This Codebook describes the input data to the run_analysis.R and the output of that code

Input to run_analysis.R:

The input data is Human Activity Recognition Using Smartphones Dataset Version 1.0. It contains data collected from the accelerometers from the Samsung Galaxy S smartphone.

The experiments have been carried out with a group of 30 volunteers within an age bracket of 19-48 years. Each person performed six activities (WALKING, WALKING_UPSTAIRS, WALKING_DOWNSTAIRS, SITTING, STANDING, LAYING) wearing a smartphone (Samsung Galaxy S II) on the waist. Using its embedded accelerometer and gyroscope, we captured 3-axial linear acceleration and 3-axial angular velocity at a constant rate of 50Hz. The experiments have been video-recorded to label the data manually. The obtained dataset has been randomly partitioned into two sets, where 70% of the volunteers was selected for generating the training data and 30% the test data.

The sensor signals (accelerometer and gyroscope) were pre-processed by applying noise filters and then sampled in fixed-width sliding windows of 2.56 sec and 50% overlap (128 readings/window). The sensor acceleration signal, which has gravitational and body motion components, was separated using a Butterworth low-pass filter into body acceleration and gravity. The gravitational force is assumed to have only low frequency components, therefore a filter with 0.3 Hz cutoff frequency was used. From each window, a vector of features was obtained by calculating variables from the time and frequency domain. See 'features_info.txt' for more details.

For each record it is provided:

- Triaxial acceleration from the accelerometer (total acceleration) and the estimated body acceleration.

- Triaxial Angular velocity from the gyroscope.

- A 561-feature vector with time and frequency domain variables.

- Its activity label.

- An identifier of the subject who carried out the experiment.

The dataset includes the following files:

- 'README.txt'

- 'features_info.txt': Shows information about the variables used on the feature vector.

- 'features.txt': List of all features.

- 'activity_labels.txt': Links the class labels with their activity name.

- 'train/X_train.txt': Training set.

- 'train/y_train.txt': Training labels.

- 'test/X_test.txt': Test set.

- 'test/y_test.txt': Test labels.

The following files are available for the train and test data. Their descriptions are equivalent.

- 'train/subject_train.txt': Each row identifies the subject who performed the activity for each window sample. Its range is from 1 to 30.

- 'train/Inertial Signals/total_acc_x_train.txt': The acceleration signal from the smartphone accelerometer X axis in standard gravity units 'g'. Every row shows a 128 element vector. The same description applies for the 'total_acc_x_train.txt' and 'total_acc_z_train.txt' files for the Y and Z axis.

- 'train/Inertial Signals/body_acc_x_train.txt': The body acceleration signal obtained by subtracting the gravity from the total acceleration.

- 'train/Inertial Signals/body_gyro_x_train.txt': The angular velocity vector measured by the gyroscope for each window sample. The units are radians/second.

For more information about this dataset contact: activityrecognition@smartlab.ws

License:

Use of this dataset in publications must be acknowledged by referencing the following publication:

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.

This dataset is distributed AS-IS and no responsibility implied or explicit can be addressed to the authors or their institutions for its use or misuse. Any commercial use is prohibited.

Jorge L. Reyes-Ortiz, Alessandro Ghio, Luca Oneto, Davide Anguita. November 2012.

Output of the run_analysis.R:

The objective of this code is to:

- Merges the training and the test sets to create one data set.
- Extracts only the measurements on the mean and standard deviation for each measurement.
- Uses descriptive activity names to name the activities in the data set
- Appropriately labels the data set with descriptive variable names.
- From the data set in step 4, creates a second, independent tidy data set with the average of each variable for each activity and each subject.

