## Variables List

The Final Tidy Dataset contains 88 fields which are grouped by Subject Id and Activity Label

The variables 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.

Note –

- All fields include mean of the variables collected from Original Samsung galaxy dataset.
- Features are normalized and bounded within [-1,1].

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

mean(): Mean value

std(): Standard deviation

The complete list of variables with description is listed in CookBook-

| S.No. | Variable Name | Unit | Type | Description |
|---|---|---|---|---|
| 1 | SubjectID | | Number | An identifier of the subject who carried out the experiment. |
| 2 | ActivityLabelName | | Character | Label Name for the Activity performed |
| 3 | tBodyAcc-mean()-X | Time | Double between -1 to 1 | Mean of Body accelerometer mean -X direction |
| 4 | tBodyAcc-mean()-Y | Time | Double between -1 to 1 | Mean of Body accelerometer mean -Y direction |
| 5 | tBodyAcc-mean()-Z | Time | Double | Mean of Body accelerometer |

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|---|---|---|---|---|
| | | | between -1 to 1 | mean -Z direction |
| 6 | tBodyAcc-std()-X | Time | Double between -1 to 1 | Mean of Body accelerometer Standard Deviation -X direction |
| 7 | tBodyAcc-std()-Y | Time | Double between -1 to 1 | Mean of Body accelerometer Standard Deviation -Y direction |
| 8 | tBodyAcc-std()-Z | Time | Double between -1 to 1 | Mean of Body accelerometer Standard Deviation - Z direction |
| 9 | tGravityAcc-mean()-X | Time | Double between -1 to 1 | Gravity Accelaration Mean |
| 10 | tGravityAcc-mean()-Y | Time | Double between -1 to 1 | Gravity Accelaration Mean |
| 11 | tGravityAcc-mean()-Z | Time | Double between -1 to 1 | Gravity Accelaration Mean |
| 12 | tGravityAcc-std()-X | Time | Double between -1 to 1 | Gravity Accelaration SD |
| 13 | tGravityAcc-std()-Y | Time | Double between -1 to 1 | Gravity Accelaration SD |
| 14 | tGravityAcc-std()-Z | Time | Double between -1 to 1 | Gravity Accelaration SD |
| 15 | tBodyAccJerk-mean()-X | Time | Double between -1 to 1 | Body accelerometer Jerk Mean |
| 16 | tBodyAccJerk-mean()-Y | Time | Double between -1 to 1 | Body accelerometer Jerk Mean |
| 17 | tBodyAccJerk-mean()-Z | Time | Double between -1 to 1 | Body accelerometer Jerk Mean |
| 18 | tBodyAccJerk-std()-X | Time | Double between -1 to 1 | Body accelerometer Jerk SD |
| 19 | tBodyAccJerk-std()-Y | Time | Double between -1 to 1 | Body accelerometer Jerk SD |
| 20 | tBodyAccJerk-std()-Z | Time | Double between -1 to 1 | Body accelerometer Jerk SD |
| 21 | tBodyGyro-mean()-X | Time | Double between -1 to 1 | Body gyroscope mean |
| 22 | tBodyGyro-mean()-Y | Time | Double between - | Body gyroscope mean |

