

# HW5\_SOLUTION

gustavoc@msu.edu

12/12/2021

## Code

```
library(BGLR)
data(wheat)
head(wheat.Y)

##           1           2           4           5
## 775    1.6716295 -1.72746986 -1.89028479  0.0509159
## 2166 -0.2527028  0.40952243  0.30938553 -1.7387588
## 2167  0.3418151 -0.64862633 -0.79955921 -1.0535691
## 2465  0.7854395  0.09394919  0.57046773  0.5517574
## 3881  0.9983176 -0.28248062  1.61868192 -0.1142848
## 3889  2.3360969  0.62647587  0.07353311  0.7195856

dim(wheat.X)

## [1]  599 1279

X=scale(wheat.X,center=TRUE,scale=TRUE)
N=nrow(X)
y=wheat.Y[,2] # picks one phenotype

nTST=50

COR=matrix(nrow=nTST,ncol=2,NA)
colnames(COR)=c('Lasso','Forward')

DF=COR

library(BGDataExt)

##
## Attaching package: 'BGDataExt'
## The following object is masked from 'package:graphics':
##
##      segments

library(glmnet)

## Loading required package: Matrix
## Loaded glmnet 4.1-3
```

```

for(i in 1:nTST){
  tst<-sample(1:N,size=150,replace=FALSE)
  XTRN<-X[-tst,]
  yTRN<-y[-tst]
  XTST<-X[tst,]
  yTST<-y[tst]

  ## Lasso
  fm=glmnet(y=yTRN,x=XTRN,alpha=1)
  tmpCor=rep(NA,100)
  for(j in 2:100){ tmpCor[j]=cor(yTST,XTST%*fm$beta[,j])}
  tmp=which.max(tmpCor)
  DF[i,'Lasso']=fm$df[tmp]
  COR[i,'Lasso']=tmpCor[tmp]

  ## Forward
  FM=FWD(y=yTRN,X=XTRN,df=200,verbose=FALSE)
  tmpCor=rep(NA,150)
  XTST=cbind(1,XTST)
  for(j in 2:200){ tmpCor[j]=cor(yTST,XTST%*FM$B[,j])}
  tmp=which.max(tmpCor)
  DF[i,'Forward']=tmp
  COR[i,'Forward']=tmpCor[tmp]
}

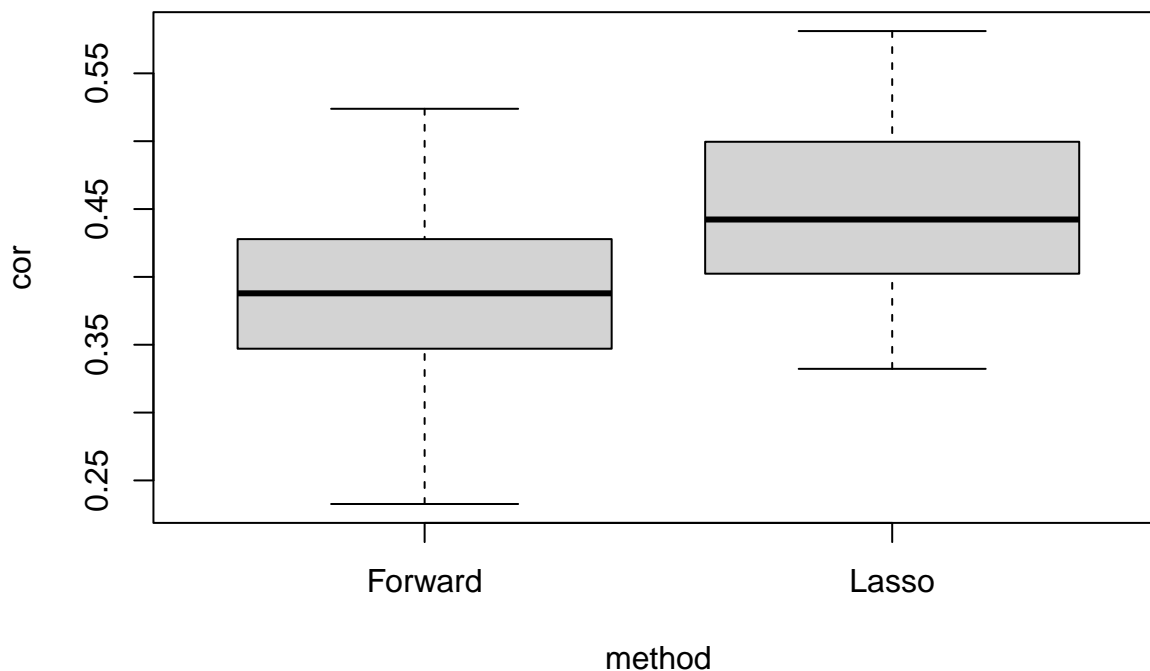
```