The output tidy data, "avg_features_data" is a tab delimited text file with following columns:

Variable	Description	Units
activity	Activity type : Walking, Walking downstairs, Walking upstars, Sitting, Standing and Laying	-
subject	Unique ID of the participant	-
subject_type	indicates to which group (Test/Train) subject's activity data is randomly assigned to	-
tBodyAcc-mean()-X	Average of time domain body linear acceleration signals along X Axis for each activity and each subject	standard gravity units 'g'
tBodyAcc-mean()-Y	Average of time domain body linear acceleration signals along Y Axis for each activity and each subject	standard gravity units 'g'
tBodyAcc-mean()-Z	Average of time domain body linear acceleration signals along Z Axis for each activity and each subject	standard gravity units 'g'
tGravityAcc-mean()-X	Average of time domain gravity linear acceleration signals along X Axis for each activity and each subject	standard gravity units 'g'
tGravityAcc-mean()-Y	Average of time domain gravity linear acceleration signals along Y Axis for each activity and each subject	standard gravity units 'g'
tGravityAcc-mean()-Z	Average of time domain gravity linear acceleration signals along Z Axis for each activity and each subject	standard gravity units 'g'
tBodyAccJerk-mean()-X	Average of time domain body linear acceleration Jerk signals along X Axis for each activity and each subject	standard gravity units 'g'
tBodyAccJerk-mean()-Y	Average of time domain body linear acceleration Jerk signals along Y Axis for each activity and each subject	standard gravity units 'g'
tBodyAccJerk-mean()-Z	Average of time domain body linear acceleration Jerk signals along Z Axis for each activity and each subject	standard gravity units 'g'
tBodyGyro-mean()-X	Average of time domain body angular velocity signals along X Axis for each activity and each subject	radians/second
tBodyGyro-mean()-Y	Average of time domain body angular velocity signals along Y Axis for each activity and each subject	radians/second

tBodyGyro-mean()-Z	Average of time domain body angular velocity signals along Z Axis for each activity and each subject	radians/second
tBodyGyroJerk-mean()-X	Average of time domain body angular velocity Jerk signals along X Axis for each activity and each subject	radians/second
tBodyGyroJerk-mean()-Y	Average of time domain body angular velocity Jerk signals along Y Axis for each activity and each subject	radians/second
tBodyGyroJerk-mean()-Z	Average of time domain body angular velocity Jerk signals along Z Axis for each activity and each subject	radians/second
tBodyAccMag-mean()	Average of time domain body linear acceleration magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	standard gravity units 'g'
tGravityAccMag-mean()	Average of time domain gravity linear acceleration magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	standard gravity units 'g'
tBodyAccJerkMag-mean()	Average of time domain body linear acceleration jerk signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	standard gravity units 'g'
tBodyGyroMag-mean()	Average of time domain body angular velocity signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	radians/second
tBodyGyroJerkMag-mean()	Average of time domain body angular velocity jerk signals jerk signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	radians/second
fBodyAcc-mean()-X	Average of frequency domain body linear acceleration signals along X Axis for each activity and each subject	standard gravity units 'g'
fBodyAcc-mean()-Y	Average of frequency domain body linear acceleration signals along Y Axis for each activity and each subject	standard gravity units 'g'
fBodyAcc-mean()-Z	Average of frequency domain body linear acceleration signals along Z Axis for each activity and each subject	standard gravity units 'g'
fBodyAccJerk-mean()-X	Average of frequency domain body linear acceleration Jerk signals along X Axis for each activity and each subject	standard gravity units 'g'
fBodyAccJerk-mean()-Y	Average of frequency domain body linear acceleration Jerk signals along Y Axis for each activity and each subject	standard gravity units 'g'
fBodyAccJerk-mean()-Z	Average of frequency domain body linear acceleration Jerk signals along Z Axis for each activity and each subject	standard gravity units 'g'

