assignment 8

```r
library(dplyr)
```

```
## Warning: package 'dplyr' was built under R version 3.5.2
##
## Attaching package: 'dplyr'
## The following objects are masked from 'package:stats':
##
##     filter, lag
## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union
```

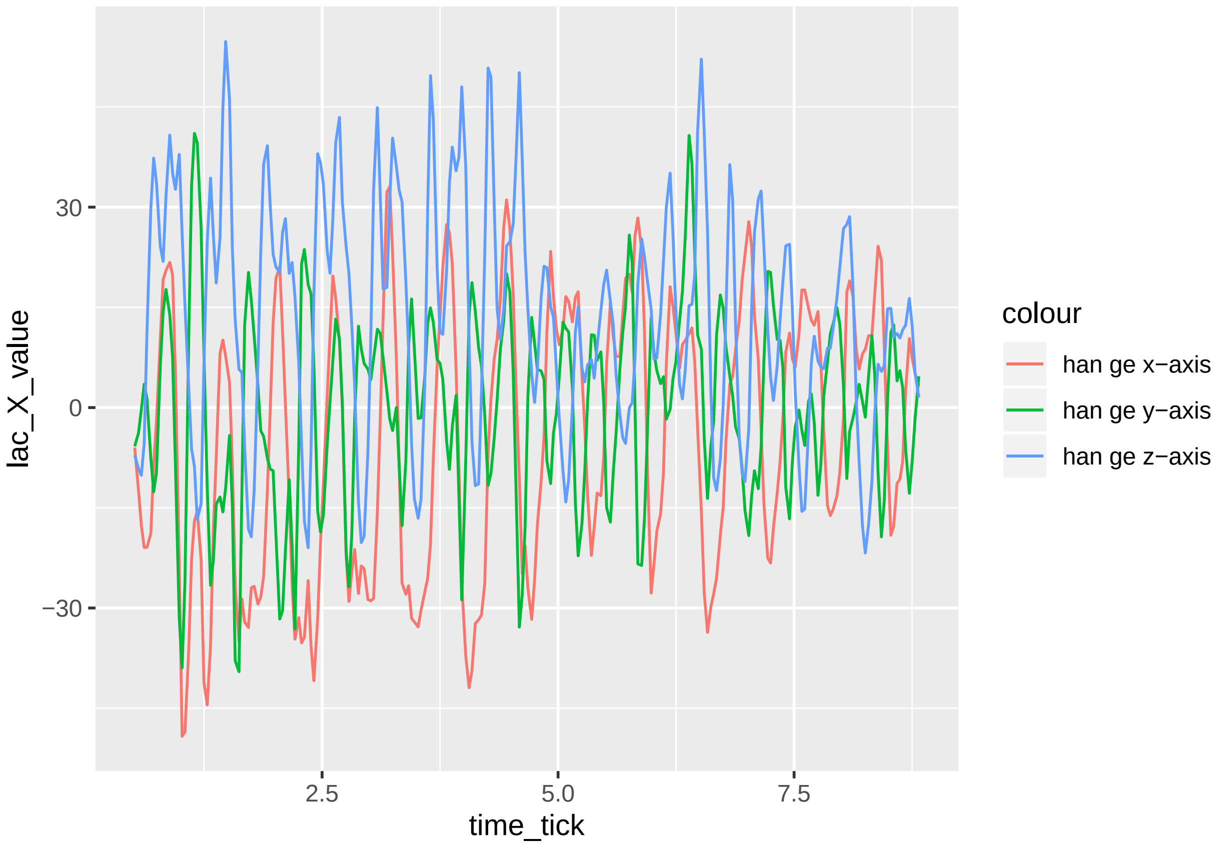
```r
library(tidyverse)
```

```
## -- Attaching packages --------------------------------------- tidyverse 1.2.1 --
## <U+221A> ggplot2 3.2.1     <U+221A> readr   1.3.1
## <U+221A> tibble  2.1.3     <U+221A> purrr   0.2.5
## <U+221A> tidyr   1.0.0     <U+221A> stringr 1.3.1
## <U+221A> ggplot2 3.2.1     <U+221A> forcats 0.3.0
## Warning: package 'ggplot2' was built under R version 3.5.2
## Warning: package 'tibble' was built under R version 3.5.2
## Warning: package 'tidyr' was built under R version 3.5.2
## -- Conflicts ------------------------------------------ tidyverse_conflicts() --
## x dplyr::filter() masks stats::filter()
## x dplyr::lag()    masks stats::lag()
```

