Prediction assignment

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. These type of devices are part of the quantified self movement – a group of enthusiasts who take measurements about themselves regularly to improve their health, to find patterns in their behavior, or because they are tech geeks. One thing that people regularly do is quantify how much of a particular activity they do, but they rarely quantify how well they do it. In this project, your goal will be to use data from accelerometers on the belt, forearm, arm, and dumbell of 6 participants. They were asked to perform barbell lifts correctly and incorrectly in 5 different ways. More information is available from the website here: http://groupware.les.inf.puc-rio.br/har (see the section on the Weight Lifting Exercise Dataset).

Data

The training data for this project are available here:
https://d396qusza40orc.cloudfront.net/predmachlearn/pml-training.csv
The test data are available here:
https://d396qusza40orc.cloudfront.net/predmachlearn/pml-testing.csv

Loading data and initialization

```
set.seed(777)

library(caret)
library(randomForest)

mydata <- read.table("c:/Data/pml-training.csv", header=TRUE, sep=",",row.names = "X")
validation <- read.table("c:/Data/pml-testing.csv", header=TRUE, sep=",",row.names = "X")
```

Data processing

Removing non predictive variables

```
mydata <- mydata[,-c(1:6)]
validation<-validation[,-c(1:6)]
```

Removing variables with 90% or more missing values

```
x <- sapply(mydata, function(x) mean(is.na(x))) > 0.9
 mydata <- mydata[, x==FALSE]
 validation <- validation[, x==FALSE]
```

Transform to numeric

```
 mydata[,-ncol(mydata)] <- apply(mydata[,-ncol(mydata)], 2,
function(x){as.numeric(as.character(x))})
```

Removing again variables with 90% or more missing values

```
 x <- sapply(mydata, function(x) mean(is.na(x))) > 0.9
  mydata <- mydata[, x==FALSE]
  validation <- validation[, x==FALSE]
```

Prediction

Train and test samples

```
inTrain  <- createDataPartition(mydata$classe, p=0.7, list=FALSE)
train <- mydata[inTrain, ]
test  <- mydata[-inTrain, ]
```

Prediction

```
fit1<-randomForest(train$classe ~ .,   data=train, do.trace=F, ntree=50)
pred1<-predict(fit1, newdata = test)
```

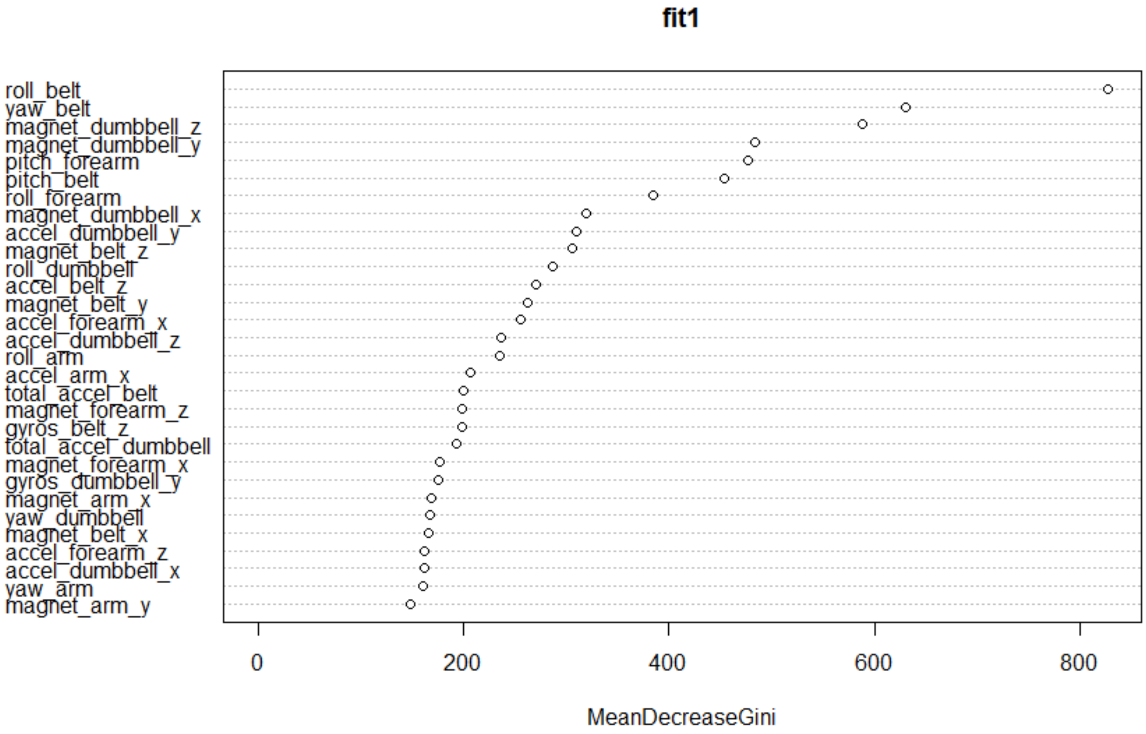
Prediction accuracy and variable importance

```
confusionMatrix(pred1,test$classe)
varImpPlot(fit1)
```

Plot of `Confusion Matrix`

```
Confusion Matrix and Statistics

          Reference
Prediction    A    B    C    D    E
         A 1672    5    0    0    0
         B    0 1131    7    0    0
         C    2    3 1018    9    1
         D    0    0    1  953    3
         E    0    0    0    2 1078

Overall Statistics

               Accuracy : 0.9944
                 95% CI : (0.9921, 0.9961)
    No Information Rate : 0.2845
    P-Value [Acc > NIR] : < 2.2e-16

                  Kappa : 0.9929
 Mcnemar's Test P-Value : NA

Statistics by Class:

                     Class: A Class: B Class: C Class: D Class: E
Sensitivity            0.9988   0.9930   0.9922   0.9886   0.9963
Specificity            0.9988   0.9985   0.9969   0.9992   0.9996
Pos Pred Value         0.9970   0.9938   0.9855   0.9958   0.9981
Neg Pred Value         0.9995   0.9983   0.9984   0.9978   0.9992
Prevalence             0.2845   0.1935   0.1743   0.1638   0.1839
Detection Rate         0.2841   0.1922   0.1730   0.1619   0.1832
Detection Prevalence   0.2850   0.1934   0.1755   0.1626   0.1835
Balanced Accuracy      0.9988   0.9958   0.9946   0.9939   0.9979
```

Plot of variable importance



Assignment results

```
Results <- predict(fit1, newdata=validation)
Results
```