



Session 17 Assignment

Weight Lifting Exercise

This human activity recognition research has traditionally focused on discriminating between different activities, i.e. to predict "which" activity was performed at a specific point in time (like with the Daily Living Activities dataset above). The approach we propose for the Weight Lifting Exercises dataset is to investigate "how (well)" an activity was performed by the wearer. The "how (well)" investigation has only received little attention so far, even though it potentially provides useful information for a large variety of applications, such as sports training.

2. Perform the below given activities:
 - a. Create classification model using logistic regression model
 - b. verify model goodness of fit
 - c. Report the accuracy measures
 - d. Report the variable importance
 - e. Report the unimportant variables
 - f. Interpret the results
 - g. Visualize the results

```
setwd("C:/Users/Seshan/Desktop/sv R related/acadgild/assignments/session17")
```

```
library(readr)
```

```
Example_WearableComputing_weight_lifting_exercises_biceps_curl_variations1 <-  
read.csv("Example_WearableComputing_weight_lifting_exercises_biceps_curl_variations1.csv",header=  
T,na.strings=c(""))
```

```
View(Example_WearableComputing_weight_lifting_exercises_biceps_curl_variations1)
```

```
View(Example_WearableComputing_weight_lifting_exercises_biceps_curl_variations1)

data<-Example_WearableComputing_weight_lifting_exercises_biceps_curl_variations1

#Example_WearableComputing_weight_lifting_exercises_biceps_curl_variations1 <-
read.csv("Example_WearableComputing_weight_lifting_exercises_biceps_curl_variations1.csv",header=
T,na.strings=c(""))

#data<-s <-
read.csv("Example_WearableComputing_weight_lifting_exercises_biceps_curl_variations1.csv",header=
T,na.strings=c(""))

View(data)


# load libraries

library(caret)

library(randomForest)

library(rpart)

library(rpart.plot)

library(ggplot2)

library(lattice)

library(rattle)

summary(data)

library(C50)

#install.package('devtools') # Only needed if you dont have this installed.

library(devtools)

install_github('adam-m-mcelhinney/helpRFunctions')

library(helpRFunctions)

names(data)

dim(data)

library(caret)
```

```
library(zoo)

library(plyr)

is.na(data)

which(is.na(data))

sum(is.na(data))

colSums(is.na(data))

data[is.na(data)] <- mean(data, na.rm = TRUE)

str(data)

summary(data)

pairs(data[8:15])


# set last (classe) and prior (- classe) column index

last <- as.numeric(ncol(data))

prior <- last - 1

# set variables to numerics for correlation check, except the "classe"

for (i in 1:prior) {

  data[,i] <- as.numeric(data[,i])}


# enable multi-core processing

library(doParallel)

#cl <- makeCluster(detectedCores())

registerDoParallel()

set.seed(12345)

dataTrain<-data[1:4004,]
```

```
dataTest<-data[4005:4024,]

cor.check <- cor(dataTrain[, -c(last)])

diag(cor.check) <- 0

plot( levelplot(cor.check,main ="Correlation matrix for all WLE features in training set",
               scales=list(x=list(rot=90), cex=1.0) ))

# logistic regression model:

fit <- glm(classe~.,data = dataTrain,family = binomial(link='logit'))

summary(fit)

library(MASS)

step_fit <- stepAIC(fit,method='backward')

summary(step_fit)

confint(step_fit)

#ANOVA on base model

anova(fit,test = 'Chisq')

#ANOVA from reduced model after applying the Step AIC

anova(step_fit,test = 'Chisq')

#plot the fitted model

plot(fit$fitted.values)

pred_link <- predict(fit,newdata = dataTest,type = 'link')
```

```
#check for multicollinearity

library(car)

vif(fit)

vif(step_fit)


library(caret)

#with default prob cut 0.50

dataTest$pred_classe <- ifelse(pred<0.7,'yes','no')


table(dataTest$pred_classe,dataTest$classe)


#training split of churn classes

round(table(dataTrain$classe)/nrow(dataTrain),2)*100

# test split of churn classes

round(table(dataTest$classe)/nrow(dataTest),2)*100

#predicted split of churn classes

round(table(dataTest$pred_classe)/nrow(dataTest),2)*100


#create confusion matrix

confusionMatrix(dataTest$classe,dataTest$pred_classe)


#how do we create a cross validation scheme

control <- trainControl(method = 'repeatedcv',
  number = 10,
  repeats = 3)
```

```
seed <- 7

metric <- 'Accuracy'

set.seed(seed)

fit_default <- train(classe~.,
                     data = dataTrain,
                     method = 'glm',
                     metric = 0,
                     trControl = control)

print(fit_default)


library(caret)

varImp(step_fit)

varImp(fit_default)

library(devtools)


install_github("riv", "tomasgreif")


install_github("woe", "tomasgreif")


library(woe)


library(riv)


iv_df <- iv.mult(dataTrain, y="classe", summary=TRUE, verbose=TRUE)

iv_df
```

```
iv <- iv.mult(dataTrain, y="classe", summary=FALSE, verbose=TRUE)
```

```
# Plot information value summary
```

```
iv.plot.summary(iv_df)
```

```
-0.1697 : 1      -0.08596: 1      -0.10319: 1      -0.00863: 1
-0.20332: 1     -0.1009 : 1      -0.14513: 1      -0.05777: 1
  max_roll_arm    max_pitch_arm    max_yaw_arm    min_roll_arm
Min.   :-36.3000  Min.   :-164.000  Min.   : 0.0000  Min.   :-87.1000
1st Qu.: 0.0000  1st Qu.:  0.000  1st Qu.: 0.0000  1st Qu.:  0.0000
Median : 0.0000  Median :  0.000  Median : 0.0000  Median :  0.0000
Mean   : 0.2127  Mean   :  1.232  Mean   : 0.8345  Mean   : -0.6085
3rd Qu.: 0.0000  3rd Qu.:  0.000  3rd Qu.: 0.0000  3rd Qu.:  0.0000
Max.    : 81.4000  Max.    : 180.000  Max.    :59.0000  Max.    : 35.7000
min_pitch_arm    min_yaw_arm    amplitude_roll_arm
Min.   :-180.000  Min.   : 0.0000  Min.   : 0.0000
1st Qu.:  0.000  1st Qu.: 0.0000  1st Qu.: 0.0000
Median :  0.000  Median : 0.0000  Median : 0.0000
Mean   : -1.213  Mean   : 0.2806  Mean   : 0.8211
3rd Qu.:  0.000  3rd Qu.: 0.0000  3rd Qu.: 0.0000
Max.    : 146.000  Max.    :34.0000  Max.    :90.0000
amplitude_pitch_arm amplitude_yaw_arm roll_dumbbell    pitch_dumbbell
Min.   : 0.000  Min.   : 0.0000  Min.   : -152.782  Min.   : -134.73
1st Qu.: 0.000  1st Qu.: 0.0000  1st Qu.: -34.657  1st Qu.: -12.93
Median : 0.000  Median : 0.0000  Median : -2.295  Median :  14.48
Mean   : 2.445  Mean   : 0.5539  Mean   :  3.500  Mean   :  5.18
3rd Qu.: 0.000  3rd Qu.: 0.0000  3rd Qu.: 58.014  3rd Qu.: 27.95
Max.    :360.000  Max.    :52.0000  Max.    :139.729  Max.    : 97.28
  yaw_dumbbell    kurtosis_roll_dumbbell    kurtosis_pitch_dumbbell
Min.   : -129.33  Min.   : -2.088900  Min.   : -2.088900
1st Qu.: 21.35  1st Qu.: 0.000000  1st Qu.: 0.000000
Median : 72.49  Median : 0.000000  Median : 0.000000
Mean   : 55.66  Mean   : 0.007174  Mean   : 0.001251
3rd Qu.:122.01  3rd Qu.: 0.000000  3rd Qu.: 0.000000
Max.    :152.92  Max.    : 7.563300  Max.    :11.273400
kurtosis_yaw_dumbbell skewness_roll_dumbbell skewness_pitch_dumbbell
#DIV/0!: 88      Min.   : -2.6110000  Min.   : -2.050100
0       :3936    1st Qu.: 0.0000000  1st Qu.: 0.000000
          Median : 0.0000000  Median : 0.000000
          Mean   : 0.0003258  Mean   : -0.001974
          3rd Qu.: 0.0000000  3rd Qu.: 0.000000
          Max.    : 2.3814000  Max.    : 2.783200
skewness_yaw_dumbbell max_roll_dumbbell    max_pitch_dumbbell
#DIV/0!: 88      Min.   : -70.9000  Min.   : -84.500
0       :3936    1st Qu.: 0.0000  1st Qu.:  0.000
          Median : 0.0000  Median :  0.000
```

	Mean : 0.7494	Mean : 1.927	
	3rd Qu.: 0.0000	3rd Qu.: 0.000	
	Max. : 97.3000	Max. :152.900	
max_yaw_dumbbell	min_roll_dumbbell	min_pitch_dumbbell	
Min. :-2.100000	Min. :-134.7000	Min. :-129.3000	
1st Qu.: 0.000000	1st Qu.: 0.0000	1st Qu.: 0.0000	
Median : 0.000000	Median : 0.0000	Median : 0.0000	
Mean : 0.007232	Mean : -0.6017	Mean : 0.3381	
3rd Qu.: 0.000000	3rd Qu.: 0.0000	3rd Qu.: 0.0000	
Max. : 7.600000	Max. : 26.8000	Max. : 122.9000	
min_yaw_dumbbell	amplitude_roll_dumbbell	amplitude_pitch_dumbbell	
Min. :-2.100000	Min. : 0.000	Min. : 0.000	
1st Qu.: 0.000000	1st Qu.: 0.000	1st Qu.: 0.000	
Median : 0.000000	Median : 0.000	Median : 0.000	
Mean : 0.007232	Mean : 1.351	Mean : 1.589	
3rd Qu.: 0.000000	3rd Qu.: 0.000	3rd Qu.: 0.000	
Max. : 7.600000	Max. :171.750	Max. :217.330	
amplitude_yaw_dumbbell	total_accel_dumbbell	var_accel_dumbbell	
Min. :0	Min. : 1.00	Min. : 0.0000	
1st Qu.:0	1st Qu.: 6.00	1st Qu.: 0.0000	
Median :0	Median : 9.00	Median : 0.0000	
Mean :0	Mean :12.02	Mean : 0.2074	
3rd Qu.:0	3rd Qu.:14.00	3rd Qu.: 0.0000	
Max. :0	Max. :37.00	Max. :230.4278	
avg_roll_dumbbell	stddev_roll_dumbbell	var_roll_dumbbell	
Min. :-110.93280	Min. : 0.0000	Min. : 0.00	
1st Qu.: 0.00000	1st Qu.: 0.0000	1st Qu.: 0.00	
Median : 0.00000	Median : 0.0000	Median : 0.00	
Mean : 0.05821	Mean : 0.5755	Mean : 29.73	
3rd Qu.: 0.00000	3rd Qu.: 0.0000	3rd Qu.: 0.00	
Max. : 117.40360	Max. :103.1239	Max. :10634.53	
avg_pitch_dumbbell	stddev_pitch_dumbbell	var_pitch_dumbbell	
Min. :-70.91580	Min. : 0.0000	Min. : 0.000	
1st Qu.: 0.00000	1st Qu.: 0.0000	1st Qu.: 0.000	
Median : 0.00000	Median : 0.0000	Median : 0.000	
Mean : 0.07618	Mean : 0.3323	Mean : 7.486	
3rd Qu.: 0.00000	3rd Qu.: 0.0000	3rd Qu.: 0.000	
Max. : 57.45260	Max. :48.4298	Max. :2345.441	
avg_yaw_dumbbell	stddev_yaw_dumbbell	var_yaw_dumbbell	gyros_dumbbell_x
Min. :-105.650	Min. : 0.0000	Min. : 0.00	Min. :-1.4300
1st Qu.: 0.000	1st Qu.: 0.0000	1st Qu.: 0.00	1st Qu.: -0.0200
Median : 0.000	Median : 0.0000	Median : 0.00	Median : 0.3200
Mean : 1.117	Mean : 0.4127	Mean : 12.65	Mean : 0.2487
3rd Qu.: 0.000	3rd Qu.: 0.0000	3rd Qu.: 0.00	3rd Qu.: 0.5300
Max. : 129.933	Max. :71.0596	Max. :5049.47	Max. : 1.4800
gyros_dumbbell_y	gyros_dumbbell_z	accel_dumbbell_x	accel_dumbbell_y
Min. :-2.04000	Min. :-1.4600	Min. :-237.000	Min. :-163.00
1st Qu.: -0.27000	1st Qu.: -0.3300	1st Qu.: -6.000	1st Qu.: -28.00
Median : -0.06000	Median : -0.1300	Median : 11.000	Median : -2.00
Mean : -0.04674	Mean : -0.1337	Mean : -7.091	Mean : 12.83
3rd Qu.: 0.14000	3rd Qu.: 0.0500	3rd Qu.: 23.000	3rd Qu.: 47.00
Max. : 4.37000	Max. : 1.8900	Max. : 217.000	Max. : 281.00
accel_dumbbell_z	magnet_dumbbell_x	magnet_dumbbell_y	magnet_dumbbell_z
Min. :-273.00	Min. :-638.00	Min. :-730.0	Min. :-262.00
1st Qu.: 12.00	1st Qu.: -515.00	1st Qu.: -544.0	1st Qu.: -101.00
Median : 51.00	Median : 107.50	Median : -486.0	Median : -59.00
Mean : 16.63	Mean : 10.55	Mean : -115.7	Mean : -41.12

3rd Qu.: 79.00	3rd Qu.: 506.00	3rd Qu.: 304.0	3rd Qu.: 1.00
Max. : 122.00	Max. : 579.00	Max. : 618.0	Max. : 300.00
roll_forearm	pitch_forearm	yaw_forearm	kurtosis_roll_forearm
Min. : -180.0	Min. : -64.00	Min. : -180.00	0 : 3936
1st Qu.: -115.0	1st Qu.: 0.00	1st Qu.: -106.00	#DIV/0!: 8
Median : 89.5	Median : 19.70	Median : 83.50	-1.3846: 2
Mean : 36.1	Mean : 18.57	Mean : 17.79	-0.0699: 1
3rd Qu.: 136.0	3rd Qu.: 43.90	3rd Qu.: 108.00	-0.0781: 1
Max. : 180.0	Max. : 86.90	Max. : 180.00	-0.1168: 1
kurtosis_pitch_forearm	kurtosis_yaw_forearm	skewness_roll_forearm	
0 : 3936	#DIV/0!: 88	0 : 3936	
#DIV/0!: 8	0 : 3936	#DIV/0!: 8	
-0.0259: 1		-0.009 : 1	
-0.0918: 1		-0.011 : 1	
-0.1289: 1		-0.0252: 1	
-0.1574: 1		-0.0525: 1	
skewness_pitch_forearm	skewness_yaw_forearm	max_roll_forearm	
0 : 3937	#DIV/0!: 88	Min. : -63.9000	
#DIV/0!: 8	0 : 3936	1st Qu.: 0.0000	
-0.0428: 1		Median : 0.0000	
-0.0673: 1		Mean : 0.7345	
-0.0732: 1		3rd Qu.: 0.0000	
-0.14 : 1		Max. : 86.9000	
max_pitch_forearm	max_yaw_forearm	min_roll_forearm	min_pitch_forearm
Min. : -152.000	0 : 3937	Min. : -64.00000	Min. : -180.00
1st Qu.: 0.000	-1.3 : 14	1st Qu.: 0.00000	1st Qu.: 0.00
Median : 0.000	#DIV/0!: 8	Median : 0.00000	Median : 0.00
Mean : 2.445	-1.5 : 6	Mean : 0.06573	Mean : -1.79
3rd Qu.: 0.000	-0.7 : 5	3rd Qu.: 0.00000	3rd Qu.: 0.00
Max. : 180.000	-0.9 : 5	Max. : 47.50000	Max. : 125.00
min_yaw_forearm	amplitude_roll_forearm	amplitude_pitch_forearm	
0 : 3937	Min. : 0.0000	Min. : 0.000	
-1.3 : 14	1st Qu.: 0.0000	1st Qu.: 0.000	
#DIV/0!: 8	Median : 0.0000	Median : 0.000	
-1.5 : 6	Mean : 0.6687	Mean : 4.235	
-0.7 : 5	3rd Qu.: 0.0000	3rd Qu.: 0.000	
-0.9 : 5	Max. : 77.1000	Max. : 359.000	
amplitude_yaw_forearm	total_accel_forearm	var_accel_forearm	
#DIV/0!: 8	Min. : 10.00	Min. : 0.0000	
0 : 4016	1st Qu.: 30.00	1st Qu.: 0.0000	
	Median : 35.00	Median : 0.0000	
	Mean : 34.38	Mean : 0.6562	
	3rd Qu.: 37.00	3rd Qu.: 0.0000	
	Max. : 59.00	Max. : 124.1778	
avg_roll_forearm	stddev_roll_forearm	var_roll_forearm	
Min. : -145.1395	Min. : 0.000	Min. : 0.0	
1st Qu.: 0.0000	1st Qu.: 0.000	1st Qu.: 0.0	
Median : 0.0000	Median : 0.000	Median : 0.0	
Mean : 0.8809	Mean : 1.482	Mean : 199.9	
3rd Qu.: 0.0000	3rd Qu.: 0.000	3rd Qu.: 0.0	
Max. : 151.2500	Max. : 176.478	Max. : 31144.6	
avg_pitch_forearm	stddev_pitch_forearm	var_pitch_forearm	
Min. : -63.9000	Min. : 0.0000	Min. : 0.000	
1st Qu.: 0.0000	1st Qu.: 0.0000	1st Qu.: 0.000	
Median : 0.0000	Median : 0.0000	Median : 0.000	
Mean : 0.3827	Mean : 0.2087	Mean : 3.371	
3rd Qu.: 0.0000	3rd Qu.: 0.0000	3rd Qu.: 0.000	

```

Max.      : 68.1682    Max.      :26.7293    Max.      :714.453
avg_yaw_forearm    stddev_yaw_forearm    var_yaw_forearm    gyros_forearm_x
Min.      :-152.3333   Min.      : 0.000    Min.      : 0.0     Min.      :-1.8800
1st Qu.:  0.0000     1st Qu.: 0.000     1st Qu.:  0.0     1st Qu.: -0.1400
Median :  0.0000     Median : 0.000     Median :  0.0     Median : 0.0600
Mean      :  0.4121    Mean      : 1.354    Mean      : 157.2    Mean      : 0.1076
3rd Qu.:  0.0000     3rd Qu.: 0.000     3rd Qu.:  0.0     3rd Qu.: 0.4200
Max.      : 132.5854   Max.      :197.508   Max.      :39009.3   Max.      : 1.8100
gyros_forearm_y    gyros_forearm_z    accel_forearm_x
Min.      :-5.730000   Min.      :-2.58000   Min.      :-328.000
1st Qu.: -1.780000    1st Qu.: -0.31000    1st Qu.: -117.000
Median : -0.020000    Median : -0.02000    Median :  -6.000
Mean      :-0.004108   Mean      : 0.09302   Mean      : -6.445
3rd Qu.: 1.830000     3rd Qu.: 0.48000     3rd Qu.: 113.000
Max.      : 5.170000   Max.      : 3.35000   Max.      : 279.000
accel_forearm_y    accel_forearm_z    magnet_forearm_x    magnet_forearm_y
Min.      :-467.00    Min.      :-366     Min.      :-1160.0    Min.      :-725.0
1st Qu.:  75.75     1st Qu.: -210     1st Qu.: -589.0     1st Qu.: -76.0
Median : 229.50     Median : -181     Median : -330.5     Median : 653.0
Mean      : 171.47    Mean      : -163     Mean      : -348.7    Mean      : 358.6
3rd Qu.: 297.00     3rd Qu.: -150     3rd Qu.: -152.0     3rd Qu.: 747.0
Max.      : 575.00    Max.      : 239     Max.      : 413.0     Max.      :1440.0
magnet_forearm_z   classe
Min.      :-876.0     A:1365
1st Qu.:  370.8     B: 901
Median :  560.0     C: 112
Mean      : 475.2     D: 276
3rd Qu.:  670.0     E:1370
Max.      :1040.0
[ reached getOption("max.print") -- omitted 1 row ]
> pairs(data[8:15])
> # set last (classe) and prior (- classe) column index
> last <- as.numeric(ncol(data))
> prior <- last - 1
> # set variables to numerics for correlation check, except the "classe"
> for (i in 1:prior) {
+   data[,i] <- as.numeric(data[,i])
+ }
> # enable multi-core processing
> library(doParallel)
Loading required package: foreach
Loading required package: iterators
Loading required package: parallel
> #cl <- makeCluster(detectCores())
> registerDoParallel()
> set.seed(12345)
> dataTrain<-data[1:4004,]
> dataTest<-data[4005:4024,]
> cor.check <- cor(dataTrain[, -c(last)])
Warning message:
In cor(dataTrain[, -c(last)]) : the standard deviation is zero
> diag(cor.check) <- 0
> plot( levelplot(cor.check,main ="Correlation matrix for all WLE features in
training set",
+       scales=list(x=list(rot=90), cex=1.0) ))
> # logistic regression model:
> fit <- glm(classe~.,data = dataTrain,family = binomial(link='logit'))