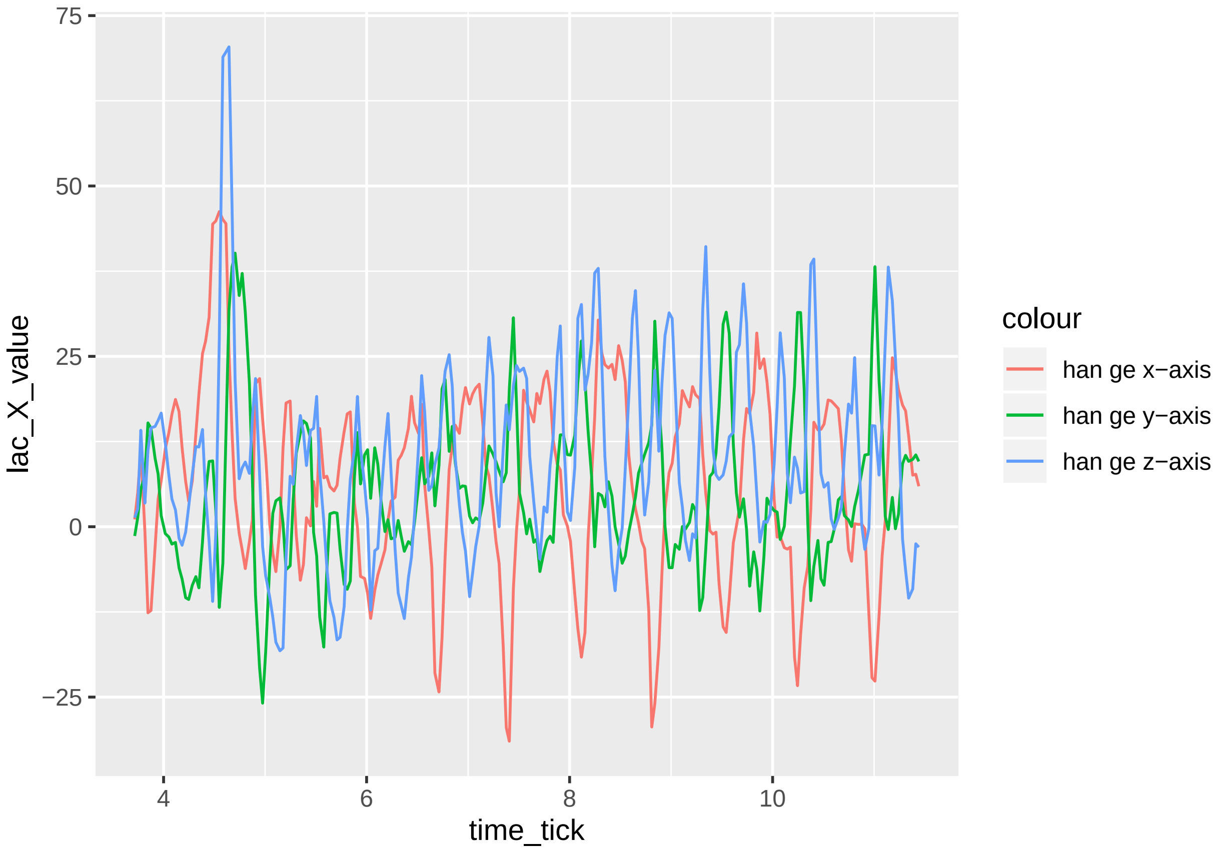
```r
library(tidyr)
library(GGally)
```

```
##
## Attaching package: 'GGally'
## The following object is masked from 'package:dplyr':
##
##     nasa
```

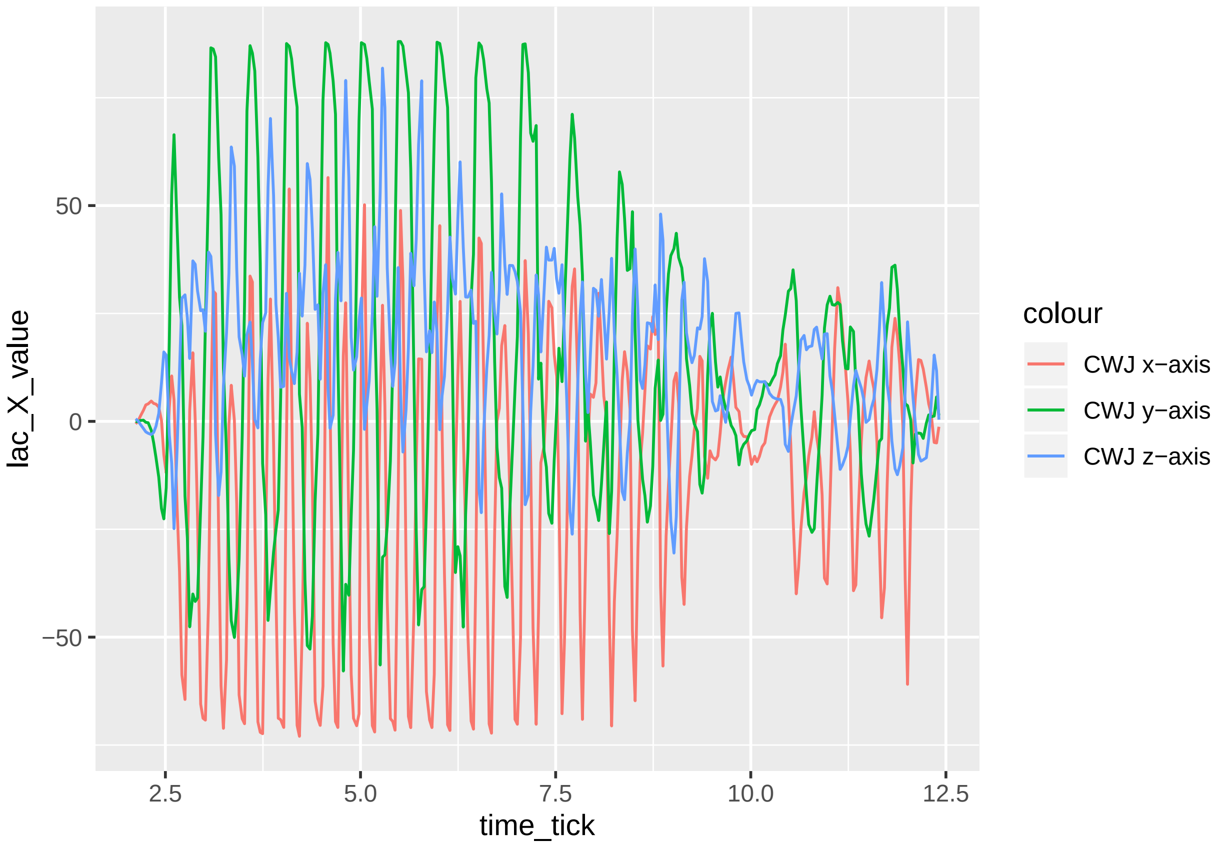
```r
library(ggplot2)
library(dplyr)
#The measured X and Y linear accelerations determine the position of the ball along the X and Y axes. T
GH1 <- read.csv("~/Desktop/master fall/assignment8/gh 1- before.csv")
GH2 <- read.csv("~/Desktop/master fall/assignment8/gh2-after.csv")
ggplot(GH1, aes(x=time_tick)) + geom_line(aes(y=lac_X_value,color ="han ge x-axis"))+geom_line(aes(y=la
```



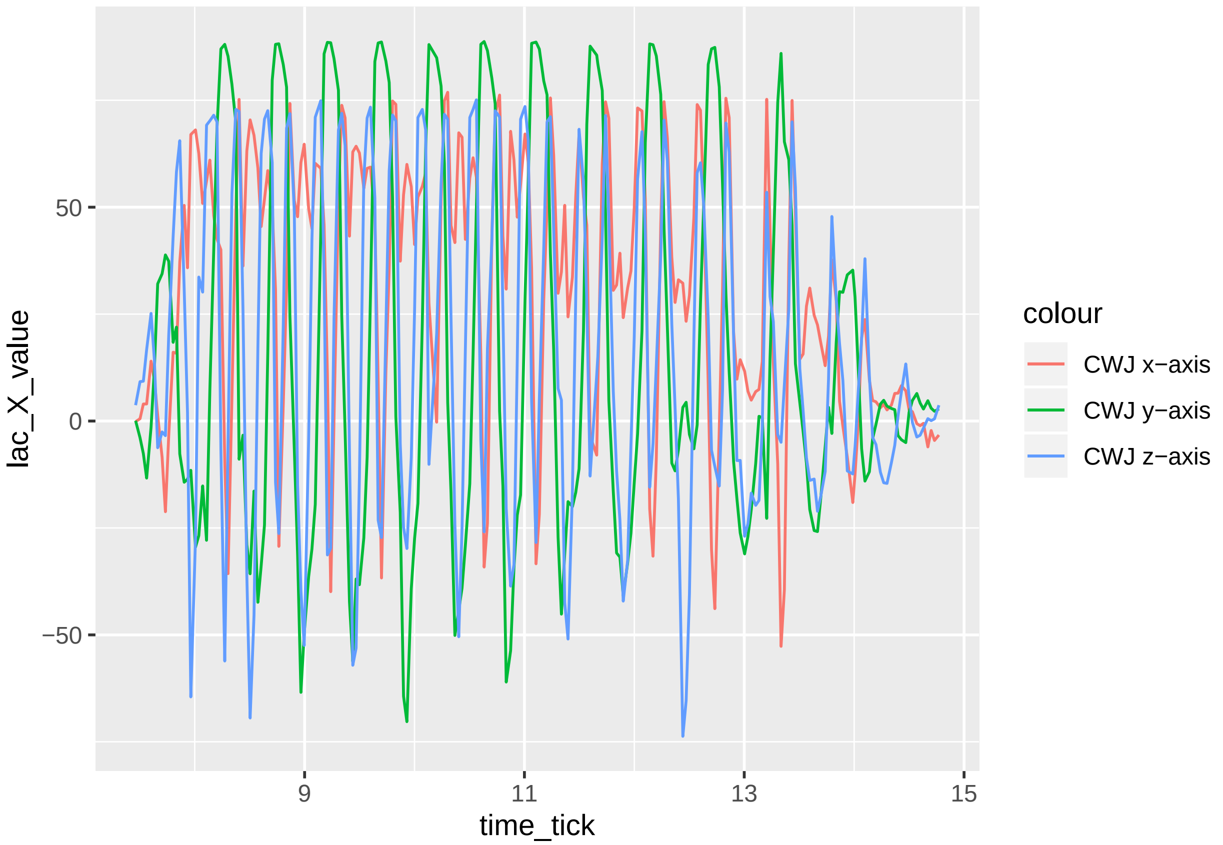

```
ggplot(GH2, aes(x=time_tick)) + geom_line(aes(y=lac_X_value,color ="han ge x-axis"))+geom_line(aes(y=la
```



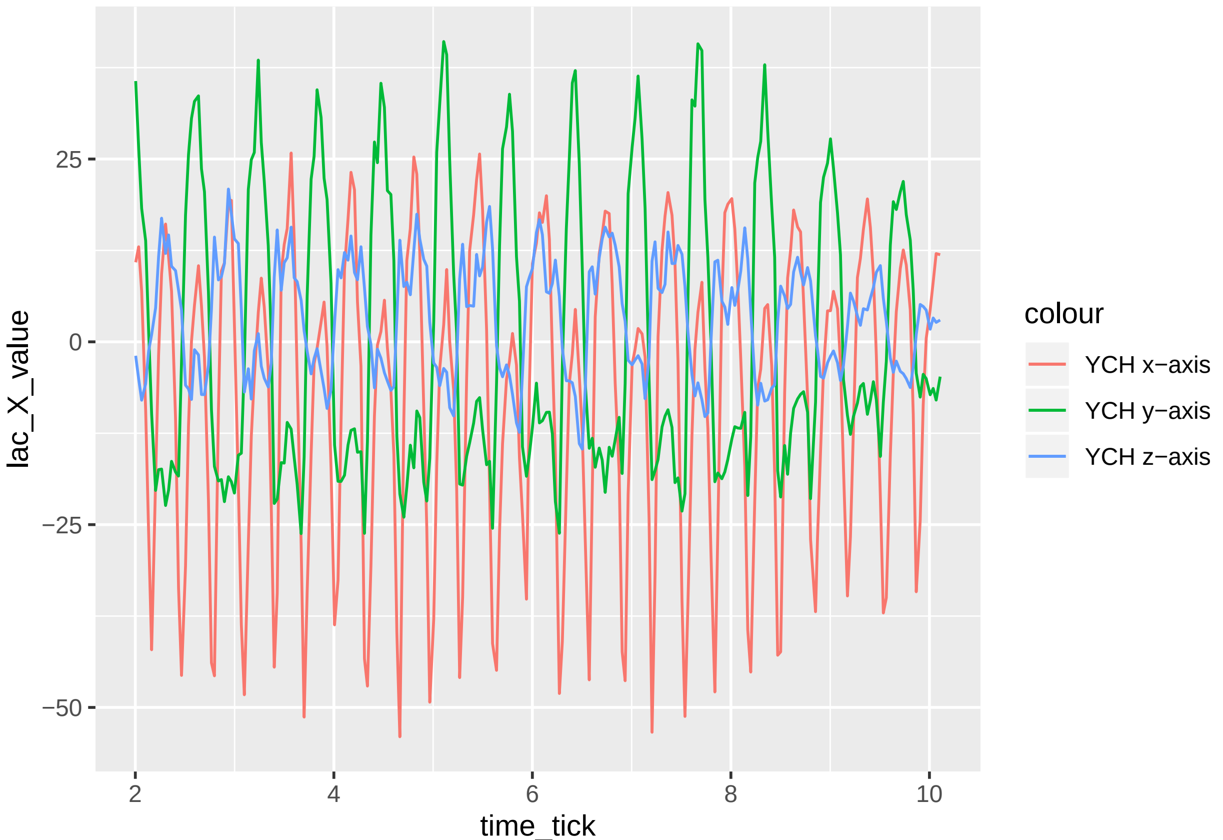

```