## Plots

```

TMP=data.frame(method=rep(colnames(COR),each=nrow(COR)),cor=as.vector(COR))
boxplot(cor~method,data=TMP)

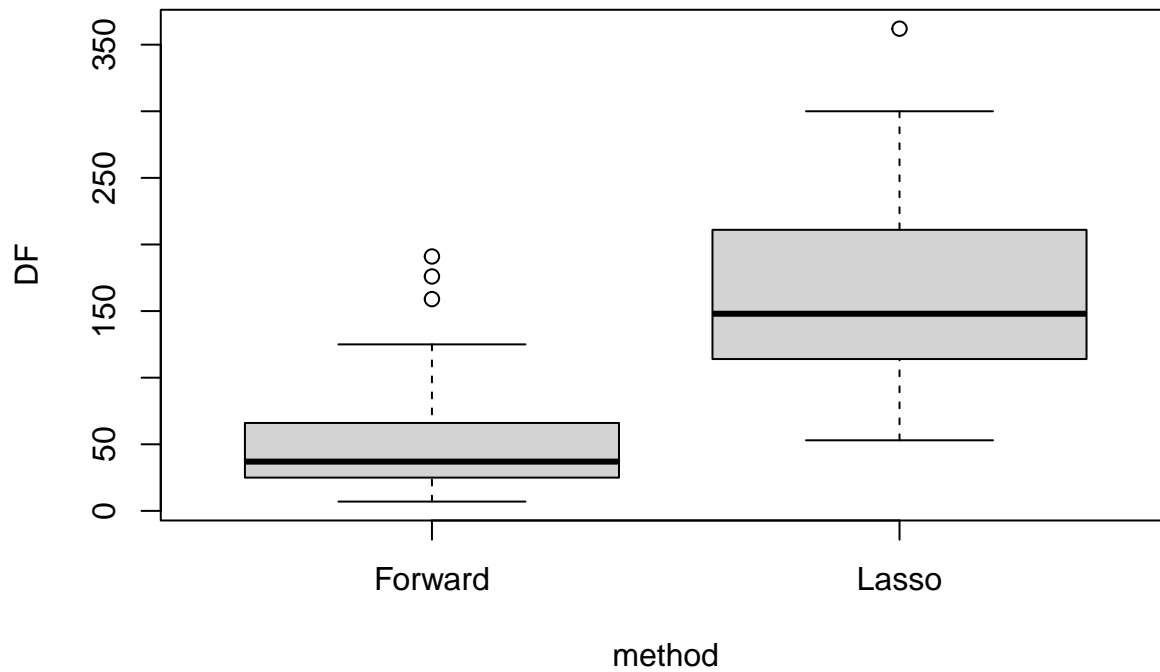
```



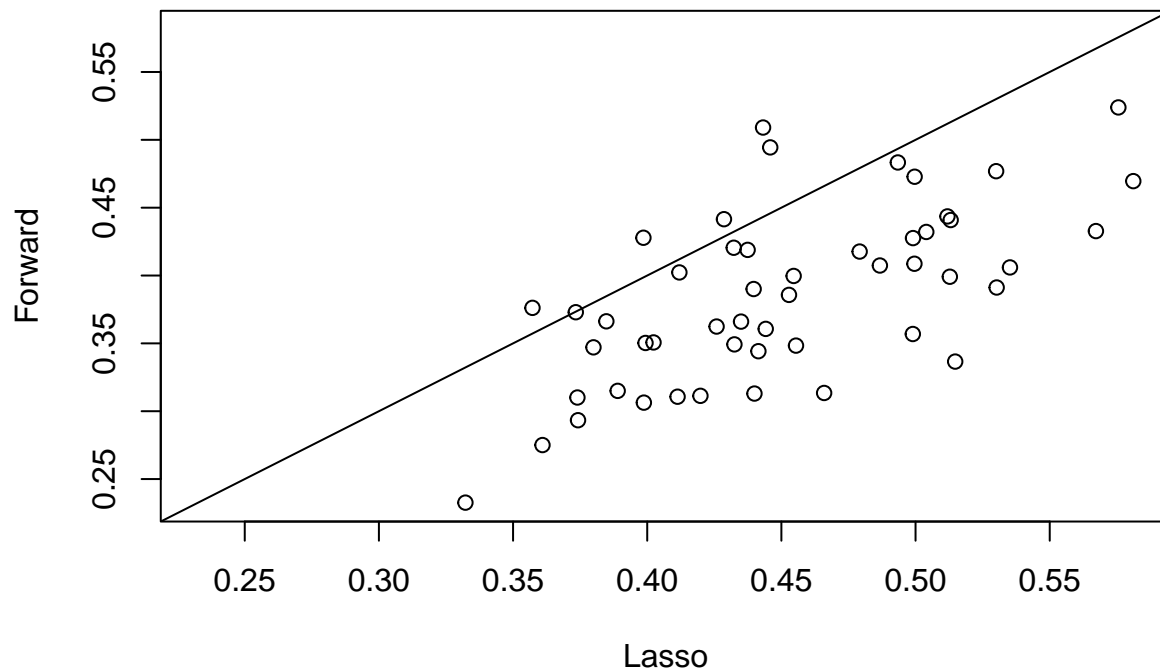
```

TMP=data.frame(method=rep(colnames(COR),each=nrow(COR)),DF=as.vector(DF))
boxplot(DF~method,data=TMP)

```



```
tmp=range(as.vector(COR),na.rm=T)
plot(COR,xlim=tmp,ylim=tmp);abline(a=0,b=1)
```



### Conclusions

- Lasso achieved higher prediction accuracy than the Forward regression in most training-testing partitions.
- The Forward regression achieved its maximum accuracy with smaller DF than Lasso.