

# Codebook

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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.

The set of variables that were estimated from these signals are:

mean(): Mean value

std(): Standard deviation

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The variables included in the data set:

**tBodyAcc-mean()-X** - Mean of the mean of the body acceleration on the x axis in standard gravity units (g).

**tBodyAcc-mean()-Y** - Mean of the mean of the body acceleration signals on the y axis in standard gravity units (g).

**tBodyAcc-mean()-Z** - Mean of the mean of the body acceleration signals on the z axis in standard gravity units (g).

**tBodyAcc-std()-X** - Mean of the standard deviation of the body acceleration signals on the x axis in standard gravity units (g).

**tBodyAcc-std()-Y** - Mean of the standard deviation of the body acceleration signals on the y axis in standard gravity units (g).

**tBodyAcc-std()-Z** - Mean of the standard deviation of the body acceleration signals on the z axis in standard gravity units (g).

**tGravityAcc-mean()-X** - Mean of the mean gravity acceleration signals on the x axis in standard gravity units (g).

**tGravityAcc-mean()-Y** - Mean of the mean of the gravity acceleration signals on the y axis in standard gravity units (g).

**tGravityAcc-mean()-Z** - Mean of the mean of the gravity acceleration signals on the z axis in standard gravity units (g).

**tGravityAcc-std()-X** - Mean of the standard deviation of the gravity acceleration signals on the x axis in standard gravity units (g).

**tGravityAcc-std()-Y** - Mean of the standard deviation of the gravity acceleration signals on the y axis in standard gravity units (g).

**tGravityAcc-std()-Z** - Mean of the standard deviation of the gravity acceleration signals on the z axis in standard gravity units (g).

**tBodyAccJerk-mean()-X** - Mean of the mean of the body linear acceleration signals derived in time on the x axis in standard gravity units (g).

**tBodyAccJerk-mean()-Y** - Mean of the mean of the body linear acceleration signals derived in time on the y axis in standard gravity units (g).

**tBodyAccJerk-mean()-Z** - Mean of the mean of the body linear acceleration signals derived in time on the z axis in standard gravity units (g).

**tBodyAccJerk-std()-X** - Mean of the standard deviation of the body linear acceleration signals derived in time on the x axis in standard gravity units (g).

**tBodyAccJerk-std()-Y** - Mean of the standard deviation of the body linear acceleration signals derived in time on the y axis in standard gravity units (g).

**tBodyAccJerk-std()-Z** - Mean of the standard deviation of the body linear acceleration signals derived in time on the z axis in standard gravity units (g).

**tBodyGyro-mean()-X** - Mean of the mean of the angular velocity signals on the x axis in standard gravity units (g).

**tBodyGyro-mean()-Y** - Mean of the mean of the angular velocity signals on the y axis in standard gravity units (g).

**tBodyGyro-mean()-Z** - Mean of the mean of the angular velocity signals on the z axis in standard gravity units (g).

**tBodyGyro-std()-X** - Mean of the standard deviation of the angular velocity signals on the x axis in standard gravity units (g).

**tBodyGyro-std()-Y** - Mean of the standard deviation of the angular velocity signals on the y axis in standard gravity units (g).

**tBodyGyro-std()-Z** - Mean of the standard deviation of the angular velocity signals on the z axis in standard gravity units (g).

**tBodyGyroJerk-mean()-X** - Mean of the mean of the angular velocity signals on the x axis derived in time.

**tBodyGyroJerk-mean()-Y** - Mean of the mean of the angular velocity signals on the y axis derived in time.

**tBodyGyroJerk-mean()-Z** - Mean of the mean of the angular velocity signals on the z axis derived in time.

**tBodyGyroJerk-std()-X** - Mean of the standard deviation of the angular velocity signals on the x axis derived in time.

**tBodyGyroJerk-std()-Y** - Mean of the standard deviation of the angular velocity signals on the y axis derived in time.

**tBodyGyroJerk-std()-Z** - Mean of the standard deviation of the angular velocity signals on the z axis derived in time.