CWJ1 <- read.csv("~/Desktop/master fall/assignment8/cwj1.csv")
CWJ2 <- read.csv("~/Desktop/master fall/assignment8/cwj2.csv")
ggplot(CWJ1, aes(x=time_tick)) + geom_line(aes(y=lac_X_value,color ="CWJ x-axis"))+geom_line(aes(y=lac_Y
```



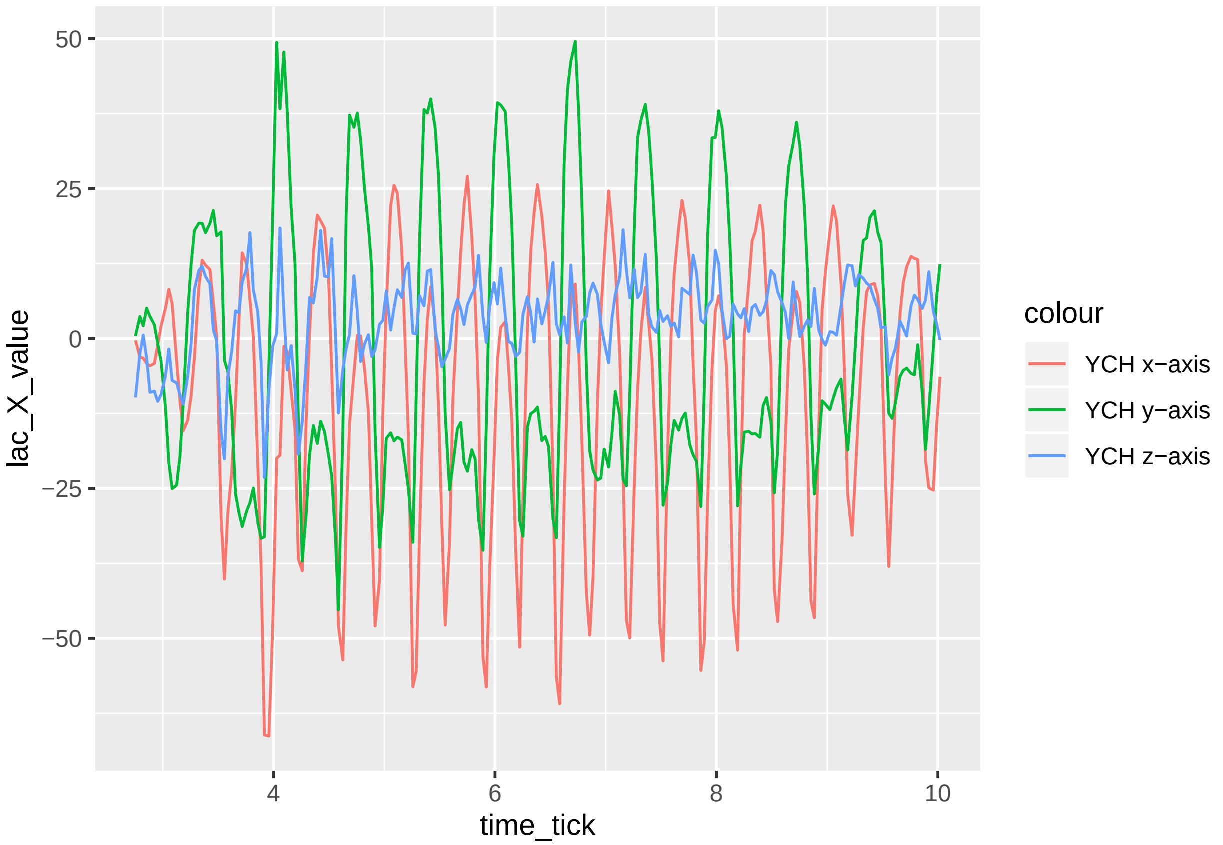

```
ggplot(CWJ2, aes(x=time_tick)) + geom_line(aes(y=lac_X_value,color ="CWJ x-axis"))+geom_line(aes(y=lac_Y
```



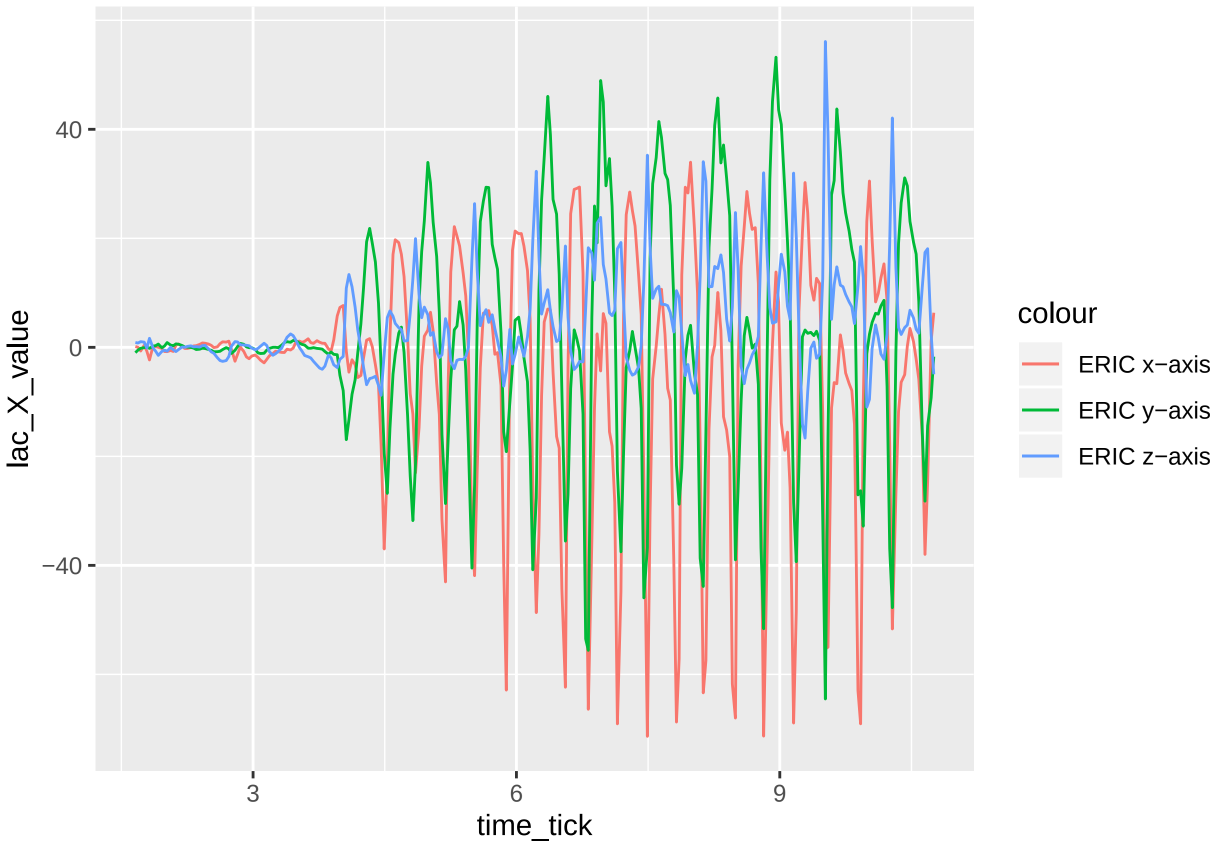

```
YCH1 <- read.csv("~/Desktop/master fall/assignment8/ych - before.csv")
YCH2 <- read.csv("~/Desktop/master fall/assignment8/ych - after.csv")
ggplot(YCH1, aes(x=time_tick)) + geom_line(aes(y=lac_X_value,color ="YCH x-axis"))+geom_line(aes(y=lac_
```



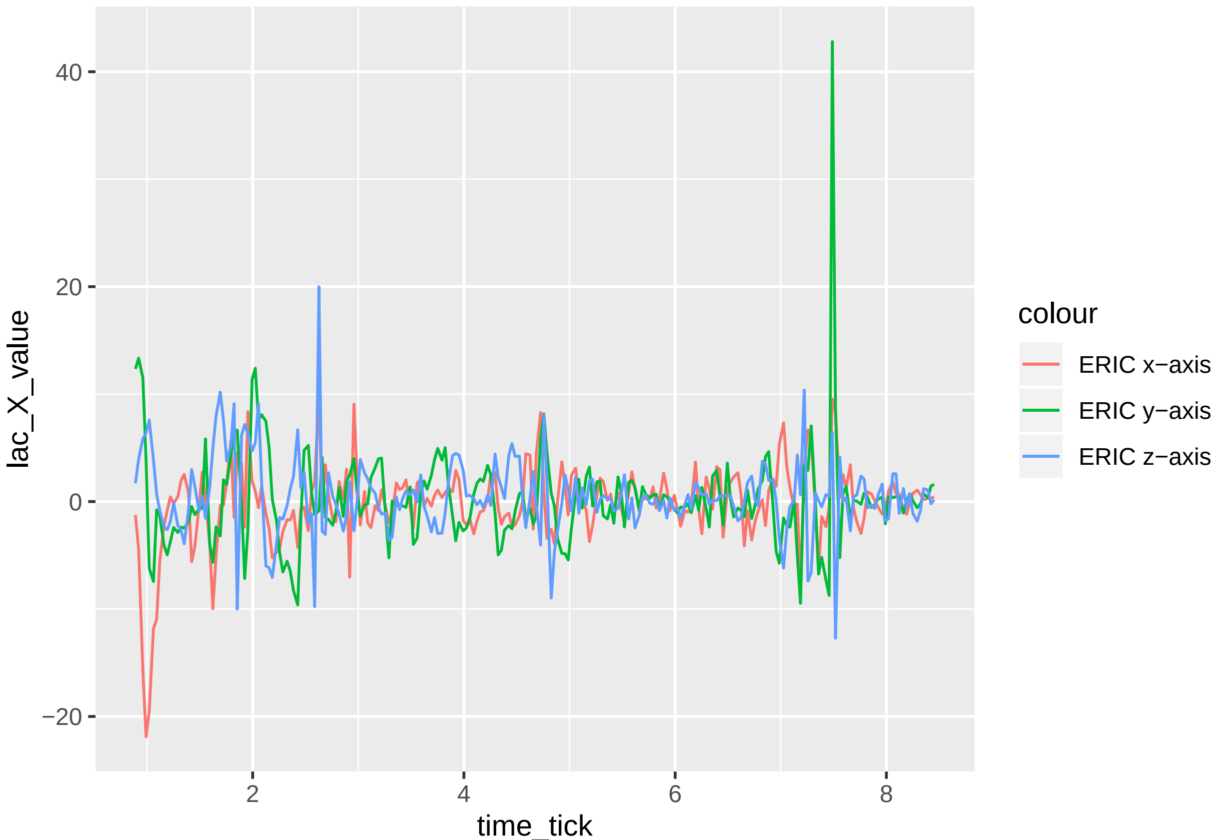

```
ggplot(YCH2, aes(x=time_tick)) + geom_line(aes(y=lac_X_value,color ="YCH x-axis"))+geom_line(aes(y=lac_Y
```




```
ERIC1 <- read.csv("~/Desktop/master fall/assignment8/eric before.csv")
