Code Book

This code book summarizes the resulting data fields in tidy.txt.

Raw Data Collection

Based on UCI Machine Learning Repositories, the data was collected during experiments carried out with a group of 30 volunteers within an age bracket of 19-48 years old. Each volunteer performed six activities (WALKING, WALKING_UPSTAIRS, WALKING_DOWNSTAIRS, SITTING, STANDING, LAYING) while wearing a smartphone (Samsung Galaxy S II) on the waist. Embedded accelerometer and gyroscope was used to capture the 3-axial (x,y,z) linear acceleration and 3-axial (x,y,z) angular velocity at a constant rate of 50 Hz. The experiments were video recorded in order to label the data manually. The dataset generated is randomized into two datasets with 70% of the volunteers selected for generating the training dataset and 30% selected for test datasets.

The sensor signalsfrom accelerometer and gyroscope were pre-processed using noise filters application and then sampled in fixed-width sliding windows of 2.56 seconds and 50% overlap(128 readings/window).

Dataset Description

Files Utilised In This Project

The dataset includes the following files:

- `features_info.txt`:information about the variables used in 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.
- `train/subject_train.txt`: Subjects in Training set.
- `test/X_test.txt`: Test set.
- `test/y_test.txt`: Test labels.
- `test/subject_test.txt`: Subjects in Test set.

Features

Based on **features_info.txt** file in the dataset zip file, the measurements came from accelerometer and gyroscope: time domain signals (*tAcc-XYZ* and *tGyro-XYZ*), body and gravity acceleration signals (*tBodyAcc-XYZ* and *tGravityAcc-XYZ*), body linear acceleration and angular velocity derived in time to obtain Jerk signals (*tBodyAccJerk-XYZ* and *tBodyGyroJerk-XYZ*), Eucliden norm calculated magnitude of these three-dimensional signals (*tBodyAccMag*, *tGravityAccMag*, *tBodyAccJerkMag*, *tBodyGyroMag*, *tBodyGyroJerkMag*) and Fast Fourier Transform (FFT) application on the signals (*fBodyAcc-XYZ*, *fBodyAccJerk-XYZ*, *fBodyGyro-XYZ*, *fBodyAccJerkMag*, *fBodyGyroMag*, *fBodyGyroJerkMag*). Prefix 't' denotes time and 'f' denotes frequency domain signals.

The following signals were used to estimate variables of the feature vector for each pattern with '-XYZ' denoting the 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
- 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.

Additional vectors obtained by averaging the signals in a signal window sample. These are used on the angle() variable:

- gravityMean
- tBodyAccMean
- tBodyAccJerkMean
- tBodyGyroMean
- tBodyGyroJerkMean

Activity

- WALKING (value 1): subject was walking during the test
- WALKING_UPSTAIRS (value 2): subject was walking up a staircase during the test
- WALKING_DOWNSTAIRS (value 3): subject was walking down a staircase during the test
- SITTING (value 4): subject was sitting during the test
- STANDING (value 5): subject was standing during the test
- LAYING (value 6): subject was laying down during the test

Data Transformation

PART I: Merges the training and the test sets to create one data set

Install Packages

```
install.packages('data.table')
```

Load Libraries

```
library(data.table)
```

Download and Unzip Data

```
fileUrl <-
"https://d396qusza40orc.cloudfront.net/getdata%2Fprojectfiles%2FUCI%20HAR%20Dataset.zip"

download.file(fileUrl, destfile = "dataset.zip")
unzip("dataset.zip")
```

Reading Features and Activities Labels

```
featureLabels <- read.table("UCI HAR Dataset/features.txt")
activityLabels <- read.table("UCI HAR Dataset/activity_labels.txt", header =
FALSE)
```

Reading Training Data

```
trainingFeatures <- read.table("UCI HAR Dataset/train/X_train.txt",header=FALSE)
trainingActivity <- read.table("UCI HAR Dataset/train/y_train.txt",header=FALSE)
trainingSubject <- read.table("UCI HAR
Dataset/train/subject_train.txt",header=FALSE)
```

Reading Test Data

```
testFeatures <- read.table("UCI HAR Dataset/test/X_test.txt",header=FALSE)
testActivity <- read.table("UCI HAR Dataset/test/y_test.txt",header=FALSE)
testSubject <- read.table("UCI HAR Dataset/test/subject_test.txt",header=FALSE)
```