**tBodyAccMag-mean()** - Mean of the mean of the magnitude of the body acceleration signals.

**tBodyAccMag-std()** - Mean of the standard deviation of the magnitude of the body acceleration signals.

**tGravityAccMag-mean()** - Mean of the mean of the magnitude of the gravity acceleration signals.

**tGravityAccMag-std()** - Mean of the standard deviation of the magnitude of the gravity acceleration signals.

**tBodyAccJerkMag-mean()** - Mean of the mean of the magnitude of the body acceleration signals derived in time.

**tBodyAccJerkMag-std()** - Mean of the standard deviation of the magnitude of the body acceleration signals derived in time.

**tBodyGyroMag-mean()** - Mean of the mean of the magnitude of the angular velocity signals.

**tBodyGyroMag-std()** - Mean of the standard deviation of the magnitude of the angular velocity signals.

**tBodyGyroJerkMag-mean()** - Mean of the mean of the magnitude of the angular velocity signals derived in time.

**tBodyGyroJerkMag-std()** - Mean of the standard deviation of the magnitude of the angular velocity signals derived in time.

**fBodyAcc-mean()-X** - Mean of the mean of the body acceleration signals on the x axis with a fast fourier transformation.

**fBodyAcc-mean()-Y** - Mean of the mean of the body acceleration signals on the y axis with a fast fourier transformation.

**fBodyAcc-mean()-Z** - Mean of the mean of the body acceleration signals on the z axis with a fast fourier transformation.

**fBodyAcc-std()-X** - Mean of the standard deviation of the body acceleration signals on the x axis with a fast fourier transformation.

**fBodyAcc-std()-Y** - Mean of the standard deviation of the body acceleration signals on the y axis with a fast fourier transformation.

**fBodyAcc-std()-Z** - Mean of the standard deviation of the body acceleration signals on the z axis with a fast fourier transformation.

**fBodyAccJerk-mean()-X** - Mean of the mean of the body acceleration signals on the x axis derived in time with a fast fourier transformation.

**fBodyAccJerk-mean()-Y** - Mean of the mean of the body acceleration signals on the y axis derived in time with a fast fourier transformation.

**fBodyAccJerk-mean()-Z** - Mean of the mean of the body acceleration signals on the z axis derived in time with a fast fourier transformation.

**fBodyAccJerk-std()-X** - Mean of the standard deviation of the body acceleration signals on the x axis derived in time with a fast fourier transformation.

**fBodyAccJerk-std()-Y** - Mean of the standard deviation of the body acceleration signals on the y axis derived in time with a fast fourier transformation.

**fBodyAccJerk-std()-Z** - Mean of the standard deviation of the body acceleration signals on the z axis derived in time with a fast fourier transformation.

**fBodyGyro-mean()-X** - Mean of the mean of the angular velocity signals on the x axis with a fast fourier transformation.

**fBodyGyro-mean()-Y** - Mean of the mean of the angular velocity signals on the y axis with a fast fourier transformation.

**fBodyGyro-mean()-Z** - Mean of the mean of the angular velocity signals on the z axis with a fast fourier transformation.

**fBodyGyro-std()-X** - Mean of the standard deviation of the angular velocity signals on the x axis with a fast fourier transformation.

**fBodyGyro-std()-Y** - Mean of the standard deviation of the angular velocity signals on the y axis with a fast fourier transformation.

**fBodyGyro-std()-Z** - Mean of the standard deviation of the angular velocity signals on the z axis with a fast fourier transformation.

**fBodyAccMag-mean()** - Mean of the mean of the of the magnitude of the body acceleration signals with a fast fourier transformation.

**fBodyAccMag-std()** - Mean of the standard deviation of the of the magnitude of the body acceleration signals with a fast fourier transformation.

**fBodyBodyAccJerkMag-mean()** - Mean of the mean of the magnitude of the body acceleration signals derived in time with a fast fourier transformation.

**fBodyBodyAccJerkMag-std()** - Mean of the standard deviation of the magnitude of the body acceleration signals derived in time with a fast fourier transformation.

**fBodyBodyGyroMag-mean()** - Mean of the mean of the magnitude of the angular velocity signals with a fast fourier transformation.

**fBodyBodyGyroMag-std()** - Mean of the standard deviation of the magnitude of the angular velocity signals with a fast fourier transformation.

**fBodyBodyGyroJerkMag-mean()** - Mean of the mean of the magnitude of the angular velocity signals derived in time with a fast fourier transformation.

**fBodyBodyGyroJerkMag-std()** - Mean of the standard deviation of the magnitude of the angular velocity signals derived in time with a fast fourier transformation.