ERIC2 <- read.csv("~/Desktop/master fall/assignment8/eric - after.csv")
ggplot(ERIC1, aes(x=time_tick)) + geom_line(aes(y=lac_X_value,color ="ERIC x-axis"))+geom_line(aes(y=lac
```




```
ggplot(ERIC2, aes(x=time_tick)) + geom_line(aes(y=lac_X_value,color ="ERIC x-axis"))+geom_line(aes(y=lac
```




```
GH1 <- abs(GH1)
GH2 <- abs(GH2)
mean.gh1 <- c(mean(GH1$lac_X_value),mean(GH1$lac_Y_value),mean(GH1$lac_Z_value))
var.gh1 <- c(var(GH1$lac_X_value),var(GH1$lac_Y_value),var(GH1$lac_Z_value))
sd.gh1 <- sqrt(var.gh1)
mean.gh1
```

```
## [1] 17.65577 11.31354 18.38602
```

```
var.gh1
```

```
## [1] 103.72839  76.66497 155.98830
```

```
sd.gh1
```

```
## [1] 10.184713  8.755853 12.489528
```

```
mean.gh2 <- c(mean(GH2$lac_X_value),mean(GH2$lac_Y_value),mean(GH2$lac_Z_value))
var.gh2 <- c(var(GH2$lac_X_value),var(GH2$lac_Y_value),var(GH2$lac_Z_value))
sd.gh2 <- sqrt(var.gh2)
mean.gh2
```

```
