Peer-graded Assignment: Course Project 1

```
knitr::opts_chunk$set(echo = TRUE, results = 'hold')
```

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Introduction

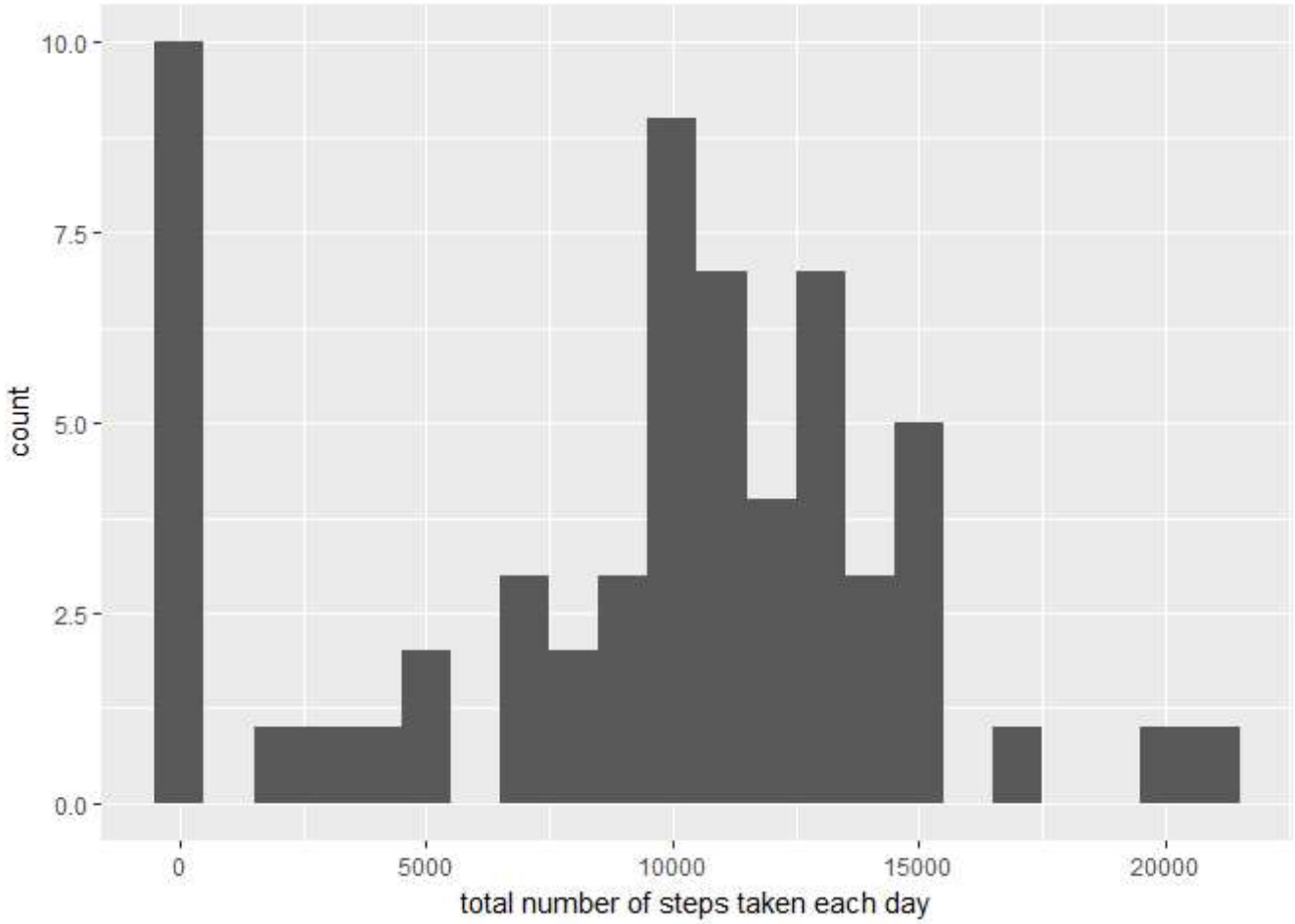
It is now possible to collect a large amount of data about personal movement using activity monitoring devices such as a Fitbit, Nike Fuelband, or Jawbone Up. These type of devices are part of the “quantified self” movement - a group of enthusiasts who take measurements about themselves regularly to improve their health, to find patterns in their behavior, or because they are tech geeks. But these data remain under-utilized both because the raw data are hard to obtain and there is a lack of statistical methods and software for processing and interpreting the data.

