

# Getting and cleaning data course project codebook

## Contents

Introduction: .....	1
Variables: .....	1
Tidied Dataset: .....	2
References: .....	11

## Introduction:

In Dec 2012 an experiment was carried out on 30 volunteers aged between 19-48 years on Human Activity Recognition on Smartphones using a Multiclass Hardware-Friendly Support Vector Machine<sup>[1]</sup> Each person performed six activities (WALKING, WALKING\_UPSTAIRS, WALKING\_DOWNSTAIRS, SITTING, STANDING, LAYING) wearing a smartphone (Samsung Galaxy S II). Using the embedded accelerometer and gyroscope 3-axial linear acceleration and 3-axial angular velocity at a constant rate of 50Hz was captured for a number of different variables. The data generated from this experiment was randomly partitioned to create two datasets; with the data from 70% of the volunteers used to create a training dataset and that from the remainder used to create a test dataset.

The dataset created as part of this project creates a wide format tidy dataset of a subset of the combined experimental data variables – namely the mean and standard deviation measurements of each variable. For each of these variables the dataset provides the average recorded value for each volunteer by activity.

## Variables:

From the original experiment: The variables selected for this database come from the accelerometer and gyroscope 3-axial raw signals tAcc-XYZ and tGyro-XYZ. These time domain signals (prefix 't' to denote time) were captured at a constant rate of 50 Hz.. Similarly, the acceleration signal was then separated into body and gravity acceleration signals (tBodyAcc-XYZ and tGravityAcc-XYZ) using another low pass Butterworth filter with a corner frequency of 0.3 Hz.

Subsequently, the body linear acceleration and angular velocity were derived in time to obtain Jerk signals (tBodyAccJerk-XYZ and tBodyGyroJerk-XYZ). Also the magnitude of these three-dimensional signals were calculated using the Euclidean norm (tBodyAccMag, tGravityAccMag, tBodyAccJerkMag, tBodyGyroMag, tBodyGyroJerkMag). Finally a Fast Fourier Transform (FFT) was applied to some of these signals producing fBodyAcc-XYZ, fBodyAccJerk-XYZ, fBodyGyro-XYZ, fBodyAccJerkMag, fBodyGyroMag, fBodyGyroJerkMag. (Note the 'f' to indicate frequency domain signals).

These 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.

Tidied dataset: The set of variables used these signals are mean and standard deviation (std).

tBodyAcc-XYZ

tGravityAcc-XYZ

tBodyAccJerk-XYZ

tBodyGyroXYZ

tBodyGyroJerkXYZ

tBodyAccMag

tGravityAccMag

tBodyAccJerkMag

tBodyGyroMag

tBodyGyroJerkMag

fBodyAccXYZ

fBodyAccJerkXYZ

fBodyGyroXYZ

fBodyAccMag

fBodyAccJerkMag

fBodyGyroMag

fBodyGyroJerkMag

### **Tidied Dataset:**

WALKING\_1: mean values calculated for volunteer # 1 while walking. Data type: numeric

WALKING\_2: mean values calculated for volunteer # 2 while walking. Data type: numeric

WALKING\_3: mean values calculated for volunteer # 3 while walking. Data type: numeric

WALKING\_4: mean values calculated for volunteer # 4 while walking. Data type: numeric

WALKING\_5: mean values calculated for volunteer # 5 while walking. Data type: numeric

WALKING\_6: mean values calculated for volunteer # 6 while walking. Data type: numeric

WALKING\_7: mean values calculated for volunteer # 7 while walking. Data type: numeric

WALKING\_8: mean values calculated for volunteer # 8 while walking. Data type: numeric

WALKING\_9: mean values calculated for volunteer # 9 while walking. Data type: numeric

WALKING\_10: mean values calculated for volunteer # 10 while walking. Data type: numeric

WALKING\_11: mean values calculated for volunteer # 11 while walking. Data type: numeric

WALKING\_12: mean values calculated for volunteer # 12 while walking. Data type: numeric

WALKING\_13: mean values calculated for volunteer # 13 while walking. Data type: numeric

WALKING\_14: mean values calculated for volunteer # 14 while walking. Data type: numeric

WALKING\_15: mean values calculated for volunteer # 15 while walking. Data type: numeric

WALKING\_16: mean values calculated for volunteer # 16 while walking. Data type: numeric

WALKING\_17: mean values calculated for volunteer # 17 while walking. Data type: numeric

