HAR

Human Activity Recognition

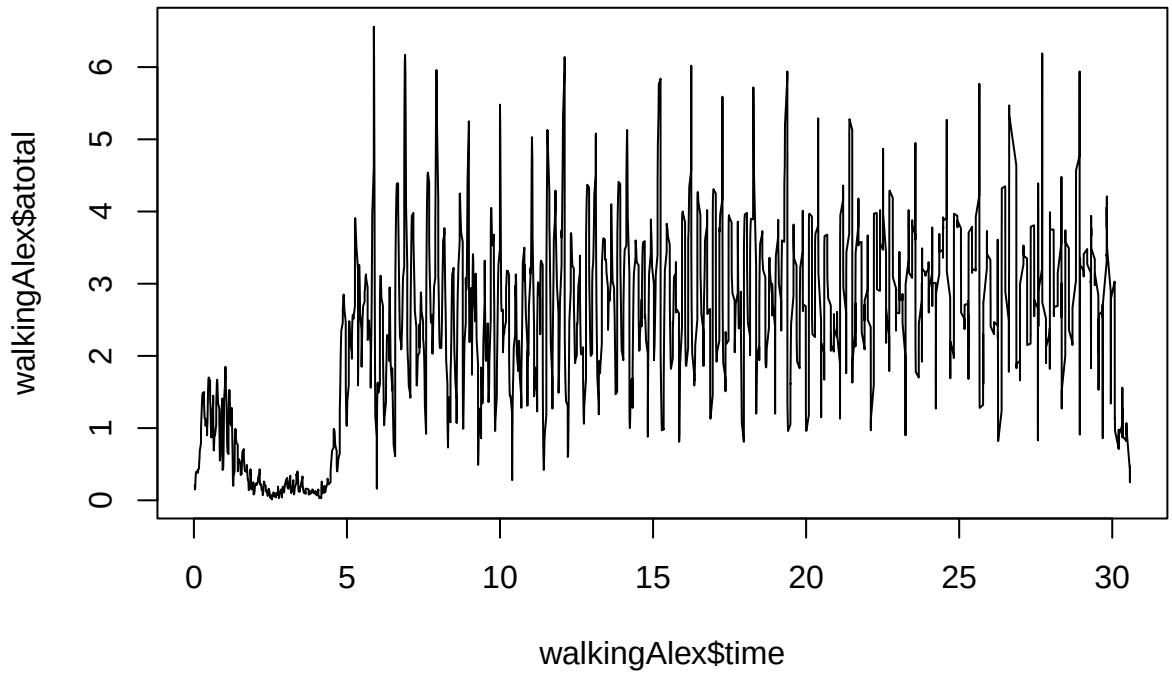
EDA

Load the Data

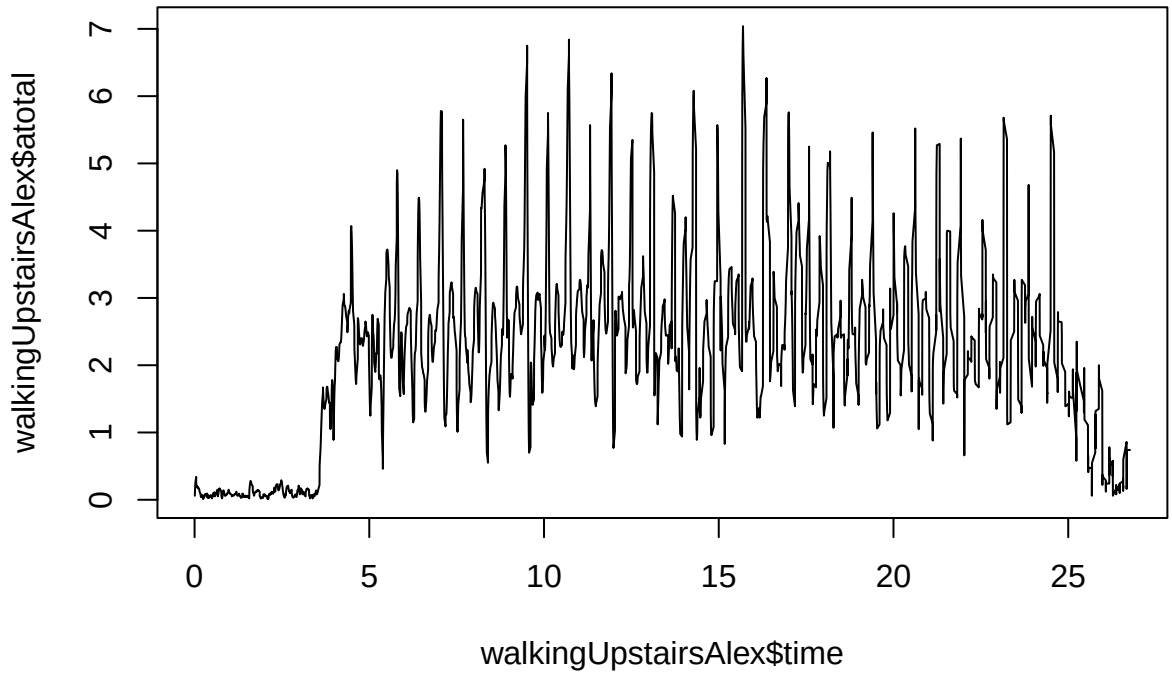
```
walkingAlex <- read.csv("~/Documents/Master - HealthCareIT/1. Semester/Introduction to ML/HAR_Project/n

walkingUpstairsAlex <- read.csv("~/Documents/Master - HealthCareIT/1. Semester/Introduction to ML/HAR_P

squatsAlex <- read.csv("~/Documents/Master - HealthCareIT/1. Semester/Introduction to ML/HAR_Project/sp

jumpingJacksAlex <- read.csv("~/Documents/Master - HealthCareIT/1. Semester/Introduction to ML/HAR_Proj


head(walkingAlex)
```

```
##         time    ax    ay   az atotal
## 1 0.03072309 -0.14 -0.01 0.15   0.20
## 2 0.03119397 -0.14 -0.02 0.16   0.21
## 3 0.03163004 -0.09 -0.16 0.06   0.19
## 4 0.03403282  0.02 -0.14 0.07   0.15
## 5 0.04401684  0.00 -0.08 0.17   0.18
## 6 0.05338097  0.01 -0.11 0.28   0.30
```

