

# Codebook

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This dataset contains 19 variables extracted and cleaned from the original research—see 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.

All original files are available at <https://d396qusza40orc.cloudfront.net/getdata%2Fprojectfiles%2FUCI%20HAR%20Dataset.zip>

## Data Processing:

The text files provided by Anguita et al. contain different statistics of the x, y, and z coordinates of different movement types detected by the smartphones of 30 test subjects as they performed 6 different types of movements. The processed dataset, `run_var_mean.csv`, is a subset of such— selecting only the mean and standard deviation of the individual XYZ observations—in which each variable corresponds the average of these observations for each activity and each subject.

## Identifier Variables:

- `subject` - a numeric identifier (1-30) of the 30 test subjects in the original experiment.
- `type_exercise` - a character identifier of the 6 types of physical activities detected by the smartphone. The types of exercise include laying, sitting, standing, walking, walking\_downstairs, and walking\_upstairs.

## Feature Variables:

(Excerpt from Original Experiment)

The features 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. Then they were filtered using a median filter and a 3rd order low pass Butterworth filter with a corner frequency of 20 Hz to remove noise. 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.

- 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