WALKING\_18: mean values calculated for volunteer # 18 while walking. Data type: numeric

WALKING\_19: mean values calculated for volunteer # 19 while walking. Data type: numeric

WALKING\_20: mean values calculated for volunteer # 20 while walking. Data type: numeric

WALKING\_21: mean values calculated for volunteer # 21 while walking. Data type: numeric

WALKING\_22: mean values calculated for volunteer # 22 while walking. Data type: numeric

WALKING\_23: mean values calculated for volunteer # 23 while walking. Data type: numeric

WALKING\_24: mean values calculated for volunteer # 24 while walking. Data type: numeric

WALKING\_25: mean values calculated for volunteer # 25 while walking. Data type: numeric

WALKING\_26: mean values calculated for volunteer # 26 while walking. Data type: numeric

WALKING\_27: mean values calculated for volunteer # 27 while walking. Data type: numeric

WALKING\_28: mean values calculated for volunteer # 28 while walking. Data type: numeric

WALKING\_29: mean values calculated for volunteer # 29 while walking. Data type: numeric

WALKING\_30: mean values calculated for volunteer # 30 while walking. Data type: numeric

WALKING\_UPSTAIRS\_1: mean values calculated for volunteer # 1 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_2: mean values calculated for volunteer # 2 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_3: mean values calculated for volunteer # 3 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_4: mean values calculated for volunteer # 4 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_5: mean values calculated for volunteer # 5 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_6: mean values calculated for volunteer # 6 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_7: mean values calculated for volunteer # 7 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_8: mean values calculated for volunteer # 8 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_9: mean values calculated for volunteer # 9 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_10: mean values calculated for volunteer # 10 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_11: mean values calculated for volunteer # 11 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_12: mean values calculated for volunteer # 12 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_13: mean values calculated for volunteer # 13 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_14: mean values calculated for volunteer # 14 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_15: mean values calculated for volunteer # 15 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_16: mean values calculated for volunteer # 16 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_17: mean values calculated for volunteer # 17 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_18: mean values calculated for volunteer # 18 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_19: mean values calculated for volunteer # 19 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_20: mean values calculated for volunteer # 20 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_21: mean values calculated for volunteer # 21 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_22: mean values calculated for volunteer # 22 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_23: mean values calculated for volunteer # 23 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_24: mean values calculated for volunteer # 24 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_25: mean values calculated for volunteer # 25 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_26: mean values calculated for volunteer # 26 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_27: mean values calculated for volunteer # 27 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_28: mean values calculated for volunteer # 28 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_29: mean values calculated for volunteer # 29 while walking upstairs. Data type: numeric

WALKING\_UPSTAIRS\_30: mean values calculated for volunteer # 30 while walking upstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_1: mean values calculated for volunteer # 1 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_2: mean values calculated for volunteer # 2 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_3: mean values calculated for volunteer # 3 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_4: mean values calculated for volunteer # 4 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_5: mean values calculated for volunteer # 5 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_6: mean values calculated for volunteer # 6 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_7: mean values calculated for volunteer # 7 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_8: mean values calculated for volunteer # 8 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_9: mean values calculated for volunteer # 9 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_10: mean values calculated for volunteer # 10 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_11: mean values calculated for volunteer # 11 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_12: mean values calculated for volunteer # 12 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_13: mean values calculated for volunteer # 13 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_14: mean values calculated for volunteer # 14 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_15: mean values calculated for volunteer # 15 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_16: mean values calculated for volunteer # 16 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_17: mean values calculated for volunteer # 17 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_18: mean values calculated for volunteer # 18 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_19: mean values calculated for volunteer # 19 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_20: mean values calculated for volunteer # 20 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_21: mean values calculated for volunteer # 21 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_22: mean values calculated for volunteer # 22 while walking downstairs. Data type: numeric

WALKING\_DOWNSTAIRS\_23: mean values calculated for volunteer # 23 while walking downstairs.  
Data type: numeric

WALKING\_DOWNSTAIRS\_24: mean values calculated for volunteer # 24 while walking downstairs.  
Data type: numeric

WALKING\_DOWNSTAIRS\_25: mean values calculated for volunteer # 25 while walking downstairs.  
Data type: numeric

WALKING\_DOWNSTAIRS\_26: mean values calculated for volunteer # 26 while walking downstairs.  
Data type: numeric

WALKING\_DOWNSTAIRS\_27: mean values calculated for volunteer # 27 while walking downstairs.  
Data type: numeric