Merge Training Set and Test Set

```
mergedFeatures <- rbind( trainingFeatures, testFeatures )
mergedSubjects <- rbind(trainingSubject, testSubject )
mergedActivities <- rbind( trainingActivity, testActivity )
```

Naming Columns Headers

```
colnames( mergedFeatures ) <- featureLabels$V2
colnames( mergedSubjects ) <- 'Subject'
colnames( mergedActivities ) <- 'Activity'
allData <- cbind( mergedFeatures, mergedActivities, mergedSubjects )
```

```
str(allData)
```

```
## 'data.frame':    10299 obs. of  563 variables:
##  $ tBodyAcc-mean()-X                 : num  0.289 0.278 0.28 0.279 0.277 ...
##  $ tBodyAcc-mean()-Y                 : num  -0.0203 -0.0164 -0.0195 -0.0262
-0.0166 ...
##  $ tBodyAcc-mean()-Z                 : num  -0.133 -0.124 -0.113 -0.123
-0.115 ...
##  $ tBodyAcc-std()-X                  : num  -0.995 -0.998 -0.995 -0.996
-0.998 ...
##  $ tBodyAcc-std()-Y                  : num  -0.983 -0.975 -0.967 -0.983
-0.981 ...
##  $ tBodyAcc-std()-Z                  : num  -0.914 -0.96 -0.979 -0.991 -0.99
...
##  $ tBodyAcc-mad()-X                  : num  -0.995 -0.999 -0.997 -0.997
-0.998 ...
##  $ tBodyAcc-mad()-Y                  : num  -0.983 -0.975 -0.964 -0.983 -0.98
...
##  $ tBodyAcc-mad()-Z                  : num  -0.924 -0.958 -0.977 -0.989 -0.99
...
##  $ tBodyAcc-max()-X                  : num  -0.935 -0.943 -0.939 -0.939
-0.942 ...
##  $ tBodyAcc-max()-Y                  : num  -0.567 -0.558 -0.558 -0.576
-0.569 ...
##  $ tBodyAcc-max()-Z                  : num  -0.744 -0.818 -0.818 -0.83 -0.825
...
##  $ tBodyAcc-min()-X                  : num  0.853 0.849 0.844 0.844 0.849 ...
##  $ tBodyAcc-min()-Y                  : num  0.686 0.686 0.682 0.682 0.683 ...
##  $ tBodyAcc-min()-Z                  : num  0.814 0.823 0.839 0.838 0.838 ...
##  $ tBodyAcc-sma()                    : num  -0.966 -0.982 -0.983 -0.986
-0.993 ...
##  $ tBodyAcc-energy()-X               : num  -1 -1 -1 -1 -1 ...
##  $ tBodyAcc-energy()-Y               : num  -1 -1 -1 -1 -1 ...
##  $ tBodyAcc-energy()-Z               : num  -0.995 -0.998 -0.999 -1 -1 ...
##  $ tBodyAcc-iqr()-X                  : num  -0.994 -0.999 -0.997 -0.997
-0.998 ...
##  $ tBodyAcc-iqr()-Y                  : num  -0.988 -0.978 -0.965 -0.984
-0.981 ...
##  $ tBodyAcc-iqr()-Z                  : num  -0.943 -0.948 -0.975 -0.986
-0.991 ...
##  $ tBodyAcc-entropy()-X              : num  -0.408 -0.715 -0.592 -0.627
-0.787 ...
##  $ tBodyAcc-entropy()-Y              : num  -0.679 -0.501 -0.486 -0.851
-0.559 ...
##  $ tBodyAcc-entropy()-Z              : num  -0.602 -0.571 -0.571 -0.912
-0.761 ...
##  $ tBodyAcc-arCoeff()-X,1            : num  0.9293 0.6116 0.273 0.0614 0.3133
...
##  $ tBodyAcc-arCoeff()-X,2            : num  -0.853 -0.3295 -0.0863 0.0748
-0.1312 ...
##  $ tBodyAcc-arCoeff()-X,3            : num  0.36 0.284 0.337 0.198 0.191 ...
##  $ tBodyAcc-arCoeff()-X,4            : num  -0.0585 0.2846 -0.1647 -0.2643
0.0869 ...
##  $ tBodyAcc-arCoeff()-Y,1            : num  0.2569 0.1157 0.0172 0.0725
0.2576 ...
