Feature Selection

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

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

- mean(): Mean value
- std(): Standard deviation

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

gravityMean

tBodyAccMean

tBodyAccJerkMean

tBodyGyroMean

tBodyGyroJerkMean

Field Name	**Description**	**Valid Values/Definitions**
"subject"	This data set included information collected from 30 different subjects. There is no mapping to a more meaningful name so the integer value is maintained.	Integer vale: 1-30
"activities"	This data set included information for 6 different activities.	1. walking 2. walking_upstairs 3. walking_downstairs 4. sitting 5. standing 6. laying
"tbodyacc_mean_x"	Average X component of body acceleration signal.	Float
"tbodyacc_mean_y"	Average Y component of body acceleration signal.	Float

"tbodyacc_mean_z"	Average Z component of body acceleration signal.	Float
"tbodyacc_std_x"	Standard deviation of X component of body acceleration signal.	Float
"tbodyacc_std_y"	Standard deviation of Y component of body acceleration signal.	Float
"tbodyacc_std_z"	Standard deviation of Z component of body acceleration signal.	Float
"tgravityacc_mean_x"	Average X component of gravity acceleration signal.	Float
"tgravityacc_mean_y"	Average Y component of gravity acceleration signal.	Float
"tgravityacc_mean_z"	Average Z component of gravity acceleration signal.	Float
"tgravityacc_std_x"	Standard deviation of X component of gravity acceleration signal.	Float
"tgravityacc_std_y"	Standard deviation of Y component of gravity acceleration signal.	Float
"tgravityacc_std_z"	Standard deviation Z component of gravity acceleration signal.	Float
"tbodyaccjerk_mean_x"	Average X component of the body linear acceleration and angular velocity were derived in time to obtain Jerk signals.	Float
"tbodyaccjerk_mean_y"	Average Y component of the body linear acceleration and angular velocity were derived in time to obtain Jerk signals.	Float
"tbodyaccjerk_mean_z"	Average Z component of the body linear acceleration and angular velocity were derived in time to obtain Jerk signals.	Float
"tbodyaccjerk_std_x"	Standard deviation of X component of the body linear acceleration and angular velocity were derived in time to obtain Jerk signals.	Float
"tbodyaccjerk_std_y"	Standard deviation of Y component of the body linear acceleration and angular velocity were derived in time	Float

	to obtain Jerk signals.	
"tbodyaccjerk_std_z"	Standard deviation of Z component of the body linear acceleration and angular velocity were derived in time to obtain Jerk signals.	Float
"tbodygyro_mean_x"	Average of X component of the body linear acceleration and angular velocity were derived in time to obtain Jerk signals.	Float
"tbodygyro_mean_y"	Average of Y component of the body linear acceleration and angular velocity were derived in time to obtain Jerk signals.	Float
"tbodygyro_mean_z"	Average of Z component of the body linear acceleration and angular velocity were derived in time to obtain Jerk signals.	Float
"tbodygyro_std_x"	Standard deviation of X component of the body linear acceleration and angular velocity were derived in time to obtain Jerk signals.	Float
"tbodygyro_std_y"	Standard deviation of Y component of the body linear acceleration and angular velocity were derived in time to obtain Jerk signals.	Float
"tbodygyro_std_z"	Standard deviation of Z component of the body linear acceleration and angular velocity were derived in time to obtain Jerk signals.	Float
"tbodygyrojerk_mean_x"	Average X component of signal used to estimate variables of the feature vector for each pattern.	Float
"tbodygyrojerk_mean_y"	Average Y component of signal used to estimate variables of the feature vector for each pattern.	Float
"tbodygyrojerk_mean_z"	Average Z component of signal used to estimate variables of the feature vector	Float

	for each pattern.	
"tbodygyrojerk_std_x"	Standard deviation of X component of signal used to estimate variables of the feature vector for each pattern.	Float
"tbodygyrojerk_std_y"	Standard deviation of Y component of signal used to estimate variables of the feature vector for each pattern.	Float
"tbodygyrojerk_std_z"	Standard deviation of Z component of signal used to estimate variables of the feature vector for each pattern.	Float
"tbodyaccmag_mean"	Average of the magnitude of three-dimensional signals calculated using the Euclidean norm.	Float
"tbodyaccmag_std"	Standard deviation of the magnitude of three-dimensional signals calculated using the Euclidean norm.	Float
"tgravityaccmag_mean"	Average of signal used to estimate variables of the feature vector for each pattern.	Float
"tgravityaccmag_std"	Standard deviation of signal used to estimate variables of the feature vector for each pattern.	Float
"tbodyaccjerkmag_mean"	Average of signal used to estimate variables of the feature vector for each pattern.	Float
"tbodyaccjerkmag_std"	Standard deviation of signal used to estimate variables of the feature vector for each pattern.	Float
"tbodygyromag_mean"	Average of signal used to estimate variables of the feature vector for each pattern.	Float
"tbodygyromag_std"	Standard deviation of signal used to estimate variables of the feature vector for each	Float

	pattern.	
"tbodygyrojerkmag_mean"	Average of signal used to estimate variables of the feature vector for each pattern.	Float
"tbodygyrojerkmag_std"	Standard deviation of signal used to estimate variables of the feature vector for each pattern.	Float
"fbodyacc_mean_x"	Average X component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyacc_mean_y"	Average Y component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyacc_mean_z"	Average Z component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyacc_std_x"	Standard deviation of X component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyacc_std_y"	Standard deviation of Y component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyacc_std_z"	Standard deviation of Z component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyacc_meanfreq_x"	Average X component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyacc_meanfreq_y"	Average Y component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyacc_meanfreq_z"	Average Z component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyaccjerk_mean_x"	Average X component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyaccjerk_mean_y"	Average Y component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyaccjerk_mean_z"	Average Z component of Fast Fourier Transform (FFT)	Float

	applied to signal.	
"fbodyaccjerk_std_x"	Standard deviation of X component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyaccjerk_std_y"	Standard deviation of Y component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyaccjerk_std_z"	Standard deviation of Z component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyaccjerk_meanfreq_x"	Average X component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyaccjerk_meanfreq_y"	Average Y component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyaccjerk_meanfreq_z"	Average Z component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodygyro_mean_x"	Average X component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodygyro_mean_y"	Average Y component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodygyro_mean_z"	Average Z component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodygyro_std_x"	Standard deviation of X component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodygyro_std_y"	Standard deviation of Y component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodygyro_std_z"	Standard deviation of Z component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodygyro_meanfreq_x"	Average X component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodygyro_meanfreq_y"	Average Y component of Fast	Float

	Fourier Transform (FFT) applied to signal.	
"fbodygyro_meanfreq_z"	Average Z component of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyaccmag_mean"	Average of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyaccmag_std"	Standard deviation of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodyaccmag_meanfreq"	Average of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodybodyaccjerkmag_mean"	Average of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodybodyaccjerkmag_std"	Standard deviation of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodybodyaccjerkmag_meanfreq"	Average of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodybodygyromag_mean"	Average of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodybodygyromag_std"	Standard deviation of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodybodygyromag_meanfreq"	Average of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodybodygyrojerkmag_mean"	Average of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodybodygyrojerkmag_std"	Standard deviation of Fast Fourier Transform (FFT) applied to signal.	Float
"fbodybodygyrojerkmag_meanfreq"	Average of Fast Fourier Transform (FFT) applied to signal.	Float