```

Warning messages:

```
1: In drawDetails(x, recording = FALSE) : reached elapsed time limit
2: glm.fit: algorithm did not converge
3: glm.fit: fitted probabilities numerically 0 or 1 occurred
> summary(fit)
```

Call:

```
glm(formula = classe ~ ., family = binomial(link = "logit"),
     data = dataTrain)
```

Deviance Residuals:

Min	1Q	Median	3Q	Max
-3.063e-04	-2.000e-08	2.000e-08	2.000e-08	3.324e-04

Coefficients: (14 not defined because of singularities)

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	4.576e+05	1.230e+09	0.000	1.000
user_name	-5.210e+01	1.849e+05	0.000	1.000
raw_timestamp_part_1	-3.450e-04	9.293e-01	0.000	1.000
raw_timestamp_part_2	1.045e-05	2.451e-02	0.000	1.000
cvtd_timestamp	-2.202e+01	8.060e+04	0.000	1.000
new_window	-7.584e+02	6.402e+06	0.000	1.000
num_window	6.767e+00	3.520e+03	0.002	0.998
roll_belt	8.705e-01	3.350e+03	0.000	1.000
pitch_belt	3.321e+00	5.762e+03	0.001	1.000
yaw_belt	9.784e-02	9.781e+02	0.000	1.000
total_accel_belt	-4.044e+00	1.389e+04	0.000	1.000
kurtosis_roll_belt	1.507e+03	2.120e+07	0.000	1.000
kurtosis_pitch_belt	-3.102e+00	4.225e+04	0.000	1.000
kurtosis_yaw_belt	NA	NA	NA	NA
skewness_roll_belt	6.595e+01	6.259e+05	0.000	1.000
skewness_roll_belt.1	7.315e-01	1.152e+04	0.000	1.000
skewness_yaw_belt	NA	NA	NA	NA
max_roll_belt	-2.531e+02	6.233e+06	0.000	1.000
max_pitch_belt	-3.091e+01	4.399e+05	0.000	1.000
max_yaw_belt	-1.502e+03	2.121e+07	0.000	1.000
min_roll_belt	2.082e+02	5.222e+06	0.000	1.000
min_pitch_belt	9.599e+01	8.100e+05	0.000	1.000
min_yaw_belt	NA	NA	NA	NA
amplitude_roll_belt	3.149e+02	5.852e+06	0.000	1.000
amplitude_pitch_belt	NA	NA	NA	NA
amplitude_yaw_belt	NA	NA	NA	NA
var_total_accel_belt	8.926e+01	9.288e+05	0.000	1.000
avg_roll_belt	-7.727e-01	4.312e+04	0.000	1.000
stddev_roll_belt	-9.439e+01	1.708e+06	0.000	1.000
var_roll_belt	6.176e+00	1.642e+05	0.000	1.000
avg_pitch_belt	-1.398e+01	1.418e+05	0.000	1.000
stddev_pitch_belt	2.683e+02	2.000e+06	0.000	1.000
var_pitch_belt	-9.808e+01	6.833e+05	0.000	1.000
avg_yaw_belt	3.630e+01	1.475e+06	0.000	1.000
stddev_yaw_belt	-2.057e+02	2.243e+06	0.000	1.000
var_yaw_belt	1.584e-01	5.367e+03	0.000	1.000
gyros_belt_x	1.753e+00	1.607e+05	0.000	1.000
gyros_belt_y	2.195e+02	4.206e+05	0.001	1.000
gyros_belt_z	-2.904e+01	1.310e+05	0.000	1.000
accel_belt_x	3.496e-01	1.758e+03	0.000	1.000
accel_belt_y	7.420e-01	2.353e+03	0.000	1.000

accel_belt_z	-2.403e-02	2.343e+03	0.000	1.000
magnet_belt_x	3.766e-01	7.941e+02	0.000	1.000
magnet_belt_y	1.431e-01	1.516e+03	0.000	1.000
magnet_belt_z	3.060e-01	6.958e+02	0.000	1.000
roll_arm	-2.981e-02	1.211e+02	0.000	1.000
pitch_arm	-8.005e-01	8.714e+02	-0.001	0.999
yaw_arm	-7.708e-03	1.841e+02	0.000	1.000
total_accel_arm	-4.613e-01	2.165e+03	0.000	1.000
var_accel_arm	2.124e+00	1.331e+04	0.000	1.000
avg_roll_arm	-3.244e-02	6.289e+03	0.000	1.000
stddev_roll_arm	-2.489e+00	4.218e+04	0.000	1.000
var_roll_arm	6.343e-03	2.574e+02	0.000	1.000
avg_pitch_arm	-8.205e+00	1.062e+05	0.000	1.000
stddev_pitch_arm	-3.290e+01	3.973e+05	0.000	1.000
var_pitch_arm	2.911e-01	3.677e+03	0.000	1.000
avg_yaw_arm	-2.145e+00	1.631e+04	0.000	1.000
stddev_yaw_arm	-4.885e+00	5.553e+04	0.000	1.000
var_yaw_arm	1.409e-02	3.264e+02	0.000	1.000
gyros_arm_x	-6.674e+00	2.568e+04	0.000	1.000
gyros_arm_y	-1.575e+01	5.820e+04	0.000	1.000
gyros_arm_z	1.132e+01	2.980e+04	0.000	1.000
accel_arm_x	-2.149e-01	5.207e+02	0.000	1.000
accel_arm_y	6.879e-01	7.116e+02	0.001	0.999
accel_arm_z	-2.381e-01	3.828e+02	-0.001	1.000
magnet_arm_x	-5.615e-02	1.698e+02	0.000	1.000
magnet_arm_y	-3.838e-01	4.520e+02	-0.001	0.999
magnet_arm_z	6.498e-02	2.805e+02	0.000	1.000
kurtosis_roll_arm	2.298e+00	1.475e+04	0.000	1.000
kurtosis_pitch_arm	-2.025e-02	9.916e+03	0.000	1.000
kurtosis_yaw_arm	-1.043e+00	1.703e+04	0.000	1.000
skewness_roll_arm	-9.194e-01	1.852e+04	0.000	1.000
skewness_pitch_arm	-1.525e+00	2.065e+04	0.000	1.000
skewness_yaw_arm	-4.074e-01	1.177e+04	0.000	1.000
max_roll_arm	8.219e+02	2.250e+07	0.000	1.000
max_pitch_arm	-5.548e+02	2.652e+07	0.000	1.000
max_yaw_arm	-7.559e+00	9.583e+04	0.000	1.000
min_roll_arm	-8.105e+02	2.244e+07	0.000	1.000
min_pitch_arm	5.575e+02	2.652e+07	0.000	1.000
min_yaw_arm	1.055e+01	9.002e+04	0.000	1.000
amplitude_roll_arm	-8.030e+02	2.238e+07	0.000	1.000
amplitude_pitch_arm	5.576e+02	2.652e+07	0.000	1.000
amplitude_yaw_arm	NA	NA	NA	NA
roll_dumbbell	3.117e-01	6.437e+02	0.000	1.000
pitch_dumbbell	-6.753e-01	1.728e+03	0.000	1.000
yaw_dumbbell	1.263e-01	4.711e+02	0.000	1.000
kurtosis_roll_dumbbell	1.012e+02	9.264e+06	0.000	1.000
kurtosis_pitch_dumbbell	-8.040e-01	1.266e+05	0.000	1.000
kurtosis_yaw_dumbbell	NA	NA	NA	NA
skewness_roll_dumbbell	-8.218e+01	9.959e+05	0.000	1.000
skewness_pitch_dumbbell	-6.297e+01	7.874e+05	0.000	1.000
skewness_yaw_dumbbell	NA	NA	NA	NA
max_roll_dumbbell	1.122e+03	9.951e+06	0.000	1.000
max_pitch_dumbbell	-2.243e+02	4.617e+06	0.000	1.000
max_yaw_dumbbell	-8.495e+01	9.121e+06	0.000	1.000
min_roll_dumbbell	-1.114e+03	9.887e+06	0.000	1.000
min_pitch_dumbbell	2.223e+02	4.614e+06	0.000	1.000
min_yaw_dumbbell	NA	NA	NA	NA

amplitude_roll_dumbbell	-1.119e+03	9.932e+06	0.000	1.000
amplitude_pitch_dumbbell	2.190e+02	4.642e+06	0.000	1.000
amplitude_yaw_dumbbell	NA	NA	NA	NA
total_accel_dumbbell	2.634e+00	8.124e+03	0.000	1.000
var_accel_dumbbell	9.387e-01	1.293e+04	0.000	1.000
avg_roll_dumbbell	3.209e-01	1.170e+04	0.000	1.000
stddev_roll_dumbbell	3.826e+00	1.714e+05	0.000	1.000
var_roll_dumbbell	-6.532e-03	1.294e+03	0.000	1.000
avg_pitch_dumbbell	-9.252e+00	9.790e+04	0.000	1.000
stddev_pitch_dumbbell	7.252e+00	2.285e+05	0.000	1.000
var_pitch_dumbbell	-8.990e-02	3.544e+03	0.000	1.000
avg_yaw_dumbbell	2.326e+00	3.002e+04	0.000	1.000
stddev_yaw_dumbbell	8.080e+00	1.707e+05	0.000	1.000
var_yaw_dumbbell	-1.969e-02	1.225e+03	0.000	1.000
gyros_dumbbell_x	-2.620e+00	5.656e+04	0.000	1.000
gyros_dumbbell_y	2.166e+00	3.581e+04	0.000	1.000
gyros_dumbbell_z	1.283e+01	5.726e+04	0.000	1.000
accel_dumbbell_x	7.158e-01	1.706e+03	0.000	1.000
accel_dumbbell_y	-2.493e-01	9.631e+02	0.000	1.000
accel_dumbbell_z	-2.423e-01	1.084e+03	0.000	1.000
magnet_dumbbell_x	-1.128e-01	3.596e+02	0.000	1.000
magnet_dumbbell_y	-2.477e-02	5.858e+02	0.000	1.000
magnet_dumbbell_z	2.711e-03	7.102e+02	0.000	1.000
roll_forearm	-7.360e-03	1.904e+02	0.000	1.000
pitch_forearm	9.473e-01	1.582e+03	0.001	1.000
yaw_forearm	4.287e-02	1.896e+02	0.000	1.000
kurtosis_roll_forearm	7.332e+00	1.101e+05	0.000	1.000
kurtosis_pitch_forearm	6.396e-01	1.035e+04	0.000	1.000
kurtosis_yaw_forearm	NA	NA	NA	NA
skewness_roll_forearm	5.414e-01	2.195e+04	0.000	1.000
skewness_pitch_forearm	6.050e-01	1.714e+04	0.000	1.000
skewness_yaw_forearm	NA	NA	NA	NA
max_roll_forearm	7.359e+02	5.512e+06	0.000	1.000
max_pitch_forearm	-7.005e-01	1.555e+04	0.000	1.000
max_yaw_forearm	-3.109e+01	4.583e+05	0.000	1.000
min_roll_forearm	-7.347e+02	5.555e+06	0.000	1.000
min_pitch_forearm	-1.021e+00	7.942e+03	0.000	1.000
min_yaw_forearm	NA	NA	NA	NA
amplitude_roll_forearm	-7.491e+02	5.527e+06	0.000	1.000
amplitude_pitch_forearm	NA	NA	NA	NA
amplitude_yaw_forearm	-1.610e+02	1.679e+06	0.000	1.000
total_accel_forearm	8.335e-01	5.021e+03	0.000	1.000
var_accel_forearm	-9.501e-01	1.683e+04	0.000	1.000
avg_roll_forearm	-3.053e+00	3.370e+04	0.000	1.000
stddev_roll_forearm	-9.505e-01	3.371e+04	0.000	1.000
var_roll_forearm	9.389e-03	2.038e+02	0.000	1.000
avg_pitch_forearm	-2.479e+00	1.298e+05	0.000	1.000
stddev_pitch_forearm	6.353e+01	3.663e+05	0.000	1.000
var_pitch_forearm	-1.023e+00	7.995e+03	0.000	1.000
avg_yaw_forearm	3.378e+00	4.000e+04	0.000	1.000
stddev_yaw_forearm	-4.433e+00	8.123e+04	0.000	1.000
var_yaw_forearm	2.646e-02	3.863e+02	0.000	1.000
gyros_forearm_x	1.456e+01	5.911e+04	0.000	1.000
gyros_forearm_y	-6.460e+00	1.369e+04	0.000	1.000
gyros_forearm_z	2.089e+01	3.623e+04	0.001	1.000
accel_forearm_x	-1.600e-01	3.288e+02	0.000	1.000
accel_forearm_y	-2.062e-01	5.004e+02	0.000	1.000

accel_forearm_z	-2.349e-01	5.413e+02	0.000	1.000
magnet_forearm_x	1.437e-01	1.610e+02	0.001	0.999
magnet_forearm_y	1.355e-02	1.972e+02	0.000	1.000
magnet_forearm_z	1.891e-01	1.861e+02	0.001	0.999

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 5.1382e+03 on 4003 degrees of freedom
 Residual deviance: 3.3492e-07 on 3859 degrees of freedom
 AIC: 290

Number of Fisher Scoring iterations: 25

```
> library(MASS)
> step_fit <- stepAIC(fit,method='backward')
Start: AIC=290
classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
  cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
  yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
  kurtosis_yaw_belt + skewness_roll_belt + skewness_pitch_belt +
  skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
  min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +
  amplitude_pitch_belt + amplitude_yaw_belt + var_total_accel_belt +
  avg_roll_belt + stddev_roll_belt + var_roll_belt + avg_pitch_belt +
  stddev_pitch_belt + var_pitch_belt + avg_yaw_belt + stddev_yaw_belt +
  var_yaw_belt + gyros_belt_x + gyros_belt_y + gyros_belt_z +
  accel_belt_x + accel_belt_y + accel_belt_z + magnet_belt_x +
  magnet_belt_y + magnet_belt_z + roll_arm + pitch_arm + yaw_arm +
  total_accel_arm + var_accel_arm + avg_roll_arm + stddev_roll_arm +
  var_roll_arm + avg_pitch_arm + stddev_pitch_arm + var_pitch_arm +
  avg_yaw_arm + stddev_yaw_arm + var_yaw_arm + gyros_arm_x +
  gyros_arm_y + gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z +
  magnet_arm_x + magnet_arm_y + magnet_arm_z + kurtosis_roll_arm +
  kurtosis_pitch_arm + kurtosis_yaw_arm + skewness_roll_arm +
  skewness_pitch_arm + skewness_yaw_arm + max_roll_arm + max_pitch_arm +
  max_yaw_arm + min_roll_arm + min_pitch_arm + min_yaw_arm +
  amplitude_roll_arm + amplitude_pitch_arm + amplitude_yaw_arm +
  roll_dumbbell + pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
  kurtosis_pitch_dumbbell + kurtosis_yaw_dumbbell + skewness_roll_dumbbell
+
  skewness_pitch_dumbbell + skewness_yaw_dumbbell + max_roll_dumbbell +
  max_pitch_dumbbell + max_yaw_dumbbell + min_roll_dumbbell +
  min_pitch_dumbbell + min_yaw_dumbbell + amplitude_roll_dumbbell +
  amplitude_pitch_dumbbell + amplitude_yaw_dumbbell + total_accel_dumbbell
+
  var_accel_dumbbell + avg_roll_dumbbell + stddev_roll_dumbbell +
  var_roll_dumbbell + avg_pitch_dumbbell + stddev_pitch_dumbbell +
  var_pitch_dumbbell + avg_yaw_dumbbell + stddev_yaw_dumbbell +
  var_yaw_dumbbell + gyros_dumbbell_x + gyros_dumbbell_y +
  gyros_dumbbell_z + accel_dumbbell_x + accel_dumbbell_y +
  accel_dumbbell_z + magnet_dumbbell_x + magnet_dumbbell_y +
  magnet_dumbbell_z + roll_forearm + pitch_forearm + yaw_forearm +
  kurtosis_roll_forearm + kurtosis_pitch_forearm + kurtosis_yaw_forearm +
  skewness_roll_forearm + skewness_pitch_forearm + skewness_yaw_forearm +
  max_roll_forearm + max_pitch_forearm + max_yaw_forearm +
  min_roll_forearm + min_pitch_forearm + min_yaw_forearm +
```

```

+ amplitude_roll_forearm + amplitude_pitch_forearm + amplitude_yaw_forearm
+
total_accel_forearm + var_accel_forearm + avg_roll_forearm +
stddev_roll_forearm + var_roll_forearm + avg_pitch_forearm +
stddev_pitch_forearm + var_pitch_forearm + avg_yaw_forearm +
stddev_yaw_forearm + var_yaw_forearm + gyros_forearm_x +
gyros_forearm_y + gyros_forearm_z + accel_forearm_x + accel_forearm_y +
accel_forearm_z + magnet_forearm_x + magnet_forearm_y + magnet_forearm_z