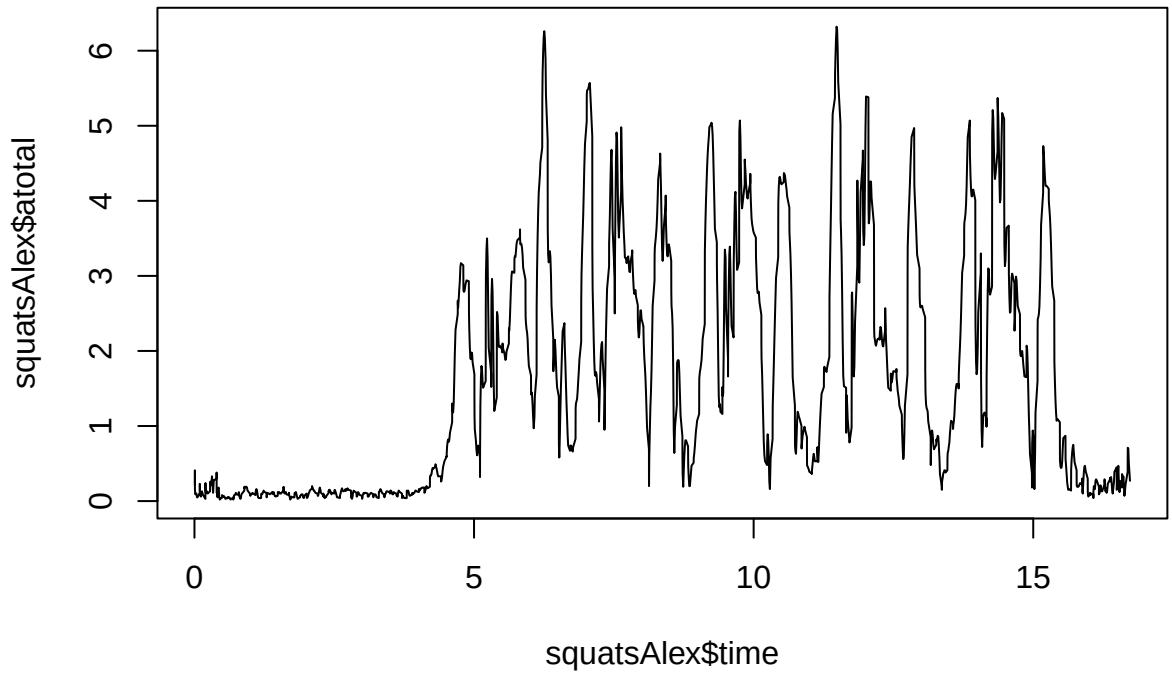
```
plot(walkingAlex$time, walkingAlex$atotal, type = "l")
```