##  $ tBodyAcc-arCoeff()-Y,2            : num  -0.2248 -0.091 -0.0745 -0.1553
-0.2725 ...
##  $ tBodyAcc-arCoeff()-Y,3            : num  0.264 0.294 0.342 0.323 0.435 ...
##  $ tBodyAcc-arCoeff()-Y,4            : num  -0.0952 -0.2812 -0.3326 -0.1708
-0.3154 ...
##  $ tBodyAcc-arCoeff()-Z,1            : num  0.279 0.086 0.239 0.295 0.44 ...
##  $ tBodyAcc-arCoeff()-Z,2            : num  -0.4651 -0.0222 -0.1362 -0.3061
-0.2691 ...
##  $ tBodyAcc-arCoeff()-Z,3            : num  0.4919 -0.0167 0.1739 0.4821
0.1794 ...
##  $ tBodyAcc-arCoeff()-Z,4            : num  -0.191 -0.221 -0.299 -0.47 -0.089
...
##  $ tBodyAcc-correlation()-X,Y        : num  0.3763 -0.0134 -0.1247 -0.3057
-0.1558 ...
##  $ tBodyAcc-correlation()-X,Z        : num  0.4351 -0.0727 -0.1811 -0.3627
-0.1898 ...
##  $ tBodyAcc-correlation()-Y,Z        : num  0.661 0.579 0.609 0.507 0.599 ...
##  $ tGravityAcc-mean()-X              : num  0.963 0.967 0.967 0.968 0.968 ...
##  $ tGravityAcc-mean()-Y              : num  -0.141 -0.142 -0.142 -0.144
-0.149 ...
##  $ tGravityAcc-mean()-Z              : num  0.1154 0.1094 0.1019 0.0999
0.0945 ...
##  $ tGravityAcc-std()-X               : num  -0.985 -0.997 -1 -0.997 -0.998
...
##  $ tGravityAcc-std()-Y               : num  -0.982 -0.989 -0.993 -0.981
-0.988 ...
```

```
##  $ tGravityAcc-std()-Z                : num  -0.878 -0.932 -0.993 -0.978
-0.979 ...
##  $ tGravityAcc-mad()-X                : num  -0.985 -0.998 -1 -0.996 -0.998
...
##  $ tGravityAcc-mad()-Y                : num  -0.984 -0.99 -0.993 -0.981 -0.989
...
##  $ tGravityAcc-mad()-Z                : num  -0.895 -0.933 -0.993 -0.978
-0.979 ...
##  $ tGravityAcc-max()-X                : num  0.892 0.892 0.892 0.894 0.894 ...
##  $ tGravityAcc-max()-Y                : num  -0.161 -0.161 -0.164 -0.164
-0.167 ...
##  $ tGravityAcc-max()-Z                : num  0.1247 0.1226 0.0946 0.0934
0.0917 ...
##  $ tGravityAcc-min()-X                : num  0.977 0.985 0.987 0.987 0.987 ...
##  $ tGravityAcc-min()-Y                : num  -0.123 -0.115 -0.115 -0.121
-0.122 ...
##  $ tGravityAcc-min()-Z                : num  0.0565 0.1028 0.1028 0.0958
0.0941 ...
##  $ tGravityAcc-sma()                  : num  -0.375 -0.383 -0.402 -0.4 -0.4
...
##  $ tGravityAcc-energy()-X             : num  0.899 0.908 0.909 0.911 0.912 ...
##  $ tGravityAcc-energy()-Y             : num  -0.971 -0.971 -0.97 -0.969 -0.967
...
##  $ tGravityAcc-energy()-Z             : num  -0.976 -0.979 -0.982 -0.982
-0.984 ...
##  $ tGravityAcc-iqr()-X                : num  -0.984 -0.999 -1 -0.996 -0.998
...
##  $ tGravityAcc-iqr()-Y                : num  -0.989 -0.99 -0.992 -0.981 -0.991
...
##  $ tGravityAcc-iqr()-Z                : num  -0.918 -0.942 -0.993 -0.98 -0.98
...
##  $ tGravityAcc-entropy()-X            : num  -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 ...
##  $ tGravityAcc-entropy()-Y            : num  -1 -1 -1 -1 -1 -1 -1 -1 -1 -1 ...
##  $ tGravityAcc-entropy()-Z            : num  0.114 -0.21 -0.927 -0.596 -0.617
...