```

Step: AIC=290

```

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
kurtosis_yaw_belt + skewness_roll_belt + skewness_pitch_belt +
skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +
amplitude_pitch_belt + amplitude_yaw_belt + var_total_accel_belt +
avg_roll_belt + stddev_roll_belt + var_roll_belt + avg_pitch_belt +
stddev_pitch_belt + var_pitch_belt + avg_yaw_belt + stddev_yaw_belt +
var_yaw_belt + gyros_belt_x + gyros_belt_y + gyros_belt_z +
accel_belt_x + accel_belt_y + accel_belt_z + magnet_belt_x +
magnet_belt_y + magnet_belt_z + roll_arm + pitch_arm + yaw_arm +
total_accel_arm + var_accel_arm + avg_roll_arm + stddev_roll_arm +
var_roll_arm + avg_pitch_arm + stddev_pitch_arm + var_pitch_arm +
avg_yaw_arm + stddev_yaw_arm + var_yaw_arm + gyros_arm_x +
gyros_arm_y + gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z +
magnet_arm_x + magnet_arm_y + magnet_arm_z + kurtosis_roll_arm +
kurtosis_pitch_arm + kurtosis_yaw_arm + skewness_roll_arm +
skewness_pitch_arm + skewness_yaw_arm + max_roll_arm + max_pitch_arm +
max_yaw_arm + min_roll_arm + min_pitch_arm + min_yaw_arm +
amplitude_roll_arm + amplitude_pitch_arm + amplitude_yaw_arm +
roll_dumbbell + pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
kurtosis_pitch_dumbbell + kurtosis_yaw_dumbbell + skewness_roll_dumbbell
+
skewness_pitch_dumbbell + skewness_yaw_dumbbell + max_roll_dumbbell +
max_pitch_dumbbell + max_yaw_dumbbell + min_roll_dumbbell +
min_pitch_dumbbell + min_yaw_dumbbell + amplitude_roll_dumbbell +
amplitude_pitch_dumbbell + amplitude_yaw_dumbbell + total_accel_dumbbell
+
var_accel_dumbbell + avg_roll_dumbbell + stddev_roll_dumbbell +
var_roll_dumbbell + avg_pitch_dumbbell + stddev_pitch_dumbbell +
var_pitch_dumbbell + avg_yaw_dumbbell + stddev_yaw_dumbbell +
var_yaw_dumbbell + gyros_dumbbell_x + gyros_dumbbell_y +
gyros_dumbbell_z + accel_dumbbell_x + accel_dumbbell_y +
accel_dumbbell_z + magnet_dumbbell_x + magnet_dumbbell_y +
magnet_dumbbell_z + roll_forearm + pitch_forearm + yaw_forearm +
kurtosis_roll_forearm + kurtosis_pitch_forearm + kurtosis_yaw_forearm +
skewness_roll_forearm + skewness_pitch_forearm + skewness_yaw_forearm +
max_roll_forearm + max_pitch_forearm + max_yaw_forearm +
min_roll_forearm + min_pitch_forearm + min_yaw_forearm +
amplitude_roll_forearm + amplitude_yaw_forearm + total_accel_forearm +
var_accel_forearm + avg_roll_forearm + stddev_roll_forearm +
var_roll_forearm + avg_pitch_forearm + stddev_pitch_forearm +
var_pitch_forearm + avg_yaw_forearm + stddev_yaw_forearm +
var_yaw_forearm + gyros_forearm_x + gyros_forearm_y + gyros_forearm_z +
accel_forearm_x + accel_forearm_y + accel_forearm_z + magnet_forearm_x +

```

magnet_forearm_y + magnet_forearm_z

Step: AIC=290

```
classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +  
  cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +  
  yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +  
  kurtosis_yaw_belt + skewness_roll_belt + skewness_roll_belt.1 +  
  skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +  
  min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +  
  amplitude_pitch_belt + amplitude_yaw_belt + var_total_accel_belt +  
  avg_roll_belt + stddev_roll_belt + var_roll_belt + avg_pitch_belt +  
  stddev_pitch_belt + var_pitch_belt + avg_yaw_belt + stddev_yaw_belt +  
  var_yaw_belt + gyros_belt_x + gyros_belt_y + gyros_belt_z +  
  accel_belt_x + accel_belt_y + accel_belt_z + magnet_belt_x +  
  magnet_belt_y + magnet_belt_z + roll_arm + pitch_arm + yaw_arm +  
  total_accel_arm + var_accel_arm + avg_roll_arm + stddev_roll_arm +  
  var_roll_arm + avg_pitch_arm + stddev_pitch_arm + var_pitch_arm +  
  avg_yaw_arm + stddev_yaw_arm + var_yaw_arm + gyros_arm_x +  
  gyros_arm_y + gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z +  
  magnet_arm_x + magnet_arm_y + magnet_arm_z + kurtosis_roll_arm +  
  kurtosis_pitch_arm + kurtosis_yaw_arm + skewness_roll_arm +  
  skewness_pitch_arm + skewness_yaw_arm + max_roll_arm + max_pitch_arm +  
  max_yaw_arm + min_roll_arm + min_pitch_arm + min_yaw_arm +  
  amplitude_roll_arm + amplitude_pitch_arm + amplitude_yaw_arm +  
  roll_dumbbell + pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +  
  kurtosis_pitch_dumbbell + kurtosis_yaw_dumbbell + skewness_roll_dumbbell  
+  
  skewness_pitch_dumbbell + skewness_yaw_dumbbell + max_roll_dumbbell +  
  max_pitch_dumbbell + max_yaw_dumbbell + min_roll_dumbbell +  
  min_pitch_dumbbell + min_yaw_dumbbell + amplitude_roll_dumbbell +  
  amplitude_pitch_dumbbell + amplitude_yaw_dumbbell + total_accel_dumbbell  
+  
  var_accel_dumbbell + avg_roll_dumbbell + stddev_roll_dumbbell +  
  var_roll_dumbbell + avg_pitch_dumbbell + stddev_pitch_dumbbell +  
  var_pitch_dumbbell + avg_yaw_dumbbell + stddev_yaw_dumbbell +  
  var_yaw_dumbbell + gyros_dumbbell_x + gyros_dumbbell_y +  
  gyros_dumbbell_z + accel_dumbbell_x + accel_dumbbell_y +  
  accel_dumbbell_z + magnet_dumbbell_x + magnet_dumbbell_y +  
  magnet_dumbbell_z + roll_forearm + pitch_forearm + yaw_forearm +  
  kurtosis_roll_forearm + kurtosis_pitch_forearm + kurtosis_yaw_forearm +  
  skewness_roll_forearm + skewness_pitch_forearm + skewness_yaw_forearm +  
  max_roll_forearm + max_pitch_forearm + max_yaw_forearm +  
  min_roll_forearm + min_pitch_forearm + amplitude_roll_forearm +  
  amplitude_yaw_forearm + total_accel_forearm + var_accel_forearm +  
  avg_roll_forearm + stddev_roll_forearm + var_roll_forearm +  
  avg_pitch_forearm + stddev_pitch_forearm + var_pitch_forearm +  
  avg_yaw_forearm + stddev_yaw_forearm + var_yaw_forearm +  
  gyros_forearm_x + gyros_forearm_y + gyros_forearm_z + accel_forearm_x +  
  accel_forearm_y + accel_forearm_z + magnet_forearm_x + magnet_forearm_y +  
  magnet_forearm_z
```

Step: AIC=290

```
classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +  
  cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +  
  yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
```



```

kurtosis_yaw_belt + skewness_roll_belt + skewness_roll_belt.1 +
skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +
amplitude_pitch_belt + amplitude_yaw_belt + var_total_accel_belt +
avg_roll_belt + stddev_roll_belt + var_roll_belt + avg_pitch_belt +
stddev_pitch_belt + var_pitch_belt + avg_yaw_belt + stddev_yaw_belt +
var_yaw_belt + gyros_belt_x + gyros_belt_y + gyros_belt_z +
accel_belt_x + accel_belt_y + accel_belt_z + magnet_belt_x +
magnet_belt_y + magnet_belt_z + roll_arm + pitch_arm + yaw_arm +
total_accel_arm + var_accel_arm + avg_roll_arm + stddev_roll_arm +
var_roll_arm + avg_pitch_arm + stddev_pitch_arm + var_pitch_arm +
avg_yaw_arm + stddev_yaw_arm + var_yaw_arm + gyros_arm_x +
gyros_arm_y + gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z +
magnet_arm_x + magnet_arm_y + magnet_arm_z + kurtosis_roll_arm +
kurtosis_pitch_arm + kurtosis_yaw_arm + skewness_roll_arm +
skewness_pitch_arm + skewness_yaw_arm + max_roll_arm + max_pitch_arm +
max_yaw_arm + min_roll_arm + min_pitch_arm + min_yaw_arm +
amplitude_roll_arm + amplitude_pitch_arm + amplitude_yaw_arm +
roll_dumbbell + pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
kurtosis_pitch_dumbbell + kurtosis_yaw_dumbbell + skewness_roll_dumbbell
+
skewness_pitch_dumbbell + skewness_yaw_dumbbell + max_roll_dumbbell +
max_pitch_dumbbell + max_yaw_dumbbell + min_roll_dumbbell +
min_pitch_dumbbell + min_yaw_dumbbell + amplitude_roll_dumbbell +
amplitude_pitch_dumbbell + amplitude_yaw_dumbbell + total_accel_dumbbell
+
var_accel_dumbbell + avg_roll_dumbbell + stddev_roll_dumbbell +
var_roll_dumbbell + avg_pitch_dumbbell + stddev_pitch_dumbbell +
var_pitch_dumbbell + avg_yaw_dumbbell + stddev_yaw_dumbbell +
var_yaw_dumbbell + gyros_dumbbell_x + gyros_dumbbell_y +
gyros_dumbbell_z + accel_dumbbell_x + accel_dumbbell_y +
accel_dumbbell_z + magnet_dumbbell_x + magnet_dumbbell_y +
magnet_dumbbell_z + roll_forearm + pitch_forearm + yaw_forearm +
kurtosis_roll_forearm + kurtosis_pitch_forearm + kurtosis_yaw_forearm +
skewness_roll_forearm + skewness_pitch_forearm + max_roll_forearm +
max_pitch_forearm + max_yaw_forearm + min_roll_forearm +
min_pitch_forearm + amplitude_roll_forearm + amplitude_yaw_forearm +
total_accel_forearm + var_accel_forearm + avg_roll_forearm +
stddev_roll_forearm + var_roll_forearm + avg_pitch_forearm +
stddev_pitch_forearm + var_pitch_forearm + avg_yaw_forearm +
stddev_yaw_forearm + var_yaw_forearm + gyros_forearm_x +
gyros_forearm_y + gyros_forearm_z + accel_forearm_x + accel_forearm_y +
accel_forearm_z + magnet_forearm_x + magnet_forearm_y + magnet_forearm_z

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Step: AIC=290

```

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
kurtosis_yaw_belt + skewness_roll_belt + skewness_roll_belt.1 +
skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +
amplitude_pitch_belt + amplitude_yaw_belt + var_total_accel_belt +
avg_roll_belt + stddev_roll_belt + var_roll_belt + avg_pitch_belt +
stddev_pitch_belt + var_pitch_belt + avg_yaw_belt + stddev_yaw_belt +
var_yaw_belt + gyros_belt_x + gyros_belt_y + gyros_belt_z +
accel_belt_x + accel_belt_y + accel_belt_z + magnet_belt_x +

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magnet_belt_y + magnet_belt_z + roll_arm + pitch_arm + yaw_arm +
total_accel_arm + var_accel_arm + avg_roll_arm + stddev_roll_arm +
var_roll_arm + avg_pitch_arm + stddev_pitch_arm + var_pitch_arm +
avg_yaw_arm + stddev_yaw_arm + var_yaw_arm + gyros_arm_x +
gyros_arm_y + gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z +
magnet_arm_x + magnet_arm_y + magnet_arm_z + kurtosis_roll_arm +
kurtosis_pitch_arm + kurtosis_yaw_arm + skewness_roll_arm +
skewness_pitch_arm + skewness_yaw_arm + max_roll_arm + max_pitch_arm +
max_yaw_arm + min_roll_arm + min_pitch_arm + min_yaw_arm +
amplitude_roll_arm + amplitude_pitch_arm + amplitude_yaw_arm +
roll_dumbbell + pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
kurtosis_pitch_dumbbell + kurtosis_yaw_dumbbell + skewness_roll_dumbbell
+
skewness_pitch_dumbbell + skewness_yaw_dumbbell + max_roll_dumbbell +
max_pitch_dumbbell + max_yaw_dumbbell + min_roll_dumbbell +
min_pitch_dumbbell + min_yaw_dumbbell + amplitude_roll_dumbbell +
amplitude_pitch_dumbbell + amplitude_yaw_dumbbell + total_accel_dumbbell
+
var_accel_dumbbell + avg_roll_dumbbell + stddev_roll_dumbbell +
var_roll_dumbbell + avg_pitch_dumbbell + stddev_pitch_dumbbell +
var_pitch_dumbbell + avg_yaw_dumbbell + stddev_yaw_dumbbell +
var_yaw_dumbbell + gyros_dumbbell_x + gyros_dumbbell_y +
gyros_dumbbell_z + accel_dumbbell_x + accel_dumbbell_y +
accel_dumbbell_z + magnet_dumbbell_x + magnet_dumbbell_y +
magnet_dumbbell_z + roll_forearm + pitch_forearm + yaw_forearm +
kurtosis_roll_forearm + kurtosis_pitch_forearm + skewness_roll_forearm +
skewness_pitch_forearm + max_roll_forearm + max_pitch_forearm +
max_yaw_forearm + min_roll_forearm + min_pitch_forearm +
amplitude_roll_forearm + amplitude_yaw_forearm + total_accel_forearm +
var_accel_forearm + avg_roll_forearm + stddev_roll_forearm +
var_roll_forearm + avg_pitch_forearm + stddev_pitch_forearm +
var_pitch_forearm + avg_yaw_forearm + stddev_yaw_forearm +
var_yaw_forearm + gyros_forearm_x + gyros_forearm_y + gyros_forearm_z +
accel_forearm_x + accel_forearm_y + accel_forearm_z + magnet_forearm_x +
magnet_forearm_y + magnet_forearm_z

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Step: AIC=290

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classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
kurtosis_yaw_belt + skewness_roll_belt + skewness_roll_belt.1 +
skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +
amplitude_pitch_belt + amplitude_yaw_belt + var_total_accel_belt +
avg_roll_belt + stddev_roll_belt + var_roll_belt + avg_pitch_belt +
stddev_pitch_belt + var_pitch_belt + avg_yaw_belt + stddev_yaw_belt +
var_yaw_belt + gyros_belt_x + gyros_belt_y + gyros_belt_z +
accel_belt_x + accel_belt_y + accel_belt_z + magnet_belt_x +
magnet_belt_y + magnet_belt_z + roll_arm + pitch_arm + yaw_arm +
total_accel_arm + var_accel_arm + avg_roll_arm + stddev_roll_arm +
var_roll_arm + avg_pitch_arm + stddev_pitch_arm + var_pitch_arm +
avg_yaw_arm + stddev_yaw_arm + var_yaw_arm + gyros_arm_x +
gyros_arm_y + gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z +
magnet_arm_x + magnet_arm_y + magnet_arm_z + kurtosis_roll_arm +
kurtosis_pitch_arm + kurtosis_yaw_arm + skewness_roll_arm +
skewness_pitch_arm + skewness_yaw_arm + max_roll_arm + max_pitch_arm +

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max_yaw_arm + min_roll_arm + min_pitch_arm + min_yaw_arm +
amplitude_roll_arm + amplitude_pitch_arm + amplitude_yaw_arm +
roll_dumbbell + pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
kurtosis_pitch_dumbbell + kurtosis_yaw_dumbbell + skewness_roll_dumbbell
+
skewness_pitch_dumbbell + skewness_yaw_dumbbell + max_roll_dumbbell +
max_pitch_dumbbell + max_yaw_dumbbell + min_roll_dumbbell +
min_pitch_dumbbell + min_yaw_dumbbell + amplitude_roll_dumbbell +
amplitude_pitch_dumbbell + total_accel_dumbbell + var_accel_dumbbell +
avg_roll_dumbbell + stddev_roll_dumbbell + var_roll_dumbbell +
avg_pitch_dumbbell + stddev_pitch_dumbbell + var_pitch_dumbbell +
avg_yaw_dumbbell + stddev_yaw_dumbbell + var_yaw_dumbbell +
gyros_dumbbell_x + gyros_dumbbell_y + gyros_dumbbell_z +
accel_dumbbell_x + accel_dumbbell_y + accel_dumbbell_z +
magnet_dumbbell_x + magnet_dumbbell_y + magnet_dumbbell_z +
roll_forearm + pitch_forearm + yaw_forearm + kurtosis_roll_forearm +
kurtosis_pitch_forearm + skewness_roll_forearm + skewness_pitch_forearm +
max_roll_forearm + max_pitch_forearm + max_yaw_forearm +
min_roll_forearm + min_pitch_forearm + amplitude_roll_forearm +
amplitude_yaw_forearm + total_accel_forearm + var_accel_forearm +
avg_roll_forearm + stddev_roll_forearm + var_roll_forearm +
avg_pitch_forearm + stddev_pitch_forearm + var_pitch_forearm +
avg_yaw_forearm + stddev_yaw_forearm + var_yaw_forearm +
gyros_forearm_x + gyros_forearm_y + gyros_forearm_z + accel_forearm_x +
accel_forearm_y + accel_forearm_z + magnet_forearm_x + magnet_forearm_y +
magnet_forearm_z

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Step: AIC=290

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classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
kurtosis_yaw_belt + skewness_roll_belt + skewness_roll_belt.1 +
skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +
amplitude_pitch_belt + amplitude_yaw_belt + var_total_accel_belt +
avg_roll_belt + stddev_roll_belt + var_roll_belt + avg_pitch_belt +
stddev_pitch_belt + var_pitch_belt + avg_yaw_belt + stddev_yaw_belt +
var_yaw_belt + gyros_belt_x + gyros_belt_y + gyros_belt_z +
accel_belt_x + accel_belt_y + accel_belt_z + magnet_belt_x +
magnet_belt_y + magnet_belt_z + roll_arm + pitch_arm + yaw_arm +
total_accel_arm + var_accel_arm + avg_roll_arm + stddev_roll_arm +
var_roll_arm + avg_pitch_arm + stddev_pitch_arm + var_pitch_arm +
avg_yaw_arm + stddev_yaw_arm + var_yaw_arm + gyros_arm_x +
gyros_arm_y + gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z +
magnet_arm_x + magnet_arm_y + magnet_arm_z + kurtosis_roll_arm +
kurtosis_pitch_arm + kurtosis_yaw_arm + skewness_roll_arm +
skewness_pitch_arm + skewness_yaw_arm + max_roll_arm + max_pitch_arm +
max_yaw_arm + min_roll_arm + min_pitch_arm + min_yaw_arm +
amplitude_roll_arm + amplitude_pitch_arm + amplitude_yaw_arm +
roll_dumbbell + pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
kurtosis_pitch_dumbbell + kurtosis_yaw_dumbbell + skewness_roll_dumbbell
+
skewness_pitch_dumbbell + skewness_yaw_dumbbell + max_roll_dumbbell +
max_pitch_dumbbell + max_yaw_dumbbell + min_roll_dumbbell +
min_pitch_dumbbell + amplitude_roll_dumbbell + amplitude_pitch_dumbbell +
total_accel_dumbbell + var_accel_dumbbell + avg_roll_dumbbell +