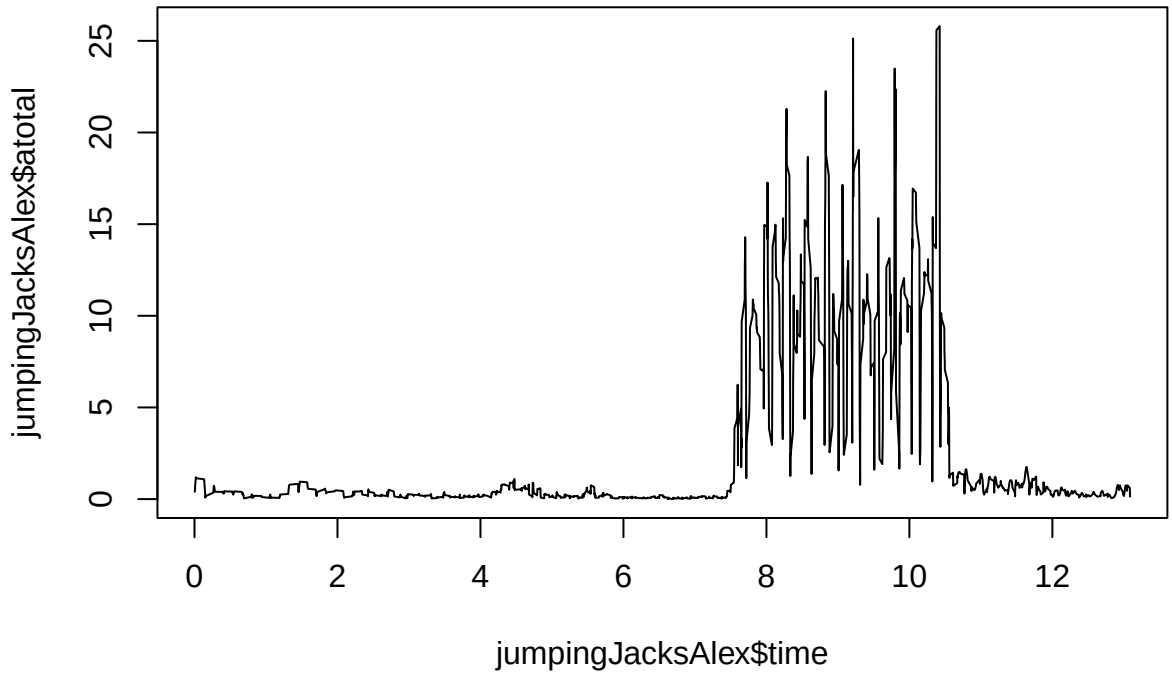

```
plot(walkingUpstairsAlex$time, walkingUpstairsAlex$atotal, type = "l")
```




```
plot(squatsAlex$time, squatsAlex$atotal, type = "l")
```




```
plot(jumpingJacksAlex$time, jumpingJacksAlex$atotal, type = "l")
```




```
library(dplyr)
```

```
##
## Attache Paket: 'dplyr'
## Die folgenden Objekte sind maskiert von 'package:stats':
##
##     filter, lag
## Die folgenden Objekte sind maskiert von 'package:base':
```

```
##
##     intersect, setdiff, setequal, union
```

```
# Change here your working directory
workingDir <- "~/Documents/Master - HealthCareIT/1. Semester/Introduction to ML/"

walkingFilesName <- list.files(paste(workingDir, "HAR_Project/normal activity/walking/allData", sep = "

walkingDataFiles <- lapply(walkingFilesName, read.csv)

walkingUpstairsFilesName <- list.files(paste(workingDir, "HAR_Project/normal activity/walking upstairs/a

walkingUpstairsDataFiles <- lapply(walkingUpstairsFilesName, read.csv)

squatsFilesName <- list.files(paste(workingDir, "HAR_Project/special activity/Squats/allData", sep = ""

squatsDataFiles <- lapply(squatsFilesName, read.csv)

jumpingJackFilesName <- list.files(paste(workingDir, "HAR_Project/special activity/JumpingJacks/allData

jumpingJackDataFiles <- lapply(jumpingJackFilesName, read.csv)

allData <- c(walkingDataFiles, walkingDataFiles, squatsDataFiles, jumpingJackDataFiles)
```

```
calculateSmaAe <- function(eventDfList, windowsize){
  SMAs <- c()
  AEs <- c()

  for (x in eventDfList) {

    # calculating SMA & AE
    for(i in 1:(nrow(x)/windowsize)){
      ax <- 0
      ay <- 0
      az <- 0

      currSmaMax <- 0

      for(ac in (1+((i-1)*windowsize)):(windowsize*i)){
        ax <- ax + abs( x$ax[ac])
        ay <- ay + abs(x$ay[ac])
        az <- az + abs(x$az[ac])
      }
      sma <- (ax+ay+az)/windowsize
      if(sma > currSmaMax){
        currSmaMax <- sma

        # calculating the AE for the max SMA

        ax <- 0
        ay <- 0
        az <- 0

        for(j in (1+((i-1)*windowsize)):(windowsize*i)){
          ax <- ax + abs( x$ax[j])^2
```

```
          ay <- ay + abs(x$ay[j])^2
          az <- az + abs(x$az[j])^2
        }
        ae <- (ax+ay+az)/3
      }
    }

    SMAs <- append(currSmaMax, SMAs)
    AEs <- append(ae, AEs)

  }

  plot(SMAs, AEs)
}
```