| | | | | |
|---|---|---|---|---|
| | | | 1 to 1 | |
| 23 | tBodyGyro-mean()-Z | Time | Double between -1 to 1 | Body gyroscope mean |
| 24 | tBodyGyro-std()-X | Time | Double between -1 to 1 | Body gyroscope SD |
| 25 | tBodyGyro-std()-Y | Time | Double between -1 to 1 | Body gyroscope SD |
| 26 | tBodyGyro-std()-Z | Time | Double between -1 to 1 | Body gyroscope SD |
| 27 | tBodyGyroJerk-mean()-X | Time | Double between -1 to 1 | Body gyroscope Jerk Mean |
| 28 | tBodyGyroJerk-mean()-Y | Time | Double between -1 to 1 | Body gyroscope Jerk Mean |
| 29 | tBodyGyroJerk-mean()-Z | Time | Double between -1 to 1 | Body gyroscope Jerk Mean |
| 30 | tBodyGyroJerk-std()-X | Time | Double between -1 to 1 | Body gyroscope Jerk SD |
| 31 | tBodyGyroJerk-std()-Y | Time | Double between -1 to 1 | Body gyroscope Jerk SD |
| 32 | tBodyGyroJerk-std()-Z | Time | Double between -1 to 1 | Body gyroscope Jerk SD |
| 33 | tBodyAccMag-mean() | Time | Double between -1 to 1 | Body Accelerometer Magnitude-Mean |
| 34 | tBodyAccMag-std() | Time | Double between -1 to 1 | Body Accelerometer Magnitude-SD |
| 35 | tGravityAccMag-mean() | Time | Double between -1 to 1 | Gravity Accelerometer Magnitude- Mean |
| 36 | tGravityAccMag-std() | Time | Double between -1 to 1 | Gravity Accelerometer Magnitude- Mean |
| 37 | tBodyAccJerkMag-mean() | Time | Double between -1 to 1 | Body Accelerometer Jerk Magnitude- Mean |
| 38 | tBodyAccJerkMag-std() | Time | Double between -1 to 1 | Body Accelerometer Jerk Magnitude- SD |
| 39 | tBodyGyroMag-mean() | Time | Double between -1 to 1 | Body gyroscope Magnitude - Mean |

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|---|---|---|---|---|
| 40 | tBodyGyroMag-std() | Time | Double between -1 to 1 | Body gyroscope Magnitude - SD |
| 41 | tBodyGyroJerkMag-mean() | Time | Double between -1 to 1 | Body gyroscope Jerk Magnitude - Mean |
| 42 | tBodyGyroJerkMag-std() | Time | Double between -1 to 1 | Body gyroscope Jerk Magnitude - SD |
| 43 | fBodyAcc-mean()-X | Frequency | Double between -1 to 1 | Body accelerometer mean -X direction |
| 44 | fBodyAcc-mean()-Y | Frequency | Double between -1 to 1 | Body accelerometer mean -Y direction |
| 45 | fBodyAcc-mean()-Z | Frequency | Double between -1 to 1 | Body accelerometer mean -Z direction |
| 46 | fBodyAcc-std()-X | Frequency | Double between -1 to 1 | Body accelerometer Standard Deviation -X direction |
| 47 | fBodyAcc-std()-Y | Frequency | Double between -1 to 1 | Body accelerometer Standard Deviation -Y direction |
| 48 | fBodyAcc-std()-Z | Frequency | Double between -1 to 1 | Body accelerometer Standard Deviation - Z direction |
| 49 | fBodyAcc-meanFreq()-X | Frequency | Double between -1 to 1 | Body accelerometer mean Frequency -X direction |
| 50 | fBodyAcc-meanFreq()-Y | Frequency | Double between -1 to 1 | Body accelerometer Frequency mean -Y direction |
| 51 | fBodyAcc-meanFreq()-Z | Frequency | Double between -1 to 1 | Body accelerometer Frequency mean -Z direction |
| 52 | fBodyAccJerk-mean()-X | Frequency | Double between -1 to 1 | Body accelerometer Jerk Mean |
| 53 | fBodyAccJerk-mean()-Y | Frequency | Double between -1 to 1 | Body accelerometer Jerk Mean |
| 54 | fBodyAccJerk-mean()-Z | Frequency | Double between -1 to 1 | Body accelerometer Jerk Mean |
| 55 | fBodyAccJerk-std()-X | Frequency | Double between -1 to 1 | Body accelerometer Jerk SD |
| 56 | fBodyAccJerk-std()-Y | Frequency | Double between -1 to 1 | Body accelerometer Jerk SD |
| 57 | fBodyAccJerk-std()-Z | Frequency | Double | Body accelerometer Jerk SD |

