HAR\_Data20181011

Harold Pollack

10/12/2018

## Introduction and overview

This codebook file describes my analysis of exercise data downloaded from the UCI machine learning repository <http://archive.ics.uci.edu/ml/datasets/Human+Activity+Recognition+Using+Smartphones> on October 6, 2018.

Pertinent data files:

1. The full micro-dataset of exercise observations extracted\_merged\_training\_test.

This dataset has 10,299 observations and 81 variables. Descriptives are shown below.

1. A dataset which averages exercise observations across volunteers and activity types: dt\_merged\_exercise.

This dataset has 180 observations and 81 variables.

Note: This codebook is drawn from the markdown file **HAR\_Data20181011.docx ,** which analyzes exercise data, and which has the complete R code to produce the two datafiles noted above.

As described here, <http://archive.ics.uci.edu/ml/machine-learning-databases/00240/UCI%20HAR%20Dataset.names>, these data are from a series of exercise experiments carried out with a group of 30 volunteers. (Individual identities are denoted by the variable “Study\_Subject”" in the final datasets.)

Each volunteer performed six activities (WALKING, WALKING\_UPSTAIRS, WALKING\_DOWNSTAIRS, SITTING, STANDING, LAYING, as captured in the variable “Activity\_type” in the final datasets.) Volunteers wore smartphones fitted with embedded accelerometers and gyroscopes to captured 3-axial linear acceleration and 3-axial angular velocity. The obtained dataset has been randomly partitioned into a 70% training set called X\_Train and a 30% test data called X\_test.

The sensor signals (accelerometer and gyroscope) were pre-processed in various ways that do not affect the current analysis. See the ‘features\_info.txt’ for more details.

The present analysis produces two production datasets: –Extracted\_merged\_training\_test is a dataframe that includes all numerical measurements for each observation–a total of 10,299 observations and 81 variables.

These 81 variables are a subset of the 561 variables listed in the documentation features.txt. They include two variables to keep track of study subjects and activity type, but keep only those variables that capture mean or standard deviation (std).

For interpretability, variable names were transformed using the following rules: Fast Fourier Transform variables beginning with the prefix “f” were transformed to begin with the prefix “FFT\_”. Time-concerning variables beginning with the letter “t” were transformed to begin with the prefix “time\_”. “Acc” were replaced with the full “Accelerometer,” and “gyro” was replaced with the full term “gyroscope.” Variables with the name “BodyBody” were altered to just say “Body,” because why not. –dt\_merged\_exercise is a data table that averages all numerical measurements in the above for each of the 30 volunteers and each of the six activities, resulting in a dataset with 180 observations and 81 variables.

Each record includes: - Triaxial total acceleration from the accelerometer and the estimated body acceleration. - Triaxial Angular velocity from the gyroscope. - A 561-feature vector with time and frequency domain variables. - An activity label (“Activity\_type” in the final dataset). - An identifier of the volunteer who carried out the experiment (“Study\_Subject” in the final dataset). –Body linear acceleration and angular velocity were derived in time to obtain Jerk signals (tBodyAccJerk-XYZ and tBodyGyroJerk-XYZ). Jerk is in units of time derivatives of the applied quantities. –The magnitude of three-dimensional signals were calculated using the standard Euclidean norm (tBodyAccMag, tGravityAccMag, tBodyAccJerkMag, tBodyGyroMag, tBodyGyroJerkMag).

### The production datasets were produced by processing the following files:

* ‘features.txt’: List of all features.
* ‘activity\_labels.txt’: Links the class labels with their activity name.
* ‘X\_train.txt’: The training set.
* ‘y\_train.txt’: Training labels.
* ‘X\_test.txt’: The test set.
* ‘y\_test.txt’: Test labels.
* ‘subject\_train.txt’: Each row identifies the subject who performed the activity for each window sample.
* ‘subject\_test.txt’: Each row identifies the subject who performed the activity for each window sample.

### Notes on units:

* Features are normalized and bounded within [-1,1].
* The units used for the accelerations (total and body) are ’g’s (gravity of earth -> 9.80665 m/seg2).
* The gyroscope units are rad/seg. –The total acceleration includes gravitation. Estimated body acceleration subtracts gravity from total acceleration.
* ‘Inertial Signals/body\_gyro\_x\_train.txt’: The angular velocity vector measured by the gyroscope for each window sample. The units are radians/second.
* ‘Inertial Signals/body\_gyro\_x\_test.txt’: The angular velocity vector measured by the gyroscope for each window sample. The units are radians/second. –Frequencies are calculated in Hertz units via Fast Fourier Transform.