EDA

Normal Walking

```
library(ggplot2)

head(walkingDataFiles[[1]])
```

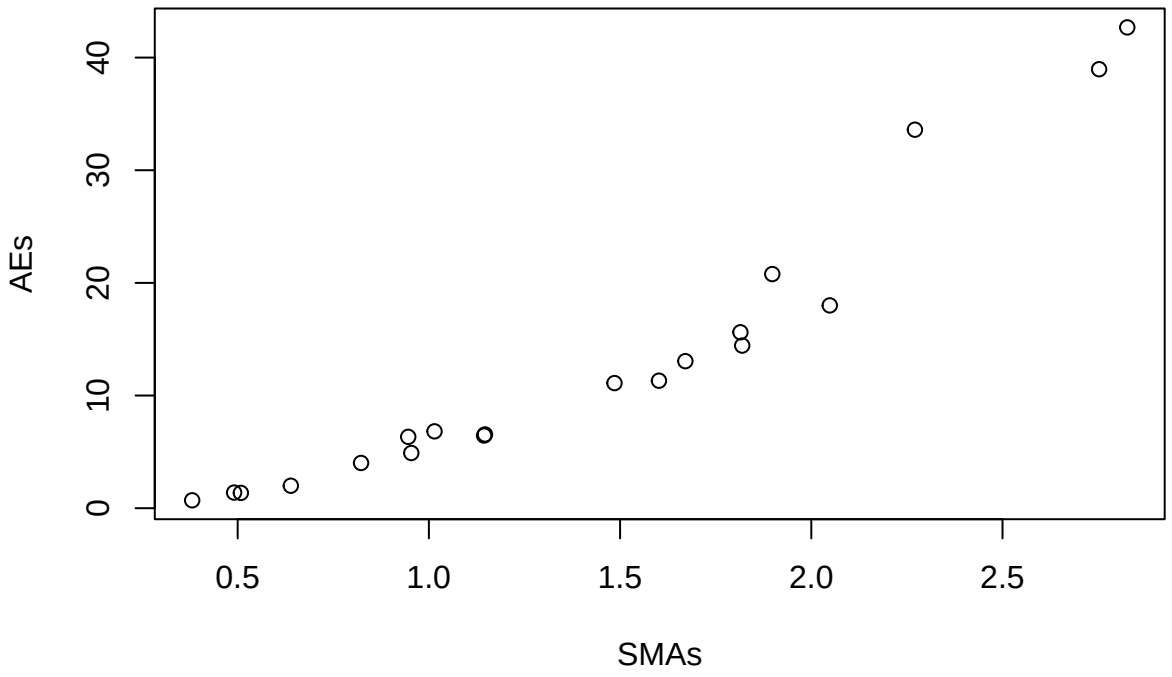
```
##          time    ax    ay    az atotal
## 1 0.005394936 -0.16  0.05 -0.13   0.21
## 2 0.010541916 -0.14 -0.02 -0.14   0.19
## 3 0.041003227 -0.13 -0.09 -0.19   0.24
## 4 0.041666985  0.11 -0.13 -0.20   0.26
## 5 0.042229176  0.20 -0.06 -0.15   0.25
## 6 0.050663948  0.18  0.02 -0.11   0.21
```

```
w <- walkingDataFiles[[1]]

atotalMeans <- c()
atotalMedians <- c()
atotalMins <- c()
atotalMaxs <- c()
SMAs <- c()
AEs <- c()

for (x in walkingDataFiles) {
  print(median(x$atotal))
  atotalMeans <- append(mean(x$atotal), atotalMeans)
  atotalMedians <- append(median(x$atotal), atotalMedians)
  atotalMins <- append(min(x$atotal), atotalMins)
  atotalMaxs <- append(max(x$atotal), atotalMaxs)

}
```

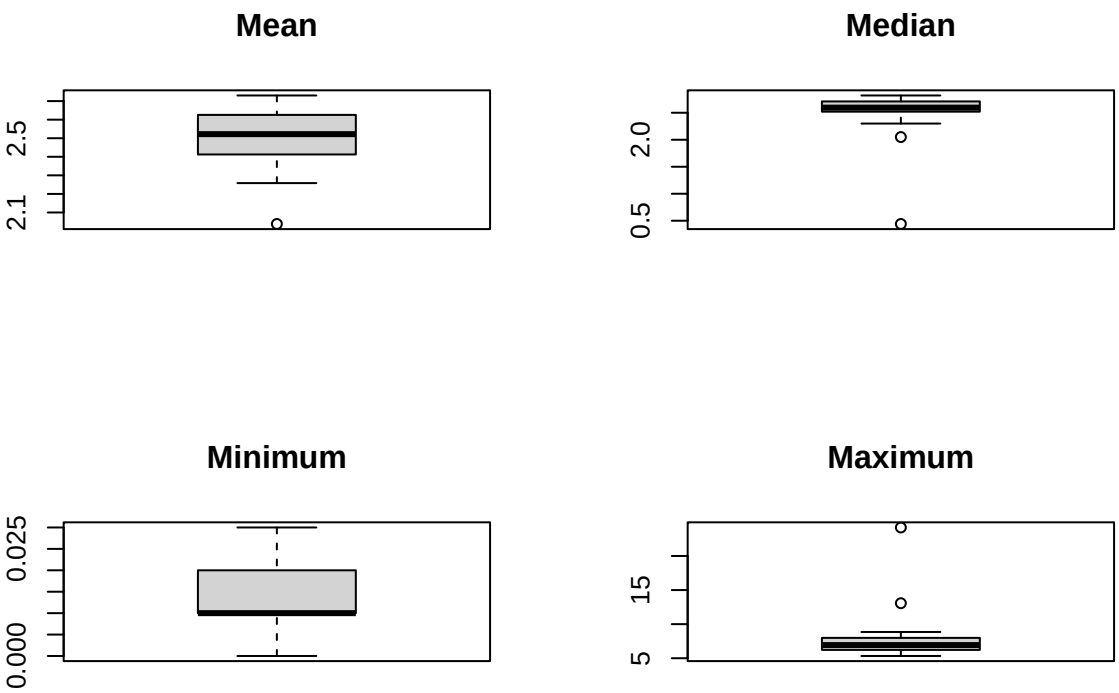
```
## [1] 2.6
## [1] 2.82
## [1] 2.75
## [1] 2.77
## [1] 2.79
```

```
## [1] 2.3
## [1] 2.56
## [1] 2.51
## [1] 2.56
## [1] 2.455
## [1] 2.67
## [1] 2.61
## [1] 2.575
## [1] 2.59
## [1] 2.65
## [1] 2.66
## [1] 2.8
## [1] 2.53
## [1] 2.05
## [1] 0.44
```

```
calculateSmaAe(walkingDataFiles, 30)
```




```
par(mfrow=c(2,2))
boxplot(atotalMeans, main="Mean")
boxplot(atotalMedians, main="Median")
boxplot(atotalMins, main="Minimum")
boxplot(atotalMaxs, main="Maximum")
```