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stddev_roll_dumbbell + var_roll_dumbbell + avg_pitch_dumbbell +
 stddev_pitch_dumbbell + var_pitch_dumbbell + avg_yaw_dumbbell +
 stddev_yaw_dumbbell + var_yaw_dumbbell + gyros_dumbbell_x +
 gyros_dumbbell_y + gyros_dumbbell_z + accel_dumbbell_x +
 accel_dumbbell_y + accel_dumbbell_z + magnet_dumbbell_x +
 magnet_dumbbell_y + magnet_dumbbell_z + roll_forearm + pitch_forearm +
 yaw_forearm + kurtosis_roll_forearm + kurtosis_pitch_forearm +
 skewness_roll_forearm + skewness_pitch_forearm + max_roll_forearm +
 max_pitch_forearm + max_yaw_forearm + min_roll_forearm +
 min_pitch_forearm + amplitude_roll_forearm + amplitude_yaw_forearm +
 total_accel_forearm + var_accel_forearm + avg_roll_forearm +
 stddev_roll_forearm + var_roll_forearm + avg_pitch_forearm +
 stddev_pitch_forearm + var_pitch_forearm + avg_yaw_forearm +
 stddev_yaw_forearm + var_yaw_forearm + gyros_forearm_x +
 gyros_forearm_y + gyros_forearm_z + accel_forearm_x + accel_forearm_y +
 accel_forearm_z + magnet_forearm_x + magnet_forearm_y + magnet_forearm_z

Step: AIC=290

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
 cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
 yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
 kurtosis_yaw_belt + skewness_roll_belt + skewness_roll_belt.1 +
 skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
 min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +
 amplitude_pitch_belt + amplitude_yaw_belt + var_total_accel_belt +
 avg_roll_belt + stddev_roll_belt + var_roll_belt + avg_pitch_belt +
 stddev_pitch_belt + var_pitch_belt + avg_yaw_belt + stddev_yaw_belt +
 var_yaw_belt + gyros_belt_x + gyros_belt_y + gyros_belt_z +
 accel_belt_x + accel_belt_y + accel_belt_z + magnet_belt_x +
 magnet_belt_y + magnet_belt_z + roll_arm + pitch_arm + yaw_arm +
 total_accel_arm + var_accel_arm + avg_roll_arm + stddev_roll_arm +
 var_roll_arm + avg_pitch_arm + stddev_pitch_arm + var_pitch_arm +
 avg_yaw_arm + stddev_yaw_arm + var_yaw_arm + gyros_arm_x +
 gyros_arm_y + gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z +
 magnet_arm_x + magnet_arm_y + magnet_arm_z + kurtosis_roll_arm +
 kurtosis_pitch_arm + kurtosis_yaw_arm + skewness_roll_arm +
 skewness_pitch_arm + skewness_yaw_arm + max_roll_arm + max_pitch_arm +
 max_yaw_arm + min_roll_arm + min_pitch_arm + min_yaw_arm +
 amplitude_roll_arm + amplitude_pitch_arm + amplitude_yaw_arm +
 roll_dumbbell + pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
 kurtosis_pitch_dumbbell + kurtosis_yaw_dumbbell + skewness_roll_dumbbell
 +
 skewness_pitch_dumbbell + max_roll_dumbbell + max_pitch_dumbbell +
 max_yaw_dumbbell + min_roll_dumbbell + min_pitch_dumbbell +
 amplitude_roll_dumbbell + amplitude_pitch_dumbbell + total_accel_dumbbell
 +
 var_accel_dumbbell + avg_roll_dumbbell + stddev_roll_dumbbell +
 var_roll_dumbbell + avg_pitch_dumbbell + stddev_pitch_dumbbell +
 var_pitch_dumbbell + avg_yaw_dumbbell + stddev_yaw_dumbbell +
 var_yaw_dumbbell + gyros_dumbbell_x + gyros_dumbbell_y +
 gyros_dumbbell_z + accel_dumbbell_x + accel_dumbbell_y +
 accel_dumbbell_z + magnet_dumbbell_x + magnet_dumbbell_y +
 magnet_dumbbell_z + roll_forearm + pitch_forearm + yaw_forearm +
 kurtosis_roll_forearm + kurtosis_pitch_forearm + skewness_roll_forearm +
 skewness_pitch_forearm + max_roll_forearm + max_pitch_forearm +
 max_yaw_forearm + min_roll_forearm + min_pitch_forearm +

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amplitude_roll_forearm + amplitude_yaw_forearm + total_accel_forearm +
var_accel_forearm + avg_roll_forearm + stddev_roll_forearm +
var_roll_forearm + avg_pitch_forearm + stddev_pitch_forearm +
var_pitch_forearm + avg_yaw_forearm + stddev_yaw_forearm +
var_yaw_forearm + gyros_forearm_x + gyros_forearm_y + gyros_forearm_z +
accel_forearm_x + accel_forearm_y + accel_forearm_z + magnet_forearm_x +
magnet_forearm_y + magnet_forearm_z

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Step: AIC=290

```

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
kurtosis_yaw_belt + skewness_roll_belt + skewness_pitch_belt +
skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +
amplitude_pitch_belt + amplitude_yaw_belt + var_total_accel_belt +
avg_roll_belt + stddev_roll_belt + var_roll_belt + avg_pitch_belt +
stddev_pitch_belt + var_pitch_belt + avg_yaw_belt + stddev_yaw_belt +
var_yaw_belt + gyros_belt_x + gyros_belt_y + gyros_belt_z +
accel_belt_x + accel_belt_y + accel_belt_z + magnet_belt_x +
magnet_belt_y + magnet_belt_z + roll_arm + pitch_arm + yaw_arm +
total_accel_arm + var_accel_arm + avg_roll_arm + stddev_roll_arm +
var_roll_arm + avg_pitch_arm + stddev_pitch_arm + var_pitch_arm +
avg_yaw_arm + stddev_yaw_arm + var_yaw_arm + gyros_arm_x +
gyros_arm_y + gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z +
magnet_arm_x + magnet_arm_y + magnet_arm_z + kurtosis_roll_arm +
kurtosis_pitch_arm + kurtosis_yaw_arm + skewness_roll_arm +
skewness_pitch_arm + skewness_yaw_arm + max_roll_arm + max_pitch_arm +
max_yaw_arm + min_roll_arm + min_pitch_arm + min_yaw_arm +
amplitude_roll_arm + amplitude_pitch_arm + amplitude_yaw_arm +
roll_dumbbell + pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
kurtosis_pitch_dumbbell + skewness_roll_dumbbell + skewness_pitch_dumbbell
1 +
max_roll_dumbbell + max_pitch_dumbbell + max_yaw_dumbbell +
min_roll_dumbbell + min_pitch_dumbbell + amplitude_roll_dumbbell +
amplitude_pitch_dumbbell + total_accel_dumbbell + var_accel_dumbbell +
avg_roll_dumbbell + stddev_roll_dumbbell + var_roll_dumbbell +
avg_pitch_dumbbell + stddev_pitch_dumbbell + var_pitch_dumbbell +
avg_yaw_dumbbell + stddev_yaw_dumbbell + var_yaw_dumbbell +
gyros_dumbbell_x + gyros_dumbbell_y + gyros_dumbbell_z +
accel_dumbbell_x + accel_dumbbell_y + accel_dumbbell_z +
magnet_dumbbell_x + magnet_dumbbell_y + magnet_dumbbell_z +
roll_forearm + pitch_forearm + yaw_forearm + kurtosis_roll_forearm +
kurtosis_pitch_forearm + skewness_roll_forearm + skewness_pitch_forearm +
max_roll_forearm + max_pitch_forearm + max_yaw_forearm +
min_roll_forearm + min_pitch_forearm + amplitude_roll_forearm +
amplitude_yaw_forearm + total_accel_forearm + var_accel_forearm +
avg_roll_forearm + stddev_roll_forearm + var_roll_forearm +
avg_pitch_forearm + stddev_pitch_forearm + var_pitch_forearm +
avg_yaw_forearm + stddev_yaw_forearm + var_yaw_forearm +
gyros_forearm_x + gyros_forearm_y + gyros_forearm_z + accel_forearm_x +
accel_forearm_y + accel_forearm_z + magnet_forearm_x + magnet_forearm_y +
magnet_forearm_z

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Step: AIC=290

```

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
  cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
  yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
  kurtosis_yaw_belt + skewness_roll_belt + skewness_pitch_belt +
  skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
  min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +
  amplitude_pitch_belt + amplitude_yaw_belt + var_total_accel_belt +
  avg_roll_belt + stddev_roll_belt + var_roll_belt + avg_pitch_belt +
  stddev_pitch_belt + var_pitch_belt + avg_yaw_belt + stddev_yaw_belt +
  var_yaw_belt + gyros_belt_x + gyros_belt_y + gyros_belt_z +
  accel_belt_x + accel_belt_y + accel_belt_z + magnet_belt_x +
  magnet_belt_y + magnet_belt_z + roll_arm + pitch_arm + yaw_arm +
  total_accel_arm + var_accel_arm + avg_roll_arm + stddev_roll_arm +
  var_roll_arm + avg_pitch_arm + stddev_pitch_arm + var_pitch_arm +
  avg_yaw_arm + stddev_yaw_arm + var_yaw_arm + gyros_arm_x +
  gyros_arm_y + gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z +
  magnet_arm_x + magnet_arm_y + magnet_arm_z + kurtosis_roll_arm +
  kurtosis_pitch_arm + kurtosis_yaw_arm + skewness_roll_arm +
  skewness_pitch_arm + skewness_yaw_arm + max_roll_arm + max_pitch_arm +
  max_yaw_arm + min_roll_arm + min_pitch_arm + min_yaw_arm +
  amplitude_roll_arm + amplitude_pitch_arm + roll_dumbbell +
  pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
  kurtosis_pitch_dumbbell + skewness_roll_dumbbell + skewness_pitch_dumbbell
1 +
  max_roll_dumbbell + max_pitch_dumbbell + max_yaw_dumbbell +
  min_roll_dumbbell + min_pitch_dumbbell + amplitude_roll_dumbbell +
  amplitude_pitch_dumbbell + total_accel_dumbbell + var_accel_dumbbell +
  avg_roll_dumbbell + stddev_roll_dumbbell + var_roll_dumbbell +
  avg_pitch_dumbbell + stddev_pitch_dumbbell + var_pitch_dumbbell +
  avg_yaw_dumbbell + stddev_yaw_dumbbell + var_yaw_dumbbell +
  gyros_dumbbell_x + gyros_dumbbell_y + gyros_dumbbell_z +
  accel_dumbbell_x + accel_dumbbell_y + accel_dumbbell_z +
  magnet_dumbbell_x + magnet_dumbbell_y + magnet_dumbbell_z +
  roll_forearm + pitch_forearm + yaw_forearm + kurtosis_roll_forearm +
  kurtosis_pitch_forearm + skewness_roll_forearm + skewness_pitch_forearm +
  max_roll_forearm + max_pitch_forearm + max_yaw_forearm +
  min_roll_forearm + min_pitch_forearm + amplitude_roll_forearm +
  amplitude_yaw_forearm + total_accel_forearm + var_accel_forearm +
  avg_roll_forearm + stddev_roll_forearm + var_roll_forearm +
  avg_pitch_forearm + stddev_pitch_forearm + var_pitch_forearm +
  avg_yaw_forearm + stddev_yaw_forearm + var_yaw_forearm +
  gyros_forearm_x + gyros_forearm_y + gyros_forearm_z + accel_forearm_x +
  accel_forearm_y + accel_forearm_z + magnet_forearm_x + magnet_forearm_y +
  magnet_forearm_z

```

Step: AIC=290

```

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
  cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
  yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
  kurtosis_yaw_belt + skewness_roll_belt + skewness_pitch_belt +
  skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
  min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +
  amplitude_pitch_belt + var_total_accel_belt + avg_roll_belt +
  stddev_roll_belt + var_roll_belt + avg_pitch_belt + stddev_pitch_belt +
  var_pitch_belt + avg_yaw_belt + stddev_yaw_belt + var_yaw_belt +
  gyros_belt_x + gyros_belt_y + gyros_belt_z + accel_belt_x +

```

```

accel_belt_y + accel_belt_z + magnet_belt_x + magnet_belt_y +
magnet_belt_z + roll_arm + pitch_arm + yaw_arm + total_accel_arm +
var_accel_arm + avg_roll_arm + stddev_roll_arm + var_roll_arm +
avg_pitch_arm + stddev_pitch_arm + var_pitch_arm + avg_yaw_arm +
stddev_yaw_arm + var_yaw_arm + gyros_arm_x + gyros_arm_y +
gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z + magnet_arm_x +
magnet_arm_y + magnet_arm_z + kurtosis_roll_arm + kurtosis_pitch_arm +
kurtosis_yaw_arm + skewness_roll_arm + skewness_pitch_arm +
skewness_yaw_arm + max_roll_arm + max_pitch_arm + max_yaw_arm +
min_roll_arm + min_pitch_arm + min_yaw_arm + amplitude_roll_arm +
amplitude_pitch_arm + roll_dumbbell + pitch_dumbbell + yaw_dumbbell +
kurtosis_roll_dumbbell + kurtosis_pitch_dumbbell + skewness_roll_dumbbell
+
skewness_pitch_dumbbell + max_roll_dumbbell + max_pitch_dumbbell +
max_yaw_dumbbell + min_roll_dumbbell + min_pitch_dumbbell +
amplitude_roll_dumbbell + amplitude_pitch_dumbbell + total_accel_dumbbell
+
var_accel_dumbbell + avg_roll_dumbbell + stddev_roll_dumbbell +
var_roll_dumbbell + avg_pitch_dumbbell + stddev_pitch_dumbbell +
var_pitch_dumbbell + avg_yaw_dumbbell + stddev_yaw_dumbbell +
var_yaw_dumbbell + gyros_dumbbell_x + gyros_dumbbell_y +
gyros_dumbbell_z + accel_dumbbell_x + accel_dumbbell_y +
accel_dumbbell_z + magnet_dumbbell_x + magnet_dumbbell_y +
magnet_dumbbell_z + roll_forearm + pitch_forearm + yaw_forearm +
kurtosis_roll_forearm + kurtosis_pitch_forearm + skewness_roll_forearm +
skewness_pitch_forearm + max_roll_forearm + max_pitch_forearm +
max_yaw_forearm + min_roll_forearm + min_pitch_forearm +
amplitude_roll_forearm + amplitude_yaw_forearm + total_accel_forearm +
var_accel_forearm + avg_roll_forearm + stddev_roll_forearm +
var_roll_forearm + avg_pitch_forearm + stddev_pitch_forearm +
var_pitch_forearm + avg_yaw_forearm + stddev_yaw_forearm +
var_yaw_forearm + gyros_forearm_x + gyros_forearm_y + gyros_forearm_z +
accel_forearm_x + accel_forearm_y + accel_forearm_z + magnet_forearm_x +
magnet_forearm_y + magnet_forearm_z

```

Step: AIC=290

```

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
kurtosis_yaw_belt + skewness_roll_belt + skewness_roll_belt.1 +
skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
min_roll_belt + min_pitch_belt + min_yaw_belt + amplitude_roll_belt +
var_total_accel_belt + avg_roll_belt + stddev_roll_belt +
var_roll_belt + avg_pitch_belt + stddev_pitch_belt + var_pitch_belt +
avg_yaw_belt + stddev_yaw_belt + var_yaw_belt + gyros_belt_x +
gyros_belt_y + gyros_belt_z + accel_belt_x + accel_belt_y +
accel_belt_z + magnet_belt_x + magnet_belt_y + magnet_belt_z +
roll_arm + pitch_arm + yaw_arm + total_accel_arm + var_accel_arm +
avg_roll_arm + stddev_roll_arm + var_roll_arm + avg_pitch_arm +
stddev_pitch_arm + var_pitch_arm + avg_yaw_arm + stddev_yaw_arm +
var_yaw_arm + gyros_arm_x + gyros_arm_y + gyros_arm_z + accel_arm_x +
accel_arm_y + accel_arm_z + magnet_arm_x + magnet_arm_y +
magnet_arm_z + kurtosis_roll_arm + kurtosis_pitch_arm + kurtosis_yaw_arm
+
skewness_roll_arm + skewness_pitch_arm + skewness_yaw_arm +
max_roll_arm + max_pitch_arm + max_yaw_arm + min_roll_arm +

```

```

min_pitch_arm + min_yaw_arm + amplitude_roll_arm + amplitude_pitch_arm +
roll_dumbbell + pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
kurtosis_pitch_dumbbell + skewness_roll_dumbbell + skewness_pitch_dumbbell
1 +
max_roll_dumbbell + max_pitch_dumbbell + max_yaw_dumbbell +
min_roll_dumbbell + min_pitch_dumbbell + amplitude_roll_dumbbell +
amplitude_pitch_dumbbell + total_accel_dumbbell + var_accel_dumbbell +
avg_roll_dumbbell + stddev_roll_dumbbell + var_roll_dumbbell +
avg_pitch_dumbbell + stddev_pitch_dumbbell + var_pitch_dumbbell +
avg_yaw_dumbbell + stddev_yaw_dumbbell + var_yaw_dumbbell +
gyros_dumbbell_x + gyros_dumbbell_y + gyros_dumbbell_z +
accel_dumbbell_x + accel_dumbbell_y + accel_dumbbell_z +
magnet_dumbbell_x + magnet_dumbbell_y + magnet_dumbbell_z +
roll_forearm + pitch_forearm + yaw_forearm + kurtosis_roll_forearm +
kurtosis_pitch_forearm + skewness_roll_forearm + skewness_pitch_forearm +
max_roll_forearm + max_pitch_forearm + max_yaw_forearm +
min_roll_forearm + min_pitch_forearm + amplitude_roll_forearm +
amplitude_yaw_forearm + total_accel_forearm + var_accel_forearm +
avg_roll_forearm + stddev_roll_forearm + var_roll_forearm +
avg_pitch_forearm + stddev_pitch_forearm + var_pitch_forearm +
avg_yaw_forearm + stddev_yaw_forearm + var_yaw_forearm +
gyros_forearm_x + gyros_forearm_y + gyros_forearm_z + accel_forearm_x +
accel_forearm_y + accel_forearm_z + magnet_forearm_x + magnet_forearm_y +
magnet_forearm_z

```

Step: AIC=290