##  $ tGravityAcc-arCoeff()-X,1          : num  -0.59042 -0.41006 0.00223
-0.06493 -0.25727 ...
##  $ tGravityAcc-arCoeff()-X,2          : num  0.5911 0.4139 0.0275 0.0754
0.2689 ...
##  $ tGravityAcc-arCoeff()-X,3          : num  -0.5918 -0.4176 -0.0567 -0.0858
-0.2807 ...
##  $ tGravityAcc-arCoeff()-X,4          : num  0.5925 0.4213 0.0855 0.0962
0.2926 ...
##  $ tGravityAcc-arCoeff()-Y,1          : num  -0.745 -0.196 -0.329 -0.295
-0.167 ...
##  $ tGravityAcc-arCoeff()-Y,2          : num  0.7209 0.1253 0.2705 0.2283
0.0899 ...
##  $ tGravityAcc-arCoeff()-Y,3          : num  -0.7124 -0.1056 -0.2545 -0.2063
-0.0663 ...
##  $ tGravityAcc-arCoeff()-Y,4          : num  0.7113 0.1091 0.2576 0.2048
0.0671 ...
##  $ tGravityAcc-arCoeff()-Z,1          : num  -0.995 -0.834 -0.705 -0.385
-0.237 ...
##  $ tGravityAcc-arCoeff()-Z,2          : num  0.996 0.834 0.714 0.386 0.239 ...
##  $ tGravityAcc-arCoeff()-Z,3          : num  -0.996 -0.834 -0.723 -0.387
-0.241 ...
##  $ tGravityAcc-arCoeff()-Z,4          : num  0.992 0.83 0.729 0.385 0.241 ...
##  $ tGravityAcc-correlation()-X,Y      : num  0.57 -0.831 -0.181 -0.991 -0.408
...
##  $ tGravityAcc-correlation()-X,Z      : num  0.439 -0.866 0.338 -0.969 -0.185
...
##  $ tGravityAcc-correlation()-Y,Z      : num  0.987 0.974 0.643 0.984 0.965 ...
##  $ tBodyAccJerk-mean()-X              : num  0.078 0.074 0.0736 0.0773 0.0734
...
##  $ tBodyAccJerk-mean()-Y              : num  0.005 0.00577 0.0031 0.02006
0.01912 ...
##  $ tBodyAccJerk-mean()-Z              : num  -0.06783 0.02938 -0.00905
-0.00986 0.01678 ...
##  $ tBodyAccJerk-std()-X               : num  -0.994 -0.996 -0.991 -0.993
-0.996 ...
##  $ tBodyAccJerk-std()-Y               : num  -0.988 -0.981 -0.981 -0.988
-0.988 ...
##  $ tBodyAccJerk-std()-Z               : num  -0.994 -0.992 -0.99 -0.993 -0.992
...
##  $ tBodyAccJerk-mad()-X               : num  -0.994 -0.996 -0.991 -0.994
-0.997 ...
##  $ tBodyAccJerk-mad()-Y               : num  -0.986 -0.979 -0.979 -0.986
-0.987 ...
##  $ tBodyAccJerk-mad()-Z               : num  -0.993 -0.991 -0.987 -0.991
-0.991 ...
```

```
##  $ tBodyAccJerk-max()-X                : num  -0.985 -0.995 -0.987 -0.987
-0.997 ...
##  $ tBodyAccJerk-max()-Y                : num  -0.992 -0.979 -0.979 -0.992
-0.992 ...
##  $ tBodyAccJerk-max()-Z                : num  -0.993 -0.992 -0.992 -0.99 -0.99
...
##  $ tBodyAccJerk-min()-X                : num  0.99 0.993 0.988 0.988 0.994 ...
##  $ tBodyAccJerk-min()-Y                : num  0.992 0.992 0.992 0.993 0.993 ...
##  $ tBodyAccJerk-min()-Z                : num  0.991 0.989 0.989 0.993 0.986 ...
##  $ tBodyAccJerk-sma()                  : num  -0.994 -0.991 -0.988 -0.993
-0.994 ...
##  $ tBodyAccJerk-energy()-X             : num  -1 -1 -1 -1 -1 ...
##  $ tBodyAccJerk-energy()-Y             : num  -1 -1 -1 -1 -1 ...
##  $ tBodyAccJerk-energy()-Z             : num  -1 -1 -1 -1 -1 ...
##   [list output truncated]
```