## [1] 12.502761  8.803834 13.379346
```

```
var.gh2
```

```
## [1]  86.35995  70.95982 137.56951
```

```
sd.gh2
```

```
## [1]  9.293005  8.423765 11.729003
```

```r
CWJ1 <- abs(CWJ1)
CWJ2 <- abs(CWJ2)
mean.CWJ1 <- c(mean(CWJ1$lac_X_value),mean(CWJ1$lac_Y_value),mean(CWJ1$lac_Z_value))
var.CWJ1 <- c(var(CWJ1$lac_X_value),var(CWJ1$lac_Y_value),var(CWJ1$lac_Z_value))
sd.CWJ1 <- sqrt(var.CWJ1)
mean.CWJ1
```

```
## [1] 26.58828 30.50502 20.03264
```

```r
var.CWJ1
```

```
## [1] 544.5335 702.4998 247.6344
```

```r
sd.CWJ1
```

```
## [1] 23.33524 26.50471 15.73640
```

```r
mean.CWJ2 <- c(mean(CWJ2$lac_X_value),mean(CWJ2$lac_Y_value),mean(CWJ2$lac_Z_value))
var.CWJ2 <- c(var(CWJ2$lac_X_value),var(CWJ2$lac_Y_value),var(CWJ2$lac_Z_value))
sd.CWJ2 <- sqrt(var.CWJ2)
mean.CWJ2
```

```
## [1] 36.48182 36.30400 32.91006
```

```r
var.CWJ2
```

```
## [1] 566.6613 880.6457 611.2729
```

```r
sd.CWJ2
```

```
## [1] 23.80465 29.67567 24.72393
```