Loading and preprocessing the data

```
data <- read.csv("activity.csv")
```

What is mean total number of steps taken per day?

```
library(ggplot2)
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")
```

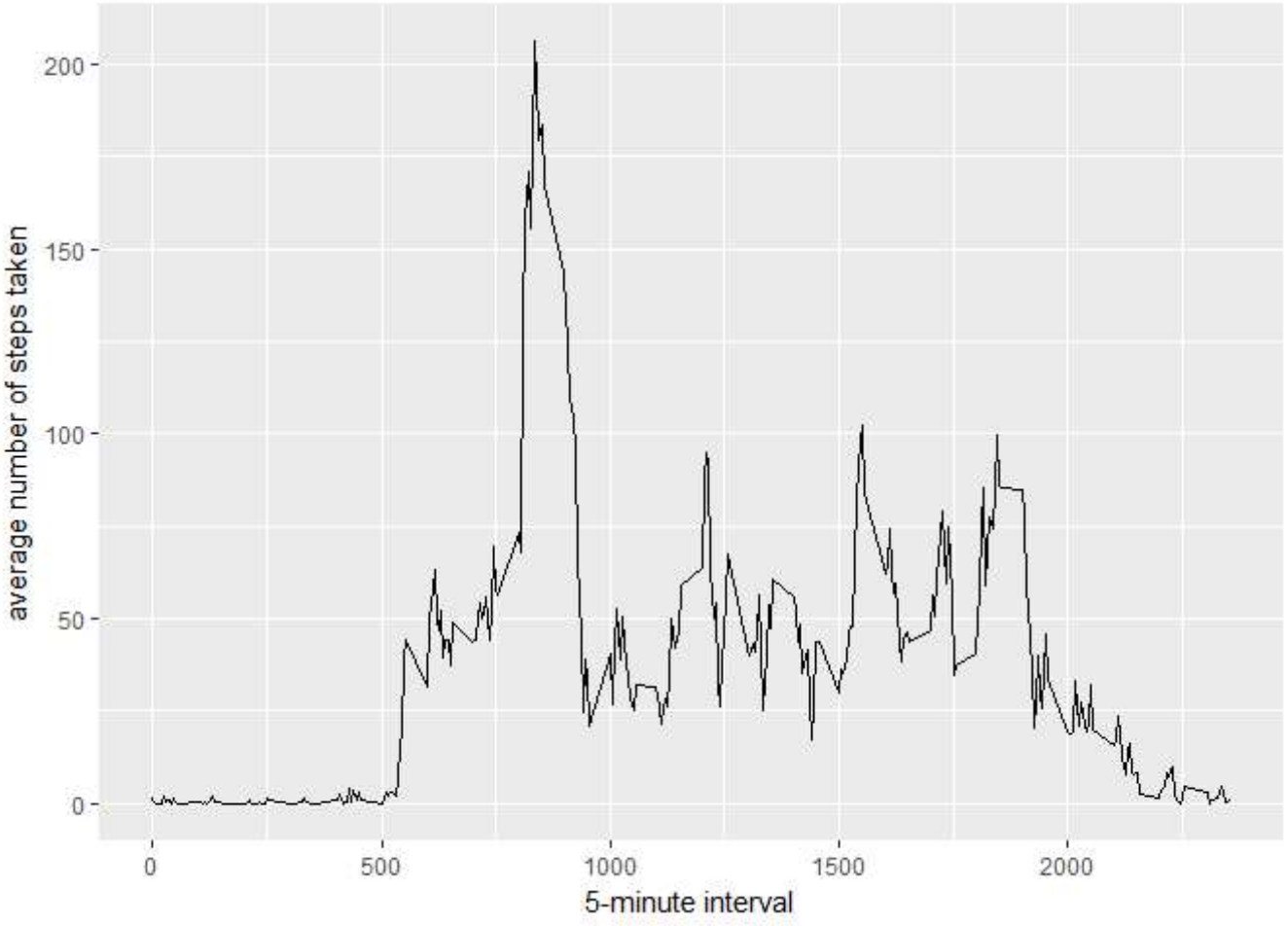



```
mean(total.steps, na.rm=TRUE)
median(total.steps, na.rm=TRUE)
```

```
## [1] 9354.23
## [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")
```



On average across all the days in the dataset, the 5-minute interval contains the maximum number of steps?