fBodyGyro-mean()-X	Average of frequency domain body angular velocity signals along X Axis for each activity and each subject	radians/second
fBodyGyro-mean()-Y	Average of frequency domain body angular velocity signals along Y Axis for each activity and each subject	radians/second
fBodyGyro-mean()-Z	Average of frequency domain body angular velocity signals along Z Axis for each activity and each subject	radians/second
fBodyAccMag-mean()	Average of frequency domain body linear acceleration magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	standard gravity units 'g'
fBodyBodyAccJerkMag-mean()	Average of frequency domain body linear acceleration jerk signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	standard gravity units 'g'
fBodyBodyGyroMag-mean()	Average of frequency domain body angular velocity signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	radians/second
fBodyBodyGyroJerkMag-mean()	Average of frequency domain body angular velocity jerk signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	radians/second
tBodyAcc-std()-X	Standard Deviation of time domain body linear acceleration signals along X Axis for each activity and each subject	standard gravity units 'g'
tBodyAcc-std()-Y	Standard Deviation of time domain body linear acceleration signals along Y Axis for each activity and each subject	standard gravity units 'g'
tBodyAcc-std()-Z	Standard Deviation of time domain body linear acceleration signals along Z Axis for each activity and each subject	standard gravity units 'g'
tGravityAcc-std()-X	Standard Deviation of time domain gravity linear acceleration signals along X Axis for each activity and each subject	standard gravity units 'g'
tGravityAcc-std()-Y	Standard Deviation of time domain gravity linear acceleration signals along Y Axis for each activity and each subject	standard gravity units 'g'
tGravityAcc-std()-Z	Standard Deviation of time domain gravity linear acceleration signals along Z Axis for each activity and each subject	standard gravity units 'g'
tBodyAccJerk-std()-X	Standard Deviation of time domain body linear acceleration Jerk signals along X Axis for each activity and each subject	standard gravity units 'g'
tBodyAccJerk-std()-Y	Standard Deviation of time domain body linear acceleration Jerk signals along Y Axis for each activity and each subject	standard gravity units 'g'

tBodyAccJerk-std()-Z	Standard Deviation of time domain body linear acceleration Jerk signals along Z Axis for each activity and each subject	standard gravity units 'g'
tBodyGyro-std()-X	Standard Deviation of time domain body angular velocity signals along X Axis for each activity and each subject	radians/second
tBodyGyro-std()-Y	Standard Deviation of time domain body angular velocity signals along Y Axis for each activity and each subject	radians/second
tBodyGyro-std()-Z	Standard Deviation of time domain body angular velocity signals along Z Axis for each activity and each subject	radians/second
tBodyGyroJerk-std()-X	Standard Deviation of time domain body angular velocity Jerk signals along X Axis for each activity and each subject	radians/second
tBodyGyroJerk-std()-Y	Standard Deviation of time domain body angular velocity Jerk signals along Y Axis for each activity and each subject	radians/second
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tGravityAccMag-std()	Standard Deviation of time domain gravity linear acceleration magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	standard gravity units 'g'
tBodyAccJerkMag-std()	Standard Deviation of time domain body linear acceleration jerk signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	standard gravity units 'g'
tBodyGyroMag-std()	Standard Deviation of time domain body angular velocity signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	radians/second
tBodyGyroJerkMag-std()	Standard Deviation of time domain body angular velocity jerk signals jerk signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	radians/second
fBodyAcc-std()-X	Standard Deviation of frequency domain body linear acceleration signals along X Axis for each activity and each subject	standard gravity units 'g'
fBodyAcc-std()-Y	Standard Deviation of frequency domain body linear acceleration signals along Y Axis for each activity and each subject	standard gravity units 'g'

fBodyAcc-std()-Z	Standard Deviation of frequency domain body linear acceleration signals along Z Axis for each activity and each subject	standard gravity units 'g'
fBodyAccJerk-std()-X	Standard Deviation of frequency domain body linear acceleration Jerk signals along X Axis for each activity and each subject	standard gravity units 'g'
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fBodyGyro-std()-X	Standard Deviation of frequency domain body angular velocity signals along X Axis for each activity and each subject	radians/second
fBodyGyro-std()-Y	Standard Deviation of frequency domain body angular velocity signals along Y Axis for each activity and each subject	radians/second
fBodyGyro-std()-Z	Standard Deviation of frequency domain body angular velocity signals along Z Axis for each activity and each subject	radians/second
fBodyAccMag-std()	Standard Deviation of frequency domain body linear acceleration magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	standard gravity units 'g'
fBodyBodyAccJerkMag-std()	Standard Deviation of frequency domain body linear acceleration jerk signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	standard gravity units 'g'
fBodyBodyGyroMag-std()	Standard Deviation of frequency domain body angular velocity signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	radians/second
fBodyBodyGyroJerkMag-std()	Standard Deviation of frequency domain body angular velocity jerk signals magnitude across 3 dimension (XYZ) calculated using Euclidean norm for each activity and each subject	radians/second