### Descriptives for the full micro-dataset extracted\_merged\_training\_test

This dataset has 10,299 observations and 81 variables.

summary(extracted\_merged\_training\_test,maxsum=ncol(extracted\_merged\_training\_test))

## Study\_Subject Activity\_type time\_BodyAccelerometer-mean()-X  
## Min. : 1.00 Length:10299 Min. :-1.0000   
## 1st Qu.: 9.00 Class :character 1st Qu.: 0.2626   
## Median :17.00 Mode :character Median : 0.2772   
## Mean :16.15 Mean : 0.2743   
## 3rd Qu.:24.00 3rd Qu.: 0.2884   
## Max. :30.00 Max. : 1.0000   
## time\_BodyAccelerometer-mean()-Y time\_BodyAccelerometer-mean()-Z  
## Min. :-1.00000 Min. :-1.00000   
## 1st Qu.:-0.02490 1st Qu.:-0.12102   
## Median :-0.01716 Median :-0.10860   
## Mean :-0.01774 Mean :-0.10892   
## 3rd Qu.:-0.01062 3rd Qu.:-0.09759   
## Max. : 1.00000 Max. : 1.00000   
## time\_BodyAccelerometer-std()-X time\_BodyAccelerometer-std()-Y  
## Min. :-1.0000 Min. :-1.00000   
## 1st Qu.:-0.9924 1st Qu.:-0.97699   
## Median :-0.9430 Median :-0.83503   
## Mean :-0.6078 Mean :-0.51019   
## 3rd Qu.:-0.2503 3rd Qu.:-0.05734   
## Max. : 1.0000 Max. : 1.00000   
## time\_BodyAccelerometer-std()-Z time\_GravityAccelerometer-mean()-X  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9791 1st Qu.: 0.8117   
## Median :-0.8508 Median : 0.9218   
## Mean :-0.6131 Mean : 0.6692   
## 3rd Qu.:-0.2787 3rd Qu.: 0.9547   
## Max. : 1.0000 Max. : 1.0000   
## time\_GravityAccelerometer-mean()-Y time\_GravityAccelerometer-mean()-Z  
## Min. :-1.000000 Min. :-1.00000   
## 1st Qu.:-0.242943 1st Qu.:-0.11671   
## Median :-0.143551 Median : 0.03680   
## Mean : 0.004039 Mean : 0.09215   
## 3rd Qu.: 0.118905 3rd Qu.: 0.21621   
## Max. : 1.000000 Max. : 1.00000   
## time\_GravityAccelerometer-std()-X time\_GravityAccelerometer-std()-Y  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9949 1st Qu.:-0.9913   
## Median :-0.9819 Median :-0.9759   
## Mean :-0.9652 Mean :-0.9544   
## 3rd Qu.:-0.9615 3rd Qu.:-0.9464   
## Max. : 1.0000 Max. : 1.0000   
## time\_GravityAccelerometer-std()-Z time\_BodyAccelerometerJerk-mean()-X  
## Min. :-1.0000 Min. :-1.00000   
## 1st Qu.:-0.9866 1st Qu.: 0.06298   
## Median :-0.9665 Median : 0.07597   
## Mean :-0.9389 Mean : 0.07894   
## 3rd Qu.:-0.9296 3rd Qu.: 0.09131   
## Max. : 1.0000 Max. : 1.00000   
## time\_BodyAccelerometerJerk-mean()-Y time\_BodyAccelerometerJerk-mean()-Z  
## Min. :-1.000000 Min. :-1.000000   
## 1st Qu.:-0.018555 1st Qu.:-0.031552   
## Median : 0.010753 Median :-0.001159   
## Mean : 0.007948 Mean :-0.004675   
## 3rd Qu.: 0.033538 3rd Qu.: 0.024578   
## Max. : 1.000000 Max. : 1.000000   
## time\_BodyAccelerometerJerk-std()-X time\_BodyAccelerometerJerk-std()-Y  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9913 1st Qu.:-0.9850   
## Median :-0.9513 Median :-0.9250   
## Mean :-0.6398 Mean :-0.6080   
## 3rd Qu.:-0.2912 3rd Qu.:-0.2218   
## Max. : 1.0000 Max. : 1.0000   
## time\_BodyAccelerometerJerk-std()-Z time\_BodyGyroscope-mean()-X  
## Min. :-1.0000 Min. :-1.00000   
## 1st Qu.:-0.9892 1st Qu.:-0.04579   
## Median :-0.9543 Median :-0.02776   
## Mean :-0.7628 Mean :-0.03098   
## 3rd Qu.:-0.5485 3rd Qu.:-0.01058   
## Max. : 1.0000 Max. : 1.00000   
## time\_BodyGyroscope-mean()-Y time\_BodyGyroscope-mean()-Z  
## Min. :-1.00000 Min. :-1.00000   
## 1st Qu.:-0.10399 1st Qu.: 0.06485   
## Median :-0.07477 Median : 0.08626   
## Mean :-0.07472 Mean : 0.08836   
## 3rd Qu.:-0.05110 3rd Qu.: 0.11044   
## Max. : 1.00000 Max. : 1.00000   
## time\_BodyGyroscope-std()-X time\_BodyGyroscope-std()-Y  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9872 1st Qu.:-0.9819   
## Median :-0.9016 Median :-0.9106   
## Mean :-0.7212 Mean :-0.6827   
## 3rd Qu.:-0.4822 3rd Qu.:-0.4461   
## Max. : 1.0000 Max. : 1.0000   
## time\_BodyGyroscope-std()-Z time\_BodyGyroscopeJerk-mean()-X  
## Min. :-1.0000 Min. :-1.00000   
## 1st Qu.:-0.9850 1st Qu.:-0.11723   
## Median :-0.8819 Median :-0.09824   
## Mean :-0.6537 Mean :-0.09671   
## 3rd Qu.:-0.3379 