```

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
yaw_belt + total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
kurtosis_yaw_belt + skewness_roll_belt + skewness_pitch_belt +
skewness_yaw_belt + max_roll_belt + max_pitch_belt + max_yaw_belt +
min_roll_belt + min_pitch_belt + amplitude_roll_belt + var_total_accel_belt
1t +
avg_roll_belt + stddev_roll_belt + var_roll_belt + avg_pitch_belt +
stddev_pitch_belt + var_pitch_belt + avg_yaw_belt + stddev_yaw_belt +
var_yaw_belt + gyros_belt_x + gyros_belt_y + gyros_belt_z +
accel_belt_x + accel_belt_y + accel_belt_z + magnet_belt_x +
magnet_belt_y + magnet_belt_z + roll_arm + pitch_arm + yaw_arm +
total_accel_arm + var_accel_arm + avg_roll_arm + stddev_roll_arm +
var_roll_arm + avg_pitch_arm + stddev_pitch_arm + var_pitch_arm +
avg_yaw_arm + stddev_yaw_arm + var_yaw_arm + gyros_arm_x +
gyros_arm_y + gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z +
magnet_arm_x + magnet_arm_y + magnet_arm_z + kurtosis_roll_arm +
kurtosis_pitch_arm + kurtosis_yaw_arm + skewness_roll_arm +
skewness_pitch_arm + skewness_yaw_arm + max_roll_arm + max_pitch_arm +
max_yaw_arm + min_roll_arm + min_pitch_arm + min_yaw_arm +
amplitude_roll_arm + amplitude_pitch_arm + roll_dumbbell +
pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
kurtosis_pitch_dumbbell + skewness_roll_dumbbell + skewness_pitch_dumbbell
1 +
max_roll_dumbbell + max_pitch_dumbbell + max_yaw_dumbbell +
min_roll_dumbbell + min_pitch_dumbbell + amplitude_roll_dumbbell +
amplitude_pitch_dumbbell + total_accel_dumbbell + var_accel_dumbbell +
avg_roll_dumbbell + stddev_roll_dumbbell + var_roll_dumbbell +
avg_pitch_dumbbell + stddev_pitch_dumbbell + var_pitch_dumbbell +
avg_yaw_dumbbell + stddev_yaw_dumbbell + var_yaw_dumbbell +

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gyros_dumbbell_x + gyros_dumbbell_y + gyros_dumbbell_z +
 accel_dumbbell_x + accel_dumbbell_y + accel_dumbbell_z +
 magnet_dumbbell_x + magnet_dumbbell_y + magnet_dumbbell_z +
 roll_forearm + pitch_forearm + yaw_forearm + kurtosis_roll_forearm +
 kurtosis_pitch_forearm + skewness_roll_forearm + skewness_pitch_forearm +
 max_roll_forearm + max_pitch_forearm + max_yaw_forearm +
 min_roll_forearm + min_pitch_forearm + amplitude_roll_forearm +
 amplitude_yaw_forearm + total_accel_forearm + var_accel_forearm +
 avg_roll_forearm + stddev_roll_forearm + var_roll_forearm +
 avg_pitch_forearm + stddev_pitch_forearm + var_pitch_forearm +
 avg_yaw_forearm + stddev_yaw_forearm + var_yaw_forearm +
 gyros_forearm_x + gyros_forearm_y + gyros_forearm_z + accel_forearm_x +
 accel_forearm_y + accel_forearm_z + magnet_forearm_x + magnet_forearm_y +
 magnet_forearm_z

```

- cvtd_timestamp          1 3.4004e-07 288
- accel_belt_y            1 3.4021e-07 288
- accel_dumbbell_x        1 3.4092e-07 288
- raw_timestamp_part_2    1 3.4122e-07 288
- accel_forearm_y         1 3.4157e-07 288
- magnet_belt_z           1 3.4178e-07 288
- accel_forearm_x         1 3.4188e-07 288
- pitch_dumbbell          1 3.4196e-07 288
- gyros_forearm_y         1 3.4250e-07 288
- gyros_belt_y            1 3.4270e-07 288
- raw_timestamp_part_1    1 3.4273e-07 288
- pitch_forearm           1 3.4273e-07 288
- roll_dumbbell           1 3.4287e-07 288
- accel_forearm_z         1 3.4324e-07 288
- accel_arm_x             1 3.4466e-07 288
- gyros_forearm_z         1 3.4786e-07 288
- accel_arm_z             1 3.5030e-07 288
- magnet_forearm_x        1 3.5500e-07 288
- magnet_forearm_z        1 3.6029e-07 288
- magnet_arm_y            1 3.6940e-07 288
- accel_arm_y             1 3.7901e-07 288
- pitch_arm               1 4.1144e-07 288
- num_window              1 5.9629e-07 288
- pitch_belt              1 1.0195e-06 288
<none>                    3.3492e-07 290
  
```

Step: AIC=288

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
 cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
 total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
 skewness_roll_belt + skewness_roll_belt.1 + max_roll_belt +
 max_pitch_belt + max_yaw_belt + min_roll_belt + min_pitch_belt +
 amplitude_roll_belt + var_total_accel_belt + avg_roll_belt +
 stddev_roll_belt + var_roll_belt + avg_pitch_belt + stddev_pitch_belt +
 var_pitch_belt + avg_yaw_belt + stddev_yaw_belt + var_yaw_belt +
 gyros_belt_x + gyros_belt_y + gyros_belt_z + accel_belt_x +
 accel_belt_y + accel_belt_z + magnet_belt_x + magnet_belt_y +
 magnet_belt_z + roll_arm + pitch_arm + yaw_arm + total_accel_arm +
 var_accel_arm + avg_roll_arm + stddev_roll_arm + var_roll_arm +

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avg_pitch_arm + stddev_pitch_arm + var_pitch_arm + avg_yaw_arm +
stddev_yaw_arm + var_yaw_arm + gyros_arm_x + gyros_arm_y +
gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z + magnet_arm_x +
magnet_arm_y + magnet_arm_z + kurtosis_roll_arm + kurtosis_pitch_arm +
kurtosis_yaw_arm + skewness_roll_arm + skewness_pitch_arm +
skewness_yaw_arm + max_roll_arm + max_pitch_arm + max_yaw_arm +
min_roll_arm + min_pitch_arm + min_yaw_arm + amplitude_roll_arm +
amplitude_pitch_arm + roll_dumbbell + pitch_dumbbell + yaw_dumbbell +
kurtosis_roll_dumbbell + kurtosis_pitch_dumbbell + skewness_roll_dumbbell
+
skewness_pitch_dumbbell + max_roll_dumbbell + max_pitch_dumbbell +
max_yaw_dumbbell + min_roll_dumbbell + min_pitch_dumbbell +
amplitude_roll_dumbbell + amplitude_pitch_dumbbell + total_accel_dumbbell
+
var_accel_dumbbell + avg_roll_dumbbell + stddev_roll_dumbbell +
var_roll_dumbbell + avg_pitch_dumbbell + stddev_pitch_dumbbell +
var_pitch_dumbbell + avg_yaw_dumbbell + stddev_yaw_dumbbell +
var_yaw_dumbbell + gyros_dumbbell_x + gyros_dumbbell_y +
gyros_dumbbell_z + accel_dumbbell_x + accel_dumbbell_y +
accel_dumbbell_z + magnet_dumbbell_x + magnet_dumbbell_y +
magnet_dumbbell_z + roll_forearm + pitch_forearm + yaw_forearm +
kurtosis_roll_forearm + kurtosis_pitch_forearm + skewness_roll_forearm +
skewness_pitch_forearm + max_roll_forearm + max_pitch_forearm +
max_yaw_forearm + min_roll_forearm + min_pitch_forearm +
amplitude_roll_forearm + amplitude_yaw_forearm + total_accel_forearm +
var_accel_forearm + avg_roll_forearm + stddev_roll_forearm +
var_roll_forearm + avg_pitch_forearm + stddev_pitch_forearm +
var_pitch_forearm + avg_yaw_forearm + stddev_yaw_forearm +
var_yaw_forearm + gyros_forearm_x + gyros_forearm_y + gyros_forearm_z +
accel_forearm_x + accel_forearm_y + accel_forearm_z + magnet_forearm_x +
magnet_forearm_y + magnet_forearm_z

```

	Df	Deviance	AIC
- roll_forearm	1	3.3393e-07	286
- kurtosis_pitch_arm	1	3.3418e-07	286
- var_yaw_dumbbell	1	3.3420e-07	286
- var_roll_dumbbell	1	3.3420e-07	286
- kurtosis_roll_dumbbell	1	3.3420e-07	286
- max_yaw_dumbbell	1	3.3420e-07	286
- stddev_roll_dumbbell	1	3.3420e-07	286
- stddev_yaw_dumbbell	1	3.3420e-07	286
- skewness_roll_forearm	1	3.3420e-07	286
- var_pitch_dumbbell	1	3.3421e-07	286
- var_yaw_arm	1	3.3421e-07	286
- avg_roll_belt	1	3.3421e-07	286
- avg_roll_dumbbell	1	3.3421e-07	286
- avg_roll_arm	1	3.3421e-07	286
- amplitude_roll_arm	1	3.3422e-07	286
- min_roll_arm	1	3.3422e-07	286
- max_roll_arm	1	3.3422e-07	286
- avg_pitch_forearm	1	3.3422e-07	286
- skewness_roll_arm	1	3.3422e-07	286
- var_roll_belt	1	3.3422e-07	286
- skewness_pitch_forearm	1	3.3423e-07	286
- stddev_roll_belt	1	3.3423e-07	286
- stddev_pitch_dumbbell	1	3.3423e-07	286
- skewness_roll_belt.1	1	3.3423e-07	286

- kurtosis_roll_forearm	1	3.3423e-07	286
- skewness_pitch_dumbbell	1	3.3424e-07	286
- min_roll_belt	1	3.3424e-07	286
- max_yaw_forearm	1	3.3424e-07	286
- max_roll_belt	1	3.3424e-07	286
- max_pitch_belt	1	3.3424e-07	286
- kurtosis_pitch_belt	1	3.3424e-07	286
- max_pitch_arm	1	3.3424e-07	286
- avg_yaw_belt	1	3.3424e-07	286
- min_pitch_arm	1	3.3424e-07	286
- amplitude_pitch_arm	1	3.3424e-07	286
- avg_pitch_arm	1	3.3424e-07	286
- gyros_dumbbell_y	1	3.3424e-07	286
- var_yaw_belt	1	3.3424e-07	286
- kurtosis_yaw_arm	1	3.3425e-07	286
- max_yaw_belt	1	3.3425e-07	286
- kurtosis_roll_belt	1	3.3425e-07	286
- skewness_yaw_arm	1	3.3425e-07	286
- kurtosis_pitch_dumbbell	1	3.3425e-07	286
- stddev_pitch_arm	1	3.3425e-07	286
- skewness_pitch_arm	1	3.3425e-07	286
- amplitude_roll_belt	1	3.3426e-07	286
- max_pitch_forearm	1	3.3426e-07	286
- amplitude_pitch_dumbbell	1	3.3426e-07	286
- var_roll_arm	1	3.3426e-07	286
- min_pitch_dumbbell	1	3.3426e-07	286
- max_pitch_dumbbell	1	3.3426e-07	286
- stddev_yaw_forearm	1	3.3426e-07	286
- avg_pitch_belt	1	3.3427e-07	286
- kurtosis_pitch_forearm	1	3.3427e-07	286
- skewness_roll_dumbbell	1	3.3427e-07	286
- var_total_accel_belt	1	3.3427e-07	286
- new_window	1	3.3427e-07	286
- avg_yaw_forearm	1	3.3427e-07	286
- avg_roll_forearm	1	3.3427e-07	286
- stddev_yaw_arm	1	3.3428e-07	286
- var_pitch_arm	1	3.3428e-07	286
- var_yaw_forearm	1	3.3428e-07	286
- skewness_roll_belt	1	3.3428e-07	286
- stddev_yaw_belt	1	3.3428e-07	286
- avg_yaw_dumbbell	1	3.3428e-07	286
- stddev_roll_arm	1	3.3429e-07	286
- var_accel_forearm	1	3.3429e-07	286
- var_accel_dumbbell	1	3.3429e-07	286
- min_pitch_belt	1	3.3430e-07	286
- magnet_dumbbell_y	1	3.3430e-07	286
- stddev_roll_forearm	1	3.3430e-07	286
- var_roll_forearm	1	3.3431e-07	286
- avg_pitch_dumbbell	1	3.3431e-07	286
- amplitude_roll_dumbbell	1	3.3431e-07	286
- min_roll_dumbbell	1	3.3431e-07	286
- max_roll_dumbbell	1	3.3431e-07	286
- amplitude_yaw_forearm	1	3.3432e-07	286
- max_yaw_arm	1	3.3432e-07	286
- stddev_pitch_belt	1	3.3433e-07	286
- kurtosis_roll_arm	1	3.3433e-07	286
- var_pitch_belt	1	3.3434e-07	286

- avg_yaw_arm	1	3.3436e-07	286
- var_accel_arm	1	3.3436e-07	286
- min_pitch_forearm	1	3.3437e-07	286
- var_pitch_forearm	1	3.3438e-07	286
- magnet_dumbbell_z	1	3.3439e-07	286
- min_yaw_arm	1	3.3440e-07	286
- min_roll_forearm	1	3.3442e-07	286
- max_roll_forearm	1	3.3443e-07	286
- yaw_arm	1	3.3443e-07	286
- amplitude_roll_forearm	1	3.3443e-07	286
- stddev_pitch_forearm	1	3.3444e-07	286
- gyros_belt_x	1	3.3456e-07	286
- accel_belt_z	1	3.3461e-07	286
- gyros_dumbbell_x	1	3.3509e-07	286
- magnet_dumbbell_x	1	3.3511e-07	286
- gyros_forearm_x	1	3.3533e-07	286
- yaw_forearm	1	3.3547e-07	286
- accel_belt_x	1	3.3562e-07	286
- total_accel_arm	1	3.3582e-07	286
- magnet_belt_y	1	3.3606e-07	286
- gyros_dumbbell_z	1	3.3609e-07	286
- gyros_arm_y	1	3.3614e-07	286
- gyros_belt_z	1	3.3621e-07	286
- roll_arm	1	3.3625e-07	286
- magnet_forearm_y	1	3.3636e-07	286
- yaw_dumbbell	1	3.3649e-07	286
- gyros_arm_x	1	3.3658e-07	286
- accel_dumbbell_z	1	3.3697e-07	286
- total_accel_forearm	1	3.3718e-07	286
- accel_dumbbell_y	1	3.3734e-07	286
- magnet_arm_z	1	3.3734e-07	286
- magnet_arm_x	1	3.3763e-07	286
- user_name	1	3.3774e-07	286
- gyros_arm_z	1	3.3788e-07	286
- magnet_belt_x	1	3.3798e-07	286
- roll_belt	1	3.3844e-07	286
- total_accel_belt	1	3.3895e-07	286
- cvtd_timestamp	1	3.3940e-07	286
- accel_belt_y	1	3.3987e-07	286
- pitch_belt	1	3.3988e-07	286
- total_accel_dumbbell	1	3.4029e-07	286
- raw_timestamp_part_2	1	3.4090e-07	286
- accel_dumbbell_x	1	3.4192e-07	286
- magnet_belt_z	1	3.4210e-07	286
- gyros_belt_y	1	3.4214e-07	286
- accel_forearm_x	1	3.4216e-07	286
- accel_forearm_y	1	3.4217e-07	286
- raw_timestamp_part_1	1	3.4253e-07	286
- accel_forearm_z	1	3.4264e-07	286
- roll_dumbbell	1	3.4268e-07	286
- pitch_dumbbell	1	3.4269e-07	286
- pitch_forearm	1	3.4316e-07	286
- gyros_forearm_y	1	3.4329e-07	286
- accel_arm_x	1	3.4429e-07	286
- gyros_forearm_z	1	3.4816e-07	286
- accel_arm_z	1	3.5009e-07	286
- magnet_forearm_x	1	3.5557e-07	286

- magnet_forearm_z	1	3.5892e-07	286
- magnet_arm_y	1	3.7165e-07	286
- accel_arm_y	1	3.8108e-07	286
- pitch_arm	1	4.1084e-07	286
- num_window	1	5.9675e-07	286
<none>		3.3424e-07	288

Step: AIC=286

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classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
  cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
  total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
  skewness_roll_belt + skewness_roll_belt.1 + max_roll_belt +
  max_pitch_belt + max_yaw_belt + min_roll_belt + min_pitch_belt +
  amplitude_roll_belt + var_total_accel_belt + avg_roll_belt +
  stddev_roll_belt + var_roll_belt + avg_pitch_belt + stddev_pitch_belt +
  var_pitch_belt + avg_yaw_belt + stddev_yaw_belt + var_yaw_belt +
  gyros_belt_x + gyros_belt_y + gyros_belt_z + accel_belt_x +
  accel_belt_y + accel_belt_z + magnet_belt_x + magnet_belt_y +
  magnet_belt_z + roll_arm + pitch_arm + yaw_arm + total_accel_arm +
  var_accel_arm + avg_roll_arm + stddev_roll_arm + var_roll_arm +
  avg_pitch_arm + stddev_pitch_arm + var_pitch_arm + avg_yaw_arm +
  stddev_yaw_arm + var_yaw_arm + gyros_arm_x + gyros_arm_y +
  gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z + magnet_arm_x +
  magnet_arm_y + magnet_arm_z + kurtosis_roll_arm + kurtosis_pitch_arm +
  kurtosis_yaw_arm + skewness_roll_arm + skewness_pitch_arm +
  skewness_yaw_arm + max_roll_arm + max_pitch_arm + max_yaw_arm +
  min_roll_arm + min_pitch_arm + min_yaw_arm + amplitude_roll_arm +
  amplitude_pitch_arm + roll_dumbbell + pitch_dumbbell + yaw_dumbbell +
  kurtosis_roll_dumbbell + kurtosis_pitch_dumbbell + skewness_roll_dumbbell
+
  skewness_pitch_dumbbell + max_roll_dumbbell + max_pitch_dumbbell +
  max_yaw_dumbbell + min_roll_dumbbell + min_pitch_dumbbell +
  amplitude_roll_dumbbell + amplitude_pitch_dumbbell + total_accel_dumbbell
+
  var_accel_dumbbell + avg_roll_dumbbell + stddev_roll_dumbbell +
  var_roll_dumbbell + avg_pitch_dumbbell + stddev_pitch_dumbbell +
  var_pitch_dumbbell + avg_yaw_dumbbell + stddev_yaw_dumbbell +
  var_yaw_dumbbell + gyros_dumbbell_x + gyros_dumbbell_y +
  gyros_dumbbell_z + accel_dumbbell_x + accel_dumbbell_y +
  accel_dumbbell_z + magnet_dumbbell_x + magnet_dumbbell_y +
  magnet_dumbbell_z + pitch_forearm + yaw_forearm + kurtosis_roll_forearm +
  kurtosis_pitch_forearm + skewness_roll_forearm + skewness_pitch_forearm +
  max_roll_forearm + max_pitch_forearm + max_yaw_forearm +
  min_roll_forearm + min_pitch_forearm + amplitude_roll_forearm +
  amplitude_yaw_forearm + total_accel_forearm + var_accel_forearm +
  avg_roll_forearm + stddev_roll_forearm + var_roll_forearm +
  avg_pitch_forearm + stddev_pitch_forearm + var_pitch_forearm +
  avg_yaw_forearm + stddev_yaw_forearm + var_yaw_forearm +
  gyros_forearm_x + gyros_forearm_y + gyros_forearm_z + accel_forearm_x +
  accel_forearm_y + accel_forearm_z + magnet_forearm_x + magnet_forearm_y +
  magnet_forearm_z