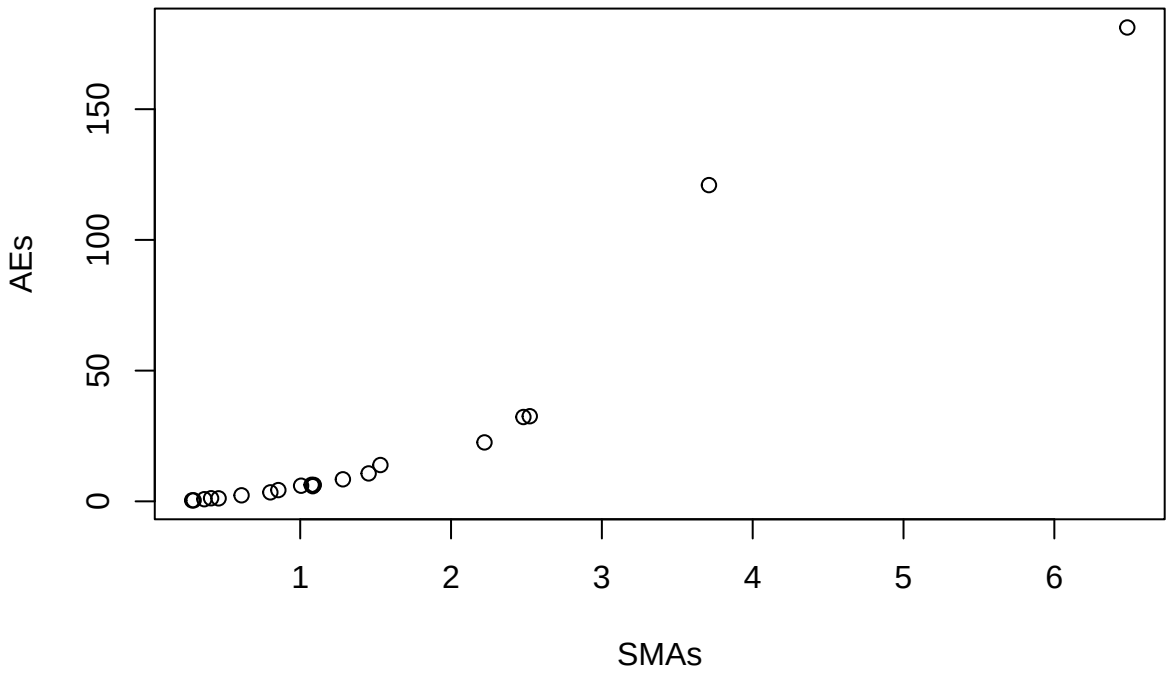
Walking upstairs

```
atotalMeans <- c()
atotalMedians <- c()
atotalMins <- c()
atotalMaxs <- c()

for (x in walkingUpstairsDataFiles) {
  print(median(x$atotal))
  atotalMeans <- append(mean(x$atotal), atotalMeans)
  atotalMedians <- append(median(x$atotal), atotalMedians)
  atotalMins <- append(min(x$atotal), atotalMins)
  atotalMaxs <- append(max(x$atotal), atotalMaxs)


  #lines(x$time, x$atotal, type = "l")
}
```