```r
YCH1 <- abs(YCH1)
YCH2 <- abs(YCH2)
mean.YCH1 <- c(mean(YCH1$lac_X_value),mean(YCH1$lac_Y_value),mean(YCH1$lac_Z_value))
var.YCH1 <- c(var(YCH1$lac_X_value),var(YCH1$lac_Y_value),var(YCH1$lac_Z_value))
sd.YCH1 <- sqrt(var.YCH1)
mean.YCH1
```

```
## [1] 17.043955 17.091830  7.198124
```

```r
var.YCH1
```

```
## [1] 190.73751  75.01579  18.44315
```

```r
sd.YCH1
```

```
## [1] 13.810775  8.661166  4.294549
```

```r
mean.YCH2 <- c(mean(YCH2$lac_X_value),mean(YCH2$lac_Y_value),mean(YCH2$lac_Z_value))
var.YCH2 <- c(var(YCH2$lac_X_value),var(YCH2$lac_Y_value),var(YCH2$lac_Z_value))
sd.YCH2 <- sqrt(var.YCH2)
mean.YCH2
```

```
## [1] 18.518670 19.959625  6.036058
```

```r
var.YCH2
```

```
## [1] 255.80427 120.05320  20.65752
```

```r
sd.YCH2
```

```
## [1] 15.993882 10.956879  4.545055
```

```r
ERIC1 <- abs(ERIC1)
ERIC2 <- abs(ERIC2)
mean.ERIC1 <- c(mean(ERIC1$lac_X_value),mean(ERIC1$lac_Y_value),mean(ERIC1$lac_Z_value))
