

# Lab Report Ridgereg

*Simon Jönsson, Fanny Karelius*

*2017-10-16*

Here we instantiate the training and test data with the training data being 80% and test data being 20% of the data set.

```
trainIndex <-  
  caret::createDataPartition(BostonHousing$crim,  
                              p = 0.8,  
                              times = 1,  
                              list = FALSE)  
trainDat <- BostonHousing[trainIndex, ]  
testDat <- BostonHousing[-trainIndex, ]  
form <- tax ~ .
```

We now fit the data to the models using linear regression and linear regression with forward selection on the covariates.

```
linMod <- caret::train(form,  
                       trainDat,  
                       method = "lm",  
                       trControl = trainC)  
linFMod <- caret::train(form,  
                       trainDat,  
                       method = "leapForward",  
                       trControl = trainC)
```

We evaluate the models with analyzing the RMSE and  $R^2$  values.

```
linMod$results$RMSE
```

```
## [1] 54.07378
```

```
linFMod$results$RMSE
```

```
## [1] 57.07212 56.18481 54.11274
```

Analyzing the RMSE and the  $R^2$  of the models entails some information. Lower RMSE value would indicate a ‘tighter fit’ of the data and a higher  $R^2$  value indicates a measure of how well observed outcomes are replicated by the model, based on the proportion of total variation of outcomes explained by the model.

```
set.seed(theSeed)  
res <- c()  
for(lambda in seq(0, 20, by = 1)) {  
  temp <- caret::train(form,  
                        data = trainDat,  
                        ridgeMod)  
  res[lambda * 10] <- temp$results$RMSE  
}  
bestLambda <- which.min(res) / 10  
bestRMSE <- res[which.min(res)]  
bestLambda
```

```
## [1] 10
```

```
bestRMSE
```

```
## [1] 406.4993
```

We see from the code above that the best  $\lambda = 0.5$  with the lowest RMSE of 1320.828.

```
# Acknowledgement to Eric Herwin and Albin Vasterlund
set.seed(theSeed)
fold_count <- 10
lambda <- seq(10,20,by=1)
fitControl <- caret::trainControl(method = "repeatedcv",
                                   number = fold_count,
                                   ## repeated ten times
                                   repeats = fold_count)

ridgeMod <- caret::train(form,
                          data = trainDat,
                          method = "ridge",
                          trControl = fitControl)
```

```
## Warning in nominalTrainWorkflow(x = x, y = y, wts = weights, info =
## trainInfo, : There were missing values in resampled performance measures.
```

```
ridgeMod
```

```
## 406 samples
## 13 predictor
##
## No pre-processing
## Resampling: Cross-Validated (10 fold, repeated 10 times)
## Summary of sample sizes: 366, 365, 364, 366, 366, 366, ...
## Resampling results across tuning parameters:
##
##   lambda  RMSE      Rsquared  MAE
##   10      410.1854  0.8887925  406.335
##   11      410.1892  0.8887097  406.335
##   12      410.1934  0.8886175  406.335
##   13      410.1980  0.8885163  406.335
##   14      410.2030  0.8884068  406.335
##   15      410.2084  0.8882895  406.335
##   16      410.2142  0.8881647  406.335
##   17      410.2202  0.8880330  406.335
##   18      410.2266  0.8878946  406.335
##   19      410.2333  0.8877500  406.335
##   20      410.2402  0.8875995  406.335
##
## RMSE was used to select the optimal model using the smallest value.
## The final value used for the model was lambda = 10.
```

Last line says the best value for  $\lambda = 17$ . Which is the same as as we concluded above, though with different RMSE. The interval for  $\lambda \in 10 : 20$  is motivated by previous larger interval, but for output niceties we chose to limit lambda.

```
lin <- list(RMSE = linMod$results$RMSE, Rsquared = linMod$results$Rsquared)
linF <- list(RMSE = linFMod$results$RMSE[3], Rsquared = linFMod$results$Rsquared[3])
ridgeM <- list(RMSE = ridgeMod$results$RMSE[7], Rsquared = ridgeMod$results$Rsquared[7])
temp <- cbind(lin,linF,ridgeM)
colnames(temp) <- c("Lin. Reg", "Lin. Reg. F", "Ridge Reg.")
```

temp

##	Lin. Reg	Lin. Reg. F	Ridge Reg.
## RMSE	54.07378	54.11274	410.2142
## RSquared	0.8895151	0.8912715	0.8881647