```

	Df	Deviance	AIC
- kurtosis_pitch_arm	1	3.3388e-07	284
- var_yaw_dumbbell	1	3.3388e-07	284
- avg_roll_dumbbell	1	3.3389e-07	284
- stddev_yaw_dumbbell	1	3.3390e-07	284

- max_yaw_dumbbell	1	3.3390e-07	284
- skewness_pitch_forearm	1	3.3390e-07	284
- kurtosis_roll_dumbbell	1	3.3390e-07	284
- var_roll_dumbbell	1	3.3391e-07	284
- skewness_roll_forearm	1	3.3391e-07	284
- var_yaw_arm	1	3.3391e-07	284
- stddev_roll_dumbbell	1	3.3391e-07	284
- avg_roll_arm	1	3.3392e-07	284
- var_pitch_dumbbell	1	3.3392e-07	284
- amplitude_roll_arm	1	3.3392e-07	284
- min_roll_arm	1	3.3392e-07	284
- max_roll_arm	1	3.3392e-07	284
- avg_pitch_forearm	1	3.3392e-07	284
- avg_roll_belt	1	3.3393e-07	284
- skewness_roll_arm	1	3.3393e-07	284
- magnet_dumbbell_y	1	3.3393e-07	284
- var_roll_belt	1	3.3393e-07	284
- stddev_pitch_dumbbell	1	3.3393e-07	284
- max_pitch_arm	1	3.3393e-07	284
- min_pitch_arm	1	3.3393e-07	284
- amplitude_pitch_arm	1	3.3393e-07	284
- avg_yaw_belt	1	3.3393e-07	284
- max_roll_belt	1	3.3394e-07	284
- min_roll_belt	1	3.3394e-07	284
- var_yaw_belt	1	3.3394e-07	284
- stddev_roll_belt	1	3.3394e-07	284
- kurtosis_roll_forearm	1	3.3394e-07	284
- max_yaw_forearm	1	3.3394e-07	284
- max_pitch_belt	1	3.3394e-07	284
- skewness_roll_belt.1	1	3.3394e-07	284
- skewness_yaw_arm	1	3.3394e-07	284
- kurtosis_pitch_belt	1	3.3395e-07	284
- skewness_pitch_dumbbell	1	3.3395e-07	284
- avg_pitch_arm	1	3.3395e-07	284
- kurtosis_pitch_dumbbell	1	3.3395e-07	284
- max_pitch_forearm	1	3.3395e-07	284
- amplitude_roll_belt	1	3.3395e-07	284
- kurtosis_yaw_arm	1	3.3395e-07	284
- kurtosis_pitch_forearm	1	3.3395e-07	284
- max_yaw_belt	1	3.3396e-07	284
- kurtosis_roll_belt	1	3.3396e-07	284
- stddev_pitch_arm	1	3.3396e-07	284
- amplitude_pitch_dumbbell	1	3.3396e-07	284
- stddev_yaw_forearm	1	3.3396e-07	284
- min_pitch_dumbbell	1	3.3396e-07	284
- var_roll_arm	1	3.3396e-07	284
- max_pitch_dumbbell	1	3.3396e-07	284
- skewness_pitch_arm	1	3.3396e-07	284
- avg_pitch_belt	1	3.3397e-07	284
- stddev_yaw_arm	1	3.3397e-07	284
- var_pitch_arm	1	3.3397e-07	284
- new_window	1	3.3397e-07	284
- var_accel_forearm	1	3.3397e-07	284
- skewness_roll_dumbbell	1	3.3397e-07	284
- avg_yaw_forearm	1	3.3397e-07	284
- var_total_accel_belt	1	3.3398e-07	284
- var_yaw_forearm	1	3.3398e-07	284

- avg_yaw_dumbbell	1	3.3398e-07	284
- avg_roll_forearm	1	3.3398e-07	284
- skewness_roll_belt	1	3.3398e-07	284
- var_accel_dumbbell	1	3.3399e-07	284
- stddev_roll_arm	1	3.3399e-07	284
- stddev_yaw_belt	1	3.3399e-07	284
- stddev_roll_forearm	1	3.3399e-07	284
- min_pitch_belt	1	3.3400e-07	284
- var_roll_forearm	1	3.3400e-07	284
- gyros_dumbbell_y	1	3.3400e-07	284
- avg_pitch_dumbbell	1	3.3401e-07	284
- max_yaw_arm	1	3.3401e-07	284
- amplitude_roll_dumbbell	1	3.3401e-07	284
- min_roll_dumbbell	1	3.3401e-07	284
- max_roll_dumbbell	1	3.3401e-07	284
- amplitude_yaw_forearm	1	3.3401e-07	284
- stddev_pitch_belt	1	3.3403e-07	284
- kurtosis_roll_arm	1	3.3404e-07	284
- var_pitch_belt	1	3.3405e-07	284
- var_accel_arm	1	3.3406e-07	284
- avg_yaw_arm	1	3.3406e-07	284
- min_pitch_forearm	1	3.3407e-07	284
- var_pitch_forearm	1	3.3407e-07	284
- magnet_dumbbell_z	1	3.3408e-07	284
- min_yaw_arm	1	3.3408e-07	284
- gyros_belt_x	1	3.3411e-07	284
- min_roll_forearm	1	3.3412e-07	284
- max_roll_forearm	1	3.3412e-07	284
- amplitude_roll_forearm	1	3.3412e-07	284
- stddev_pitch_forearm	1	3.3413e-07	284
- yaw_arm	1	3.3430e-07	284
- accel_belt_z	1	3.3441e-07	284
- gyros_dumbbell_x	1	3.3482e-07	284
- accel_belt_x	1	3.3524e-07	284
- magnet_dumbbell_x	1	3.3536e-07	284
- total_accel_arm	1	3.3539e-07	284
- gyros_dumbbell_z	1	3.3542e-07	284
- gyros_belt_z	1	3.3576e-07	284
- magnet_belt_y	1	3.3581e-07	284
- gyros_forearm_x	1	3.3585e-07	284
- magnet_forearm_y	1	3.3595e-07	284
- gyros_arm_x	1	3.3598e-07	284
- yaw_forearm	1	3.3612e-07	284
- yaw_dumbbell	1	3.3613e-07	284
- roll_arm	1	3.3620e-07	284
- gyros_arm_y	1	3.3626e-07	284
- magnet_arm_z	1	3.3651e-07	284
- accel_dumbbell_z	1	3.3669e-07	284
- roll_belt	1	3.3682e-07	284
- accel_dumbbell_y	1	3.3707e-07	284
- magnet_arm_x	1	3.3730e-07	284
- total_accel_forearm	1	3.3731e-07	284
- user_name	1	3.3779e-07	284
- gyros_arm_z	1	3.3821e-07	284
- total_accel_belt	1	3.3882e-07	284
- magnet_belt_x	1	3.3895e-07	284
- pitch_belt	1	3.3927e-07	284

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- cvtd_timestamp          1 3.3937e-07 284
- accel_belt_y            1 3.3955e-07 284
- total_accel_dumbbell    1 3.4013e-07 284
- gyros_belt_y            1 3.4196e-07 284
- roll_dumbbell           1 3.4208e-07 284
- accel_dumbbell_x        1 3.4213e-07 284
- accel_forearm_x         1 3.4219e-07 284
- raw_timestamp_part_2    1 3.4238e-07 284
- raw_timestamp_part_1    1 3.4245e-07 284
- accel_forearm_y         1 3.4264e-07 284
- magnet_belt_z           1 3.4299e-07 284
- pitch_dumbbell          1 3.4299e-07 284
- gyros_forearm_y         1 3.4304e-07 284
- pitch_forearm           1 3.4345e-07 284
- accel_forearm_z         1 3.4411e-07 284
- accel_arm_x             1 3.4426e-07 284
- gyros_forearm_z         1 3.4803e-07 284
- accel_arm_z             1 3.5000e-07 284
- magnet_forearm_x        1 3.5696e-07 284
- magnet_forearm_z        1 3.6194e-07 284
- magnet_arm_y            1 3.7411e-07 284
- accel_arm_y             1 3.8271e-07 284
- pitch_arm               1 4.1200e-07 284
- num_window              1 6.0541e-07 284
<none>                   3.3393e-07 286

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Step: AIC=284

```

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
  cvtd_timestamp + new_window + num_window + roll_belt + pitch_belt +
  total_accel_belt + kurtosis_roll_belt + kurtosis_pitch_belt +
  skewness_roll_belt + skewness_roll_belt.1 + max_roll_belt +
  max_pitch_belt + max_yaw_belt + min_roll_belt + min_pitch_belt +
  amplitude_roll_belt + var_total_accel_belt + avg_roll_belt +
  stddev_roll_belt + var_roll_belt + avg_pitch_belt + stddev_pitch_belt +
  var_pitch_belt + avg_yaw_belt + stddev_yaw_belt + var_yaw_belt +
  gyros_belt_x + gyros_belt_y + gyros_belt_z + accel_belt_x +
  accel_belt_y + accel_belt_z + magnet_belt_x + magnet_belt_y +
  magnet_belt_z + roll_arm + pitch_arm + yaw_arm + total_accel_arm +
  var_accel_arm + avg_roll_arm + stddev_roll_arm + var_roll_arm +
  avg_pitch_arm + stddev_pitch_arm + var_pitch_arm + avg_yaw_arm +
  stddev_yaw_arm + var_yaw_arm + gyros_arm_x + gyros_arm_y +
  gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z + magnet_arm_x +
  magnet_arm_y + magnet_arm_z + kurtosis_roll_arm + kurtosis_yaw_arm +
  skewness_roll_arm + skewness_pitch_arm + skewness_yaw_arm +
  max_roll_arm + max_pitch_arm + max_yaw_arm + min_roll_arm +
  min_pitch_arm + min_yaw_arm + amplitude_roll_arm + amplitude_pitch_arm +
  roll_dumbbell + pitch_dumbbell + yaw_dumbbell + kurtosis_roll_dumbbell +
  kurtosis_pitch_dumbbell + skewness_roll_dumbbell + skewness_pitch_dumbbell
1 +
  max_roll_dumbbell + max_pitch_dumbbell + max_yaw_dumbbell +
  min_roll_dumbbell + min_pitch_dumbbell + amplitude_roll_dumbbell +
  amplitude_pitch_dumbbell + total_accel_dumbbell + var_accel_dumbbell +
  avg_roll_dumbbell + stddev_roll_dumbbell + var_roll_dumbbell +
  avg_pitch_dumbbell + stddev_pitch_dumbbell + var_pitch_dumbbell +
  avg_yaw_dumbbell + stddev_yaw_dumbbell + var_yaw_dumbbell +
  gyros_dumbbell_x + gyros_dumbbell_y + gyros_dumbbell_z +
  accel_dumbbell_x + accel_dumbbell_y + accel_dumbbell_z +

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magnet_dumbbell_x + magnet_dumbbell_y + magnet_dumbbell_z +
 pitch_forearm + yaw_forearm + kurtosis_roll_forearm + kurtosis_pitch_forearm +
 skewness_roll_forearm + skewness_pitch_forearm + max_roll_forearm +
 max_pitch_forearm + max_yaw_forearm + min_roll_forearm +
 min_pitch_forearm + amplitude_roll_forearm + amplitude_yaw_forearm +
 total_accel_forearm + var_accel_forearm + avg_roll_forearm +
 stddev_roll_forearm + var_roll_forearm + avg_pitch_forearm +
 stddev_pitch_forearm + var_pitch_forearm + avg_yaw_forearm +
 stddev_yaw_forearm + var_yaw_forearm + gyros_forearm_x +
 gyros_forearm_y + gyros_forearm_z + accel_forearm_x + accel_forearm_y +
 accel_forearm_z + magnet_forearm_x + magnet_forearm_y + magnet_forearm_z

	Df	Deviance	AIC
- var_yaw_dumbbell	1	3.3384e-07	282
- var_roll_dumbbell	1	3.3385e-07	282
- avg_roll_dumbbell	1	3.3385e-07	282
- avg_pitch_forearm	1	3.3386e-07	282
- avg_yaw_belt	1	3.3387e-07	282
- var_pitch_dumbbell	1	3.3387e-07	282
- max_pitch_arm	1	3.3387e-07	282
- min_pitch_arm	1	3.3387e-07	282
- amplitude_pitch_arm	1	3.3387e-07	282
- magnet_dumbbell_y	1	3.3387e-07	282
- stddev_pitch_dumbbell	1	3.3387e-07	282
- stddev_roll_dumbbell	1	3.3387e-07	282
- avg_roll_belt	1	3.3388e-07	282
- var_yaw_belt	1	3.3388e-07	282
- skewness_pitch_forearm	1	3.3388e-07	282
- max_pitch_belt	1	3.3388e-07	282
- var_yaw_arm	1	3.3388e-07	282
- amplitude_pitch_dumbbell	1	3.3388e-07	282
- skewness_roll_arm	1	3.3389e-07	282
- min_pitch_dumbbell	1	3.3389e-07	282
- max_pitch_dumbbell	1	3.3389e-07	282
- max_pitch_forearm	1	3.3389e-07	282
- max_roll_belt	1	3.3389e-07	282
- min_roll_belt	1	3.3389e-07	282
- var_roll_belt	1	3.3389e-07	282
- kurtosis_pitch_dumbbell	1	3.3389e-07	282
- max_yaw_dumbbell	1	3.3390e-07	282
- kurtosis_roll_dumbbell	1	3.3390e-07	282
- stddev_yaw_dumbbell	1	3.3390e-07	282
- skewness_yaw_arm	1	3.3390e-07	282
- skewness_roll_forearm	1	3.3390e-07	282
- max_yaw_belt	1	3.3390e-07	282
- kurtosis_roll_belt	1	3.3390e-07	282
- amplitude_roll_belt	1	3.3390e-07	282
- stddev_yaw_forearm	1	3.3390e-07	282
- var_roll_arm	1	3.3391e-07	282
- avg_roll_arm	1	3.3391e-07	282
- stddev_roll_belt	1	3.3391e-07	282
- kurtosis_yaw_arm	1	3.3391e-07	282
- avg_pitch_arm	1	3.3392e-07	282
- kurtosis_roll_forearm	1	3.3392e-07	282
- skewness_pitch_dumbbell	1	3.3392e-07	282
- stddev_yaw_arm	1	3.3392e-07	282

- max_yaw_forearm	1	3.3392e-07	282
- kurtosis_picth_forearm	1	3.3392e-07	282
- var_accel_dumbbell	1	3.3393e-07	282
- avg_yaw_forearm	1	3.3393e-07	282
- skewness_roll_belt.1	1	3.3393e-07	282
- stddev_roll_forearm	1	3.3394e-07	282
- stddev_yaw_belt	1	3.3394e-07	282
- avg_roll_forearm	1	3.3394e-07	282
- var_roll_forearm	1	3.3394e-07	282
- gyros_dumbbell_y	1	3.3394e-07	282
- var_pitch_arm	1	3.3394e-07	282
- stddev_pitch_arm	1	3.3395e-07	282
- kurtosis_picth_belt	1	3.3395e-07	282
- var_yaw_forearm	1	3.3396e-07	282
- amplitude_roll_dumbbell	1	3.3396e-07	282
- min_roll_dumbbell	1	3.3396e-07	282
- max_roll_dumbbell	1	3.3396e-07	282
- skewness_roll_belt	1	3.3396e-07	282
- skewness_roll_dumbbell	1	3.3397e-07	282
- max_yaw_arm	1	3.3397e-07	282
- avg_pitch_dumbbell	1	3.3397e-07	282
- amplitude_yaw_forearm	1	3.3397e-07	282
- min_pitch_belt	1	3.3397e-07	282
- avg_yaw_dumbbell	1	3.3397e-07	282
- new_window	1	3.3399e-07	282
- skewness_pitch_arm	1	3.3399e-07	282
- avg_pitch_belt	1	3.3399e-07	282
- var_pitch_belt	1	3.3400e-07	282
- stddev_pitch_belt	1	3.3402e-07	282
- magnet_dumbbell_z	1	3.3402e-07	282
- min_yaw_arm	1	3.3403e-07	282
- avg_yaw_arm	1	3.3404e-07	282
- min_pitch_forearm	1	3.3404e-07	282
- var_pitch_forearm	1	3.3405e-07	282
- gyros_belt_x	1	3.3406e-07	282
- var_accel_arm	1	3.3407e-07	282
- stddev_pitch_forearm	1	3.3411e-07	282
- yaw_arm	1	3.3425e-07	282
- var_accel_forearm	1	3.3428e-07	282
- accel_belt_z	1	3.3435e-07	282
- min_roll_forearm	1	3.3435e-07	282
- max_roll_forearm	1	3.3443e-07	282
- amplitude_roll_forearm	1	3.3470e-07	282
- gyros_dumbbell_x	1	3.3476e-07	282
- accel_belt_x	1	3.3518e-07	282
- magnet_dumbbell_x	1	3.3530e-07	282
- total_accel_arm	1	3.3533e-07	282
- gyros_dumbbell_z	1	3.3538e-07	282
- var_total_accel_belt	1	3.3561e-07	282
- gyros_belt_z	1	3.3571e-07	282
- magnet_belt_y	1	3.3576e-07	282
- gyros_forearm_x	1	3.3582e-07	282
- magnet_forearm_y	1	3.3590e-07	282
- gyros_arm_x	1	3.3595e-07	282
- yaw_forearm	1	3.3606e-07	282
- yaw_dumbbell	1	3.3606e-07	282
- roll_arm	1	3.3616e-07	282

- gyros_arm_y	1	3.3623e-07	282
- roll_belt	1	3.3642e-07	282
- magnet_arm_z	1	3.3645e-07	282
- accel_dumbbell_z	1	3.3661e-07	282
- accel_dumbbell_y	1	3.3700e-07	282
- total_accel_forearm	1	3.3726e-07	282
- magnet_arm_x	1	3.3727e-07	282
- user_name	1	3.3775e-07	282
- gyros_arm_z	1	3.3821e-07	282
- total_accel_belt	1	3.3876e-07	282
- magnet_belt_x	1	3.3890e-07	282
- pitch_belt	1	3.3923e-07	282
- cvtd_timestamp	1	3.3931e-07	282
- accel_belt_y	1	3.3949e-07	282
- total_accel_dumbbell	1	3.4009e-07	282
- kurtosis_roll_arm	1	3.4040e-07	282
- gyros_belt_y	1	3.4193e-07	282
- roll_dumbbell	1	3.4200e-07	282
- accel_dumbbell_x	1	3.4209e-07	282
- accel_forearm_x	1	3.4215e-07	282
- raw_timestamp_part_2	1	3.4233e-07	282
- raw_timestamp_part_1	1	3.4244e-07	282
- accel_forearm_y	1	3.4256e-07	282
- magnet_belt_z	1	3.4289e-07	282
- pitch_dumbbell	1	3.4293e-07	282
- gyros_forearm_y	1	3.4300e-07	282
- pitch_forearm	1	3.4343e-07	282
- accel_forearm_z	1	3.4409e-07	282
- accel_arm_x	1	3.4420e-07	282
- gyros_forearm_z	1	3.4797e-07	282
- accel_arm_z	1	3.4996e-07	282
- magnet_forearm_x	1	3.5690e-07	282
- magnet_forearm_z	1	3.6191e-07	282
- amplitude_roll_arm	1	3.7097e-07	282
- magnet_arm_y	1	3.7403e-07	282
- accel_arm_y	1	3.8267e-07	282
- min_roll_arm	1	3.8518e-07	282
- pitch_arm	1	4.1200e-07	282
- max_roll_arm	1	4.8987e-07	282
- num_window	1	6.0541e-07	282
- stddev_roll_arm	1	6.7660e-07	282
<none>		3.3388e-07	284

- raw_timestamp_part_2	1	0.00	66.00
- user_name	1	0.00	66.00
- pitch_forearm	1	0.00	66.00
- magnet_arm_x	1	0.00	66.00
- accel_forearm_z	1	0.00	66.00
- total_accel_arm	1	0.00	66.00
- accel_arm_x	1	0.00	66.00
- total_accel_belt	1	0.00	66.00
- pitch_dumbbell	1	0.00	66.00
- roll_belt	1	0.00	66.00
- accel_arm_z	1	0.00	66.00
- accel_dumbbell_x	1	0.00	66.00
- magnet_belt_z	1	0.00	66.00
- magnet_dumbbell_x	1	0.00	66.00

- gyros_arm_z	1	0.00	66.00
- accel_forearm_y	1	0.00	66.00
- total_accel_dumbbell	1	0.00	66.00
- accel_forearm_x	1	0.00	66.00
- magnet_forearm_x	1	0.00	66.00
- gyros_forearm_z	1	0.00	66.00
- magnet_forearm_z	1	0.00	66.00
- raw_timestamp_part_1	1	0.00	66.00
- gyros_forearm_y	1	0.00	66.00
- pitch_arm	1	0.00	66.00
- accel_arm_y	1	0.00	66.00
- magnet_arm_y	1	0.00	66.00
<none>		0.00	68.00
- num_window	1	364.03	430.03

Step: AIC=66

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
 num_window + roll_belt + pitch_belt + total_accel_belt +
 accel_belt_y + magnet_belt_x + magnet_belt_z + pitch_arm +
 total_accel_arm + gyros_arm_z + accel_arm_x + accel_arm_y +
 accel_arm_z + magnet_arm_x + magnet_arm_y + roll_dumbbell +
 pitch_dumbbell + total_accel_dumbbell + gyros_dumbbell_z +
 accel_dumbbell_x + magnet_dumbbell_x + pitch_forearm + gyros_forearm_y +
 gyros_forearm_z + accel_forearm_x + accel_forearm_y + accel_forearm_z +
 magnet_forearm_x + magnet_forearm_z

	Df	Deviance	AIC
- accel_belt_y	1	0.00	64.00
- raw_timestamp_part_2	1	0.00	64.00
- roll_dumbbell	1	0.00	64.00
- magnet_belt_x	1	0.00	64.00
- pitch_belt	1	0.00	64.00
- user_name	1	0.00	64.00
- pitch_forearm	1	0.00	64.00
- accel_forearm_z	1	0.00	64.00
- magnet_arm_x	1	0.00	64.00
- accel_arm_x	1	0.00	64.00
- total_accel_arm	1	0.00	64.00
- gyros_dumbbell_z	1	0.00	64.00
- pitch_dumbbell	1	0.00	64.00
- total_accel_belt	1	0.00	64.00
- roll_belt	1	0.00	64.00
- magnet_belt_z	1	0.00	64.00
- accel_dumbbell_x	1	0.00	64.00
- accel_arm_z	1	0.00	64.00
- magnet_dumbbell_x	1	0.00	64.00
- total_accel_dumbbell	1	0.00	64.00
- accel_forearm_y	1	0.00	64.00
- accel_forearm_x	1	0.00	64.00
- magnet_forearm_x	1	0.00	64.00
- gyros_arm_z	1	0.00	64.00
- gyros_forearm_z	1	0.00	64.00
- raw_timestamp_part_1	1	0.00	64.00
- magnet_forearm_z	1	0.00	64.00
- gyros_forearm_y	1	0.00	64.00
- pitch_arm	1	0.00	64.00
- accel_arm_y	1	0.00	64.00

- magnet_arm_y	1	0.00	64.00
<none>		0.00	66.00
- num_window	1	364.24	428.24

Step: AIC=64

