Math 5365

Data Mining 1

Homework 13

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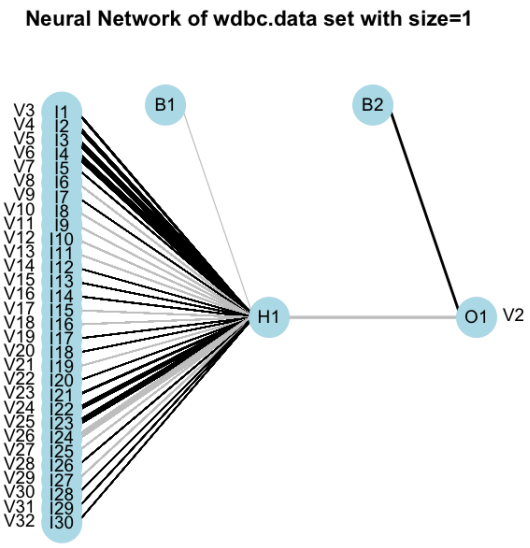
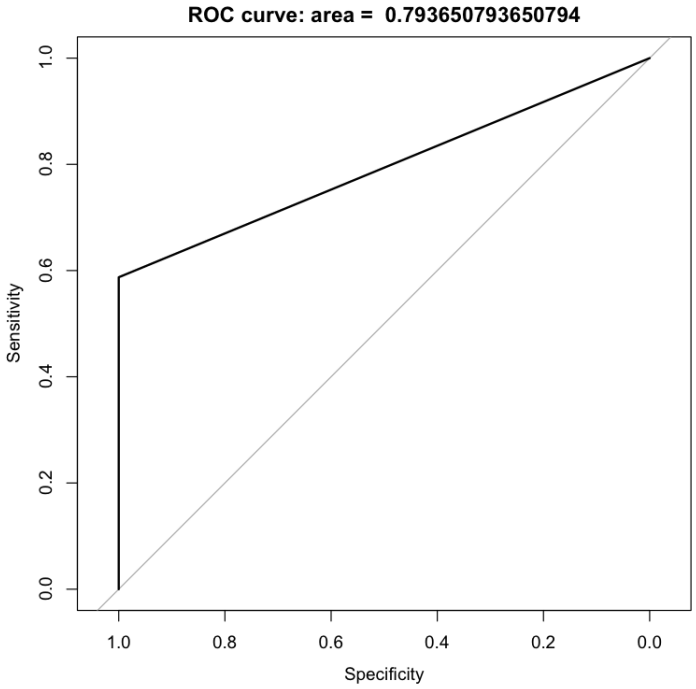
1. Split wdbc.data into 70% training and 30% test data

```
splitset <- splitdata(wdbc, 0.7, FALSE)
train <- splitset$train
```

(a) Fit a neural network with size=1 to the training data, plot it, and calculate the accuracy and area under the ROC curve using the test data.

The accuracy for this neural network was 84.79532%.





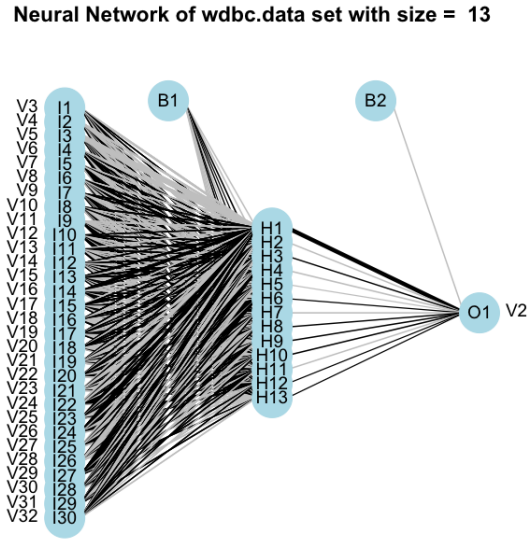
(b) Use 10-fold Cross-validation to find the optimal value of size