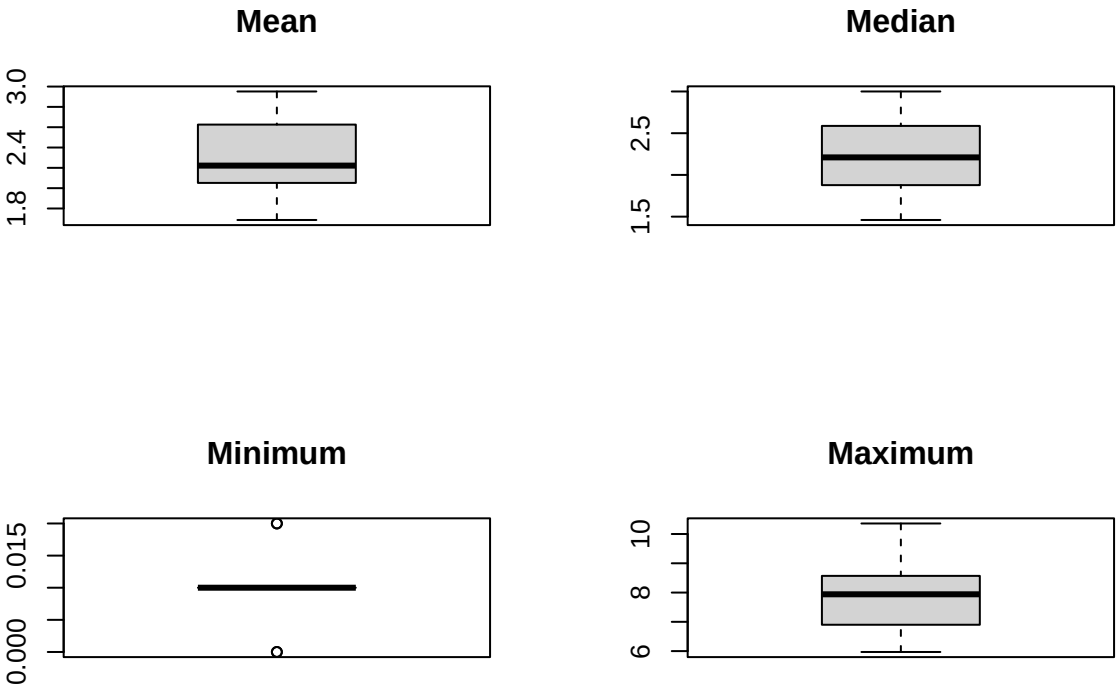
```
## [1] 1.46
## [1] 1.71
## [1] 1.84
## [1] 1.81
## [1] 2.18
## [1] 1.76
## [1] 1.915
## [1] 2.19
## [1] 2.07
## [1] 2
## [1] 2.27
## [1] 2.34
## [1] 2.37
## [1] 2.23
```

```
## [1] 2.74
## [1] 3
## [1] 2.78
## [1] 2.68
## [1] 2.495
## [1] 2.705
```

```
calculateSmaAe(walkingUpstairsDataFiles, 30)
```




```
par(mfrow=c(2,2))
boxplot(atotalMeans, main="Mean")
boxplot(atotalMedians, main="Median")
boxplot(atotalMins, main="Minimum")
boxplot(atotalMaxs, main="Maximum")
```



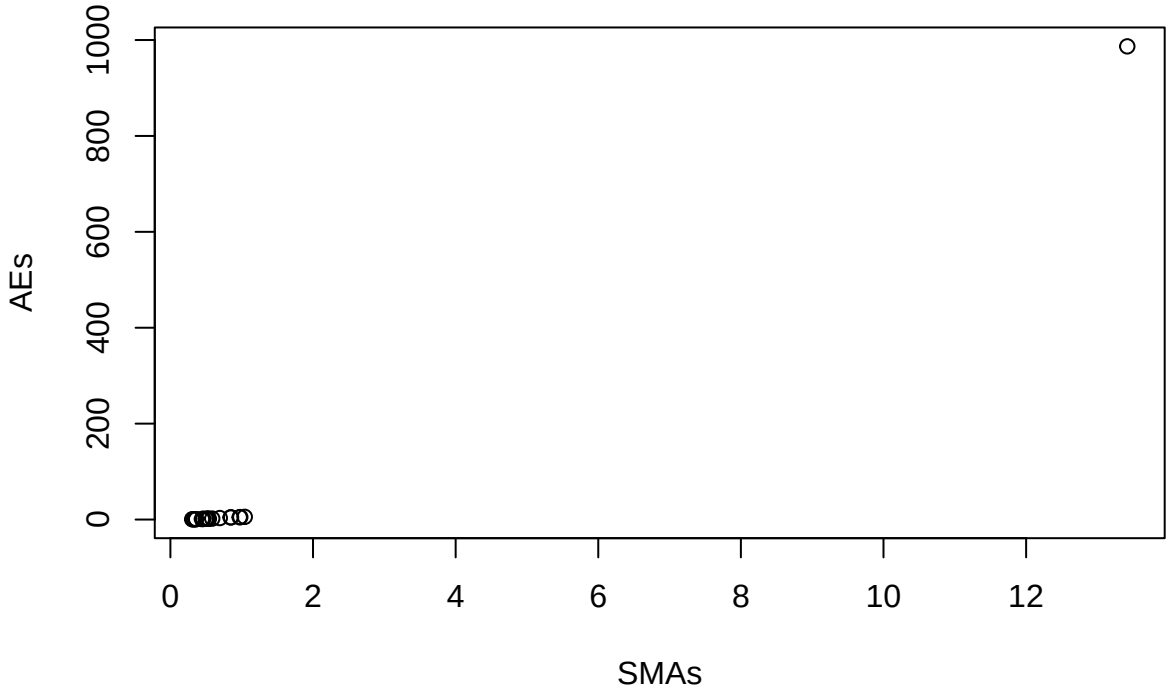
Jumping Jacks

```
atotalMeans <- c()
atotalMedians <- c()
atotalMins <- c()
atotalMaxs <- c()
SMAs <- c()

for (x in jumpingJackDataFiles) {
  print(median(x$atotal))
  atotalMeans <- append(mean(x$atotal), atotalMeans)
  atotalMedians <- append(median(x$atotal), atotalMedians)
  atotalMins <- append(min(x$atotal), atotalMins)
  atotalMaxs <- append(max(x$atotal), atotalMaxs)

  ax <- 0
  ay <- 0
  az <- 0
  for(ac in 1:nrow(x)){
    ax <- ax + abs( x$ax[ac])
    ay <- ay + abs(x$ay[ac])
    az <- az + abs(x$az[ac])
  }

  sma <- (ax+ay+az)/nrow(x)
  SMAs <- append(sma, SMAs)

  #lines(x$time, x$atotal, type = "l")
}
```