```

classe ~ user_name + raw_timestamp_part_1 + raw_timestamp_part_2 +
  num_window + roll_belt + pitch_belt + total_accel_belt +
  magnet_belt_x + magnet_belt_z + pitch_arm + total_accel_arm +
  gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z + magnet_arm_x +
  magnet_arm_y + roll_dumbbell + pitch_dumbbell + total_accel_dumbbell +
  gyros_dumbbell_z + accel_dumbbell_x + magnet_dumbbell_x +
  pitch_forearm + gyros_forearm_y + gyros_forearm_z + accel_forearm_x +
  accel_forearm_y + accel_forearm_z + magnet_forearm_x + magnet_forearm_z

```

	Df	Deviance	AIC
- raw_timestamp_part_2	1	0.00	62.00
- magnet_belt_x	1	0.00	62.00
- roll_dumbbell	1	0.00	62.00
- pitch_belt	1	0.00	62.00
- pitch_forearm	1	0.00	62.00
- user_name	1	0.00	62.00
- accel_arm_x	1	0.00	62.00
- magnet_arm_x	1	0.00	62.00
- total_accel_arm	1	0.00	62.00
- accel_forearm_z	1	0.00	62.00
- total_accel_belt	1	0.00	62.00
- pitch_dumbbell	1	0.00	62.00
- gyros_dumbbell_z	1	0.00	62.00
- roll_belt	1	0.00	62.00
- magnet_belt_z	1	0.00	62.00
- accel_arm_z	1	0.00	62.00
- total_accel_dumbbell	1	0.00	62.00
- accel_dumbbell_x	1	0.00	62.00
- accel_forearm_y	1	0.00	62.00
- accel_forearm_x	1	0.00	62.00
- magnet_dumbbell_x	1	0.00	62.00
- magnet_forearm_x	1	0.00	62.00
- gyros_arm_z	1	0.00	62.00
- gyros_forearm_z	1	0.00	62.00
- raw_timestamp_part_1	1	0.00	62.00
- magnet_forearm_z	1	0.00	62.00
- gyros_forearm_y	1	0.00	62.00
- pitch_arm	1	0.00	62.00
- accel_arm_y	1	0.00	62.00
- magnet_arm_y	1	0.00	62.00
<none>		0.00	64.00
- num_window	1	379.83	441.83

Step: AIC=62

```

classe ~ user_name + raw_timestamp_part_1 + num_window + roll_belt +
  pitch_belt + total_accel_belt + magnet_belt_x + magnet_belt_z +
  pitch_arm + total_accel_arm + gyros_arm_z + accel_arm_x +
  accel_arm_y + accel_arm_z + magnet_arm_x + magnet_arm_y +
  roll_dumbbell + pitch_dumbbell + total_accel_dumbbell + gyros_dumbbell_z
+
  accel_dumbbell_x + magnet_dumbbell_x + pitch_forearm + gyros_forearm_y +
  gyros_forearm_z + accel_forearm_x + accel_forearm_y + accel_forearm_z +

```

magnet_forearm_x + magnet_forearm_z

	Df	Deviance	AIC
- pitch_belt	1	0.0	60.0
- roll_dumbbell	1	0.0	60.0
- user_name	1	0.0	60.0
- magnet_belt_x	1	0.0	60.0
- pitch_forearm	1	0.0	60.0
- total_accel_belt	1	0.0	60.0
- magnet_arm_x	1	0.0	60.0
- accel_forearm_z	1	0.0	60.0
- pitch_dumbbell	1	0.0	60.0
- accel_arm_x	1	0.0	60.0
- total_accel_arm	1	0.0	60.0
- roll_belt	1	0.0	60.0
- magnet_belt_z	1	0.0	60.0
- total_accel_dumbbell	1	0.0	60.0
- accel_dumbbell_x	1	0.0	60.0
- gyros_dumbbell_z	1	0.0	60.0
- accel_arm_z	1	0.0	60.0
- magnet_dumbbell_x	1	0.0	60.0
- magnet_forearm_x	1	0.0	60.0
- accel_forearm_x	1	0.0	60.0
- gyros_arm_z	1	0.0	60.0
- accel_forearm_y	1	0.0	60.0
- raw_timestamp_part_1	1	0.0	60.0
- gyros_forearm_z	1	0.0	60.0
- magnet_forearm_z	1	0.0	60.0
- gyros_forearm_y	1	0.0	60.0
- pitch_arm	1	0.0	60.0
- accel_arm_y	1	0.0	60.0
- magnet_arm_y	1	0.0	60.0
<none>		0.0	62.0
- num_window	1	384.5	444.5

Step: AIC=60

classe ~ user_name + raw_timestamp_part_1 + num_window + roll_belt +
total_accel_belt + magnet_belt_x + magnet_belt_z + pitch_arm +
total_accel_arm + gyros_arm_z + accel_arm_x + accel_arm_y +
accel_arm_z + magnet_arm_x + magnet_arm_y + roll_dumbbell +
pitch_dumbbell + total_accel_dumbbell + gyros_dumbbell_z +
accel_dumbbell_x + magnet_dumbbell_x + pitch_forearm + gyros_forearm_y +
gyros_forearm_z + accel_forearm_x + accel_forearm_y + accel_forearm_z +
magnet_forearm_x + magnet_forearm_z

	Df	Deviance	AIC
- user_name	1	0.00	58.00
- magnet_belt_x	1	0.00	58.00
- roll_dumbbell	1	0.00	58.00
- total_accel_belt	1	0.00	58.00
- pitch_dumbbell	1	0.00	58.00
- magnet_arm_x	1	0.00	58.00
- pitch_forearm	1	0.00	58.00
- accel_forearm_z	1	0.00	58.00
- magnet_belt_z	1	0.00	58.00
- total_accel_arm	1	0.00	58.00
- accel_dumbbell_x	1	0.00	58.00

- accel_arm_x	1	0.00	58.00
- total_accel_dumbbell	1	0.00	58.00
- roll_belt	1	0.00	58.00
- gyros_dumbbell_z	1	0.00	58.00
- magnet_forearm_x	1	0.00	58.00
- magnet_dumbbell_x	1	0.00	58.00
- accel_forearm_x	1	0.00	58.00
- accel_arm_z	1	0.00	58.00
- accel_forearm_y	1	0.00	58.00
- gyros_arm_z	1	0.00	58.00
- raw_timestamp_part_1	1	0.00	58.00
- gyros_forearm_z	1	0.00	58.00
- magnet_forearm_z	1	0.00	58.00
- gyros_forearm_y	1	0.00	58.00
- pitch_arm	1	0.00	58.00
- accel_arm_y	1	0.00	58.00
- magnet_arm_y	1	0.00	58.00
<none>		0.00	60.00
- num_window	1	559.11	617.11

Step: AIC=58

classe ~ raw_timestamp_part_1 + num_window + roll_belt + total_accel_belt +
magnet_belt_x + magnet_belt_z + pitch_arm + total_accel_arm +
gyros_arm_z + accel_arm_x + accel_arm_y + accel_arm_z + magnet_arm_x +
magnet_arm_y + roll_dumbbell + pitch_dumbbell + total_accel_dumbbell +
gyros_dumbbell_z + accel_dumbbell_x + magnet_dumbbell_x +
pitch_forearm + gyros_forearm_y + gyros_forearm_z + accel_forearm_x +
accel_forearm_y + accel_forearm_z + magnet_forearm_x + magnet_forearm_z

	Df	Deviance	AIC
- magnet_belt_x	1	0.00	56.00
- roll_dumbbell	1	0.00	56.00
- pitch_forearm	1	0.00	56.00
- accel_forearm_z	1	0.00	56.00
- pitch_dumbbell	1	0.00	56.00
- magnet_belt_z	1	0.00	56.00
- magnet_arm_x	1	0.00	56.00
- total_accel_belt	1	0.00	56.00
- total_accel_arm	1	0.00	56.00
- accel_arm_x	1	0.00	56.00
- gyros_dumbbell_z	1	0.00	56.00
- roll_belt	1	0.00	56.00
- magnet_forearm_x	1	0.00	56.00
- accel_forearm_y	1	0.00	56.00
- accel_arm_z	1	0.00	56.00
- accel_dumbbell_x	1	0.00	56.00
- accel_forearm_x	1	0.00	56.00
- raw_timestamp_part_1	1	0.00	56.00
- total_accel_dumbbell	1	0.00	56.00
- gyros_arm_z	1	0.00	56.00
- gyros_forearm_z	1	0.00	56.00
- magnet_forearm_z	1	0.00	56.00
- magnet_dumbbell_x	1	0.00	56.00
- gyros_forearm_y	1	0.00	56.00
- accel_arm_y	1	0.00	56.00
- pitch_arm	1	0.00	56.00
- magnet_arm_y	1	0.00	56.00

<none>		0.00	58.00
- num_window	1	873.48	929.48

Step: AIC=56

classe ~ raw_timestamp_part_1 + num_window + roll_belt + total_accel_belt +
 magnet_belt_z + pitch_arm + total_accel_arm + gyros_arm_z +
 accel_arm_x + accel_arm_y + accel_arm_z + magnet_arm_x +
 magnet_arm_y + roll_dumbbell + pitch_dumbbell + total_accel_dumbbell +
 gyros_dumbbell_z + accel_dumbbell_x + magnet_dumbbell_x +
 pitch_forearm + gyros_forearm_y + gyros_forearm_z + accel_forearm_x +
 accel_forearm_y + accel_forearm_z + magnet_forearm_x + magnet_forearm_z

	Df	Deviance	AIC
- roll_dumbbell	1	0.00	54.0
- pitch_forearm	1	0.00	54.0
- magnet_belt_z	1	0.00	54.0
- magnet_arm_x	1	0.00	54.0
- accel_forearm_z	1	0.00	54.0
- pitch_dumbbell	1	0.00	54.0
- total_accel_belt	1	0.00	54.0
- accel_arm_x	1	0.00	54.0
- total_accel_arm	1	0.00	54.0
- gyros_dumbbell_z	1	0.00	54.0
- roll_belt	1	0.00	54.0
- magnet_forearm_x	1	0.00	54.0
- accel_forearm_y	1	0.00	54.0
- accel_arm_z	1	0.00	54.0
- accel_dumbbell_x	1	0.00	54.0
- accel_forearm_x	1	0.00	54.0
- total_accel_dumbbell	1	0.00	54.0
- gyros_forearm_z	1	0.00	54.0
- gyros_arm_z	1	0.00	54.0
- magnet_forearm_z	1	0.00	54.0
- magnet_dumbbell_x	1	0.00	54.0
- gyros_forearm_y	1	0.00	54.0
- raw_timestamp_part_1	1	0.00	54.0
- accel_arm_y	1	0.00	54.0
- pitch_arm	1	0.00	54.0
- magnet_arm_y	1	0.00	54.0
<none>		0.00	56.0
- num_window	1	995.31	1049.3

Step: AIC=54

classe ~ raw_timestamp_part_1 + num_window + roll_belt + total_accel_belt +
 magnet_belt_z + pitch_arm + total_accel_arm + gyros_arm_z +
 accel_arm_x + accel_arm_y + accel_arm_z + magnet_arm_x +
 magnet_arm_y + pitch_dumbbell + total_accel_dumbbell + gyros_dumbbell_z +
 accel_dumbbell_x + magnet_dumbbell_x + pitch_forearm + gyros_forearm_y +
 gyros_forearm_z + accel_forearm_x + accel_forearm_y + accel_forearm_z +
 magnet_forearm_x + magnet_forearm_z

	Df	Deviance	AIC
- pitch_dumbbell	1	0	52
- magnet_arm_x	1	0	52
- pitch_forearm	1	0	52
- accel_forearm_z	1	0	52
- total_accel_belt	1	0	52


```

- magnet_belt_z          1          0  52
- gyros_dumbbell_z       1          0  52
- total_accel_arm        1          0  52
- accel_arm_x            1          0  52
- roll_belt              1          0  52
- magnet_forearm_x       1          0  52
- accel_forearm_y        1          0  52
- accel_dumbbell_x       1          0  52
- accel_forearm_x        1          0  52
- accel_arm_z            1          0  52
- total_accel_dumbbell   1          0  52
- gyros_forearm_z        1          0  52
- magnet_forearm_z       1          0  52
- gyros_arm_z            1          0  52
- magnet_dumbbell_x      1          0  52
- gyros_forearm_y        1          0  52
- raw_timestamp_part_1   1          0  52
- pitch_arm              1          0  52
- accel_arm_y            1          0  52
- magnet_arm_y           1          0  52
<none>                   0          54
- num_window             1      1062 1114

- num_window             1   1952.44 1988.44

```

Step: AIC=36

```

classe ~ raw_timestamp_part_1 + num_window + pitch_arm + gyros_arm_z +
  accel_arm_x + accel_arm_y + accel_arm_z + magnet_arm_y +
  total_accel_dumbbell + accel_dumbbell_x + magnet_dumbbell_x +
  pitch_forearm + gyros_forearm_y + gyros_forearm_z + accel_forearm_x +
  magnet_forearm_x + magnet_forearm_z

```

	Df	Deviance	AIC
- accel_arm_z	1	0.00	34.00
- total_accel_dumbbell	1	0.00	34.00
- accel_dumbbell_x	1	0.00	34.00
- accel_forearm_x	1	0.00	34.00
- gyros_arm_z	1	0.00	34.00
- magnet_forearm_z	1	0.00	34.00
- gyros_forearm_z	1	0.00	34.00
- accel_arm_y	1	0.00	34.00
- magnet_forearm_x	1	0.00	34.00
- pitch_forearm	1	0.00	34.00
- pitch_arm	1	0.00	34.00
- magnet_arm_y	1	0.00	34.00
- gyros_forearm_y	1	0.00	34.00
- magnet_dumbbell_x	1	0.00	34.00
- accel_arm_x	1	0.00	34.00
<none>		0.00	36.00
- raw_timestamp_part_1	1	363.71	397.71
- num_window	1	2159.60	2193.60

Step: AIC=34