PART II: Extracts only the measurements on the mean and standard deviation for each measurement

Extract fields containing mean() and std() (along with the columns: 'Subject' and 'Activity')

```
extractedData <- allData[,grepl("mean\\(\\)|std\\(\\)|Subject|Activity",
names(allData))]
```

```
str(extractedData)
```

```
## 'data.frame':    10299 obs. of  68 variables:
##  $ tBodyAcc-mean()-X          : num  0.289 0.278 0.28 0.279 0.277 ...
##  $ tBodyAcc-mean()-Y          : num  -0.0203 -0.0164 -0.0195 -0.0262 -0.0166
...
##  $ tBodyAcc-mean()-Z          : num  -0.133 -0.124 -0.113 -0.123 -0.115 ...
##  $ tBodyAcc-std()-X           : num  -0.995 -0.998 -0.995 -0.996 -0.998 ...
##  $ tBodyAcc-std()-Y           : num  -0.983 -0.975 -0.967 -0.983 -0.981 ...
##  $ tBodyAcc-std()-Z           : num  -0.914 -0.96 -0.979 -0.991 -0.99 ...
##  $ tGravityAcc-mean()-X       : num  0.963 0.967 0.967 0.968 0.968 ...
##  $ tGravityAcc-mean()-Y       : num  -0.141 -0.142 -0.142 -0.144 -0.149 ...
##  $ tGravityAcc-mean()-Z       : num  0.1154 0.1094 0.1019 0.0999 0.0945 ...
##  $ tGravityAcc-std()-X        : num  -0.985 -0.997 -1 -0.997 -0.998 ...
##  $ tGravityAcc-std()-Y        : num  -0.982 -0.989 -0.993 -0.981 -0.988 ...
##  $ tGravityAcc-std()-Z        : num  -0.878 -0.932 -0.993 -0.978 -0.979 ...
##  $ tBodyAccJerk-mean()-X      : num  0.078 0.074 0.0736 0.0773 0.0734 ...
##  $ tBodyAccJerk-mean()-Y      : num  0.005 0.00577 0.0031 0.02006 0.01912 ...
##  $ tBodyAccJerk-mean()-Z      : num  -0.06783 0.02938 -0.00905 -0.00986 0.01678
...
##  $ tBodyAccJerk-std()-X       : num  -0.994 -0.996 -0.991 -0.993 -0.996 ...
##  $ tBodyAccJerk-std()-Y       : num  -0.988 -0.981 -0.981 -0.988 -0.988 ...
##  $ tBodyAccJerk-std()-Z       : num  -0.994 -0.992 -0.99 -0.993 -0.992 ...
##  $ tBodyGyro-mean()-X         : num  -0.0061 -0.0161 -0.0317 -0.0434 -0.034 ...
##  $ tBodyGyro-mean()-Y         : num  -0.0314 -0.0839 -0.1023 -0.0914 -0.0747
...
##  $ tBodyGyro-mean()-Z         : num  0.1077 0.1006 0.0961 0.0855 0.0774 ...
##  $ tBodyGyro-std()-X          : num  -0.985 -0.983 -0.976 -0.991 -0.985 ...
##  $ tBodyGyro-std()-Y          : num  -0.977 -0.989 -0.994 -0.992 -0.992 ...
##  $ tBodyGyro-std()-Z          : num  -0.992 -0.989 -0.986 -0.988 -0.987 ...
##  $ tBodyGyroJerk-mean()-X     : num  -0.0992 -0.1105 -0.1085 -0.0912 -0.0908
...
##  $ tBodyGyroJerk-mean()-Y     : num  -0.0555 -0.0448 -0.0424 -0.0363 -0.0376
...
