DATA TRANSFORMATIONS & CODE BOOK (VARIABLES DESCRIPTION)

Data transformations

Data in the original form has been selected and cleaned using a series of operations described below. Later on grouping and aggregation operations were performed to form per subject/per activity summaries.
Here is the high-level explanation, all detailed comments for the concrete operations can be found in a code.
1. Cleaning operations:
    a. Test/training data has been loaded separately from the proper path
    b. Only columns describing mean or standard deviation has been extracted (including the Mean Frequency column, as it carries useful information about the devices functioning)
    c. Column renaming operation has been performed:
        i. Remove - characters
        ii. Remove (,) characters
        iii. Split CamelCaseNames to Dot.Separated.Names
        iv. Remove duplicated words from column names e.g. Body.Body
    d. Encoding the activities names – translate numeric values provided in Feature_info.txt file to human-readable format
2. Merging operations:
    a. Test data and Training data has been merged to long form – new rows has been added
3. Aggregation operations
    a. Assumptions and methodology
       Aggregation has been performed for every subject, against every activity. The long form of the data has been used, so we have as separate row for every subject-activity pair. So the total number of rows is:
       n.subjects * n.activities
       30 * 6 = 180
    b. Oprations:
        i. Create empty data frame
        ii. For each subject:
            1. Summarize each activity
            2. Add result to data frame
        iii. Return data frame
    c. Correctness – correctness of operation performed above can be checked by counting subjects against activities in the final data set. Every subject should contain one and only row per activity, as presented below:

Subject\activity	laying	Sitting	Standing	Walking	Walking downstairs	Walking upstairs
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	1	1	1	1	1	1
4	1	1	1	1	1	1
5	1	1	1	1	1	1
6	1	1	1	1	1	1
7	1	1	1	1	1	1
8	1	1	1	1	1	1
9	1	1	1	1	1	1
10	1	1	1	1	1	1
11	1	1	1	1	1	1
12	1	1	1	1	1	1
13	1	1	1	1	1	1
14	1	1	1	1	1	1
15	1	1	1	1	1	1
16	1	1	1	1	1	1
17	1	1	1	1	1	1
18	1	1	1	1	1	1
19	1	1	1	1	1	1
20	1	1	1	1	1	1
21	1	1	1	1	1	1
22	1	1	1	1	1	1
23	1	1	1	1	1	1
24	1	1	1	1	1	1
25	1	1	1	1	1	1
26	1	1	1	1	1	1
27	1	1	1	1	1	1
28	1	1	1	1	1	1
29	1	1	1	1	1	1
30	1	1	1	1	1	1

Data code book

1. Activity

   a. Factor

   b. Gives a descriptive name to coded activity from the raw data set. Mapping has been performed according to the activity_labels.txt attached to the main data set:

