Boosting Compare

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Boosting Models

It was originally designed for classification problems, but it can profitably be extended to regression as well. The motivation for boosting was a procedure that combines the outputs of many "weak" classifiers to produce a powerful "committee." From this perspective boosting bears a resemblance to bagging and other committee-based approaches

Based on http://topepo.github.io/caret/Boosting.html I will describe each model and predictions for the ausair data.

```
library(fpp)
```

```
## Loading required package: forecast
## Loading required package: zoo
##
## Attaching package: 'zoo'
##
## The following objects are masked from 'package:base':
##
##     as.Date, as.Date.numeric
##
## Loading required package: timeDate
## This is forecast 5.5
##
## Loading required package: fma
## Loading required package: tseries
## Loading required package: expsmooth
## Loading required package: lmtest
```

```
library(caret)
```

```
## Loading required package: lattice
## Loading required package: ggplot2
```

```
library(ggplot2)
data(ausair)

ts1<-ausair
years<-c(1970:2009)
data<-data.frame(Años=years,Pasajeros=ts1)
inTrain<-createDataPartition(y=data$Años, p=0.75, list=FALSE)
training<-data[inTrain,]
testing<-data[-inTrain,]
```

Models and Predictions

```
#Boosted Generalized Additive Model
modbsgam <- train(Pasajeros ~ ., method = "gamboost", data = training) #RMSE=2.74
```

```
## Loading required package: mboost
## Loading required package: parallel
## Loading required package: stabs
## This is mboost 2.4-0. See 'package?mboost' and the NEWS file
## for a complete list of changes.
##
##
## Attaching package: 'mboost'
##
## The following object is masked from 'package:ggplot2':
##
##     %+%
```

```
predbsgam <- predict(modbsgam, testing) #RMSE=2.71
#rmse(testrf$Pasajeros,predbsgam)
#[1] 2.207791

#Stochastic Gradient Boosting
#modbsgbm <- train(Pasajeros ~ ., method = "gbm", data = training)**    #No se pudo

 #Cubist
modbscub <- train(Pasajeros ~ ., method = "cubist", data = training)   #RMSE=1.6
```

```
## Loading required package: Cubist
```

```
predbscub <- predict(modbscub, testing)
#rmse(testrf$Pasajeros,predbscub)
#[1] 2.337806

#C5.0 y Cost-Sensitive C5.0
#modbsc5c <- train(Pasajeros ~ ., method = "C5.0Cost", data = training) #No se pudo
#modbsc5 <- train(Pasajeros ~ ., method = "C5.0", data = training, model=) #Nspudo

#Boosted Tree
modbstt <- train(Pasajeros ~ ., method = "bstTree", data = training)   #RMSE= 4.3
```

```
## Loading required package: bst
## Loading required package: plyr
##
## Attaching package: 'plyr'
##
## The following object is masked from 'package:fma':
##
##     ozone
```