WALKING\_DOWNSTAIRS\_28: mean values calculated for volunteer # 28 while walking downstairs.  
Data type: numeric

WALKING\_DOWNSTAIRS\_29: mean values calculated for volunteer # 29 while walking downstairs.  
Data type: numeric

WALKING\_DOWNSTAIRS\_30: mean values calculated for volunteer # 30 while walking downstairs.  
Data type: numeric

SITTING\_1: mean values calculated for volunteer # 1 sitting. Data type: numeric

SITTING\_2: mean values calculated for volunteer # 2 sitting. Data type: numeric

SITTING\_3: mean values calculated for volunteer # 3 sitting. Data type: numeric

SITTING\_4: mean values calculated for volunteer # 4 sitting. Data type: numeric

SITTING\_5: mean values calculated for volunteer # 5 sitting. Data type: numeric

SITTING\_6: mean values calculated for volunteer # 6 sitting. Data type: numeric

SITTING\_7: mean values calculated for volunteer # 7 sitting. Data type: numeric

SITTING\_8: mean values calculated for volunteer # 8 sitting. Data type: numeric

SITTING\_9: mean values calculated for volunteer # 9 sitting. Data type: numeric

SITTING\_10: mean values calculated for volunteer # 10 sitting. Data type: numeric

SITTING\_11: mean values calculated for volunteer # 11 sitting. Data type: numeric

SITTING\_12: mean values calculated for volunteer # 12 sitting. Data type: numeric

SITTING\_13: mean values calculated for volunteer # 13 sitting. Data type: numeric

SITTING\_14: mean values calculated for volunteer # 14 sitting. Data type: numeric

SITTING\_15: mean values calculated for volunteer # 15 sitting. Data type: numeric

SITTING\_16: mean values calculated for volunteer # 16 sitting. Data type: numeric

SITTING\_17: mean values calculated for volunteer # 17 sitting. Data type: numeric

SITTING\_18: mean values calculated for volunteer # 18 sitting. Data type: numeric

SITTING\_19: mean values calculated for volunteer # 19 sitting. Data type: numeric

SITTING\_20: mean values calculated for volunteer # 20 sitting. Data type: numeric

SITTING\_21: mean values calculated for volunteer # 21 sitting. Data type: numeric

SITTING\_22: mean values calculated for volunteer # 22 sitting. Data type: numeric

SITTING\_23: mean values calculated for volunteer # 23 sitting. Data type: numeric

SITTING\_24: mean values calculated for volunteer # 24 sitting. Data type: numeric

SITTING\_25: mean values calculated for volunteer # 25 sitting. Data type: numeric

SITTING\_26: mean values calculated for volunteer # 26 sitting. Data type: numeric

SITTING\_27: mean values calculated for volunteer # 27 sitting. Data type: numeric

SITTING\_28: mean values calculated for volunteer # 28 sitting. Data type: numeric

SITTING\_29: mean values calculated for volunteer # 29 sitting. Data type: numeric

SITTING\_30: mean values calculated for volunteer # 30 sitting. Data type: numeric

STANDING\_1: mean values calculated for volunteer # 1 while standing. Data type: numeric

STANDING\_2: mean values calculated for volunteer # 2 while standing. Data type: numeric

STANDING\_3: mean values calculated for volunteer # 3 while standing. Data type: numeric

STANDING\_4: mean values calculated for volunteer # 4 while standing. Data type: numeric

STANDING\_5: mean values calculated for volunteer # 5 while standing. Data type: numeric

STANDING\_6: mean values calculated for volunteer # 6 while standing. Data type: numeric

STANDING\_7: mean values calculated for volunteer # 7 while standing. Data type: numeric

STANDING\_8: mean values calculated for volunteer # 8 while standing. Data type: numeric

STANDING\_9: mean values calculated for volunteer # 9 while standing. Data type: numeric

STANDING\_10: mean values calculated for volunteer # 10 while standing. Data type: numeric

STANDING\_11: mean values calculated for volunteer # 11 while standing. Data type: numeric

STANDING\_12: mean values calculated for volunteer # 12 while standing. Data type: numeric



STANDING\_13: mean values calculated for volunteer # 13 while standing. Data type: numeric

STANDING\_14: mean values calculated for volunteer # 14 while standing. Data type: numeric

STANDING\_15: mean values calculated for volunteer # 15 while standing. Data type: numeric