3rd Qu.:-0.07930   
## Max. : 1.0000 Max. : 1.00000   
## time\_BodyGyroscopeJerk-mean()-Y time\_BodyGyroscopeJerk-mean()-Z  
## Min. :-1.00000 Min. :-1.00000   
## 1st Qu.:-0.05868 1st Qu.:-0.07936   
## Median :-0.04056 Median :-0.05455   
## Mean :-0.04232 Mean :-0.05483   
## 3rd Qu.:-0.02521 3rd Qu.:-0.03168   
## Max. : 1.00000 Max. : 1.00000   
## time\_BodyGyroscopeJerk-std()-X time\_BodyGyroscopeJerk-std()-Y  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9907 1st Qu.:-0.9922   
## Median :-0.9348 Median :-0.9548   
## Mean :-0.7313 Mean :-0.7861   
## 3rd Qu.:-0.4865 3rd Qu.:-0.6268   
## Max. : 1.0000 Max. : 1.0000   
## time\_BodyGyroscopeJerk-std()-Z time\_BodyAccelerometerMag-mean()  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9926 1st Qu.:-0.9819   
## Median :-0.9503 Median :-0.8746   
## Mean :-0.7399 Mean :-0.5482   
## 3rd Qu.:-0.5097 3rd Qu.:-0.1201   
## Max. : 1.0000 Max. : 1.0000   
## time\_BodyAccelerometerMag-std() time\_GravityAccelerometerMag-mean()  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9822 1st Qu.:-0.9819   
## Median :-0.8437 Median :-0.8746   
## Mean :-0.5912 Mean :-0.5482   
## 3rd Qu.:-0.2423 3rd Qu.:-0.1201   
## Max. : 1.0000 Max. : 1.0000   
## time\_GravityAccelerometerMag-std() time\_BodyAccelerometerJerkMag-mean()  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9822 1st Qu.:-0.9896   
## Median :-0.8437 Median :-0.9481   
## Mean :-0.5912 Mean :-0.6494   
## 3rd Qu.:-0.2423 3rd Qu.:-0.2956   
## Max. : 1.0000 Max. : 1.0000   
## time\_BodyAccelerometerJerkMag-std() time\_BodyGyroscopeMag-mean()  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9907 1st Qu.:-0.9781   
## Median :-0.9288 Median :-0.8223   
## Mean :-0.6278 Mean :-0.6052   
## 3rd Qu.:-0.2733 3rd Qu.:-0.2454   
## Max. : 1.0000 Max. : 1.0000   
## time\_BodyGyroscopeMag-std() time\_BodyGyroscopeJerkMag-mean()  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9775 1st Qu.:-0.9923   
## Median :-0.8259 Median :-0.9559   
## Mean :-0.6625 Mean :-0.7621   
## 3rd Qu.:-0.3940 3rd Qu.:-0.5499   
## Max. : 1.0000 Max. : 1.0000   
## time\_BodyGyroscopeJerkMag-std() FFT\_BodyAccelerometer-mean()-X  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9922 1st Qu.:-0.9913   
## Median :-0.9403 Median :-0.9456   
## Mean :-0.7780 Mean :-0.6228   
## 3rd Qu.:-0.6093 3rd Qu.:-0.2646   
## Max. : 1.0000 Max. : 1.0000   
## FFT\_BodyAccelerometer-mean()-Y FFT\_BodyAccelerometer-mean()-Z  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9792 1st Qu.:-0.9832   
## Median :-0.8643 Median :-0.8954   
## Mean :-0.5375 Mean :-0.6650   
## 3rd Qu.:-0.1032 3rd Qu.:-0.3662   
## Max. : 1.0000 Max. : 1.0000   
## FFT\_BodyAccelerometer-std()-X FFT\_BodyAccelerometer-std()-Y  
## Min. :-1.0000 Min. :-1.00000   
## 1st Qu.:-0.9929 1st Qu.:-0.97689   
## Median :-0.9416 Median :-0.83261   
## Mean :-0.6034 Mean :-0.52842   
## 3rd Qu.:-0.2493 3rd Qu.:-0.09216   
## Max. : 1.0000 Max. : 1.00000   
## FFT\_BodyAccelerometer-std()-Z FFT\_BodyAccelerometer-meanFreq()-X  
## Min. :-1.0000 Min. :-1.00000   
## 1st Qu.:-0.9780 1st Qu.:-0.41878   
## Median :-0.8398 Median :-0.23825   
## Mean :-0.6179 Mean :-0.22147   
## 3rd Qu.:-0.3023 3rd Qu.:-0.02043   
## Max. : 1.0000 Max. : 1.00000   
## FFT\_BodyAccelerometer-meanFreq()-Y FFT\_BodyAccelerometer-meanFreq()-Z  
## Min. :-1.000000 Min. :-1.00000   
## 1st Qu.:-0.144772 1st Qu.:-0.13845   
## Median : 0.004666 Median : 0.06084   
## Mean : 0.015401 Mean : 0.04731   
## 3rd Qu.: 0.176603 3rd Qu.: 0.24922   
## Max. : 1.000000 Max. : 1.00000   
## FFT\_BodyAccelerometerJerk-mean()-X FFT\_BodyAccelerometerJerk-mean()-Y  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9912 1st Qu.:-0.9848   
## Median :-0.9516 Median :-0.9257   
## Mean :-0.6567 Mean :-0.6290   
## 3rd Qu.:-0.3270 3rd Qu.:-0.2638   
## Max. : 1.0000 Max. : 1.0000   
## FFT\_BodyAccelerometerJerk-mean()-Z FFT\_BodyAccelerometerJerk-std()-X  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9873 1st Qu.:-0.9920   