      i. 1 - walking

      ii. 2 – walking upstairs

      iii. 3 – walking downstairs

      iv. 4 – sitting

      v. 5 – standing

      vi. 6 - laying

2. T.body.Acc.mean.X

   a. numeric

   b. Mean of body acceleration over time, along X axis

3. T.body.Acc.mean.Y

   a. Nnumeric

   b. Mean of body acceleration over time, along Y axis

4. T.Body.Acc.mean.Z

   a. Nnumeric

   b. Mean of body acceleration over time, along Z axis

5. T.body.Acc.std.X

   a. numeric

   b. Standard deviation of body acceleration over time, along X axis

6. T.body.Acc.std.Y

   a. numeric

   b. Standard deviation of body acceleration over time, along Y axis

7. T.body.Acc.std.Z

   a. numeric

   b. Standard deviation of body acceleration over time, along Z axis

8. T.gravity.Acc.mean.X

   a. numeric

   b. Mean of gravity acceleration signal over time, along X axis

9. T.gravity.Acc.mean.Y

   a. Nnumeric

   b. Mean of gravity acceleration signal over time, along Y axis

10. T.gravity.Acc.mean.Z

   a. Nnumeric

   b. Mean of gravity acceleration signal over time, along Z axis

11. T.gravity.Acc.std.X

   a. numeric

   b. Standard deviation of gravity acceleration signal over time, along X axis

12. T.gravity.Acc.std.Y

   a. numeric

   b. Standard deviation of gravity acceleration over time, along Y axis

13. T. gravity.Acc.std.Z

    a. numeric

    b. Standard deviation of gravity acceleration over time, along Z axis

14. t.Body.Acc.Jerk.mean.X

    a. numeric

    b. Mean of body jerk acceleration over time, along X axis

15. t.Body.Acc.Jerk.mean.Y

    a. numeric

    b. Mean of body jerk acceleration over time, along Y axis

16. t.Body.Acc.Jerk.mean.Z

    a. numeric

    b. Mean of body jerk acceleration over time, along Z axis

17. t.Body.Acc.Jerk.std.X

    a. numeric

    b. standard deviation of body jerk acceleration over time, along X axis

18. t.Body.Acc.Jerk.std.Y

    a. numeric

    b. standard deviation of body jerk acceleration over time, along Y axis

19. t.Body.Acc.Jerk.std.Z

    a. numeric

    b. standard deviation of body jerk acceleration over time, along Z axis

20. t.Body.Gyro.mean.X

    a. numeric

    b. Mean of body gyroscope position over time, along X axis

21. t.Body.Gyro.mean.Y

    a. numeric

    b. Mean of body gyroscope position over time, along Y axis

22. t.Body.Gyro.mean.Z

    a. numeric

    b. Mean of body gyroscope position over time, along Z axis

23. t.Body.Gyro.std.X

    a. numeric

    b. standard deviation of body gyroscope position over time, along X

24. t.Body.Gyro.std.Y

    a.   numeric

    b.   standard deviation of body gyroscope position over time, along Y

25. t.Body.Gyro.std.Z

    a.   numeric

    b.   standard deviation of body gyroscope position over time, along Z

26. t.Body.Gyro.Jerk.mean.X

    a.   numeric

    b.   Mean of body gyroscope jerk acceleration over time, along X axis

27. t.Body.Gyro.Jerk.mean.Y

    a.   numeric

    b.   Mean of body gyroscope jerk acceleration over time, along Y axis

28. t.Body.Gyro.Jerk.mean.Z

    a.   numeric

    b.   Mean of body gyroscope jerk acceleration over time, along Z axis

29. t.Body.Gyro.Jerk.std.X

    a.   numeric

    b.   Standard deviation of body gyroscope jerk acceleration over time, along X axis

30. t.Body.Gyro.Jerk.std.Y

    a.   numeric

    b.   Standard deviation of body gyroscope jerk acceleration over time, along Y axis

31. t.Body.Gyro.Jerk.std.Z

    a.   numeric

    b.   Standard deviation of body gyroscope jerk acceleration over time, along Z axis

