Practical learning machine - Final project

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Background

Using devices such as Jawbone Up, Nike FuelBand, and Fitbit it is now possible to collect a large amount of data about personal activity relatively inexpensively. In this project, our goal will be to use data from accelerometers on the belt, forearm, arm, and dumbell of 6 participants, and the participants were asked to perform barbell lifts correctly and incorrectly in 5 different ways.

The goal of our project is to predict the manner in which they did the exercise. This is the "class" variable in the training set. We may use any of the other variables to predict with. We should create a report describing how we built our model, how we used cross validation, what we think the expected out of sample error is, and why we made the choices we did. We will also use our prediction model to predict 20 different test cases.

Download libraries and reading data

```
library(ggplot2)
library(lattice)
library(caret)
library(rpart)
library(RColorBrewer)
library(rattle)
```

```
## Loading required package: tibble
```

```
## Loading required package: bitops
```

```
## Rattle: A free graphical interface for data science with R.
## Version 5.4.0 Copyright (c) 2006-2020 Togaware Pty Ltd.
## Type 'rattle()' to shake, rattle, and roll your data.
```

```
library(e1071)
library(randomForest)
```

```
## randomForest 4.6-14
```

```
## Type rfNews() to see new features/changes/bug fixes.
```

```
##
## Attaching package: 'randomForest'
```

```
## The following object is masked from 'package:rattle':
##
##     importance
```

```
## The following object is masked from 'package:ggplot2':
##
##     margin

library(mlbench)
library(parallel)
library(doParallel)

## Loading required package: foreach

## Loading required package: iterators

library(corrplot)

## corrplot 0.84 loaded

library(gbm)

## Loaded gbm 2.1.8

library(dplyr)

##
## Attaching package: 'dplyr'

## The following object is masked from 'package:randomForest':
##
##     combine

## The following objects are masked from 'package:stats':
##
##     filter, lag

## The following objects are masked from 'package:base':
##
##     intersect, setdiff, setequal, union

train <- read.csv('./data/pml-training.csv', header=T)
validation <- read.csv('./data/pml-testing.csv', header=T)
dim(train)
dim(validation)
```

Cleaning data from NA values

```
traindb<- Filter(function(x) !any(is.na(x)), train)
validationdb <- Filter(function(x) !any(is.na(x)), validation)
traindb <- as.data.frame(traindb)
validationdb <- as.data.frame(validationdb)
dim(traindb)

## [1] 19622    93

dim(validationdb)

## [1] 20 60
```

Making train data base of the same length of validation base

```
classe <- traindb$classe
trainRemove <- grepl("^X|timestamp|window", names(traindb))
traindb <- traindb[, !trainRemove]
trainCleaned <- traindb[, sapply(traindb, is.numeric)]
trainCleaned$classe <- classe
testRemove <- grepl("^X|timestamp|window", names(validationdb))
validationdb <- validationdb[, !testRemove]
validCleaned <- validationdb[, sapply(validationdb, is.numeric)]
dim(trainCleaned)
```

```
## [1] 19622    53
```

```
dim(validCleaned)
```

```
## [1] 20 53
```

Creating test data set

```
traindb <- trainCleaned[createDataPartition(trainCleaned$classe, p=0.7,
list=FALSE), ]
testdb <- trainCleaned[-(createDataPartition(trainCleaned$classe, p=0.7,
list=FALSE)), ]
nrow(traindb)
```

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

```
nrow(testdb)
```

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

Trainning the model with random forest technique and decission trees

```
cluster <- makeCluster(detectCores() - 1)
registerDoParallel(cluster)
fitControl <- trainControl(method = "cv", number = 2, allowParallel =
TRUE)
system.time(modFit <- train(classe ~ .,
method="rf",data=traindb,trControl = fitControl))
```

```
##    user  system elapsed
##  50.015   0.857 118.908
```

```
stopCluster(cluster)
registerDoSEQ()

predict <- predict(modFit, newdata=testdb)

vi <- varImp(modFit)$importance
vi[head(order(unlist(vi), decreasing = TRUE), 5L), , drop = FALSE]
```

```
##                     Overall
## roll_belt         100.00000
## pitch_forearm      60.19416
```

```
## yaw_belt            55.78411
## magnet_dumbbell_y   47.24668
## pitch_belt          45.76193
```

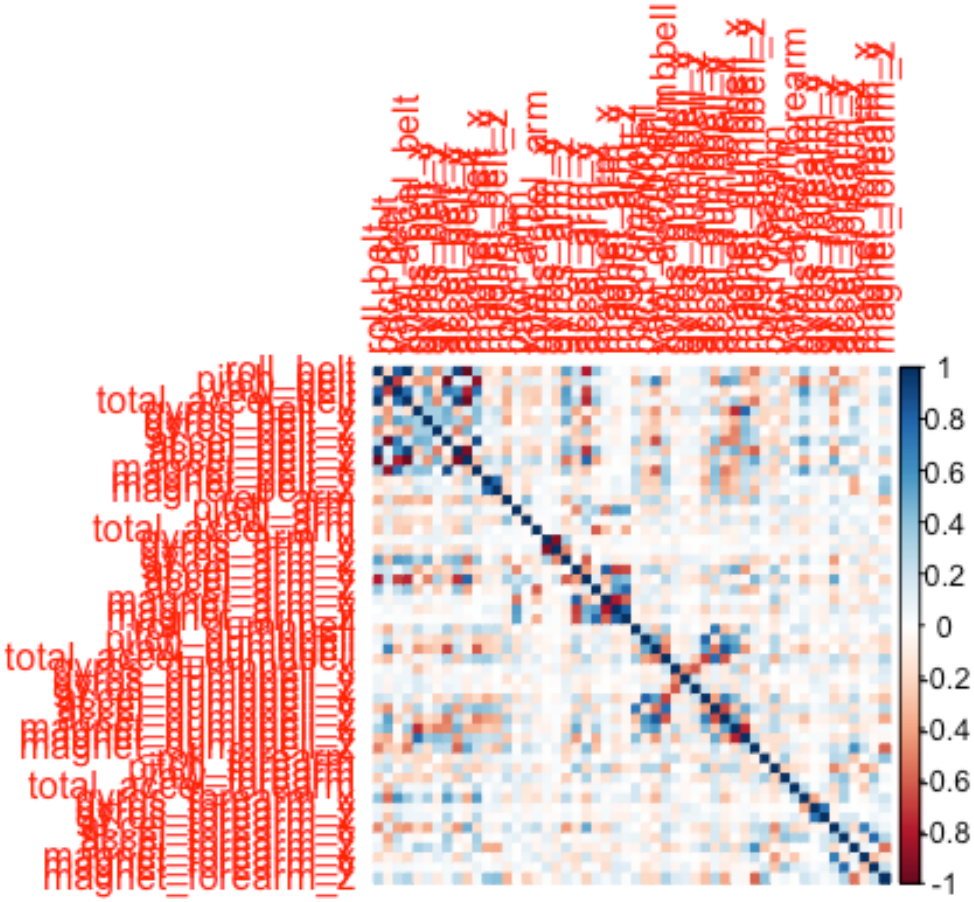
Predicting values for validation data

```
finalprediction <- predict(modFit, newdata=validCleaned)
finalprediction

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

Figures

```
corrPlot <- cor(traindb[, -length(names(traindb))])
corrplot(corrPlot, method="color")
```



Source of the data Velloso,Bulling, Gellersen,Ugulino, And Fuks. Qualitative Activity Recognition of Weight Lifting Exercises. Proceedings of 4th International Conference in Cooperation with SIGCHI, Germany: ACM SIGCHI, 2013.