## Median :-0.9475 Median :-0.9562   
## Mean :-0.7436 Mean :-0.6550   
## 3rd Qu.:-0.5133 3rd Qu.:-0.3203   
## Max. : 1.0000 Max. : 1.0000   
## FFT\_BodyAccelerometerJerk-std()-Y FFT\_BodyAccelerometerJerk-std()-Z  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9865 1st Qu.:-0.9895   
## Median :-0.9280 Median :-0.9590   
## Mean :-0.6122 Mean :-0.7809   
## 3rd Qu.:-0.2361 3rd Qu.:-0.5903   
## Max. : 1.0000 Max. : 1.0000   
## FFT\_BodyAccelerometerJerk-meanFreq()-X  
## Min. :-1.00000   
## 1st Qu.:-0.29770   
## Median :-0.04544   
## Mean :-0.04771   
## 3rd Qu.: 0.20447   
## Max. : 1.00000   
## FFT\_BodyAccelerometerJerk-meanFreq()-Y  
## Min. :-1.000000   
## 1st Qu.:-0.427951   
## Median :-0.236530   
## Mean :-0.213393   
## 3rd Qu.: 0.008651   
## Max. : 1.000000   
## FFT\_BodyAccelerometerJerk-meanFreq()-Z FFT\_BodyGyroscope-mean()-X  
## Min. :-1.00000 Min. :-1.0000   
## 1st Qu.:-0.33139 1st Qu.:-0.9853   
## Median :-0.10246 Median :-0.8917   
## Mean :-0.12383 Mean :-0.6721   
## 3rd Qu.: 0.09124 3rd Qu.:-0.3837   
## Max. : 1.00000 Max. : 1.0000   
## FFT\_BodyGyroscope-mean()-Y FFT\_BodyGyroscope-mean()-Z  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9847 1st Qu.:-0.9851   
## Median :-0.9197 Median :-0.8877   
## Mean :-0.7062 Mean :-0.6442   
## 3rd Qu.:-0.4735 3rd Qu.:-0.3225   
## Max. : 1.0000 Max. : 1.0000   
## FFT\_BodyGyroscope-std()-X FFT\_BodyGyroscope-std()-Y  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9881 1st Qu.:-0.9808   
## Median :-0.9053 Median :-0.9061   
## Mean :-0.7386 Mean :-0.6742   
## 3rd Qu.:-0.5225 3rd Qu.:-0.4385   
## Max. : 1.0000 Max. : 1.0000   
## FFT\_BodyGyroscope-std()-Z FFT\_BodyGyroscope-meanFreq()-X  
## Min. :-1.0000 Min. :-1.00000   
## 1st Qu.:-0.9862 1st Qu.:-0.27189   
## Median :-0.8915 Median :-0.09868   
## Mean :-0.6904 Mean :-0.10104   
## 3rd Qu.:-0.4168 3rd Qu.: 0.06810   
## Max. : 1.0000 Max. : 1.00000   
## FFT\_BodyGyroscope-meanFreq()-Y FFT\_BodyGyroscope-meanFreq()-Z  
## Min. :-1.00000 Min. :-1.00000   
## 1st Qu.:-0.36257 1st Qu.:-0.23240   
## Median :-0.17298 Median :-0.05369   
## Mean :-0.17428 Mean :-0.05139   
## 3rd Qu.: 0.01366 3rd Qu.: 0.12251   
## Max. : 1.00000 Max. : 1.00000   
## FFT\_BodyAccelerometerMag-mean() FFT\_BodyAccelerometerMag-std()  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9847 1st Qu.:-0.9829   
## Median :-0.8755 Median :-0.8547   
## Mean :-0.5860 Mean :-0.6595   
## 3rd Qu.:-0.2173 3rd Qu.:-0.3823   
## Max. : 1.0000 Max. : 1.0000   
## FFT\_BodyAccelerometerMag-meanFreq() FFT\_BodyAccelerometerJerkMag-mean()  
## Min. :-1.00000 Min. :-1.0000   
## 1st Qu.:-0.09663 1st Qu.:-0.9898   
## Median : 0.07026 Median :-0.9290   
## Mean : 0.07688 Mean :-0.6208   
## 3rd Qu.: 0.24495 3rd Qu.:-0.2600   
## Max. : 1.00000 Max. : 1.0000   
## FFT\_BodyAccelerometerJerkMag-std()  
## Min. :-1.0000   
## 1st Qu.:-0.9907   
## Median :-0.9255   
## Mean :-0.6401   
## 3rd Qu.:-0.3082   
## Max. : 1.0000   
## FFT\_BodyAccelerometerJerkMag-meanFreq() FFT\_BodyGyroscopeMag-mean()  
## Min. :-1.000000 Min. :-1.0000   
## 1st Qu.:-0.002959 1st Qu.:-0.9825   
## Median : 0.164180 Median :-0.8756   
## Mean : 0.173220 Mean :-0.6974   
## 3rd Qu.: 0.357307 3rd Qu.:-0.4514   
## Max. : 1.000000 Max. : 1.0000   
## FFT\_BodyGyroscopeMag-std() FFT\_BodyGyroscopeMag-meanFreq()  
## Min. :-1.0000 Min. :-1.00000   
## 1st Qu.:-0.9781 1st Qu.:-0.23436   
## Median :-0.8275 Median :-0.05210   
## Mean :-0.7000 Mean :-0.04156   
## 3rd Qu.:-0.4713 3rd Qu.: 0.15158   
## Max. : 1.0000 Max. : 1.00000   
## FFT\_BodyGyroscopeJerkMag-mean() FFT\_BodyGyroscopeJerkMag-std()  
## Min. :-1.0000 Min. :-1.0000   
## 1st Qu.:-0.9921 1st Qu.:-0.9926   
## Median :-0.9453 Median :-0.9382   
## Mean :-0.7798 Mean :-0.7922   
## 3rd Qu.:-0.6122 3rd Qu.:-0.6437   
## Max. : 1.0000 Max. : 1.0000   
## FFT\_BodyGyroscopeJerkMag-meanFreq()  
## Min. :-1.00000   
## 1st Qu.:-0.01948   
## Median : 0.13625   
## Mean : 0.12671   
## 3rd Qu.: 0.28896   
## Max. : 1.00000