```

classe ~ raw_timestamp_part_1 + num_window + pitch_arm + gyros_arm_z +
  accel_arm_x + accel_arm_y + magnet_arm_y + total_accel_dumbbell +
  accel_dumbbell_x + magnet_dumbbell_x + pitch_forearm + gyros_forearm_y +
  gyros_forearm_z + accel_forearm_x + magnet_forearm_x + magnet_forearm_z

```

	Df	Deviance	AIC
- gyros_arm_z	1	0.00	32.00
- accel_arm_y	1	0.00	32.00
- magnet_forearm_x	1	0.00	32.00
- gyros_forearm_z	1	0.00	32.00
- pitch_forearm	1	0.00	32.00
- accel_forearm_x	1	0.00	32.00
- magnet_forearm_z	1	0.00	32.00
- accel_dumbbell_x	1	0.00	32.00
- total_accel_dumbbell	1	0.00	32.00
- pitch_arm	1	0.00	32.00
- gyros_forearm_y	1	0.00	32.00
- magnet_arm_y	1	0.00	32.00
- magnet_dumbbell_x	1	0.00	32.00
- accel_arm_x	1	0.00	32.00
<none>		0.00	34.00
- raw_timestamp_part_1	1	363.71	395.71
- num_window	1	2226.35	2258.35

Step: AIC=32

classe ~ raw_timestamp_part_1 + num_window + pitch_arm + accel_arm_x +
 accel_arm_y + magnet_arm_y + total_accel_dumbbell + accel_dumbbell_x +
 magnet_dumbbell_x + pitch_forearm + gyros_forearm_y + gyros_forearm_z +
 accel_forearm_x + magnet_forearm_x + magnet_forearm_z

	Df	Deviance	AIC
- accel_arm_y	1	0.00	30.00
- magnet_forearm_z	1	0.00	30.00
- pitch_forearm	1	0.00	30.00
- magnet_forearm_x	1	0.00	30.00
- accel_dumbbell_x	1	0.00	30.00
- accel_forearm_x	1	0.00	30.00
- total_accel_dumbbell	1	0.00	30.00
- pitch_arm	1	0.00	30.00
- gyros_forearm_z	1	0.00	30.00
- gyros_forearm_y	1	0.00	30.00
- magnet_arm_y	1	0.00	30.00
- magnet_dumbbell_x	1	0.00	30.00
- accel_arm_x	1	0.00	30.00
<none>		0.00	32.00
- raw_timestamp_part_1	1	411.68	441.68
- num_window	1	2246.17	2276.17

Step: AIC=30

classe ~ raw_timestamp_part_1 + num_window + pitch_arm + accel_arm_x +
 magnet_arm_y + total_accel_dumbbell + accel_dumbbell_x +
 magnet_dumbbell_x + pitch_forearm + gyros_forearm_y + gyros_forearm_z +
 accel_forearm_x + magnet_forearm_x + magnet_forearm_z

	Df	Deviance	AIC
- magnet_forearm_z	1	0.0	28.0
- magnet_forearm_x	1	0.0	28.0
- accel_forearm_x	1	0.0	28.0
- total_accel_dumbbell	1	0.0	28.0
- pitch_forearm	1	0.0	28.0
- gyros_forearm_z	1	0.0	28.0

- gyros_forearm_y	1	0.0	28.0
- magnet_arm_y	1	0.0	28.0
- pitch_arm	1	0.0	28.0
- accel_dumbbell_x	1	0.0	28.0
- magnet_dumbbell_x	1	0.0	28.0
- accel_arm_x	1	0.0	28.0
<none>		0.0	30.0
- raw_timestamp_part_1	1	453.4	481.4
- num_window	1	2249.4	2277.4

Step: AIC=28

```

classe ~ raw_timestamp_part_1 + num_window + pitch_arm + accel_arm_x +
  magnet_arm_y + total_accel_dumbbell + accel_dumbbell_x +
  magnet_dumbbell_x + pitch_forearm + gyros_forearm_y + gyros_forearm_z +
  accel_forearm_x + magnet_forearm_x

```

	Df	Deviance	AIC
- magnet_forearm_x	1	0.00	26.00
- accel_forearm_x	1	0.00	26.00
- total_accel_dumbbell	1	0.00	26.00
- pitch_forearm	1	0.00	26.00
- gyros_forearm_z	1	0.00	26.00
- gyros_forearm_y	1	0.00	26.00
- magnet_arm_y	1	0.00	26.00
- pitch_arm	1	0.00	26.00
- accel_dumbbell_x	1	0.00	26.00
- magnet_dumbbell_x	1	0.00	26.00
<none>		0.00	28.00
- raw_timestamp_part_1	1	512.71	538.71
- accel_arm_x	1	2234.71	2260.71
- num_window	1	2687.05	2713.05

Step: AIC=26

```

classe ~ raw_timestamp_part_1 + num_window + pitch_arm + accel_arm_x +
  magnet_arm_y + total_accel_dumbbell + accel_dumbbell_x +
  magnet_dumbbell_x + pitch_forearm + gyros_forearm_y + gyros_forearm_z +
  accel_forearm_x

```

	Df	Deviance	AIC
- accel_forearm_x	1	0.00	24.00
- gyros_forearm_y	1	0.00	24.00
- pitch_forearm	1	0.00	24.00
- total_accel_dumbbell	1	0.00	24.00
- gyros_forearm_z	1	0.00	24.00
- magnet_arm_y	1	0.00	24.00
- pitch_arm	1	0.00	24.00
- magnet_dumbbell_x	1	0.00	24.00
- accel_arm_x	1	0.00	24.00
- accel_dumbbell_x	1	0.00	24.00
<none>		0.00	26.00
- raw_timestamp_part_1	1	550.76	574.76
- num_window	1	2702.16	2726.16

Step: AIC=24

```

classe ~ raw_timestamp_part_1 + num_window + pitch_arm + accel_arm_x +
  magnet_arm_y + total_accel_dumbbell + accel_dumbbell_x +
  magnet_dumbbell_x + pitch_forearm + gyros_forearm_y + gyros_forearm_z

```

	Df	Deviance	AIC
- gyros_forearm_y	1	0.0	22.0
- total_accel_dumbbell	1	0.0	22.0
- gyros_forearm_z	1	0.0	22.0
- magnet_arm_y	1	0.0	22.0
- pitch_arm	1	0.0	22.0
- accel_dumbbell_x	1	0.0	22.0
- magnet_dumbbell_x	1	0.0	22.0
- accel_arm_x	1	0.0	22.0
- pitch_forearm	1	0.0	22.0
<none>		0.0	24.0
- raw_timestamp_part_1	1	631.1	653.1
- num_window	1	2752.0	2774.0

Step: AIC=22

classe ~ raw_timestamp_part_1 + num_window + pitch_arm + accel_arm_x +
magnet_arm_y + total_accel_dumbbell + accel_dumbbell_x +
magnet_dumbbell_x + pitch_forearm + gyros_forearm_z

	Df	Deviance	AIC
- gyros_forearm_z	1	0.00	20.00
- total_accel_dumbbell	1	0.00	20.00
- pitch_arm	1	0.00	20.00
- accel_dumbbell_x	1	0.00	20.00
- magnet_dumbbell_x	1	0.00	20.00
- magnet_arm_y	1	0.00	20.00
- pitch_forearm	1	0.00	20.00
- accel_arm_x	1	0.00	20.00
<none>		0.00	22.00
- raw_timestamp_part_1	1	636.19	656.19
- num_window	1	2797.77	2817.77

Step: AIC=20

classe ~ raw_timestamp_part_1 + num_window + pitch_arm + accel_arm_x +
magnet_arm_y + total_accel_dumbbell + accel_dumbbell_x +
magnet_dumbbell_x + pitch_forearm

	Df	Deviance	AIC
- pitch_arm	1	0.00	18.00
- total_accel_dumbbell	1	0.00	18.00
- magnet_dumbbell_x	1	0.00	18.00
- magnet_arm_y	1	0.00	18.00
- pitch_forearm	1	0.00	18.00
- accel_arm_x	1	0.00	18.00
- accel_dumbbell_x	1	0.00	18.00
<none>		0.00	20.00
- raw_timestamp_part_1	1	636.38	654.38
- num_window	1	2830.14	2848.14

Step: AIC=18

classe ~ raw_timestamp_part_1 + num_window + accel_arm_x + magnet_arm_y +
total_accel_dumbbell + accel_dumbbell_x + magnet_dumbbell_x +
pitch_forearm

	Df	Deviance	AIC
- total_accel_dumbbell	1	0.00	16.00

- accel_dumbbell_x	1	0.00	16.00
- magnet_dumbbell_x	1	0.00	16.00
- accel_arm_x	1	0.00	16.00
- pitch_forearm	1	0.00	16.00
- magnet_arm_y	1	0.00	16.00
<none>		0.00	18.00
- raw_timestamp_part_1	1	779.63	795.63
- num_window	1	2972.84	2988.84

Step: AIC=16

classe ~ raw_timestamp_part_1 + num_window + accel_arm_x + magnet_arm_y +
 accel_dumbbell_x + magnet_dumbbell_x + pitch_forearm

	Df	Deviance	AIC
- accel_dumbbell_x	1	0.0	14.0
- magnet_dumbbell_x	1	0.0	14.0
- magnet_arm_y	1	0.0	14.0
- accel_arm_x	1	0.0	14.0
- pitch_forearm	1	0.0	14.0
<none>		0.0	16.0
- raw_timestamp_part_1	1	1009.6	1023.6
- num_window	1	2999.6	3013.6

Step: AIC=14

classe ~ raw_timestamp_part_1 + num_window + accel_arm_x + magnet_arm_y +
 magnet_dumbbell_x + pitch_forearm

	Df	Deviance	AIC
- magnet_dumbbell_x	1	0.0	12.0
- magnet_arm_y	1	0.0	12.0
- pitch_forearm	1	0.0	12.0
- accel_arm_x	1	0.0	12.0
<none>		0.0	14.0
- raw_timestamp_part_1	1	2170.5	2182.5
- num_window	1	3211.5	3223.5

Step: AIC=12

classe ~ raw_timestamp_part_1 + num_window + accel_arm_x + magnet_arm_y +
 pitch_forearm

	Df	Deviance	AIC
- magnet_arm_y	1	0.0	10.0
- accel_arm_x	1	0.0	10.0
- pitch_forearm	1	0.0	10.0
<none>		0.0	12.0
- raw_timestamp_part_1	1	3282.6	3292.6
- num_window	1	3437.9	3447.9

Step: AIC=10

classe ~ raw_timestamp_part_1 + num_window + accel_arm_x + pitch_forearm

	Df	Deviance	AIC
- accel_arm_x	1	0.0	8.0
- pitch_forearm	1	0.0	8.0
<none>		0.0	10.0
- num_window	1	3520.4	3528.4
- raw_timestamp_part_1	1	4496.5	4504.5

```
Step: AIC=8
classe ~ raw_timestamp_part_1 + num_window + pitch_forearm
```

	Df	Deviance	AIC
- pitch_forearm	1	0.0	6.0
<none>		0.0	8.0
- num_window	1	3520.4	3526.4
- raw_timestamp_part_1	1	4662.4	4668.4

```
Step: AIC=6
classe ~ raw_timestamp_part_1 + num_window
```

	Df	Deviance	AIC
<none>		0.0	6.0
- num_window	1	4449.3	4453.3
- raw_timestamp_part_1	1	5138.0	5142.0

There were 50 or more warnings (use warnings() to see the first 50)

```
> summary(step_fit)
```

Call:

```
glm(formula = classe ~ raw_timestamp_part_1 + num_window, family = binomial(1),
     link = "logit"),
     data = dataTrain)
```

Deviance Residuals:

Min	1Q	Median	3Q	Max
-2.304e-03	-2.000e-08	2.000e-08	2.000e-08	2.235e-03

Coefficients:

	Estimate	Std. Error	z value	Pr(> z)
(Intercept)	2.688e+08	9.192e+08	0.292	0.770
raw_timestamp_part_1	-2.032e-01	6.947e-01	-0.292	0.770
num_window	4.362e+01	1.477e+02	0.295	0.768

(Dispersion parameter for binomial family taken to be 1)

Null deviance: 5.1382e+03 on 4003 degrees of freedom
Residual deviance: 3.8673e-04 on 4001 degrees of freedom
AIC: 6.0004

Number of Fisher Scoring iterations: 25

```
> confint(step_fit)
```

Waiting for profiling to be done...

	2.5 %	97.5 %
(Intercept)	5.356253e+08	4.612380e+08
raw_timestamp_part_1	-3.486092e-01	-4.048320e-01
num_window	8.649066e+01	7.453712e+01

Warning messages:

- 1: glm.fit: fitted probabilities numerically 0 or 1 occurred
- 2: glm.fit: fitted probabilities numerically 0 or 1 occurred
- 3: glm.fit: fitted probabilities numerically 0 or 1 occurred
- 4: glm.fit: fitted probabilities numerically 0 or 1 occurred
- 5: glm.fit: fitted probabilities numerically 0 or 1 occurred
- 6: glm.fit: fitted probabilities numerically 0 or 1 occurred
- 7: glm.fit: fitted probabilities numerically 0 or 1 occurred

```

8: glm.fit: fitted probabilities numerically 0 or 1 occurred
9: glm.fit: fitted probabilities numerically 0 or 1 occurred
> #ANOVA on base model
> anova(fit,test = 'Chisq')

```

Analysis of Deviance Table

Model: binomial, link: logit

Response: classe

Terms added sequentially (first to last)

		Df	Deviance	Resid. Df	Resid. Dev	Pr(>Chi)
NULL				4003	5138.2	
raw_timestamp_part_1	1	689.0		4002	4449.3	< 2.2e-16 ***
num_window	1	4449.3		4001	0.0	< 2.2e-16 ***

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Warning message:

glm.fit: fitted probabilities numerically 0 or 1 occurred

>

> #plot the fitted model

> plot(fit\$fitted.values)

> pred_link <- predict(fit,newdata = dataTest,type = 'link')

Warning message:

In predict.lm(object, newdata, se.fit, scale = 1, type = ifelse(type == :
prediction from a rank-deficient fit may be misleading

>

> #check for multicollinearity

> library(car)

Loading required package: carData

Attaching package: 'car'

The following object is masked from 'package:arules':

recode

> vif(fit)

Error in vif.default(fit) : there are aliased coefficients in the model

> vif(step_fit)

raw_timestamp_part_1	num_window
67.38515	67.38515

> library(caret)

> #with default prob cut 0.50

> dataTest\$pred_classe <- ifelse(pred<0.7,'yes','no')

>

> table(dataTest\$pred_classe,dataTest\$classe)

	A	B	C	D	E
no	0	0	19	0	0
yes	0	0	1	0	0

```
>
```

```
#training split of churn classes
```

```
> round(table(dataTrain$classe)/nrow(dataTrain),2)*100
```

```
  A  B  C  D  E  
34 23  2  7 34
```

```
> # test split of churn classes
```

```
> round(table(dataTest$classe)/nrow(dataTest),2)*100
```

```
  A  B  C  D  E  
0  0 100  0  0
```

```
> #predicted split of churn classes
```

```
> round(table(dataTest$pred_classe)/nrow(dataTest),2)*100
```

```
no yes
```

```
95    5
```

Confusion Matrix and Statistics

Prediction	Reference				
	A	B	C	D	E
A	0	0	0	0	0
B	0	0	0	0	0
C	0	0	20	0	0
D	0	0	0	0	0
E	0	0	0	0	0

Overall Statistics

```
Accuracy : 1  
95% CI : (0.8316, 1)  
No Information Rate : 1  
P-Value [Acc > NIR] : 1
```

```
Kappa : NaN  
McNemar's Test P-Value : NA
```

Statistics by Class:

	Class: A	Class: B	Class: C	Class: D	Class: E
Sensitivity	NA	NA	1	NA	NA
Specificity	1	1	NA	1	1
Pos Pred Value	NA	NA	NA	NA	NA
Neg Pred Value	NA	NA	NA	NA	NA
Prevalence	0	0	1	0	0
Detection Rate	0	0	1	0	0
Detection Prevalence	0	0	1	0	0
Balanced Accuracy	NA	NA	NA	NA	NA

```
>
```

```
#how do we create a cross validation scheme
```

```
> control <- trainControl(method = 'repeatedcv',  
+                           number = 10,
```



```

+                                     repeats = 3)
> seed <-7
> metric <- 'Accuracy'
> set.seed(seed)
> fit_default <- train(classe~.,
+                       data = dataTrain,
+                       method = 'glm',
+                       metric = metric,
+                       trControl = control)
Something is wrong; all the Accuracy metric values are missing:
      Accuracy      Kappa
Min.   : NA      Min.   : NA
1st Qu.: NA      1st Qu.: NA
Median : NA      Median : NA
Mean    :NaN      Mean    :NaN
3rd Qu.: NA      3rd Qu.: NA
Max.    : NA      Max.    : NA
NA's    :1        NA's    :1
Error: Stopping
In addition: warning message:
In nominalTrainWorkflow(x = x, y = y, wts = weights, info = trainInfo,  :
  There were missing values in resampled performance measures.
> print(fit_default)
Error in print(fit_default) : object 'fit_default' not found

```

```

>
> library(caret)
> varImp(step_fit)
              overall
raw_timestamp_part_1 0.2924915
num_window           0.2953298
> varImp(fit_default)
Error in varImp(fit_default) : object 'fit_default' not found
>

```

```

> library(devtools)
>
> install_github("riv","tomasgreif")
Skipping install of 'woe' from a github remote, the SHA1 (43fcf268) has not c
hanged since last install.
  Use `force = TRUE` to force installation
warning message:
Username parameter is deprecated. Please use tomasgreif/riv
>
> install_github("woe","tomasgreif")
Skipping install of 'woe' from a github remote, the SHA1 (43fcf268) has not c
hanged since last install.
  Use `force = TRUE` to force installation
warning message:
Username parameter is deprecated. Please use tomasgreif/woe
>
> library(woe)
>
> library(riv)

```

```

> iv_df <- iv.mult(dataTrain, y="classe", summary=TRUE, verbose=TRUE)
Started processing of data frame: dataTrain
Calling iv.num for variable: user_name
  Building rpart model
  Model finished
  Sending model to tree parser
  Rules parsed: 2
  Mapping nodes to data
    SQL Merge
    DF Merge
  Calling iv.str for nodes
Error in iv.str(df, "tmp_iv_calc_label", y) : Not a binary outcome
> iv_df
Error: object 'iv_df' not found
>
> iv <- iv.mult(dataTrain, y="classe", summary=FALSE, verbose=TRUE)
Started processing of data frame: dataTrain
Calling iv.num for variable: user_name
  Building rpart model
  Model finished
  Sending model to tree parser
  Rules parsed: 2
  Mapping nodes to data
    SQL Merge
    DF Merge
  Calling iv.str for nodes
Error in iv.str(df, "tmp_iv_calc_label", y) : Not a binary outcome
> # Plot information value summary
>
> iv.plot.summary(iv_df)
Error in ggplot(data = iv) : object 'iv_df' not found

```



