The code Book

**Information about the variables in the data set not contained in the tidy data**

In original data there are 561 variables, 475 are not included in tidy date, all are listed in *feature.txt* and info about them is listed in features\_info.txt of original data in *UCI HAR Dataset*

The set of variables that were estimated from are:

signals were used to estimate variables of the feature vector for each pattern:

'-XYZ' is used to denote 3-axial signals in the X, Y and Z directions.

tBodyAcc-XYZ

tGravityAcc-XYZ

tBodyAccJerk-XYZ

tBodyGyro-XYZ

tBodyGyroJerk-XYZ

tBodyAccMag

tGravityAccMag

tBodyAccJerkMag

tBodyGyroMag

tBodyGyroJerkMag

fBodyAcc-XYZ

fBodyAccJerk-XYZ

fBodyGyro-XYZ

fBodyAccMag

fBodyAccJerkMag

fBodyGyroMag

fBodyGyroJerkMag

The set of variables that were estimated from these signals are (**variables from tidy data era excluded**):

mad(): Median absolute deviation

max(): Largest value in array

min(): Smallest value in array

sma(): Signal magnitude area

energy(): Energy measure. Sum of the squares divided by the number of values.

iqr(): Interquartile range

entropy(): Signal entropy

arCoeff(): Autorregresion coefficients with Burg order equal to 4

correlation(): correlation coefficient between two signals

maxInds(): index of the frequency component with largest magnitude

meanFreq(): Weighted average of the frequency components to obtain a mean frequency

skewness(): skewness of the frequency domain signal

kurtosis(): kurtosis of the frequency domain signal

bandsEnergy(): Energy of a frequency interval within the 64 bins of the FFT of each window.

angle(): Angle between to vectors.

Additional vectors obtained by averaging the signals in a signal window sample. These are used on the angle() variable:

gravityMean

tBodyAccMean

tBodyAccJerkMean

tBodyGyroMean

tBodyGyroJerkMean

**Tidy data contains 87 variables and 6 observations;**

We have selected only *mean(): Mean value* and *std(): Standard deviation* . Observations measurements have been made for 6 different types of Activity 1 WALKING,2 WALKING\_UPSTAIRS, 3 WALKING\_DOWNSTAIRS, 4 SITTING, 5 STANDING, 6 LAYING. We averaged each variable for each activity and each subject.. We have 6 observations with 86 variables (from 2-nd to 87-th) for each Activity. 1-st variable is a type of Activity. The total size 6x87

[1] "Activity" "tBodyAcc.mean...X"

[3] "tBodyAcc.mean...Y" "tBodyAcc.mean...Z"

[5] "tBodyAcc.std...X" "tBodyAcc.std...Y"

[7] "tBodyAcc.std...Z" "tGravityAcc.mean...X"

[9] "tGravityAcc.mean...Y" "tGravityAcc.mean...Z"

[11] "tGravityAcc.std...X" "tGravityAcc.std...Y"

[13] "tGravityAcc.std...Z" "tBodyAccJerk.mean...X"

[15] "tBodyAccJerk.mean...Y" "tBodyAccJerk.mean...Z"

[17] "tBodyAccJerk.std...X" "tBodyAccJerk.std...Y"

[19] "tBodyAccJerk.std...Z" "tBodyGyro.mean...X"

[21] "tBodyGyro.mean...Y" "tBodyGyro.mean...Z"

[23] "tBodyGyro.std...X" "tBodyGyro.std...Y"

[25] "tBodyGyro.std...Z" "tBodyGyroJerk.mean...X"

[27] "tBodyGyroJerk.mean...Y" "tBodyGyroJerk.mean...Z"

[29] "tBodyGyroJerk.std...X" "tBodyGyroJerk.std...Y"

[31] "tBodyGyroJerk.std...Z" "tBodyAccMag.mean.."

[33] "tBodyAccMag.std.." "tGravityAccMag.mean.."

[35] "tGravityAccMag.std.." "tBodyAccJerkMag.mean.."

[37] "tBodyAccJerkMag.std.." "tBodyGyroMag.mean.."

[39] "tBodyGyroMag.std.." "tBodyGyroJerkMag.mean.."

[41] "tBodyGyroJerkMag.std.." "fBodyAcc.mean...X"

[43] "fBodyAcc.mean...Y" "fBodyAcc.mean...Z"

[45] "fBodyAcc.std...X" "fBodyAcc.std...Y"

[47] "fBodyAcc.std...Z" "fBodyAcc.meanFreq...X"

[49] "fBodyAcc.meanFreq...Y" "fBodyAcc.meanFreq...Z"

[51] "fBodyAccJerk.mean...X" "fBodyAccJerk.mean...Y"

[53] "fBodyAccJerk.mean...Z" "fBodyAccJerk.std...X"

[55] "fBodyAccJerk.std...Y" "fBodyAccJerk.std...Z"

[57] "fBodyAccJerk.meanFreq...X" "fBodyAccJerk.meanFreq...Y"

[59] "fBodyAccJerk.meanFreq...Z" "fBodyGyro.mean...X"

[61] "fBodyGyro.mean...Y" "fBodyGyro.mean...Z"

[63] "fBodyGyro.std...X" "fBodyGyro.std...Y"

[65] "fBodyGyro.std...Z" "fBodyGyro.meanFreq...X"

[67] "fBodyGyro.meanFreq...Y" "fBodyGyro.meanFreq...Z"

[69] "fBodyAccMag.mean.." "fBodyAccMag.std.."

[71] "fBodyAccMag.meanFreq.." "fBodyBodyAccJerkMag.mean.."

[73] "fBodyBodyAccJerkMag.std.." "fBodyBodyAccJerkMag.meanFreq.."

[75] "fBodyBodyGyroMag.mean.." "fBodyBodyGyroMag.std.."

[77] "fBodyBodyGyroMag.meanFreq.." "fBodyBodyGyroJerkMag.mean.."

[79] "fBodyBodyGyroJerkMag.std.." "fBodyBodyGyroJerkMag.meanFreq.."

[81] "angle.tBodyAccMean.gravity." "angle.tBodyAccJerkMean..gravityMean."

[83] "angle.tBodyGyroMean.gravityMean." "angle.tBodyGyroJerkMean.gravityMean."

[85] "angle.X.gravityMean." "angle.Y.gravityMean."

[87] "angle.Z.gravityMean."

**Information about the experimental study design**

The experiments have been carried out with a group of 30 volunteers within an age bracket of 19-48 years. Each person performed six activities (WALKING, WALKING\_UPSTAIRS, WALKING\_DOWNSTAIRS, SITTING, STANDING, LAYING) wearing a smartphone (Samsung Galaxy S II) on the waist. Using its embedded accelerometer and gyroscope, we captured 3-axial linear acceleration and 3-axial angular velocity at a constant rate of 50Hz. The experiments have been video-recorded to label the data manually. The obtained dataset has been randomly partitioned into two sets, where 70% of the volunteers was selected for generating the training data and 30% the test data.

The sensor signals (accelerometer and gyroscope) were pre-processed by applying noise filters and then sampled in fixed-width sliding windows of 2.56 sec and 50% overlap (128 readings/window). The sensor acceleration signal, which has gravitational and body motion components, was separated using a Butterworth low-pass filter into body acceleration and gravity. The gravitational force is assumed to have only low frequency components, therefore a filter with 0.3 Hz cutoff frequency was used. From each window, a vector of features was obtained by calculating variables from the time and frequency domain. See 'features\_info.txt' for more details.