### 

### Descriptive statistics for person-activity averaged data table dt\_merged\_exercise.

This dataset has 180 observations and 81 variables.

summary(dt\_merged\_exercise, maxsum=ncol(dt\_merged\_exercise))

## Study\_Subject Activity\_type time\_BodyAccelerometer-mean()-X  
## Min. : 1.0 Length:180 Min. :0.2216   
## 1st Qu.: 8.0 Class :character 1st Qu.:0.2712   
## Median :15.5 Mode :character Median :0.2770   
## Mean :15.5 Mean :0.2743   
## 3rd Qu.:23.0 3rd Qu.:0.2800   
## Max. :30.0 Max. :0.3015   
## time\_BodyAccelerometer-mean()-Y time\_BodyAccelerometer-mean()-Z  
## Min. :-0.040514 Min. :-0.15251   
## 1st Qu.:-0.020022 1st Qu.:-0.11207   
## Median :-0.017262 Median :-0.10819   
## Mean :-0.017876 Mean :-0.10916   
## 3rd Qu.:-0.014936 3rd Qu.:-0.10443   
## Max. :-0.001308 Max. :-0.07538   
## time\_BodyAccelerometer-std()-X time\_BodyAccelerometer-std()-Y  
## Min. :-0.9961 Min. :-0.99024   
## 1st Qu.:-0.9799 1st Qu.:-0.94205   
## Median :-0.7526 Median :-0.50897   
## Mean :-0.5577 Mean :-0.46046   
## 3rd Qu.:-0.1984 3rd Qu.:-0.03077   
## Max. : 0.6269 Max. : 0.61694   
## time\_BodyAccelerometer-std()-Z time\_GravityAccelerometer-mean()-X  
## Min. :-0.9877 Min. :-0.6800   
## 1st Qu.:-0.9498 1st Qu.: 0.8376   
## Median :-0.6518 Median : 0.9208   
## Mean :-0.5756 Mean : 0.6975   
## 3rd Qu.:-0.2306 3rd Qu.: 0.9425   
## Max. : 0.6090 Max. : 0.9745   
## time\_GravityAccelerometer-mean()-Y time\_GravityAccelerometer-mean()-Z  
## Min. :-0.47989 Min. :-0.49509   
## 1st Qu.:-0.23319 1st Qu.:-0.11726   
## Median :-0.12782 Median : 0.02384   
## Mean :-0.01621 Mean : 0.07413   
## 3rd Qu.: 0.08773 3rd Qu.: 0.14946   
## Max. : 0.95659 Max. : 0.95787   
## time\_GravityAccelerometer-std()-X time\_GravityAccelerometer-std()-Y  
## Min. :-0.9968 Min. :-0.9942   
## 1st Qu.:-0.9825 1st Qu.:-0.9711   
## Median :-0.9695 Median :-0.9590   
## Mean :-0.9638 Mean :-0.9524   
## 3rd Qu.:-0.9509 3rd Qu.:-0.9370   
## Max. :-0.8296 Max. :-0.6436   
## time\_GravityAccelerometer-std()-Z time\_BodyAccelerometerJerk-mean()-X  
## Min. :-0.9910 Min. :0.04269   
## 1st Qu.:-0.9605 1st Qu.:0.07396   
## Median :-0.9450 Median :0.07640   
## Mean :-0.9364 Mean :0.07947   
## 3rd Qu.:-0.9180 3rd Qu.:0.08330   
## Max. :-0.6102 Max. :0.13019   
## time\_BodyAccelerometerJerk-mean()-Y time\_BodyAccelerometerJerk-mean()-Z  
## Min. :-0.0386872 Min. :-0.067458   
## 1st Qu.: 0.0004664 1st Qu.:-0.010601   
## Median : 0.0094698 Median :-0.003861   
## Mean : 0.0075652 Mean :-0.004953   
## 3rd Qu.: 0.0134008 3rd Qu.: 0.001958   
## Max. : 0.0568186 Max. : 0.038053   
## time\_BodyAccelerometerJerk-std()-X time\_BodyAccelerometerJerk-std()-Y  
## Min. :-0.9946 Min. :-0.9895   
## 1st Qu.:-0.9832 1st Qu.:-0.9724   
## Median :-0.8104 Median :-0.7756   
## Mean :-0.5949 Mean :-0.5654   
## 3rd Qu.:-0.2233 3rd Qu.:-0.1483   
## Max. : 0.5443 Max. : 0.3553   
## time\_BodyAccelerometerJerk-std()-Z time\_BodyGyroscope-mean()-X  
## Min. :-0.99329 Min. :-0.20578   