##  $ tBodyGyroJerk-mean()-Z     : num  -0.062 -0.0592 -0.0558 -0.0605 -0.0583 ...
##  $ tBodyGyroJerk-std()-X      : num  -0.992 -0.99 -0.988 -0.991 -0.991 ...
##  $ tBodyGyroJerk-std()-Y      : num  -0.993 -0.997 -0.996 -0.997 -0.996 ...
##  $ tBodyGyroJerk-std()-Z      : num  -0.992 -0.994 -0.992 -0.993 -0.995 ...
##  $ tBodyAccMag-mean()         : num  -0.959 -0.979 -0.984 -0.987 -0.993 ...
##  $ tBodyAccMag-std()          : num  -0.951 -0.976 -0.988 -0.986 -0.991 ...
##  $ tGravityAccMag-mean()      : num  -0.959 -0.979 -0.984 -0.987 -0.993 ...
##  $ tGravityAccMag-std()       : num  -0.951 -0.976 -0.988 -0.986 -0.991 ...
##  $ tBodyAccJerkMag-mean()     : num  -0.993 -0.991 -0.989 -0.993 -0.993 ...
##  $ tBodyAccJerkMag-std()      : num  -0.994 -0.992 -0.99 -0.993 -0.996 ...
##  $ tBodyGyroMag-mean()        : num  -0.969 -0.981 -0.976 -0.982 -0.985 ...
##  $ tBodyGyroMag-std()         : num  -0.964 -0.984 -0.986 -0.987 -0.989 ...
##  $ tBodyGyroJerkMag-mean()    : num  -0.994 -0.995 -0.993 -0.996 -0.996 ...
##  $ tBodyGyroJerkMag-std()     : num  -0.991 -0.996 -0.995 -0.995 -0.995 ...
##  $ fBodyAcc-mean()-X          : num  -0.995 -0.997 -0.994 -0.995 -0.997 ...
##  $ fBodyAcc-mean()-Y          : num  -0.983 -0.977 -0.973 -0.984 -0.982 ...
##  $ fBodyAcc-mean()-Z          : num  -0.939 -0.974 -0.983 -0.991 -0.988 ...
##  $ fBodyAcc-std()-X           : num  -0.995 -0.999 -0.996 -0.996 -0.999 ...
##  $ fBodyAcc-std()-Y           : num  -0.983 -0.975 -0.966 -0.983 -0.98 ...
##  $ fBodyAcc-std()-Z           : num  -0.906 -0.955 -0.977 -0.99 -0.992 ...
##  $ fBodyAccJerk-mean()-X      : num  -0.992 -0.995 -0.991 -0.994 -0.996 ...
##  $ fBodyAccJerk-mean()-Y      : num  -0.987 -0.981 -0.982 -0.989 -0.989 ...
##  $ fBodyAccJerk-mean()-Z      : num  -0.99 -0.99 -0.988 -0.991 -0.991 ...
##  $ fBodyAccJerk-std()-X       : num  -0.996 -0.997 -0.991 -0.991 -0.997 ...
##  $ fBodyAccJerk-std()-Y       : num  -0.991 -0.982 -0.981 -0.987 -0.989 ...
##  $ fBodyAccJerk-std()-Z       : num  -0.997 -0.993 -0.99 -0.994 -0.993 ...
##  $ fBodyGyro-mean()-X         : num  -0.987 -0.977 -0.975 -0.987 -0.982 ...
##  $ fBodyGyro-mean()-Y         : num  -0.982 -0.993 -0.994 -0.994 -0.993 ...
##  $ fBodyGyro-mean()-Z         : num  -0.99 -0.99 -0.987 -0.987 -0.989 ...
##  $ fBodyGyro-std()-X          : num  -0.985 -0.985 -0.977 -0.993 -0.986 ...
##  $ fBodyGyro-std()-Y          : num  -0.974 -0.987 -0.993 -0.992 -0.992 ...
##  $ fBodyGyro-std()-Z          : num  -0.994 -0.99 -0.987 -0.989 -0.988 ...
##  $ fBodyAccMag-mean()         : num  -0.952 -0.981 -0.988 -0.988 -0.994 ...
##  $ fBodyAccMag-std()          : num  -0.956 -0.976 -0.989 -0.987 -0.99 ...
##  $ fBodyBodyAccJerkMag-mean() : num  -0.994 -0.99 -0.989 -0.993 -0.996 ...
##  $ fBodyBodyAccJerkMag-std()  : num  -0.994 -0.992 -0.991 -0.992 -0.994 ...
##  $ fBodyBodyGyroMag-mean()    : num  -0.98 -0.988 -0.989 -0.989 -0.991 ...
##  $ fBodyBodyGyroMag-std()     : num  -0.961 -0.983 -0.986 -0.988 -0.989 ...
##  $ fBodyBodyGyroJerkMag-mean(): num  -0.992 -0.996 -0.995 -0.995 -0.995 ...
##  $ fBodyBodyGyroJerkMag-std() : num  -0.991 -0.996 -0.995 -0.995 -0.995 ...
##  $ Activity                   : int  5 5 5 5 5 5 5 5 5 5 ...
##  $ Subject                    : int  1 1 1 1 1 1 1 1 1 1 ...
```