STANDING\_16: mean values calculated for volunteer # 16 while standing. Data type: numeric

STANDING\_17: mean values calculated for volunteer # 17 while standing. Data type: numeric

STANDING\_18: mean values calculated for volunteer # 18 while standing. Data type: numeric

STANDING\_19: mean values calculated for volunteer # 19 while standing. Data type: numeric

STANDING\_20: mean values calculated for volunteer # 20 while standing. Data type: numeric

STANDING\_21: mean values calculated for volunteer # 21 while standing. Data type: numeric

STANDING\_22: mean values calculated for volunteer # 22 while standing. Data type: numeric

STANDING\_23: mean values calculated for volunteer # 23 while standing. Data type: numeric

STANDING\_24: mean values calculated for volunteer # 24 while standing. Data type: numeric

STANDING\_25: mean values calculated for volunteer # 25 while standing. Data type: numeric

STANDING\_26: mean values calculated for volunteer # 26 while standing. Data type: numeric

STANDING\_27: mean values calculated for volunteer # 27 while standing. Data type: numeric

STANDING\_28: mean values calculated for volunteer # 28 while standing. Data type: numeric

STANDING\_29: mean values calculated for volunteer # 29 while standing. Data type: numeric

STANDING\_30: mean values calculated for volunteer # 30 while standing. Data type: numeric

LAYING\_1: mean values calculated for volunteer # 1 while laying down. Data type: numeric

LAYING\_2: mean values calculated for volunteer # 2 while laying down. Data type: numeric

LAYING\_3: mean values calculated for volunteer # 3 while laying down. Data type: numeric

LAYING\_4: mean values calculated for volunteer # 4 while laying down. Data type: numeric

LAYING\_5: mean values calculated for volunteer # 5 while laying down. Data type: numeric

LAYING\_6: mean values calculated for volunteer # 6 while laying down. Data type: numeric

LAYING\_7: mean values calculated for volunteer # 7 while laying down. Data type: numeric

LAYING\_8: mean values calculated for volunteer # 8 while laying down. Data type: numeric

LAYING\_9: mean values calculated for volunteer # 9 while laying down. Data type: numeric

LAYING\_10: mean values calculated for volunteer # 10 while laying down. Data type: numeric

LAYING\_11: mean values calculated for volunteer # 11 while laying down. Data type: numeric

LAYING\_12: mean values calculated for volunteer # 12 while laying down. Data type: numeric

LAYING\_13: mean values calculated for volunteer # 13 while laying down. Data type: numeric

LAYING\_14: mean values calculated for volunteer # 14 while laying down. Data type: numeric

LAYING\_15: mean values calculated for volunteer # 15 while laying down. Data type: numeric

LAYING\_16: mean values calculated for volunteer # 16 while laying down. Data type: numeric

LAYING\_17: mean values calculated for volunteer # 17 while laying down. Data type: numeric

LAYING\_18: mean values calculated for volunteer # 18 while laying down. Data type: numeric

LAYING\_19: mean values calculated for volunteer # 19 while laying down. Data type: numeric

LAYING\_20: mean values calculated for volunteer # 20 while laying down. Data type: numeric

LAYING\_21: mean values calculated for volunteer # 21 while laying down. Data type: numeric

LAYING\_22: mean values calculated for volunteer # 22 while laying down. Data type: numeric

LAYING\_23: mean values calculated for volunteer # 23 while laying down. Data type: numeric

LAYING\_24: mean values calculated for volunteer # 24 while laying down. Data type: numeric

LAYING\_25: mean values calculated for volunteer # 25 while laying down. Data type: numeric

LAYING\_26: mean values calculated for volunteer # 26 while laying down. Data type: numeric

LAYING\_27: mean values calculated for volunteer # 27 while laying down. Data type: numeric

LAYING\_28: mean values calculated for volunteer # 28 while laying down. Data type: numeric

LAYING\_29: mean values calculated for volunteer # 29 while laying down. Data type: numeric

LAYING\_30: mean values calculated for volunteer # 30 while laying down. Data type: numeric

## References:

- [1] Davide Anguita, Alessandro Ghio, Luca Oneto, Xavier Parra and Jorge L. Reyes-Ortiz. Human Activity Recognition on Smartphones using a Multiclass Hardware-Friendly Support Vector Machine. International Workshop of Ambient Assisted Living (IWAAL 2012). Vitoria-Gasteiz, Spain. Dec 2012