

# Prediction Assignment Writeup

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For the prediction

I delete all the variables with enough missing values, to 160, i have 60 variables with classe. I delete them because if do some knn impute all the missing values will be the same so it's useless to do that

```

##          X          user_name raw_timestamp_part_1 raw_timestamp_part_2
## Min.      :    1    adelmo :3892    Min.      :1.322e+09    Min.      :    294
## 1st Qu.: 4906    carlitos:3112    1st Qu.:1.323e+09    1st Qu.:252912
## Median : 9812    charles :3536    Median :1.323e+09    Median :496380
## Mean      : 9812    eurico  :3070    Mean      :1.323e+09    Mean      :500656
## 3rd Qu.:14717    jeremy  :3402    3rd Qu.:1.323e+09    3rd Qu.:751891
## Max.      :19622    pedro   :2610    Max.      :1.323e+09    Max.      :998801
##
##          cvtd_timestamp new_window    num_window    roll_belt
## 28/11/2011 14:14: 1498    no :19216    Min.      :    1.0    Min.      : -28.90
## 05/12/2011 11:24: 1497    yes: 406    1st Qu.:222.0    1st Qu.:    1.10
## 30/11/2011 17:11: 1440                                Median :424.0    Median :113.00
## 05/12/2011 11:25: 1425                                Mean      :430.6    Mean      : 64.41
## 02/12/2011 14:57: 1380                                3rd Qu.:644.0    3rd Qu.:123.00
## 02/12/2011 13:34: 1375                                Max.      :864.0    Max.      :162.00
## (Other)          :11007
##    pitch_belt          yaw_belt    total_accel_belt kurtosis_roll_belt
## Min.      : -55.8000    Min.      : -180.00    Min.      : 0.00          :19216
## 1st Qu.:    1.7600    1st Qu.: -88.30    1st Qu.: 3.00    #DIV/0! :    10
## Median :    5.2800    Median : -13.00    Median :17.00    -1.908453:    2
## Mean      :    0.3053    Mean      : -11.21    Mean      :11.31    -0.016850:    1
## 3rd Qu.:   14.9000    3rd Qu.: 12.90    3rd Qu.:18.00    -0.021024:    1
## Max.      :   60.3000    Max.      : 179.00    Max.      :29.00    -0.025513:    1
##                                     (Other) :   391
## kurtosis_picth_belt kurtosis_yaw_belt skewness_roll_belt skewness_roll_belt.1
##          :19216          :19216          :19216          :19216
## #DIV/0! :    32    #DIV/0! : 406    #DIV/0! :    9    #DIV/0! :    32
## 47.000000:    4          0.000000 :    4    0.000000 :    4
## -0.150950:    3          0.422463 :    2    -2.156553:    3
## -0.684748:    3          -0.003095:    1    -3.072669:    3
## -1.750749:    3          -0.010002:    1    -6.324555:    3
## (Other) : 361          (Other) : 389    (Other) : 361
## skewness_yaw_belt max_roll_belt    max_picth_belt    max_yaw_belt
##          :19216    Min.      : -94.300    Min.      : 3.00          :19216
## #DIV/0! : 406    1st Qu.: -88.000    1st Qu.: 5.00    -1.1 :    30
##          Median : -5.100    Median :18.00    -1.4 :    29
##          Mean      : -6.667    Mean      :12.92    -1.2 :    26
##          3rd Qu.: 18.500    3rd Qu.:19.00    -0.9 :    24
##          Max.      :180.000    Max.      :30.00    -1.3 :    22
##          NA's      :19216    NA's      :19216    (Other): 275
## min_roll_belt    min_pitch_belt    min_yaw_belt    amplitude_roll_belt
## Min.      : -180.00    Min.      : 0.00          :19216    Min.      : 0.000
## 1st Qu.: -88.40    1st Qu.: 3.00    -1.1 :    30    1st Qu.: 0.300
## Median : -7.85    Median :16.00    -1.4 :    29    Median : 1.000
## Mean      : -10.44    Mean      :10.76    -1.2 :    26    Mean      : 3.769
## 3rd Qu.: 9.05    3rd Qu.:17.00    -0.9 :    24    3rd Qu.: 2.083
## Max.      : 173.00    Max.      :23.00    -1.3 :    22    Max.      :360.000
## NA's      :19216    NA's      :19216    (Other): 275    NA's      :19216
## amplitude_pitch_belt amplitude_yaw_belt var_total_accel_belt avg_roll_belt
## Min.      : 0.000          :19216    Min.      : 0.000    Min.      : -27.40
## 1st Qu.: 1.000    #DIV/0! : 10    1st Qu.: 0.100    1st Qu.: 1.10
## Median : 1.000    0.00 : 12    Median : 0.200    Median :116.35
## Mean      : 2.167    0.0000 : 384    Mean      : 0.926    Mean      : 68.06
## 3rd Qu.: 2.000          3rd Qu.: 0.300    3rd Qu.:123.38
## Max.      :12.000          Max.      :16.500    Max.      :157.40
## NA's      :19216          NA's      :19216    NA's      :19216
## stddev_roll_belt var_roll_belt    avg_pitch_belt    stddev_pitch_belt
## Min.      : 0.000    Min.      : 0.000    Min.      : -51.400    Min.      :0.000
## 1st Qu.: 0.200    1st Qu.: 0.000    1st Qu.: 2.025    1st Qu.:0.200
## Median : 0.400    Median : 0.100    Median : 5.200    Median :0.400
## Mean      : 1.337    Mean      : 7.699    Mean      : 0.520    Mean      :0.603

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## 3rd Qu.: 0.700    3rd Qu.: 0.500    3rd Qu.: 15.775    3rd Qu.:0.700
## Max.      :14.200    Max.      :200.700    Max.      : 59.700    Max.      :4.000
## NA's      :19216    NA's      :19216    NA's      :19216    NA's      :19216
## var_pitch_belt    avg_yaw_belt      stddev_yaw_belt    var_yaw_belt
## Min.      : 0.000    Min.      :-138.300    Min.      : 0.000    Min.      : 0.000
## 1st Qu.: 0.000    1st Qu.: -88.175    1st Qu.: 0.100    1st Qu.: 0.010
## Median : 0.100    Median : -6.550    Median : 0.300    Median : 0.090
## Mean      : 0.766    Mean      : -8.831    Mean      : 1.341    Mean      : 107.487
## 3rd Qu.: 0.500    3rd Qu.: 14.125    3rd Qu.: 0.700    3rd Qu.: 0.475
## Max.      :16.200    Max.      : 173.500    Max.      :176.600    Max.      :31183.240
## NA's      :19216    NA's      :19216    NA's      :19216    NA's      :19216
## gyros_belt_x      gyros_belt_y      gyros_belt_z      accel_belt_x
## Min.      :-1.040000    Min.      :-0.64000    Min.      :-1.4600    Min.      :-120.000
## 1st Qu.: -0.030000    1st Qu.: 0.00000    1st Qu.: -0.2000    1st Qu.: -21.000
## Median : 0.030000    Median : 0.02000    Median : -0.1000    Median : -15.000
## Mean      : -0.005592    Mean      : 0.03959    Mean      : -0.1305    Mean      : -5.595
## 3rd Qu.: 0.110000    3rd Qu.: 0.11000    3rd Qu.: -0.0200    3rd Qu.: -5.000
## Max.      : 2.220000    Max.      : 0.64000    Max.      : 1.6200    Max.      : 85.000
##
## accel_belt_y      accel_belt_z      magnet_belt_x      magnet_belt_y
## Min.      : -69.00    Min.      : -275.00    Min.      : -52.0    Min.      : 354.0
## 1st Qu.: 3.00    1st Qu.: -162.00    1st Qu.: 9.0    1st Qu.: 581.0
## Median : 35.00    Median : -152.00    Median : 35.0    Median : 601.0
## Mean      : 30.15    Mean      : -72.59    Mean      : 55.6    Mean      : 593.7
## 3rd Qu.: 61.00    3rd Qu.: 27.00    3rd Qu.: 59.0    3rd Qu.: 610.0
## Max.      :164.00    Max.      : 105.00    Max.      :485.0    Max.      :673.0
##
## magnet_belt_z      roll_arm      pitch_arm      yaw_arm
## Min.      : -623.0    Min.      : -180.00    Min.      : -88.800    Min.      : -180.0000
## 1st Qu.: -375.0    1st Qu.: -31.77    1st Qu.: -25.900    1st Qu.: -43.1000
## Median : -320.0    Median : 0.00    Median : 0.000    Median : 0.0000
## Mean      : -345.5    Mean      : 17.83    Mean      : -4.612    Mean      : -0.6188
## 3rd Qu.: -306.0    3rd Qu.: 77.30    3rd Qu.: 11.200    3rd Qu.: 45.8750
## Max.      : 293.0    Max.      : 180.00    Max.      : 88.500    Max.      : 180.0000
##
## total_accel_arm    var_accel_arm      avg_roll_arm      stddev_roll_arm
## Min.      : 1.00    Min.      : 0.00    Min.      : -166.67    Min.      : 0.000
## 1st Qu.:17.00    1st Qu.: 9.03    1st Qu.: -38.37    1st Qu.: 1.376
## Median :27.00    Median : 40.61    Median : 0.00    Median : 5.702
## Mean      :25.51    Mean      : 53.23    Mean      : 12.68    Mean      : 11.201
## 3rd Qu.:33.00    3rd Qu.: 75.62    3rd Qu.: 76.33    3rd Qu.: 14.921
## Max.      :66.00    Max.      :331.70    Max.      : 163.33    Max.      :161.964
## NA's      :19216    NA's      :19216    NA's      :19216    NA's      :19216
## var_roll_arm      avg_pitch_arm      stddev_pitch_arm    var_pitch_arm
## Min.      : 0.000    Min.      : -81.773    Min.      : 0.000    Min.      : 0.000
## 1st Qu.: 1.898    1st Qu.: -22.770    1st Qu.: 1.642    1st Qu.: 2.697
## Median : 32.517    Median : 0.000    Median : 8.133    Median : 66.146
## Mean      : 417.264    Mean      : -4.901    Mean      :10.383    Mean      : 195.864
## 3rd Qu.: 222.647    3rd Qu.: 8.277    3rd Qu.:16.327    3rd Qu.: 266.576
## Max.      :26232.208    Max.      : 75.659    Max.      :43.412    Max.      :1884.565
## NA's      :19216    NA's      :19216    NA's      :19216    NA's      :19216
## avg_yaw_arm      stddev_yaw_arm      var_yaw_arm      gyros_arm_x
## Min.      : -173.440    Min.      : 0.000    Min.      : 0.000    Min.      : -6.37000
## 1st Qu.: -29.198    1st Qu.: 2.577    1st Qu.: 6.642    1st Qu.: -1.33000
## Median : 0.000    Median : 16.682    Median : 278.309    Median : 0.08000
## Mean      : 2.359    Mean      : 22.270    Mean      :1055.933    Mean      : 0.04277
## 3rd Qu.: 38.185    3rd Qu.: 35.984    3rd Qu.:1294.850    3rd Qu.: 1.57000
## Max.      : 152.000    Max.      :177.044    Max.      :31344.568    Max.      : 4.87000
## NA's      :19216    NA's      :19216    NA's      :19216    NA's      :19216
## gyros_arm_y      gyros_arm_z      accel_arm_x      accel_arm_y
## Min.      : -3.4400    Min.      : -2.3300    Min.      : -404.00    Min.      : -318.0
## 1st Qu.: -0.8000    1st Qu.: -0.0700    1st Qu.: -242.00    1st Qu.: -54.0

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## Median :-0.2400 Median : 0.2300 Median : -44.00 Median : 14.0
## Mean :-0.2571 Mean : 0.2695 Mean : -60.24 Mean : 32.6
## 3rd Qu.: 0.1400 3rd Qu.: 0.7200 3rd Qu.: 84.00 3rd Qu.: 139.0
## Max. : 2.8400 Max. : 3.0200 Max. : 437.00 Max. : 308.0
##
## accel_arm_z magnet_arm_x magnet_arm_y magnet_arm_z
## Min. :-636.00 Min. :-584.0 Min. :-392.0 Min. :-597.0
## 1st Qu.: -143.00 1st Qu.: -300.0 1st Qu.: -9.0 1st Qu.: 131.2
## Median : -47.00 Median : 289.0 Median : 202.0 Median : 444.0
## Mean : -71.25 Mean : 191.7 Mean : 156.6 Mean : 306.5
## 3rd Qu.: 23.00 3rd Qu.: 637.0 3rd Qu.: 323.0 3rd Qu.: 545.0
## Max. : 292.00 Max. : 782.0 Max. : 583.0 Max. : 694.0
##
## kurtosis_roll_arm kurtosis_pitch_arm kurtosis_yaw_arm skewness_roll_arm
## :19216 :19216 :19216 :19216
## #DIV/0! : 78 #DIV/0! : 80 #DIV/0! : 11 #DIV/0! : 77
## -0.02438: 1 -0.00484: 1 0.55844 : 2 -0.00051: 1
## -0.04190: 1 -0.01311: 1 0.65132 : 2 -0.00696: 1
## -0.05051: 1 -0.02967: 1 -0.01548: 1 -0.01884: 1
## -0.05695: 1 -0.07394: 1 -0.01749: 1 -0.03359: 1
## (Other) : 324 (Other) : 322 (Other) : 389 (Other) : 325
## skewness_pitch_arm skewness_yaw_arm max_roll_arm max_pitch_arm
## :19216 :19216 Min. :-73.100 Min. :-173.000
## #DIV/0! : 80 #DIV/0! : 11 1st Qu.: -0.175 1st Qu.: -1.975
## -0.00184: 1 -1.62032: 2 Median : 4.950 Median : 23.250
## -0.01185: 1 0.55053 : 2 Mean : 11.236 Mean : 35.751
## -0.01247: 1 -0.00311: 1 3rd Qu.: 26.775 3rd Qu.: 95.975
## -0.02063: 1 -0.00562: 1 Max. : 85.500 Max. : 180.000
## (Other) : 322 (Other) : 389 NA's :19216 NA's :19216
## max_yaw_arm min_roll_arm min_pitch_arm min_yaw_arm
## Min. : 4.00 Min. :-89.10 Min. :-180.00 Min. : 1.00
## 1st Qu.:29.00 1st Qu.: -41.98 1st Qu.: -72.62 1st Qu.: 8.00
## Median :34.00 Median :-22.45 Median : -33.85 Median :13.00
## Mean :35.46 Mean :-21.22 Mean : -33.92 Mean :14.66
## 3rd Qu.:41.00 3rd Qu.: 0.00 3rd Qu.: 0.00 3rd Qu.:19.00
## Max. :65.00 Max. : 66.40 Max. : 152.00 Max. :38.00
## NA's :19216 NA's :19216 NA's :19216 NA's :19216
## amplitude_roll_arm amplitude_pitch_arm amplitude_yaw_arm roll_dumbbell
## Min. : 0.000 Min. : 0.000 Min. : 0.00 Min. :-153.71
## 1st Qu.: 5.425 1st Qu.: 9.925 1st Qu.:13.00 1st Qu.: -18.49
## Median : 28.450 Median : 54.900 Median :22.00 Median : 48.17
## Mean : 32.452 Mean : 69.677 Mean :20.79 Mean : 23.84
## 3rd Qu.: 50.960 3rd Qu.:115.175 