PART III: Uses descriptive activity names to name the activities in the data set

```
extractedData$Activity <-
factor(extractedData$Activity,levels=activityLabels$V1,labels=activityLabels$V2)
```

```
table(extractedData$Activity)
```

Before:

```
##
##    1    2    3    4    5    6
## 1722 1544 1406 1777 1906 1944
```

After:

```
##
##             WALKING    WALKING_UPSTAIRS WALKING_DOWNSTAIRS
##                1722                1544                1406
##             SITTING            STANDING              LAYING
##                1777                1906                1944
```

PART IV: Appropriately labels the data set with descriptive names

Labelling features using descriptive names:

- prefix t = 'time'
- prefix f = 'frequency'
- prefix Acc = 'Accelerometer'
- prefix Gyro = 'Gyroscope'
- prefix Mag = 'Magnitude'
- prefix BodyBody = 'Body'
- prefix std() = 'StdDev'
- prefix mean() = 'Mean'

```
names(extractedData)<-gsub("^t", "time", names(extractedData))
names(extractedData)<-gsub("^f", "frequency", names(extractedData))
names(extractedData)<-gsub("Acc", "Accelerometer", names(extractedData))
names(extractedData)<-gsub("Gyro", "Gyroscope", names(extractedData))
names(extractedData)<-gsub("Mag", "Magnitude", names(extractedData))
names(extractedData)<-gsub("BodyBody", "Body", names(extractedData))
names(extractedData)<-gsub("std\\(\\)", "StdDev", names(extractedData))
names(extractedData)<-gsub("mean\\(\\)", "Mean", names(extractedData))
```

Before	After
tBodyAcc-mean()-X	timeBodyAccelerometer-Mean-X
tBodyAcc-mean()-Y	timeBodyAccelerometer-Mean-Y
tBodyAcc-mean()-Z	timeBodyAccelerometer-Mean-Z
tBodyAcc-std()-X	timeBodyAccelerometer-StdDev-X
tBodyAcc-std()-Y	timeBodyAccelerometer-StdDev-Y
tBodyAcc-std()-Z	timeBodyAccelerometer-StdDev-Z
tGravityAcc-mean()-X	timeGravityAccelerometer-Mean-X
tGravityAcc-mean()-Y	timeGravityAccelerometer-Mean-Y
tGravityAcc-mean()-Z	timeGravityAccelerometer-Mean-Z
tGravityAcc-std()-X	timeGravityAccelerometer-StdDev-X
tGravityAcc-std()-Y	timeGravityAccelerometer-StdDev-Y
tGravityAcc-std()-Z	timeGravityAccelerometer-StdDev-Z
tBodyAccJerk-mean()-X	timeBodyAccelerometerJerk-Mean-X
tBodyAccJerk-mean()-Y	timeBodyAccelerometerJerk-Mean-Y
tBodyAccJerk-mean()-Z	timeBodyAccelerometerJerk-Mean-Z
tBodyAccJerk-std()-X	timeBodyAccelerometerJerk-StdDev-X
tBodyAccJerk-std()-Y	timeBodyAccelerometerJerk-StdDev-Y
tBodyAccJerk-std()-Z	timeBodyAccelerometerJerk-StdDev-Z

