
    filled <- NA
    if (!is.na(steps))
        filled <- c(steps)
    else
        filled <- (averages[averages$interval==interval, "steps"])
    return(filled)
}
filled.data <- data
filled.data$steps <- mapply(fill.value, filled.data$steps, filled.data$interval)
```

Now, using the completed dataset, let's display a histogram of the total number of steps taken each day and calculate the mean and the median of the number of steps.

```
total.steps <- tapply(filled.data$steps, filled.data$date, FUN=sum)
qplot(total.steps, binwidth=1000, xlab="total number of steps taken each day")
```



```
mean(total.steps)
```

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

```
median(total.steps)
```

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

Mean and median values are higher after filling the missing data. The reason is that missing values may affect the mean and median of the observations.

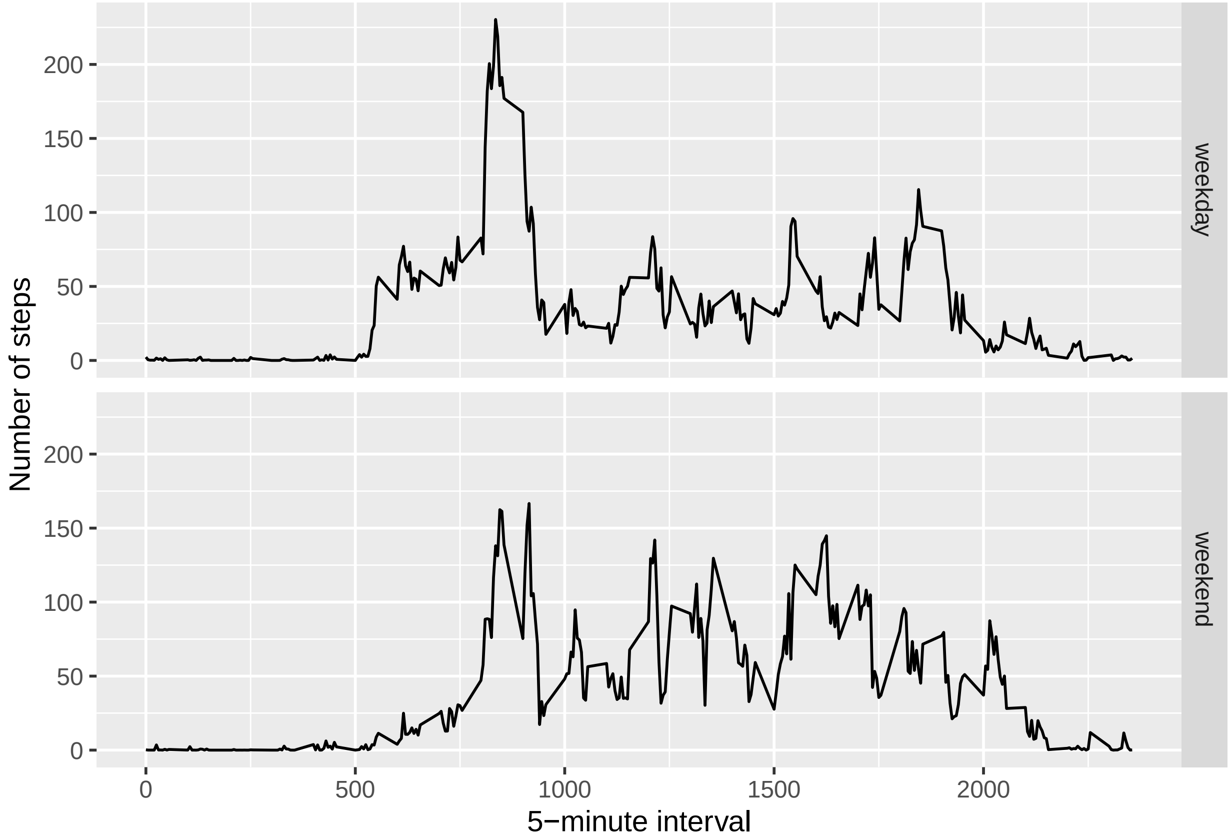
Are there differences in activity patterns between weekdays and weekends?

First, let's find the day of the week for each measurement in the dataset. In this part, we use the dataset with the filled-in values.

```r
weekday.or.weekend <- function(date) {
    day <- weekdays(date)
    if (day %in% c("Monday", "Tuesday", "Wednesday", "Thursday", "Friday"))
        return("weekday")
    else if (day %in% c("Saturday", "Sunday"))
        return("weekend")
    else
        stop("invalid date")
}
filled.data$date <- as.Date(filled.data$date)
filled.data$day <- sapply(filled.data$date, FUN=weekday.or.weekend)
```

This is the panel plot of the average number of steps taken on weekdays and weekends.

```r
averages <- aggregate(steps ~ interval + day, data=filled.data, mean)
ggplot(averages, aes(interval, steps)) + geom_line() + facet_grid(day ~ .) +
    xlab("5-minute interval") + ylab("Number of steps")
```


Number of steps
weekday
weekend
5−minute interval