3rd Qu.:28.75 3rd Qu.: 67.61
## Max. :119.500 Max. :360.000 Max. :52.00 Max. : 153.55
## NA's :19216 NA's :19216 NA's :19216
## pitch_dumbbell yaw_dumbbell kurtosis_roll_dumbbell
## Min. :-149.59 Min. :-150.871 :19216
## 1st Qu.: -40.89 1st Qu.: -77.644 #DIV/0! : 5
## Median : -20.96 Median : -3.324 -0.2583: 2
## Mean : -10.78 Mean : 1.674 -0.3705: 2
## 3rd Qu.: 17.50 3rd Qu.: 79.643 -0.5855: 2
## Max. : 149.40 Max. : 154.952 -2.0851: 2
## (Other): 393
## kurtosis_pitch_dumbbell kurtosis_yaw_dumbbell skewness_roll_dumbbell
## :19216 :19216 :19216
## -0.5464: 2 #DIV/0! : 406 #DIV/0! : 4
## -0.9334: 2 -0.9324: 2
## -2.0833: 2 0.1110 : 2
## -2.0851: 2 1.0312 : 2
## -2.0889: 2 -0.0082: 1
## (Other): 396 (Other): 395
## skewness_pitch_dumbbell skewness_yaw_dumbbell max_roll_dumbbell

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##          :19216                               Min.      :-70.10
## -0.2328:    2                #DIV/0!:  406          1st Qu.: -27.15
## -0.3521:    2                               Median : 14.85
## -0.7036:    2                               Mean  : 13.76
## 0.1090 :    2                               3rd Qu.: 50.58
## 1.0326 :    2                               Max.   :137.00
## (Other):  396                               NA's    :19216
## max_picth_dumbbell max_yaw_dumbbell min_roll_dumbbell min_pitch_dumbbell
## Min.      :-112.90                :19216   Min.      :-149.60   Min.      :-147.00
## 1st Qu.: -66.70      -0.6      :    20   1st Qu.: -59.67   1st Qu.: -91.80
## Median :  40.05      0.2       :    19   Median : -43.55   Median : -66.15
## Mean    :   32.75     -0.8      :    18   Mean    : -41.24   Mean    : -33.18
## 3rd Qu.: 133.22     -0.3      :    16   3rd Qu.: -25.20   3rd Qu.:  21.20
## Max.     : 155.00     -0.2      :    15   Max.     :   73.20   Max.     : 120.90
## NA's      :19216      (Other):  318   NA's      :19216   NA's      :19216
## min_yaw_dumbbell amplitude_roll_dumbbell amplitude_pitch_dumbbell
##          :19216   Min.      :  0.00                Min.      :  0.00
## -0.6      :    20   1st Qu.: 14.97                1st Qu.: 17.06
## 0.2       :    19   Median : 35.05                Median : 41.73
## -0.8      :    18   Mean    : 55.00                Mean    : 65.93
## -0.3      :    16   3rd Qu.: 81.04                3rd Qu.: 99.55
## -0.2      :    15   Max.     :256.48                Max.     :273.59
## (Other):  318   NA's      :19216                NA's      :19216
## amplitude_yaw_dumbbell total_accel_dumbbell var_accel_dumbbell
##          :19216                Min.      :  0.00                Min.      :  0.000
## #DIV/0!:    5                1st Qu.:  4.00                1st Qu.:  0.378
## 0.00      :   401                Median :10.00                Median :  1.000
##                                     Mean     :13.72                Mean     :  4.388
##                                     3rd Qu.:19.00                3rd Qu.:  3.434
##                                     Max.      :58.00                Max.      :230.428
##                                     NA's      :19216
## avg_roll_dumbbell stddev_roll_dumbbell var_roll_dumbbell avg_pitch_dumbbell
## Min.      :-128.96   Min.      :  0.000                Min.      :  0.00   Min.      :-70.73
## 1st Qu.: -12.33     1st Qu.:  4.639                1st Qu.:  21.52   1st Qu.: -42.00
## Median :  48.23     Median : 12.204                Median : 148.95   Median : -19.91
## Mean    :  23.86     Mean    : 20.761                Mean    :1020.27   Mean    : -12.33
## 3rd Qu.:  64.37     3rd Qu.: 26.356                3rd Qu.:  694.65   3rd Qu.:  13.21
## Max.     : 125.99     Max.     :123.778                Max.     :15321.01 Max.     :  94.28
## NA's      :19216     NA's      :19216                NA's      :19216   NA's      :19216
## stddev_pitch_dumbbell var_pitch_dumbbell avg_yaw_dumbbell
## Min.      :  0.000                Min.      :  0.00   Min.      :-117.950
## 1st Qu.:  3.482                1st Qu.: 12.12     1st Qu.: -76.696
## Median :  8.089                Median :  65.44     Median :  -4.505
## Mean    :13.147                Mean    : 350.31     Mean    :   0.202
## 3rd Qu.:19.238                3rd Qu.: 370.11     3rd Qu.:  71.234
## Max.     :82.680                Max.     :6836.02     Max.     : 134.905
## NA's      :19216     NA's      :19216                NA's      :19216
## stddev_yaw_dumbbell var_yaw_dumbbell gyros_dumbbell_x gyros_dumbbell_y
## Min.      :  0.000                Min.      :  0.00   Min.      :-204.0000   Min.      :-2.10000
## 1st Qu.:  3.885                1st Qu.: 15.09     1st Qu.: -0.0300     1st Qu.: -0.14000
## Median : 10.264                Median : 105.35     Median :  0.1300     Median :  0.03000
## Mean    : 16.647                Mean    : 589.84     Mean    :  0.1611     Mean    :  0.04606
## 3rd Qu.: 24.674                3rd Qu.: 608.79     3rd Qu.:  0.3500     3rd Qu.:  0.21000
## Max.     :107.088                Max.     :11467.91   Max.      :  2.2200     Max.     :52.00000
## NA's      :19216     NA's      :19216
## gyros_dumbbell_z accel_dumbbell_x accel_dumbbell_y accel_dumbbell_z
## Min.      : -2.380                Min.      :-419.00   Min.      :-189.00   Min.      :-334.00
## 1st Qu.: -0.310                1st Qu.: -50.00     1st Qu.:  -8.00     1st Qu.: -142.00
## Median : -0.130                Median :  -8.00     Median :  41.50     Median :  -1.00
## Mean    : -0.129                Mean    : -28.62     Mean    :  52.63     Mean    : -38.32
## 3rd Qu.:  0.030                3rd Qu.: 11.00     3rd Qu.: 111.00     3rd Qu.:  38.00
## Max.     :317.000                Max.      :235.00     Max.      :315.00     Max.      :318.00

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## magnet_dumbbell_x magnet_dumbbell_y magnet_dumbbell_z roll_forearm