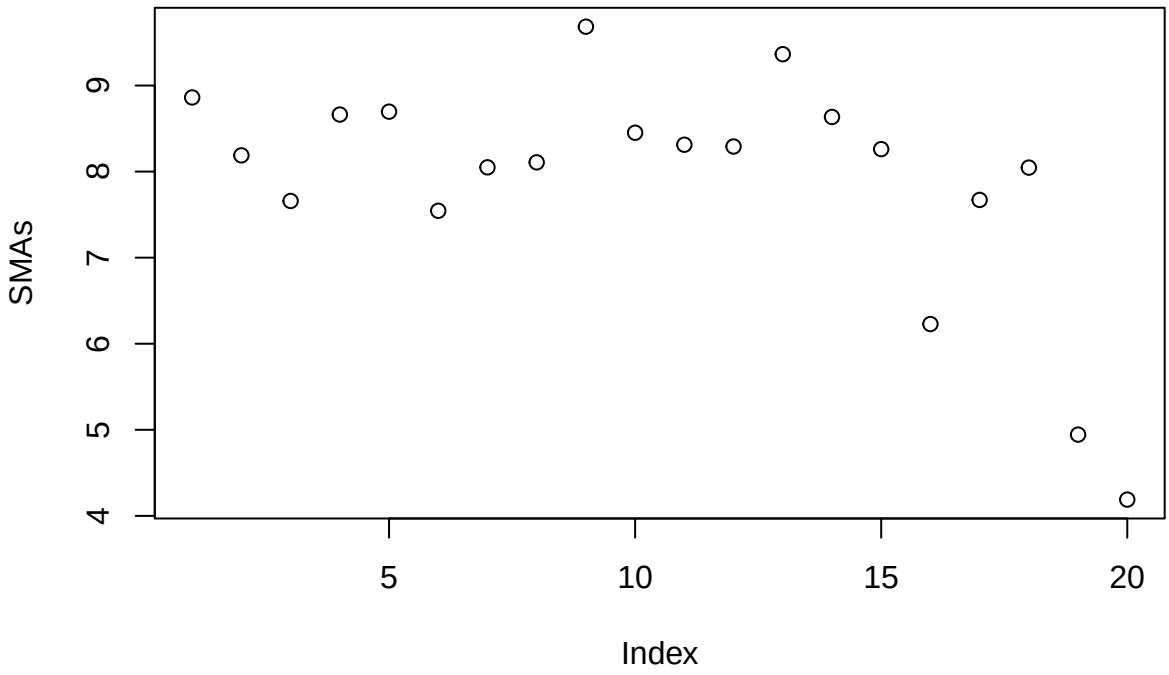
```
## [1] 0.31
## [1] 0.4
```

```
## [1] 3.01
## [1] 2.83
## [1] 0.39
## [1] 2.47
## [1] 3
## [1] 3.95
## [1] 3.06
## [1] 2.405
## [1] 1.16
## [1] 3.865
## [1] 0.93
## [1] 0.73
## [1] 0.615
## [1] 0.82
## [1] 0.36
## [1] 0.51
## [1] 0.37
## [1] 0.55
```

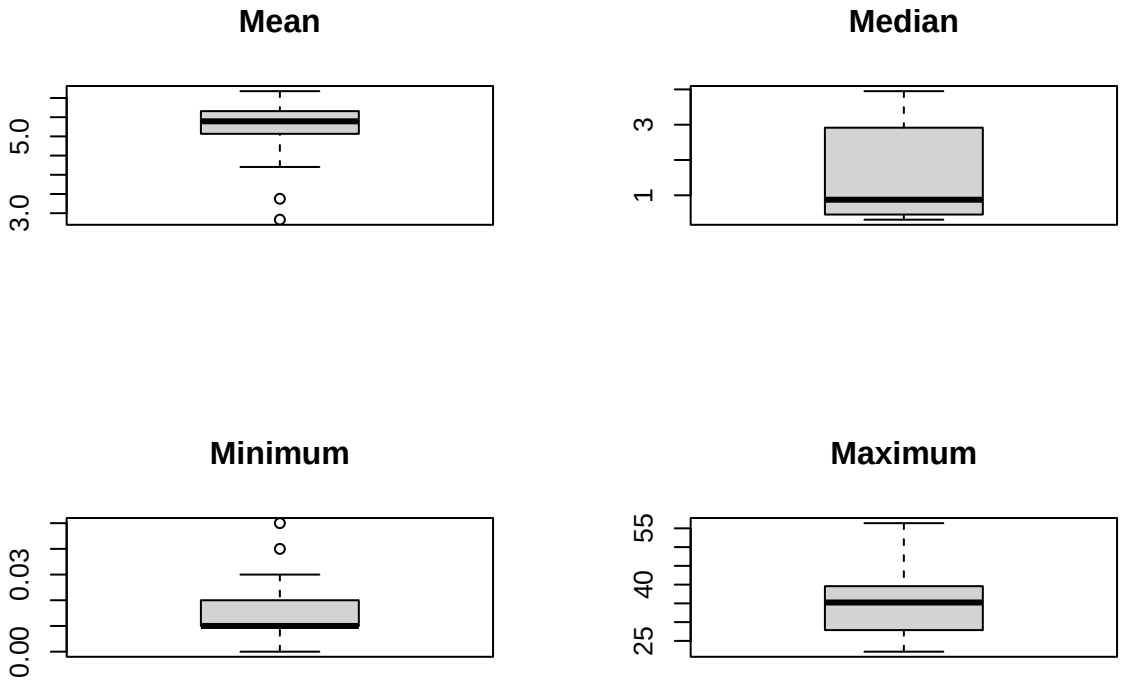
```
calculateSmaAe(jumpingJackDataFiles, 30)
```




```
plot(SMAs)
```




```
par(mfrow=c(2,2))
boxplot(atotalMeans, main="Mean")
boxplot(atotalMedians, main="Median")
boxplot(atotalMins, main="Minimum")
boxplot(atotalMaxs, main="Maximum")
```