## 1st Qu.:-0.98266 1st Qu.:-0.04712   
## Median :-0.88366 Median :-0.02871   
## Mean :-0.73596 Mean :-0.03244   
## 3rd Qu.:-0.51212 3rd Qu.:-0.01676   
## Max. : 0.03102 Max. : 0.19270   
## time\_BodyGyroscope-mean()-Y time\_BodyGyroscope-mean()-Z  
## Min. :-0.20421 Min. :-0.07245   
## 1st Qu.:-0.08955 1st Qu.: 0.07475   
## Median :-0.07318 Median : 0.08512   
## Mean :-0.07426 Mean : 0.08744   
## 3rd Qu.:-0.06113 3rd Qu.: 0.10177   
## Max. : 0.02747 Max. : 0.17910   
## time\_BodyGyroscope-std()-X time\_BodyGyroscope-std()-Y  
## Min. :-0.9943 Min. :-0.9942   
## 1st Qu.:-0.9735 1st Qu.:-0.9629   
## Median :-0.7890 Median :-0.8017   
## Mean :-0.6916 Mean :-0.6533   
## 3rd Qu.:-0.4414 3rd Qu.:-0.4196   
## Max. : 0.2677 Max. : 0.4765   
## time\_BodyGyroscope-std()-Z time\_BodyGyroscopeJerk-mean()-X  
## Min. :-0.9855 Min. :-0.15721   
## 1st Qu.:-0.9609 1st Qu.:-0.10322   
## Median :-0.8010 Median :-0.09868   
## Mean :-0.6164 Mean :-0.09606   
## 3rd Qu.:-0.3106 3rd Qu.:-0.09110   
## Max. : 0.5649 Max. :-0.02209   
## time\_BodyGyroscopeJerk-mean()-Y time\_BodyGyroscopeJerk-mean()-Z  
## Min. :-0.07681 Min. :-0.092500   
## 1st Qu.:-0.04552 1st Qu.:-0.061725   
## Median :-0.04112 Median :-0.053430   
## Mean :-0.04269 Mean :-0.054802   
## 3rd Qu.:-0.03842 3rd Qu.:-0.048985   
## Max. :-0.01320 Max. :-0.006941   
## time\_BodyGyroscopeJerk-std()-X time\_BodyGyroscopeJerk-std()-Y  
## Min. :-0.9965 Min. :-0.9971   
## 1st Qu.:-0.9800 1st Qu.:-0.9832   
## Median :-0.8396 Median :-0.8942   
## Mean :-0.7036 Mean :-0.7636   
## 3rd Qu.:-0.4629 3rd Qu.:-0.5861   
## Max. : 0.1791 Max. : 0.2959   
## time\_BodyGyroscopeJerk-std()-Z time\_BodyAccelerometerMag-mean()  
## Min. :-0.9954 Min. :-0.9865   
## 1st Qu.:-0.9848 1st Qu.:-0.9573   
## Median :-0.8610 Median :-0.4829   
## Mean :-0.7096 Mean :-0.4973   
## 3rd Qu.:-0.4741 3rd Qu.:-0.0919   
## Max. : 0.1932 Max. : 0.6446   
## time\_BodyAccelerometerMag-std() time\_GravityAccelerometerMag-mean()  
## Min. :-0.9865 Min. :-0.9865   
## 1st Qu.:-0.9430 1st Qu.:-0.9573   
## Median :-0.6074 Median :-0.4829   
## Mean :-0.5439 Mean :-0.4973   
## 3rd Qu.:-0.2090 3rd Qu.:-0.0919   
## Max. : 0.4284 Max. : 0.6446   
## time\_GravityAccelerometerMag-std() time\_BodyAccelerometerJerkMag-mean()  
## Min. :-0.9865 Min. :-0.9928   
## 1st Qu.:-0.9430 1st Qu.:-0.9807   
## Median :-0.6074 Median :-0.8168   
## Mean :-0.5439 Mean :-0.6079   
## 3rd Qu.:-0.2090 3rd Qu.:-0.2456   
## Max. : 0.4284 Max. : 0.4345   
## time\_BodyAccelerometerJerkMag-std() time\_BodyGyroscopeMag-mean()  
## Min. :-0.9946 Min. :-0.9807   
## 1st Qu.:-0.9765 1st Qu.:-0.9461   
## Median :-0.8014 Median :-0.6551   
## Mean :-0.5842 Mean :-0.5652   
## 3rd Qu.:-0.2173 3rd Qu.:-0.2159   
## Max. : 0.4506 Max. : 0.4180   
## time\_BodyGyroscopeMag-std() time\_BodyGyroscopeJerkMag-mean()  
## Min. :-0.9814 Min. :-0.99732   
## 1st Qu.:-0.9476 1st Qu.:-0.98515   
## Median :-0.7420 Median :-0.86479   
## Mean :-0.6304 Mean :-0.73637   
## 3rd Qu.:-0.3602 3rd Qu.:-0.51186   
## Max. : 0.3000 Max. : 0.08758   
## time\_BodyGyroscopeJerkMag-std() FFT\_BodyAccelerometer-mean()-X  
## Min. :-0.9977 Min. :-0.9952   
## 1st Qu.:-0.9805 1st Qu.:-0.9787   
## Median :-0.8809 Median :-0.7691   
## Mean :-0.7550 Mean :-0.5758   
## 3rd Qu.:-0.5767 3rd Qu.:-0.2174   
## Max. : 0.2502 Max. : 0.5370   
## FFT\_BodyAccelerometer-mean()-Y FFT\_BodyAccelerometer-mean()-Z  
## Min. :-0.98903 Min. :-0.9895   
## 1st Qu.:-0.95361 1st Qu.:-0.9619   
## Median :-0.59498 Median :-0.7236   
## Mean :-0.48873 Mean :-0.6297   
## 3rd Qu.:-0.06341 3rd Qu.:-0.3183   
## Max. : 0.52419 Max. : 0.2807   
## FFT\_BodyAccelerometer-std()-X FFT\_BodyAccelerometer-std()-Y  
## Min. :-0.9966 Min. :-0.99068   
## 1st Qu.:-0.9820 1st Qu.:-0.94042   
## Median :-0.7470 Median :-0.51338   
## Mean :-0.5522 Mean :-0.48148   
## 3rd Qu.:-0.1966 3rd Qu.:-0.07913   
## Max. : 0.6585 Max. : 0.56019   
## FFT\_BodyAccelerometer-std()-Z FFT\_BodyAccelerometer-meanFreq()-X  
## Min. :-0.9872 Min. :-0.63591   
## 1st Qu.:-0.9459 1st Qu.:-0.39165   
## Median :-0.6441 Median :-0.25731   
## Mean :-0.5824 Mean :-0.23227   
## 3rd Qu.:-0.2655 3rd Qu.:-0.06105   
## Max. : 0.6871 Max. : 0.15912   
## FFT\_BodyAccelerometer-meanFreq()-Y FFT\_BodyAccelerometer-meanFreq()-Z  
## Min. :-0.379518 Min. :-0.52011   
## 1st Qu.:-0.081314 1st Qu.:-0.03629   
## Median : 0.007855 Median : 0.06582   
## Mean : 0.011529 Mean : 0.04372   
## 3rd Qu.: 0.086281 3rd Qu.: 0.17542   
## Max. : 0.466528 Max. : 0.40253   
## FFT\_BodyAccelerometerJerk-mean()-X FFT\_BodyAccelerometerJerk-mean()-Y  
## Min. :-0.9946 Min. :-0.9894   
## 1st Qu.:-0.9828 1st Qu.:-0.9725   
## Median :-0.8126 Median :-0.7817   
## Mean :-0.6139 Mean :-0.5882   
## 3rd Qu.:-0.2820 3rd Qu.:-0.1963   
## Max. : 0.4743 Max. : 0.2767   
## FFT\_BodyAccelerometerJerk-mean()-Z FFT\_BodyAccelerometerJerk-std()-X  
## Min. :-0.9920 Min. :-0.9951   
## 1st Qu.:-0.9796 1st Qu.:-0.9847   
## Median :-0.8707 Median :-0.8254   
## Mean :-0.7144 Mean :-0.6121   
## 3rd Qu.:-0.4697 3rd Qu.:-0.2475   
## Max. : 0.1578 Max. : 0.4768   
## FFT\_BodyAccelerometerJerk-std()-Y FFT\_BodyAccelerometerJerk-std()-Z  
## Min. :-0.9905 Min. :-0.993108   
## 1st Qu.:-0.9737 1st Qu.:-0.983747   
## Median :-0.7852 Median :-0.895121   
## Mean :-0.5707 Mean :-0.756489   
## 3rd Qu.:-0.1685 3rd Qu.:-0.543787   
## Max. : 0.3498 Max. :-0.006236   
## FFT\_BodyAccelerometerJerk-meanFreq()-X  
## Min. :-0.57604   
## 1st Qu.:-0.28966   
## Median :-0.06091   
## Mean :-0.06910   
## 3rd Qu.: 0.17660   
## Max. : 0.33145   
## FFT\_BodyAccelerometerJerk-meanFreq()-Y  
## Min. :-0.60197   
## 1st Qu.:-0.39751   
## Median :-0.23209   
## Mean :-0.22810   
## 3rd Qu.:-0.04721   
## Max. : 0.19568   
## FFT\_BodyAccelerometerJerk-meanFreq()-Z FFT\_BodyGyroscope-mean()-X  
## Min. :-0.62756 Min. :-0.9931   
## 1st Qu.:-0.30867 1st Qu.:-0.9697   
## Median :-0.09187 Median :-0.7300   
## Mean :-0.13760 Mean :-0.6367   
