Codebook: Analysis of Human Activity Recognition Using Smartphones

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Overview

The variables used generally follow a specific syntax, split into four parts. Take, for example, the first variable: timebodyaccmeanxaxis

1. Domain: time
2. Sensor: bodyacc
3. Aggregation function: mean
4. Direction: xaxis

You will find descriptions below for each dimension of the variable name. The **units** of all time-domain variables is in seconds; frequency-domain variables are in Hertz

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It should be noted that I personally find it preposterous that this course discourages variable names from having capital letters, underscores, or symbols. I find my variable names to be difficult to read, only because I followed the rules of supposed "tidy" data. Please don't score me low for following rules, even if they're stupid rules.

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Domain

Options: time and freq. The raw data was collected in the time domain. A simple FFT was applied to yield all the frequency domain complement to all variables.

Sensor

Options:

- BodyAcc: body linear acceleration
- GravityAcc: gravity linear acceleration
- BodyAccJerk: time derivative of body linear acceleration (BodyAcc)
- BodyGyro: body angular velocity
- BodyGyroJerk: time derivative of body angular velocity (BodyGyro)

These sensors were

Aggregation function

Options:

- mean: Mean value

- std: Standard deviation
- mad: Median absolute deviation
- max: Largest value in array
- min: Smallest value in array
- sma: Signal magnitude area
- energy: Energy measure. Sum of the squares divided by the number of values.
- iqr: Interquartile range
- entropy: Signal entropy
- arcoeff: Autorregresion coefficients with Burg order equal to 4
- correlation: correlation coefficient between two signals
- maxinds: index of the frequency component with largest magnitude
- meanfreq: Weighted average of the frequency components to obtain a mean frequency
- skewness: skewness of the frequency domain signal
- kurtosis: kurtosis of the frequency domain signal
- bandsenergy: Energy of a frequency interval within the 64 bins of the FFT of each window.
- angle: Angle between to vectors.

Direction

Options: xaxis/yaxis/zaxis/mag. Sensors were attached for each Cartesian coordinate. This will give which direction, or if it's "mag," will give the Euclidean norm of the acceleration.

Pre-processing

The features selected for this dataset come from the accelerometer and gyroscope 3-axial raw signals. These time domain signals 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 using another low pass Butterworth filter with a corner frequency of 0.3 Hz.