tBodyGyro-mean()-X	timeBodyGyroscope-Mean-X
tBodyGyro-mean()-Y	timeBodyGyroscope-Mean-Y
tBodyGyro-mean()-Z	timeBodyGyroscope-Mean-Z
tBodyGyro-std()-X	timeBodyGyroscope-StdDev-X
tBodyGyro-std()-Y	timeBodyGyroscope-StdDev-Y
tBodyGyro-std()-Z	timeBodyGyroscope-StdDev-Z
tBodyGyroJerk-mean()-X	timeBodyGyroscopeJerk-Mean-X
tBodyGyroJerk-mean()-Y	timeBodyGyroscopeJerk-Mean-Y
tBodyGyroJerk-mean()-Z	timeBodyGyroscopeJerk-Mean-Z
tBodyGyroJerk-std()-X	timeBodyGyroscopeJerk-StdDev-X
tBodyGyroJerk-std()-Y	timeBodyGyroscopeJerk-StdDev-Y
tBodyGyroJerk-std()-Z	timeBodyGyroscopeJerk-StdDev-Z
tBodyAccMag-mean()	timeBodyAccelerometerMagnitude-Mean
tBodyAccMag-std()	timeBodyAccelerometerMagnitude-StdDev
tGravityAccMag-mean()	timeGravityAccelerometerMagnitude-Mean
tGravityAccMag-std()	timeGravityAccelerometerMagnitude-StdDev
tBodyAccJerkMag-mean()	timeBodyAccelerometerJerkMagnitude-Mean
tBodyAccJerkMag-std()	timeBodyAccelerometerJerkMagnitude-StdDev
tBodyGyroMag-mean()	timeBodyGyroscopeMagnitude-Mean
tBodyGyroMag-std()	timeBodyGyroscopeMagnitude-StdDev
tBodyGyroJerkMag-mean()	timeBodyGyroscopeJerkMagnitude-Mean
tBodyGyroJerkMag-std()	timeBodyGyroscopeJerkMagnitude-StdDev
fBodyAcc-mean()-X	frequencyBodyAccelerometer-Mean-X
fBodyAcc-mean()-Y	frequencyBodyAccelerometer-Mean-Y
fBodyAcc-mean()-Z	frequencyBodyAccelerometer-Mean-Z
fBodyAcc-std()-X	frequencyBodyAccelerometer-StdDev-X
fBodyAcc-std()-Y	frequencyBodyAccelerometer-StdDev-Y
fBodyAcc-std()-Z	frequencyBodyAccelerometer-StdDev-Z
fBodyAccJerk-mean()-X	frequencyBodyAccelerometerJerk-Mean-X
fBodyAccJerk-mean()-Y	frequencyBodyAccelerometerJerk-Mean-Y
fBodyAccJerk-mean()-Z	frequencyBodyAccelerometerJerk-Mean-Z
fBodyAccJerk-std()-X	frequencyBodyAccelerometerJerk-StdDev-X
fBodyAccJerk-std()-Y	frequencyBodyAccelerometerJerk-StdDev-Y
fBodyAccJerk-std()-Z	frequencyBodyAccelerometerJerk-StdDev-Z
fBodyGyro-mean()-X	frequencyBodyGyroscope-Mean-X
fBodyGyro-mean()-Y	frequencyBodyGyroscope-Mean-Y
fBodyGyro-mean()-Z	frequencyBodyGyroscope-Mean-Z
fBodyGyro-std()-X	frequencyBodyGyroscope-StdDev-X
fBodyGyro-std()-Y	frequencyBodyGyroscope-StdDev-Y
fBodyGyro-std()-Z	frequencyBodyGyroscope-StdDev-Z
fBodyAccMag-mean()	frequencyBodyAccelerometerMagnitude-Mean
fBodyAccMag-std()	frequencyBodyAccelerometerMagnitude-StdDev
fBodyBodyAccJerkMag-mean()	frequencyBodyAccelerometerJerkMagnitude-Mean
fBodyBodyAccJerkMag-std()	frequencyBodyAccelerometerJerkMagnitude-StdDev
fBodyBodyGyroMag-mean()	frequencyBodyGyroscopeMagnitude-Mean
fBodyBodyGyroMag-std()	frequencyBodyGyroscopeMagnitude-StdDev
fBodyBodyGyroJerkMag-mean()	frequencyBodyGyroscopeJerkMagnitude-Mean
fBodyBodyGyroJerkMag-std()	frequencyBodyGyroscopeJerkMagnitude-StdDev
Activity	Activity
Subject	Subject

PART V: Creates a second, independent tidy data set with the average of each variable for each activity and each subject

```
finalData <- aggregate(. ~Subject + Activity, extractedData, mean)
finalData <- finalData[order(finalData$Subject,finalData$Activity),]
write.table(finalData, file = "tidydata.txt",row.name=FALSE)
```

```
dim(finalData)
```

```
## [1] 180  68
```