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

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

Imputing missing values

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

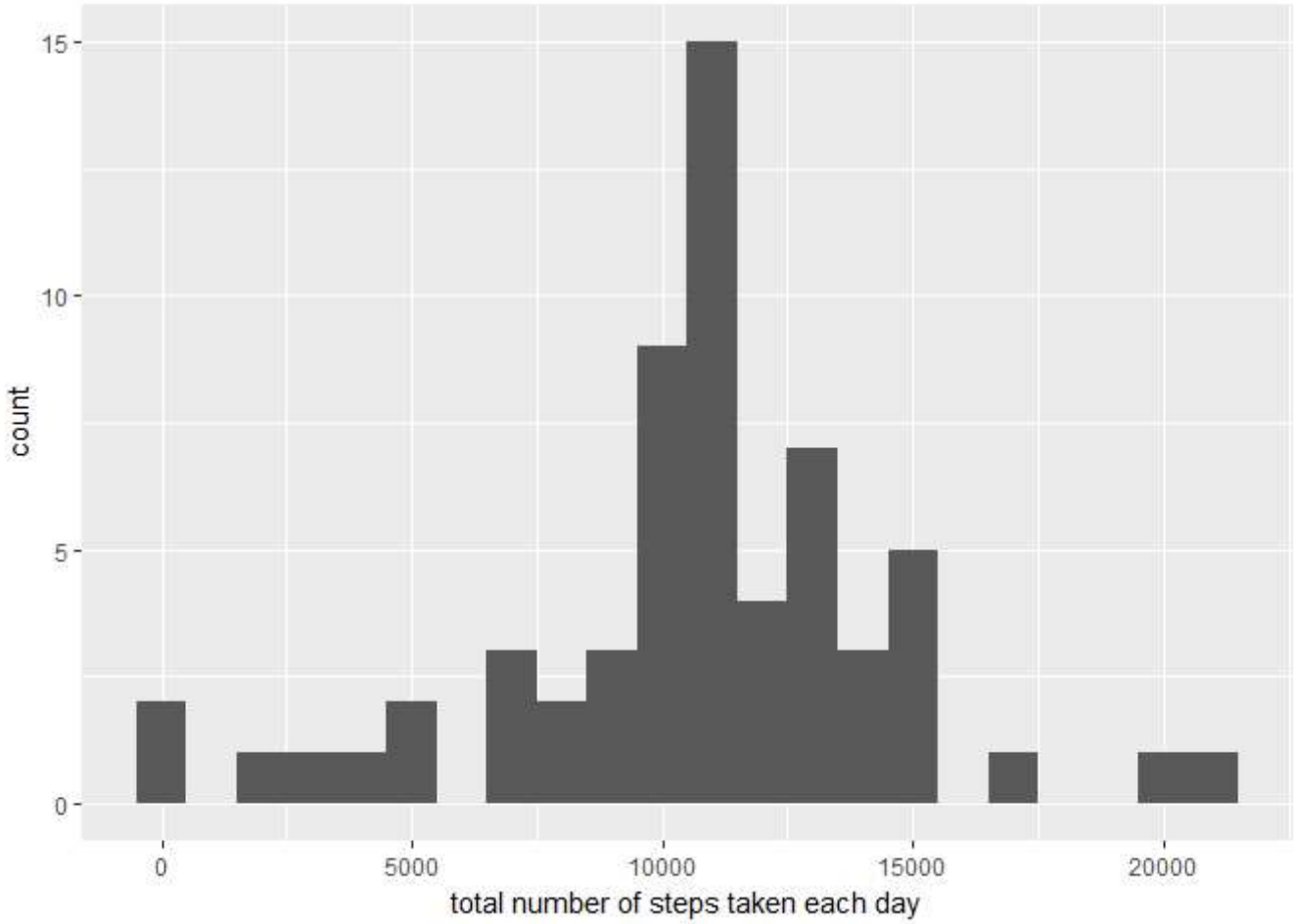
```
## missing
## FALSE  TRUE
## 15264  2304
```

