How data was recorded

By using the sensors(Gyroscope and accelerometer) in a smartphone, they have captured '3-axial linear acceleration'(*_tAcc-XYZ_*) from accelerometer and '3-axial angular velocity' (*_tGyro-XYZ_*) from Gyroscope with several variations.

> prefix 't' in those metrics denotes time.

> suffix 'XYZ' represents 3-axial signals in X , Y, and Z directions.

Feature names

1. These sensor signals are preprocessed by applying noise filters and then sampled in fixed-width windows(sliding windows) of 2.56 seconds each with 50% overlap. ie., each window has 128 readings.

2. From Each window, a feature vector was obtianed by calculating variables from the time and frequency domain.
> In our dataset, each datapoint represents a window with different readings
3. The accelertion signal was saperated into Body and Gravity acceleration signals(___tBodyAcc-XYZ___ and ___tGravityAcc-XYZ___) using some low pass filter with corner frequecy of 0.3Hz.

4. After that, the body linear acceleration and angular velocity were derived in time to obtian *_jerk signals_* (___tBodyAccJerk-XYZ___ and ___tBodyGyroJerk-XYZ___).

5. The magnitude of these 3-dimensional signals were calculated using the Euclidian norm. This magnitudes are represented as features with names like *_tBodyAccMag_*, *_tGravityAccMag_*, *_tBodyAccJerkMag_*, *_tBodyGyroMag_* and *_tBodyGyroJerkMag_*.

6. Finally, We've got frequency domain signals from some of the available signals by applying a FFT (Fast Fourier Transform). These signals obtained were labeled with ___prefix 'f'___ just like original signals with ___prefix 't'___. These signals are labeled as ___fBodyAcc-XYZ___, ___fBodyGyroMag___ etc.,.

7. These are the signals that we got so far.
  + 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

8. We can esitmate some set of variables from the above signals. ie., We will estimate the following properties on each and every signal that we recoreded so far.

  + ___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.

9. We can obtain some other vectors by taking the average of signals in a single window sample. These are used on the angle() variable'
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  + gravityMean
  + tBodyAccMean
  + tBodyAccJerkMean
  + tBodyGyroMean
  + tBodyGyroJerkMean

Y_Labels(Encoded)
+ In the dataset, Y_labels are represented as numbers from 1 to 6 as their identifiers.

  - WALKING as __**1**__
  - WALKING_UPSTAIRS as __**2**__
  - WALKING_DOWNSTAIRS as __**3**__
  - SITTING as __**4**__
  - STANDING as __**5**__
  - LAYING as __**6**__

Train and test data were saperated
 - The readings from ___70%___ of the volunteers were taken as ___trianing data___ and remaining ___30%___ subjects recordings were taken for ___test data___

Data

* All the data is present in 'UCI_HAR_dataset/' folder in present working directory.
     - Feature names are present in 'UCI_HAR_dataset/features.txt'
     - ___Train Data___
         - 'UCI_HAR_dataset/train/X_train.txt'
         - 'UCI_HAR_dataset/train/subject_train.txt'

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        - 'UCI_HAR_dataset/train/y_train.txt'
    - ___Test Data___
        - 'UCI_HAR_dataset/test/X_test.txt'
        - 'UCI_HAR_dataset/test/subject_test.txt'
        - 'UCI_HAR_dataset/test/y_test.txt'


## Data Size :
> 27 MB
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