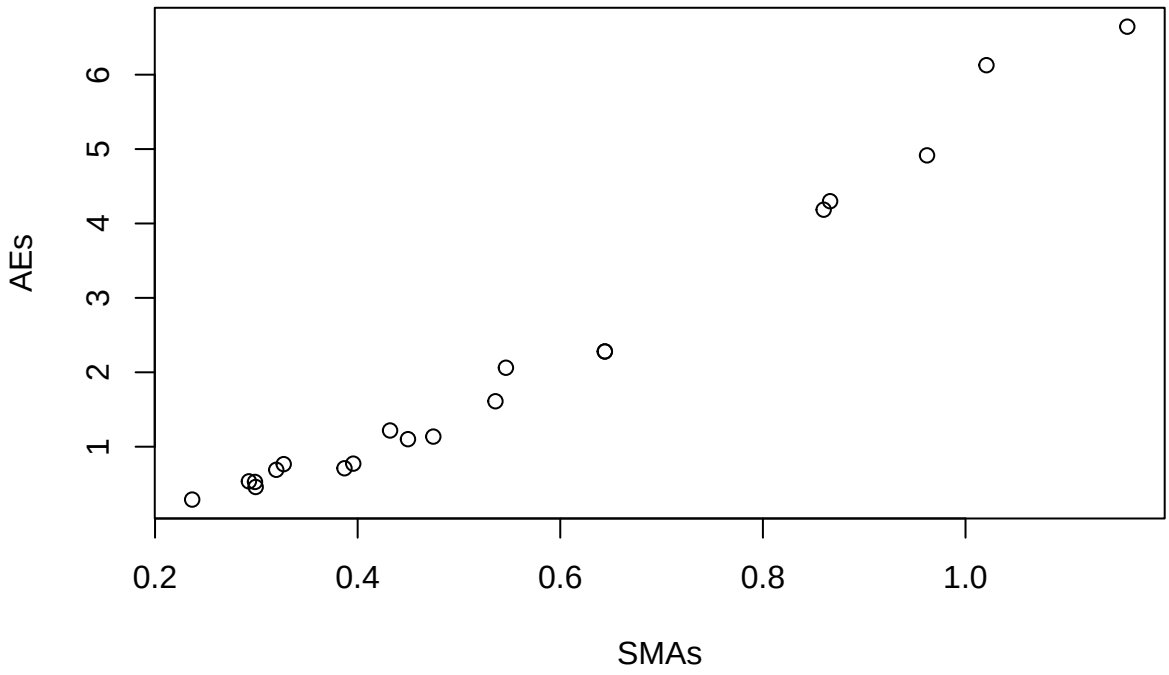
Squats

```
atotalMeans <- c()
atotalMedians <- c()
```

```r
atotalMins <- c()
atotalMaxs <- c()

for (x in squatsDataFiles) {
  print(median(x$atotal))
  atotalMeans <- append(mean(x$atotal), atotalMeans)
  atotalMedians <- append(median(x$atotal), atotalMedians)
  atotalMins <- append(min(x$atotal), atotalMins)
  atotalMaxs <- append(max(x$atotal), atotalMaxs)


  #lines(x$time, x$atotal, type = "l")
}
```

```
## [1] 1.18
## [1] 0.97
## [1] 1.11
## [1] 1.14
## [1] 1.14
## [1] 0.55
## [1] 0.44
## [1] 0.59
## [1] 0.78
## [1] 0.59
## [1] 1.265
## [1] 1.1
## [1] 0.805
## [1] 0.845
## [1] 1.445
## [1] 0.79
## [1] 0.96
## [1] 0.8
## [1] 0.88
## [1] 1.13
```

```r
calculateSmaAe(squatsDataFiles, 30)
```




```
par(mfrow=c(2,2))
boxplot(atotalMeans, main="Mean")
boxplot(atotalMedians, main="Median")
boxplot(atotalMins, main="Minimum")
boxplot(atotalMaxs, main="Maximum")
```