32. t.Body.Acc.Mag.mean

    a.   Numeric

    b.   Mean of body acceleration magnitude over time

33. t.Body.Acc.Mag.std

    a.   numeric

    b.   standard deviation of body acceleration magnitude over time

34. t.Gravity.Acc.Mag.mean

    a.   numeric

    b.   Mean of gravity factor acceleration magnitude over time

35. t.Gravity.Acc.Mag.std

   a.   numeric

   b.   standard deviation of gravity factor acceleration magnitude over time

36. t.Body.Acc.Jerk.Mag.mean

   a.   numeric

   b.   Mean of body jerk acceleration magnitude over time

37. t.Body.Acc.Jerk.Mag.std

   a.   numeric

   b.   standard deviation of body jerk acceleration magnitude over time

38. t.Body.Gyro.Mag.mean

   a.   numeric

   b.   Mean of body gyroscope change magnitude over time

39. t.Body.Gyro.Mag.std

   a.   numeric

   b.   standard deviation of body gyroscope change magnitude over time

40. t.Body.Gyro.Jerk.Mag.mean

   a.   numeric

   b.   Mean of body gyroscope jerk change magnitude over time

41. t.Body.Gyro.Jerk.Mag.std

   a.   numeric

   b.   standard deviation of body gyroscope jerk change magnitude over time

42. f.body.Acc.mean.X

   a.   numeric

   b.   Mean of body acceleration frequency, along X axis

43. f.body.Acc.mean.Y

   a.   Nnumeric

   b.   Mean of body acceleration frequency, along Y axis

44. f.Body.Acc.mean.Z

   a.   Nnumeric

   b.   Mean of body acceleration frequency, along Z axis

45. f.body.Acc.std.X

   a.   numeric

   b.   Standard deviation of body acceleration frequency, along X axis

46.   f.body.Acc.std.Y

    a.   numeric

    b.   Standard deviation of body acceleration frequency, along Y axis

47.   f.body.Acc.std.Z

    a.   numeric

    b.   Standard deviation of body acceleration frequency, along Z axis

48.   f.Body.Acc.mean.Freq.X

    a.   numeric

    b.   mean frequency of body acceleration along X axis

49.   f.Body.Acc.mean.Freq.Y

    a.   numeric

    b.   frequency of mean body acceleration along Y axis

50.   f.Body.Acc.mean.Freq.Z

    a.   numeric

    b.   frequency of mean body acceleration along Z axis

51.   f.Body.Acc.Jerk.mean.X

    a.   numeric

    b.   frequency of mean body acceleration along X axis

52.   f.Body.Acc.Jerk.mean.Y

    a.   numeric

    b.   frequency of mean body acceleration along Y axis

53.   f.Body.Acc.Jerk.mean.Z

    a.   numeric

    b.   frequency of mean body acceleration along Z axis

54.   f.Body.Acc.Jerk.std.X

    a.   numeric

    b.   frequency of body acceleration standard deviation along X axis

55.   f.Body.Acc.Jerk.std.Y

    a.   numeric

    b.   frequency of body acceleration standard deviation along Y axis

56.   f.Body.Acc.Jerk.std.Z

    a.   numeric

    b.   frequency of body acceleration standard deviation along Z axis

57. f.Body.Acc.Jerk.mean.Freq.X

    a.   numeric

    b.   frequency of body jerk acceleration mean along X axis

58. f.Body.Acc.Jerk.mean.Freq.Y

    a.   numeric

    b.   frequency of body jerk acceleration mean along Y axis

59. f.Body.Acc.Jerk.mean.Freq.Z

    a.   numeric

    b.   frequency of body jerk acceleration mean along Z axis

60. f.Body.Gyro.mean.X

    a.   numeric

    b.   frequency of body gyroscope position mean along X axis

61. f.Body.Gyro.mean.Y

    a.   numeric

    b.   frequency of body gyroscope position mean along Y axis

62. f.Body.Gyro.mean.Z

    a.   numeric

    b.   frequency of body gyroscope position mean along Z axis

63. f.Body.Gyro.std.X

    a.   numeric

    b.   frequency of body gyroscope position standard deviation along X axis

64. f.Body.Gyro.std.Y

    a.   numeric

    b.   frequency of body gyroscope position standard deviation along Y axis

65. f.Body.Gyro.std.Z

    a.   numeric

    b.   frequency of body gyroscope position standard deviation along Z axis

66. f.Body.Gyro.mean.Freq.X

    a.   numeric

    b.   Mean frequency of body gyroscope along X axis

67. f.Body.Gyro.mean.Freq.Y

    a.   numeric

    b.   Mean frequency of body gyroscope along Y axis

68. f.Body.Gyro.mean.Freq.Z

   a. numeric

   b. Mean frequency of body gyroscope along Z axis

69. f.Body.Acc.Mag.mean

   a. numeric

   b. Frequency of body acceleration magnitude mean

70. f.Body.Acc.Mag.std

   a. numeric

   b. Frequency of body acceleration magnitude standard deviation

71. f.Body.Acc.Mag.mean.Freq

   a. numeric

   b. Mean Frequency of body acceleration magnitude

72. f.Body.Acc.Jerk.Mag.mean

   a. numeric

   b. Mean Frequency of body acceleration magnitude

73. f.Body.Acc.Jerk.Mag.std

   a. numeric

   b. Frequency of body jerk acceleration magnitude standard deviation

74. f.Body.Acc.Jerk.Mag.mean.Freq

   a. numeric

   b. Body jerk acceleration magnitude mean frequency

75. f.Body.Gyro.Mag.mean

   a. numeric

   b. mean of body gyroscope position change magnitude

76. f.Body.Gyro.Mag.std

   a. numeric

   b. standard deviation of body gyroscope position change

77. f.Body.Gyro.Mag.mean.Freq

   a. numeric

   b. mean frequency of body gyroscope position change magnitude

78. f.Body.Gyro.Jerk.Mag.mean

   a. numeric

   b. mean of body gyroscope jerk position change magnitude

79. f.Body.Gyro.Jerk.Mag.std

   a.   numeric

   b.   standard deviation of body gyroscope jerk position change magnitude

80. f.Body.Gyro.Jerk.Mag.mean.Freq

   a.   numeric

   b.   mean frequency of body gyroscope jerk position change magnitude

81. subject

   a.   factor

   b.   describes the number of subject, who has performed given activity