var.ERIC1 <- c(var(ERIC1$lac_X_value),var(ERIC1$lac_Y_value),var(ERIC1$lac_Z_value))
sd.ERIC1 <- sqrt(var.ERIC1)
mean.ERIC1
```

```
## [1] 14.289840 14.460356  6.805683
```

```r
var.ERIC1
```

```
## [1] 296.09811 224.29023  65.34541
```

```r
sd.ERIC1
```

```
## [1] 17.207501 14.976322  8.083651
```

```r
mean.ERIC2 <- c(mean(ERIC2$lac_X_value),mean(ERIC2$lac_Y_value),mean(ERIC2$lac_Z_value))
var.ERIC2 <- c(var(ERIC2$lac_X_value),var(ERIC2$lac_Y_value),var(ERIC2$lac_Z_value))
sd.ERIC2 <- sqrt(var.ERIC2)
mean.ERIC2
```

```
## [1] 2.370068 2.819741 2.340801
```

```r
var.ERIC2
```

```
## [1]  8.464091 13.856002  7.138585
```

```r
sd.ERIC2
```

```
## [1] 2.909311 3.722365 2.671813
```

```r
CB1 <- rbind(GH1,CWJ1,YCH1,ERIC1)
CB2 <- rbind(GH2,CWJ2,YCH2,ERIC2)
group <- c(1)
CB1 <- cbind(CB1,group)
group <- c(2)
CB2 <- cbind(CB2,group)
CB <- rbind(CB1,CB2)
str(CB)
```

