Feature Selection

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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.

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

The complete list of variables of each feature vector is available bellow:

"1" "tBodyAcc_mean_X"

"2" "tBodyAcc_mean_Y"

"3" "tBodyAcc_mean_Z"

"4" "tBodyAcc_std_X"

"5" "tBodyAcc_std_Y"

"6" "tBodyAcc_std_Z"

"7" "tGravityAcc_mean_X"

"8" "tGravityAcc_mean_Y"

"9" "tGravityAcc_mean_Z"

"10" "tGravityAcc_std_X"

"11" "tGravityAcc_std_Y"

"12" "tGravityAcc_std_Z"

"13" "tBodyAccJerk_mean_X"

"14" "tBodyAccJerk_mean_Y"

"15" "tBodyAccJerk_mean_Z"

"16" "tBodyAccJerk_std_X"

"17" "tBodyAccJerk_std_Y"

"18" "tBodyAccJerk_std_Z"

"19" "tBodyGyro_mean_X"

"20" "tBodyGyro_mean_Y"

"21" "tBodyGyro_mean_Z"

"22" "tBodyGyro_std_X"

"23" "tBodyGyro_std_Y"

"24" "tBodyGyro_std_Z"

"25" "tBodyGyroJerk_mean_X"

"26" "tBodyGyroJerk_mean_Y"

"27" "tBodyGyroJerk_mean_Z"

"28" "tBodyGyroJerk_std_X"

"29" "tBodyGyroJerk_std_Y"

"30" "tBodyGyroJerk_std_Z"

"31" "tBodyAccMag_mean"

"32" "tBodyAccMag_std"

"33" "tGravityAccMag_mean"

"34" "tGravityAccMag_std"

"35" "tBodyAccJerkMag_mean"

"36" "tBodyAccJerkMag_std"

"37" "tBodyGyroMag_mean"

"38" "tBodyGyroMag_std"

"39" "tBodyGyroJerkMag_mean"

"40" "tBodyGyroJerkMag_std"

"41" "fBodyAcc_mean_X"

"42" "fBodyAcc_mean_Y"

"43" "fBodyAcc_mean_Z"

"44" "fBodyAcc_std_X"

"45" "fBodyAcc_std_Y"

"46" "fBodyAcc_std_Z"

"47" "fBodyAcc_meanFreq_X"

"48" "fBodyAcc_meanFreq_Y"

"49" "fBodyAcc_meanFreq_Z"

"50" "fBodyAccJerk_mean_X"

"51" "fBodyAccJerk_mean_Y"

"52" "fBodyAccJerk_mean_Z"

"53" "fBodyAccJerk_std_X"

"54" "fBodyAccJerk_std_Y"

"55" "fBodyAccJerk_std_Z"

"56" "fBodyAccJerk_meanFreq_X"

"57" "fBodyAccJerk_meanFreq_Y"

"58" "fBodyAccJerk_meanFreq_Z"

"59" "fBodyGyro_mean_X"

"60" "fBodyGyro_mean_Y"

"61" "fBodyGyro_mean_Z"

"62" "fBodyGyro_std_X"

"63" "fBodyGyro_std_Y"

"64" "fBodyGyro_std_Z"

"65" "fBodyGyro_meanFreq_X"

"66" "fBodyGyro_meanFreq_Y"

"67" "fBodyGyro_meanFreq_Z"

"68" "fBodyAccMag_mean"

"69" "fBodyAccMag_std"

"70" "fBodyAccMag_meanFreq"

"71" "fBodyBodyAccJerkMag_mean"

"72" "fBodyBodyAccJerkMag_std"

"73" "fBodyBodyAccJerkMag_meanFreq"

"74" "fBodyBodyGyroMag_mean"

"75" "fBodyBodyGyroMag_std"

"76" "fBodyBodyGyroMag_meanFreq"

"77" "fBodyBodyGyroJerkMag_mean"

"78" "fBodyBodyGyroJerkMag_std"

"79" "fBodyBodyGyroJerkMag_meanFreq"”

The data set “avg_measure_per_activity_per_subject.txt” includes the following columns:

1. Activity_lable
2. subject
3. columns 3-81 are one column per feature above – which is the average value for the specific activity and specific subject.