## Min. : -643.0 Min. : -3600 Min. : -262.00 Min. : -180.0000
## 1st Qu.: -535.0 1st Qu.: 231 1st Qu.: -45.00 1st Qu.: -0.7375
## Median : -479.0 Median : 311 Median : 13.00 Median : 21.7000
## Mean : -328.5 Mean : 221 Mean : 46.05 Mean : 33.8265
## 3rd Qu.: -304.0 3rd Qu.: 390 3rd Qu.: 95.00 3rd Qu.: 140.0000
## Max. : 592.0 Max. : 633 Max. : 452.00 Max. : 180.0000
##
## pitch_forearm yaw_forearm kurtosis_roll_forearm
## Min. : -72.50 Min. : -180.00 :19216
## 1st Qu.: 0.00 1st Qu.: -68.60 #DIV/0!: 84
## Median : 9.24 Median : 0.00 -0.8079: 2
## Mean : 10.71 Mean : 19.21 -0.9169: 2
## 3rd Qu.: 28.40 3rd Qu.: 110.00 -0.0227: 1
## Max. : 89.80 Max. : 180.00 -0.0359: 1
## (Other): 316
## kurtosis_pitch_forearm kurtosis_yaw_forearm skewness_roll_forearm
## :19216 :19216 :19216
## #DIV/0!: 85 #DIV/0!: 406 #DIV/0!: 83
## -0.0073: 1 -0.1912: 2
## -0.0442: 1 -0.4126: 2
## -0.0489: 1 -0.0004: 1
## -0.0523: 1 -0.0013: 1
## (Other): 317 (Other): 317
## skewness_pitch_forearm skewness_yaw_forearm max_roll_forearm max_pitch_forearm
## :19216 :19216 Min. : -66.60 Min. : -151.00
## #DIV/0!: 85 #DIV/0!: 406 1st Qu.: 0.00 1st Qu.: 0.00
## 0.0000: 4 Median : 26.80 Median : 113.00
## -0.6992: 2 Mean : 24.49 Mean : 81.49
## -0.0113: 1 3rd Qu.: 45.95 3rd Qu.: 174.75
## -0.0131: 1 Max. : 89.80 Max. : 180.00
## (Other): 313 NA's :19216 NA's :19216
## max_yaw_forearm min_roll_forearm min_pitch_forearm min_yaw_forearm
## :19216 Min. : -72.500 Min. : -180.00 :19216
## #DIV/0!: 84 1st Qu.: -6.075 1st Qu.: -175.00 #DIV/0!: 84
## -1.2 : 32 Median : 0.000 Median : -61.00 -1.2 : 32
## -1.3 : 31 Mean : -0.167 Mean : -57.57 -1.3 : 31
## -1.4 : 24 3rd Qu.: 12.075 3rd Qu.: 0.00 -1.4 : 24
## -1.5 : 24 Max. : 62.100 Max. : 167.00 -1.5 : 24
## (Other): 211 NA's :19216 NA's :19216 (Other): 211
## amplitude_roll_forearm amplitude_pitch_forearm amplitude_yaw_forearm
## Min. : 0.000 Min. : 0.0 :19216
## 1st Qu.: 1.125 1st Qu.: 2.0 #DIV/0!: 84
## Median : 17.770 Median : 83.7 0.00 : 322
## Mean : 24.653 Mean : 139.1
## 3rd Qu.: 39.875 3rd Qu.: 350.0
## Max. : 126.000 Max. : 360.0
## NA's :19216 NA's :19216
## total_accel_forearm var_accel_forearm avg_roll_forearm stddev_roll_forearm
## Min. : 0.00 Min. : 0.000 Min. : -177.234 Min. : 0.000
## 1st Qu.: 29.00 1st Qu.: 6.759 1st Qu.: -0.909 1st Qu.: 0.428
## Median : 36.00 Median : 21.165 Median : 11.172 Median : 8.030
## Mean : 34.72 Mean : 33.502 Mean : 33.165 Mean : 41.986
## 3rd Qu.: 41.00 3rd Qu.: 51.240 3rd Qu.: 107.132 3rd Qu.: 85.373
## Max. : 108.00 Max. : 172.606 Max. : 177.256 Max. : 179.171
## NA's :19216 NA's :19216 NA's :19216
## var_roll_forearm avg_pitch_forearm stddev_pitch_forearm var_pitch_forearm
## Min. : 0.00 Min. : -68.17 Min. : 0.000 Min. : 0.000
## 1st Qu.: 0.18 1st Qu.: 0.00 1st Qu.: 0.336 1st Qu.: 0.113
## Median : 64.48 Median : 12.02 Median : 5.516 Median : 30.425
## Mean : 5274.10 Mean : 11.79 Mean : 7.977 Mean : 139.593

```

```