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|---|---|---|---|---|
| | | | between -1 to 1 | |
| 58 | fBodyAccJerk-meanFreq()-X | Frequency | Double between -1 to 1 | Body accelerometer Jerk Mean Feequency |
| 59 | fBodyAccJerk-meanFreq()-Y | Frequency | Double between -1 to 1 | Body accelerometer Jerk Mean Feequency |
| 60 | fBodyAccJerk-meanFreq()-Z | Frequency | Double between -1 to 1 | Body accelerometer Jerk Mean Feequency |
| 61 | fBodyGyro-mean()-X | Frequency | Double between -1 to 1 | Body gyroscope mean |
| 62 | fBodyGyro-mean()-Y | Frequency | Double between -1 to 1 | Body gyroscope mean |
| 63 | fBodyGyro-mean()-Z | Frequency | Double between -1 to 1 | Body gyroscope mean |
| 64 | fBodyGyro-std()-X | Frequency | Double between -1 to 1 | Body gyroscope SD |
| 65 | fBodyGyro-std()-Y | Frequency | Double between -1 to 1 | Body gyroscope SD |
| 66 | fBodyGyro-std()-Z | Frequency | Double between -1 to 1 | Body gyroscope SD |
| 67 | fBodyGyro-meanFreq()-X | Frequency | Double between -1 to 1 | Body gyroscope Mean frequency |
| 68 | fBodyGyro-meanFreq()-Y | Frequency | Double between -1 to 1 | Body gyroscope Mean frequency |
| 69 | fBodyGyro-meanFreq()-Z | Frequency | Double between -1 to 1 | Body gyroscope Mean frequency |
| 70 | fBodyAccMag-mean() | Frequency | Double between -1 to 1 | Body Accelerometer Magnitude-Mean |
| 71 | fBodyAccMag-std() | Frequency | Double between -1 to 1 | Body Accelerometer Magnitude-sD |
| 72 | fBodyAccMag-meanFreq() | Frequency | Double between -1 to 1 | Body Accelerometer Magnitude-Mean frequency |
| 73 | fBodyBodyAccJerkMag-mean() | Frequency | Double between -1 to 1 | Body Accelerometer Jerk Magnitude- Mean |
| 74 | fBodyBodyAccJerkMag-std() | Frequency | Double between - | Body Accelerometer Jerk Magnitude- SD |

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|---|---|---|---|---|
| | | | 1 to 1 | |
| 75 | fBodyBodyAccJerkMag-meanFreq() | Frequency | Double between -1 to 1 | Body Accelerometer Jerk Magnitude- Frequency |
| 76 | fBodyBodyGyroMag-mean() | Frequency | Double between -1 to 1 | Body gyroscope Magnitude - Mean |
| 77 | fBodyBodyGyroMag-std() | Frequency | Double between -1 to 1 | Body gyroscope Magnitude - SD |
| 78 | fBodyBodyGyroMag-meanFreq() | Frequency | Double between -1 to 1 | Body gyroscope Magnitude - Frequency |
| 79 | fBodyBodyGyroJerkMag-mean() | Frequency | Double between -1 to 1 | Body gyroscope Jerk Magnitude - Mean |
| 80 | fBodyBodyGyroJerkMag-std() | Frequency | Double between -1 to 1 | Body gyroscope Jerk Magnitude - SD |
| 81 | fBodyBodyGyroJerkMag-meanFreq() | Frequency | Double between -1 to 1 | Body gyroscope Jerk Magnitude - Mean |
| 82 | angle(tBodyAccMean,gravity) | Angle | Double between -1 to 1 | Angle between two vectors |
| 83 | angle(tBodyAccJerkMean),gravityMean) | Angle | Double between -1 to 1 | Angle between two vectors |
| 84 | angle(tBodyGyroMean,gravityMean) | Angle | Double between -1 to 1 | Angle between two vectors |
| 85 | angle(tBodyGyroJerkMean,gravityMean) | Angle | Double between -1 to 1 | Angle between two vectors |
| 86 | angle(X,gravityMean) | Angle | Double between -1 to 1 | Angle between two vectors |
| 87 | angle(Y,gravityMean) | Angle | Double between -1 to 1 | Angle between two vectors |
| 88 | angle(Z,gravityMean) | Angle | Double between -1 to 1 | Angle between two vectors |