```
## 'data.frame':    1977 obs. of  5 variables:
##  $ time_tick  : num  0.515 0.555 0.585 0.616 0.646 ...
##  $ lac_X_value: num  5.98 12.36 17.61 20.93 20.92 ...
##  $ lac_Y_value: num  5.805 3.815 0.282 3.505 1.258 ...
##  $ lac_Z_value: num  7.12 9.16 10.15 5.4 11.66 ...
##  $ group      : num  1 1 1 1 1 1 1 1 1 1 ...
```

```r
res1 <- t.test(CB1$lac_X_value,CB2$lac_X_value)
res1
```

```
##
##  Welch Two Sample t-test
##
## data:  CB1$lac_X_value and CB2$lac_X_value
## t = 2.3499, df = 1850.1, p-value = 0.01888
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  0.3292568 3.6519906
## sample estimates:
```

```
## mean of x mean of y
##  19.23048  17.23985
```

```
res2 <- t.test(CB1$lac_Y_value,CB2$lac_Y_value)
res2
```

```
##
##  Welch Two Sample t-test
##
## data:  CB1$lac_Y_value and CB2$lac_Y_value
## t = 2.5019, df = 1833.8, p-value = 0.01244
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  0.4834682 3.9909953
## sample estimates:
## mean of x mean of y
##  18.94015  16.70292
```

```
res3 <- t.test(CB1$lac_Z_value,CB2$lac_Z_value)
res3
```

```
##
##  Welch Two Sample t-test
##
## data:  CB1$lac_Z_value and CB2$lac_Z_value
## t = -0.22899, df = 1581.6, p-value = 0.8189
## alternative hypothesis: true difference in means is not equal to 0
## 95 percent confidence interval:
##  -1.577594  1.247746
## sample estimates:
## mean of x mean of y
##  13.38379  13.54871
```

```
#z-axis has no significant difference
```

```
time1<-c(10.754328-1.659422,10.10797-2.003494,12.410064-2.118693,8.82169-0.515078)
time2<-c(8.452365-0.890054,10.01876-2.752813,14.771162-7.462382,11.44068-3.715343)
time1
```

```
## [1]  9.094906  8.104476 10.291371  8.306612
```

```
time2
```

```
## [1] 7.562311 7.265947 7.308780 7.725337
```

```
height <- c(183,180,183,173)
weight<- c(95,80,80,48)
gender <-c('male','male','male','female')
group <- c(1)
D1 <- cbind(time1,height,weight,gender,group)
group <- c(2)
D2 <- cbind(time2,height,weight,gender,group)
D3 <- rbind(D1,D2)
D3 <- as.data.frame(D3)
D3$time1 <- as.character(D3$time1)
D3$height <-as.numeric(D3$height)
D3$weight <- as.numeric(D3$weight)
D3$group <- as.numeric(D3$group)
```

```r
D3$group[which(D3$group == 1)] <- "before"
D3$group[which(D3$group == 2)] <- "after"
lm1 <- lm(formula =time1~height+weight+gender+group,data = D3)
summary(lm1)
```

```
##
## Call:
## lm(formula = time1 ~ height + weight + gender + group, data = D3)
##
## Residuals:
##        1        2        3        4        5        6        7        8
##  0.02442 -0.32261  0.74942 -0.45124 -0.02442  0.32261 -0.74942  0.45124
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   6.6307     0.9708   6.830  0.00642 **
## height        1.1149     0.7615   1.464  0.23942
## weight       -0.4715     0.7615  -0.619  0.57969
## gendermale   -0.9742     1.3190  -0.739  0.51372
## groupbefore   1.4837     0.5385   2.755  0.07042 .
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7615 on 3 degrees of freedom
## Multiple R-squared:  0.7678, Adjusted R-squared:  0.4582
## F-statistic:  2.48 on 4 and 3 DF,  p-value: 0.2407
```

```r
options(contrasts = c("contr.sum", "contr.poly"))
lm2 <- lm(formula =time1~group,data = D3)
summary(lm2)
```

```
##
## Call:
## lm(formula = time1 ~ group, data = D3)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -0.84487 -0.31042 -0.03005  0.17411  1.34203
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   8.2075     0.2537  32.346 5.81e-08 ***
## group1       -0.7419     0.2537  -2.924   0.0265 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.7177 on 6 degrees of freedom
## Multiple R-squared:  0.5876, Adjusted R-squared:  0.5188
## F-statistic: 8.548 on 1 and 6 DF,  p-value: 0.0265
```

```r
lm3 <- lm(formula =time1~1,data = D3)
summary(lm3)
```

```
##
## Call:
```

```
## lm(formula = time1 ~ 1, data = D3)
##
## Residuals:
##     Min      1Q  Median      3Q     Max
## -0.9415 -0.7085 -0.2926  0.2962  2.0839
##
## Coefficients:
##             Estimate Std. Error t value Pr(>|t|)
## (Intercept)   8.2075     0.3658   22.44 8.84e-08 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 1.035 on 7 degrees of freedom
```

```r
anova(lm2,lm3)
```

```
## Analysis of Variance Table
##
## Model 1: time1 ~ group
## Model 2: time1 ~ 1
##   Res.Df    RSS Df Sum of Sq      F Pr(>F)
## 1      6 3.0904
## 2      7 7.4934 -1    -4.403 8.5484 0.0265 *
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```