## 3rd Qu.: 7289.08 3rd Qu.: 28.48 3rd Qu.:12.866 3rd Qu.: 165.532
## Max. :32102.24 Max. : 72.09 Max. :47.745 Max. :2279.617
## NA's :19216 NA's :19216 NA's :19216 NA's :19216
## avg_yaw_forearm stddev_yaw_forearm var_yaw_forearm gyros_forearm_x
## Min. :-155.06 Min. : 0.000 Min. : 0.00 Min. : -22.000
## 1st Qu.: -26.26 1st Qu.: 0.524 1st Qu.: 0.27 1st Qu.: -0.220
## Median : 0.00 Median : 24.743 Median : 612.21 Median : 0.050
## Mean : 18.00 Mean : 44.854 Mean : 4639.85 Mean : 0.158
## 3rd Qu.: 85.79 3rd Qu.: 85.817 3rd Qu.: 7368.41 3rd Qu.: 0.560
## Max. : 169.24 Max. :197.508 Max. :39009.33 Max. : 3.970
## NA's :19216 NA's :19216 NA's :19216
## gyros_forearm_y gyros_forearm_z accel_forearm_x accel_forearm_y
## Min. : -7.02000 Min. : -8.0900 Min. : -498.00 Min. : -632.0
## 1st Qu.: -1.46000 1st Qu.: -0.1800 1st Qu.: -178.00 1st Qu.: 57.0
## Median : 0.03000 Median : 0.0800 Median : -57.00 Median : 201.0
## Mean : 0.07517 Mean : 0.1512 Mean : -61.65 Mean : 163.7
## 3rd Qu.: 1.62000 3rd Qu.: 0.4900 3rd Qu.: 76.00 3rd Qu.: 312.0
## Max. :311.00000 Max. :231.0000 Max. : 477.00 Max. : 923.0
##
## accel_forearm_z magnet_forearm_x magnet_forearm_y magnet_forearm_z classe
## Min. : -446.00 Min. : -1280.0 Min. : -896.0 Min. : -973.0 A:5580
## 1st Qu.: -182.00 1st Qu.: -616.0 1st Qu.: 2.0 1st Qu.: 191.0 B:3797
## Median : -39.00 Median : -378.0 Median : 591.0 Median : 511.0 C:3422
## Mean : -55.29 Mean : -312.6 Mean : 380.1 Mean : 393.6 D:3216
## 3rd Qu.: 26.00 3rd Qu.: -73.0 3rd Qu.: 737.0 3rd Qu.: 653.0 E:3607
## Max. : 291.00 Max. : 672.0 Max. :1480.0 Max. :1090.0
##

```

the new dataset

```
## [1] 19622 60
```

For the prediction, we use first decision with library caret and we obtain Before we partitionate dataset into train set and test set

```
## [1] 13737 60
```

```
## [1] 5885 60
```

Now modelisation with decision tree

```

## CART
##
## 13737 samples
## 59 predictor
## 5 classes: 'A', 'B', 'C', 'D', 'E'
##
## No pre-processing
## Resampling: Bootstrapped (25 reps)
## Summary of sample sizes: 13737, 13737, 13737, 13737, 13737, 13737, ...
## Resampling results across tuning parameters:
##
## cp          Accuracy    Kappa
## 0.2437188  0.7714228  0.7098403
## 0.2568406  0.5800094  0.4640106
## 0.2703692  0.3684998  0.1445569
##
## Accuracy was used to select the optimal model using the largest value.
## The final value used for the model was cp = 0.2437188.

```

```
## n= 13737
##
## node), split, n, loss, yval, (yprob)
##      * denotes terminal node
##
## 1) root 13737 9831 A (0.28 0.19 0.17 0.16 0.18)
##    2) X< 5580.5 3906    0 A (1 0 0 0 0) *
##    3) X>=5580.5 9831 7173 B (0 0.27 0.24 0.23 0.26)
##      6) X< 9378 2658    0 B (0 1 0 0 0) *
##      7) X>=9378 7173 4648 E (0 0 0.33 0.31 0.35) *
```

Now we will use decision with 10 folds for the cross validation

We obtain a very high accuracy of 0.99, That's pretty good but that's can be due overfitting ! we model maybe matching well the data.

We predict 20 differents cases now

```
## [1] A A A A A A A A A A A A A A A A A A
## Levels: A B C D E
```

The model predict only A in the testing set