All of the missing values are filled in with mean value for that 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 filled data set, let's make a histogram of the total number of steps taken each day and calculate the mean and median total 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)
median(total.steps)
```

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

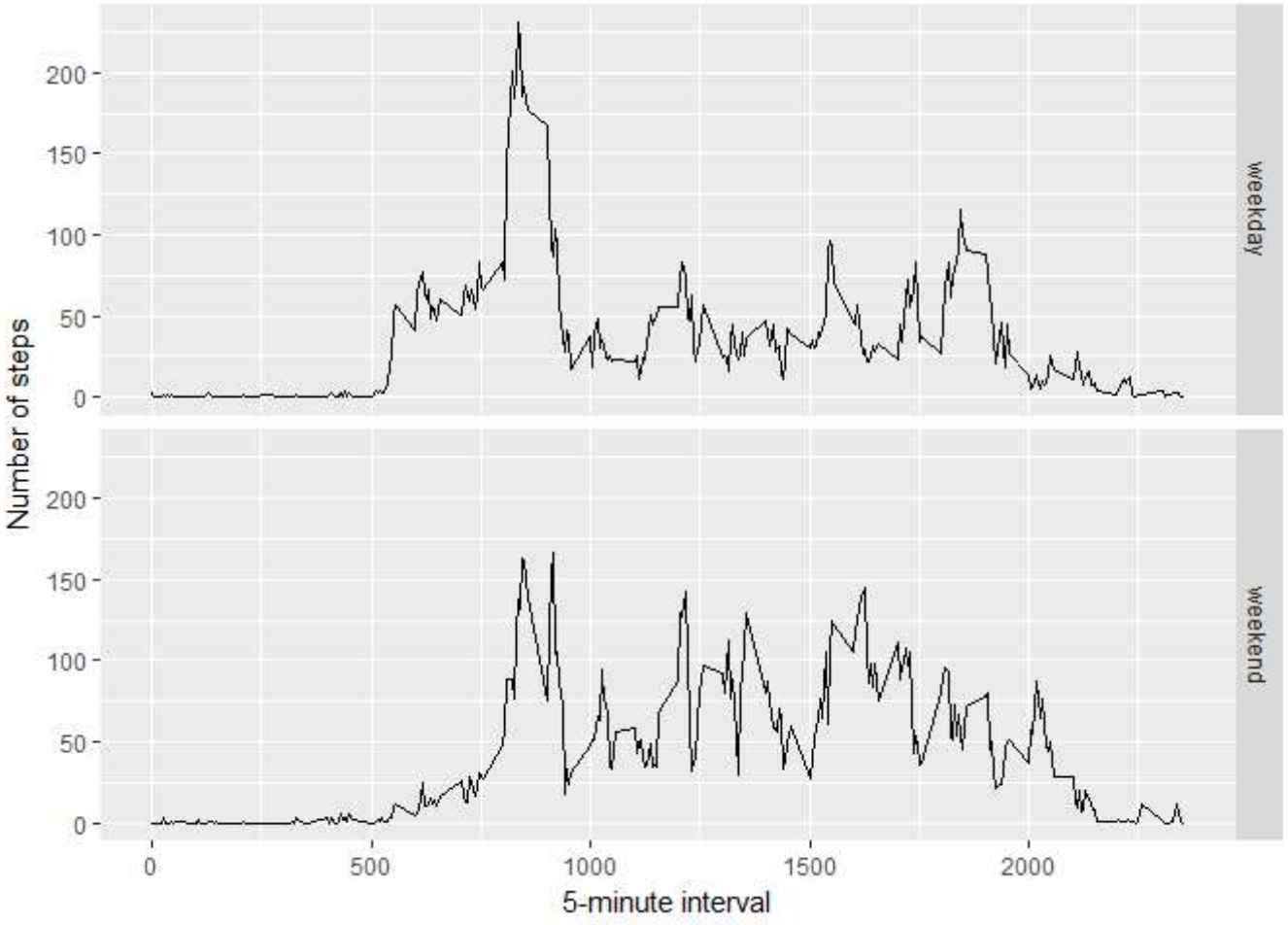
Mean and median values are higher after imputing missing data. The reason is that in the original data, there are some days with steps values NA for any interval. The total number of steps taken in such days are set to 0s by default. However, after replacing missing steps values with the mean steps of associated interval value, these 0 values are removed from the histogram of total number of steps taken each day.

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.

```
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)
```

Now, let's make a panel plot containing plots of average number of steps taken on weekdays and weekends.

```
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
200
150
100
50
0
weekday
weekend
0
500
1000
1500
2000
5-minute interval