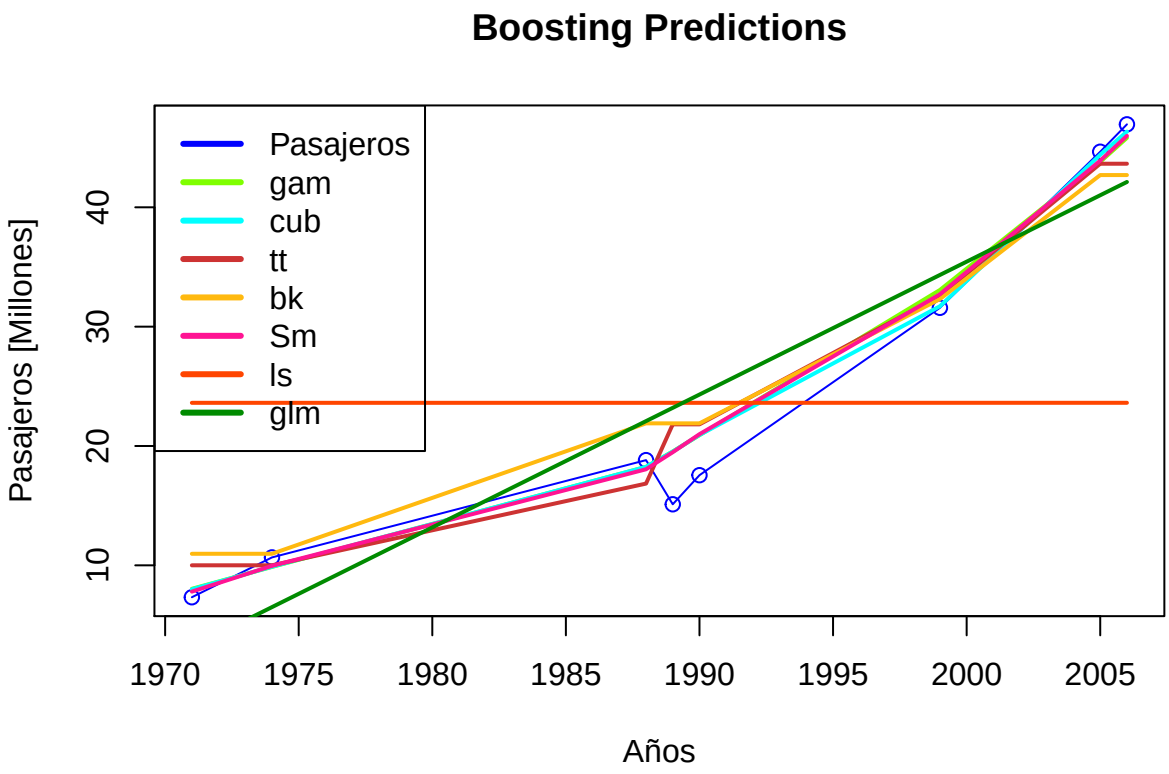
```r
predbstt <- predict(modbstt, testing)
#rmse(testrf$Pasajeros,predbstt)
#[1] 2.361692

#Boosted Tree
modbsbk <- train(Pasajeros ~ ., method = "blackboost", data = training) #RMSE= 4.55
```

```
## Loading required package: party
## Loading required package: grid
## Loading required package: sandwich
## Loading required package: strucchange
## Loading required package: modeltools
## Loading required package: stats4
##
## Attaching package: 'modeltools'
##
## The following object is masked from 'package:plyr':
##
##     empty
```

```r
predbsbk <- predict(modbsbk, testing)
#rmse(testrf$Pasajeros,predbsbk)
#[1] 3.021642

#Boosted Smoothing Spline
modbsSm <- train(Pasajeros ~ ., method = "bstSm", data = training)   #RMSE=1.27
predbsSm <- predict(modbsSm, testing)
#rmse(testrf$Pasajeros,predbsSm)
#[1] 2.245

#Boosted Logistic Regression
#modbslb <- train(Pasajeros ~ ., method = "LogitBoost", data = training)   #nsp

#Boosted Linear Model
modbsls <- train(Pasajeros ~ ., method = "bstLs", data = training) #RMSE= 13.9
predbsls <- predict(modbsls, testing)
#rmse(testrf$Pasajeros,predbsls)
#12.8992

#Boosted Generalized Linear Model
modbsglm <- train(Pasajeros ~ ., method = "glmboost", data = training) #RMSE= 3.97
predbsglm <- predict(modbsglm, testing)
#rmse(testrf$Pasajeros,predbsglm)
#[1] 4.372003

#Boosted Classification Trees
#modbsada <- train(Pasajeros ~ ., method = "ada", data = training) # error
#predbsada <- predict(modbsada, testing)
```

Plotting some Boosting predictions

```
plot(testing,xlab="Años",ylab="Pasajeros [Millones]",col="blue",
     main="Boosting Predictions")
lines(testing,lwd=1,col="blue")

#Boosted Generalized Additive Model
lines(testing$Años,predbsgam,lwd=2,col="chartreuse")

#Cubist
lines(testing$Años,predbscub,lwd=2,col="cyan1")

#Boosted Tree
lines(testing$Años,predbstt,lwd=2,col="brown3")
lines(testing$Años,predbsbk,lwd=2,col="darkgoldenrod1")

#Boosted Smoothing Spline
lines(testing$Años,predbsSm,lwd=2,col="deeppink")

#Boosted Linear Model
lines(testing$Años,predbsls,lwd=2,col="orangered")

#Boosted Generalized Linear Model
lines(testing$Años,predbsglm,lwd=2,col="green4")

legend("topleft",legend=c("Pasajeros","gam","cub","tt","bk","Sm","ls","glm"),
       col=c("blue","chartreuse","cyan1","brown3","darkgoldenrod1","deeppink"
             ,"orangered","green4"),lty=1,lwd=3)
```



The *RMSE* of the models are:

Boosted Generalized Additive Model predbsgam rmse=2.207791

Cubist predbscub rmse=2.337806

Boosted Tree predbstt rmse=2.361692

Boosted Tree predbsbk rmse 3.021642

Boosted Smoothing Spline predbsSm rmse=2.245

Boosted Linear Model predbsls rmse=12.8992

Boosted Generalized Linear Model predbsglm rmse=4.372003