## 3rd Qu.: 0.03858 3rd Qu.:-0.3387   
## Max. : 0.23011 Max. : 0.4750   
## FFT\_BodyGyroscope-mean()-Y FFT\_BodyGyroscope-mean()-Z  
## Min. :-0.9940 Min. :-0.9860   
## 1st Qu.:-0.9700 1st Qu.:-0.9624   
## Median :-0.8141 Median :-0.7909   
## Mean :-0.6767 Mean :-0.6044   
## 3rd Qu.:-0.4458 3rd Qu.:-0.2635   
## Max. : 0.3288 Max. : 0.4924   
## FFT\_BodyGyroscope-std()-X FFT\_BodyGyroscope-std()-Y  
## Min. :-0.9947 Min. :-0.9944   
## 1st Qu.:-0.9750 1st Qu.:-0.9602   
## Median :-0.8086 Median :-0.7964   
## Mean :-0.7110 Mean :-0.6454   
## 3rd Qu.:-0.4813 3rd Qu.:-0.4154   
## Max. : 0.1966 Max. : 0.6462   
## FFT\_BodyGyroscope-std()-Z FFT\_BodyGyroscope-meanFreq()-X  
## Min. :-0.9867 Min. :-0.395770   
## 1st Qu.:-0.9643 1st Qu.:-0.213363   
## Median :-0.8224 Median :-0.115527   
## Mean :-0.6577 Mean :-0.104551   
## 3rd Qu.:-0.3916 3rd Qu.: 0.002655   
## Max. : 0.5225 Max. : 0.249209   
## FFT\_BodyGyroscope-meanFreq()-Y FFT\_BodyGyroscope-meanFreq()-Z  
## Min. :-0.66681 Min. :-0.50749   
## 1st Qu.:-0.29433 1st Qu.:-0.15481   
## Median :-0.15794 Median :-0.05081   
## Mean :-0.16741 Mean :-0.05718   
## 3rd Qu.:-0.04269 3rd Qu.: 0.04152   
## Max. : 0.27314 Max. : 0.37707   
## FFT\_BodyAccelerometerMag-mean() FFT\_BodyAccelerometerMag-std()  
## Min. :-0.9868 Min. :-0.9876   
## 1st Qu.:-0.9560 1st Qu.:-0.9452   
## Median :-0.6703 Median :-0.6513   
## Mean :-0.5365 Mean :-0.6210   
## 3rd Qu.:-0.1622 3rd Qu.:-0.3654   
## Max. : 0.5866 Max. : 0.1787   
## FFT\_BodyAccelerometerMag-meanFreq() FFT\_BodyAccelerometerJerkMag-mean()  
## Min. :-0.31234 Min. :-0.9940   
## 1st Qu.:-0.01475 1st Qu.:-0.9770   
## Median : 0.08132 Median :-0.7940   
## Mean : 0.07613 Mean :-0.5756   
## 3rd Qu.: 0.17436 3rd Qu.:-0.1872   
## Max. : 0.43585 Max. : 0.5384   
## FFT\_BodyAccelerometerJerkMag-std()  
## Min. :-0.9944   
## 1st Qu.:-0.9752   
## Median :-0.8126   
## Mean :-0.5992   
## 3rd Qu.:-0.2668   
## Max. : 0.3163   
## FFT\_BodyAccelerometerJerkMag-meanFreq() FFT\_BodyGyroscopeMag-mean()  
## Min. :-0.12521 Min. :-0.9865   
## 1st Qu.: 0.04527 1st Qu.:-0.9616   
## Median : 0.17198 Median :-0.7657   
## Mean : 0.16255 Mean :-0.6671   
## 3rd Qu.: 0.27593 3rd Qu.:-0.4087   
## Max. : 0.48809 Max. : 0.2040   
## FFT\_BodyGyroscopeMag-std() FFT\_BodyGyroscopeMag-meanFreq()  
## Min. :-0.9815 Min. :-0.45664   
## 1st Qu.:-0.9488 1st Qu.:-0.16951   
## Median :-0.7727 Median :-0.05352   
## Mean :-0.6723 Mean :-0.03603   
## 3rd Qu.:-0.4277 3rd Qu.: 0.08228   
## Max. : 0.2367 Max. : 0.40952   
## FFT\_BodyGyroscopeJerkMag-mean() FFT\_BodyGyroscopeJerkMag-std()  
## Min. :-0.9976 Min. :-0.9976   
## 1st Qu.:-0.9813 1st Qu.:-0.9802   
## Median :-0.8779 Median :-0.8941   
## Mean :-0.7564 Mean :-0.7715   
## 3rd Qu.:-0.5831 3rd Qu.:-0.6081   
## Max. : 0.1466 Max. : 0.2878   
## FFT\_BodyGyroscopeJerkMag-meanFreq()  
## Min. :-0.18292   
## 1st Qu.: 0.05423   
## Median : 0.11156   
## Mean : 0.12592   
## 3rd Qu.: 0.20805   
## Max. : 0.42630