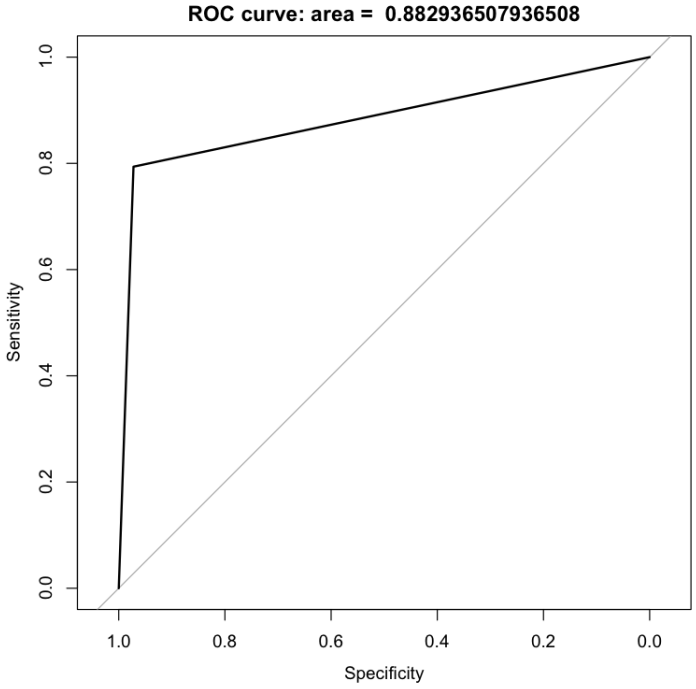
```
error <- rep(-1, 29)

for(s in 2:30){
  error[s - 1] <- kfold_val(k = 10, 4, wdbc = wdbc, idx = 1, val=s)$error
}

s <- which.max(1 - error)
1 - error[s]
```

(c) Repeat part **??** for the optimal value of size. The accuracy using the optimal size parameter is 90.64327%.





2. (a) Randomly generate 100 points from $[0, 2\pi]$, and fit a neural network for predicting $y = sin(x)$ using this data.

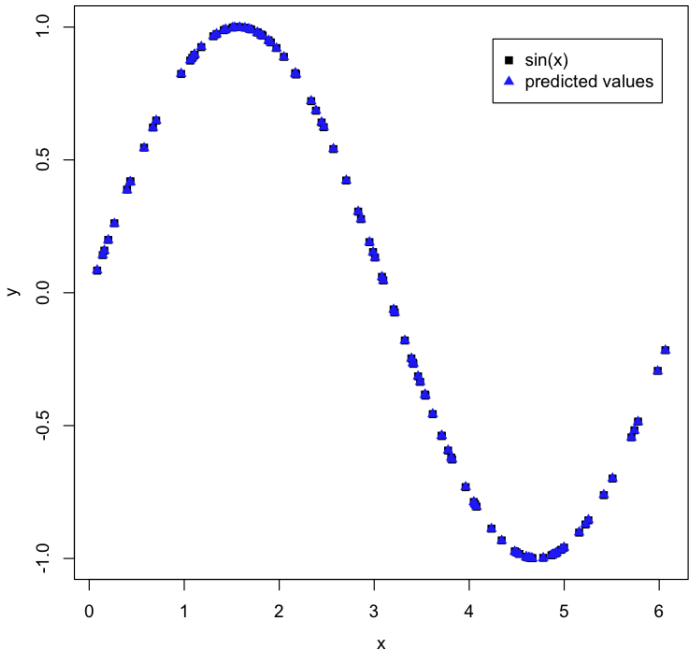
```
x <- runif(100, 0, 2 * pi)
```

```
y <- sin(x)
dset <- data.frame(y = y, x = x)
sinmodel <- nnet(y~x,size = 10, linout=TRUE)
```

(b) Use 10-fold cross validation to find the optimal value of size for this neural network.

```
len = 30
n_error = rep(-1, len - 1)
for(s in 2:len){
  n_error[s - 1] <- kfold_val(10, 5, dset, 1, s)$error
}
which.max(1 - n_error)
s <- s + 1
model <- nnet(y~x,size=s,linout=TRUE)
predsin <- predict(model,dset)
```

(c) Plot $y = sin(x)$ and the predictions from your neural network on the same graph.



```
#Data Mining hw 13
library(nnet)
library(pROC)

wdbc <- read.table("~/Dropbox/Tarleton/data_mining/dfiles/wdbc.data",
        header = FALSE, sep = ",")
wdbc <- wdbc[,-1]

# 1 Split wdbc.data into 70% training and 30% test data

splitset <- splitdata(wdbc, 0.7, FALSE)
train <- splitset$train

#a Fit a neural network with size=1 to the training data, plot it,
#  and calculate the accuracy and area under the ROC curve using the
#  test data.

model <- nnet(V2~., wdbc[train,], size = 1, linout=FALSE)
#summary(model)
predV2 <- predict(model, newdata=wdbc[-train,], type='class')
confmatrix(wdbc$V2[-train], predV2)
plot(model, main='Neural Network of wdbc.data set with size=1')

phat <- predict(model,newdata=wdbc[-train,],type='raw')[,1]
idx <- as.numeric(1 * (wdbc$V2[-train] == 'M'))
roc_curve <- roc(idx, phat)
title=paste('ROC curve: area = ', roc_curve$auc)
```

```
plot(roc_curve, main=title)

# b Use 10-fold Cross-validation to find the optimal value of size
error <- rep(-1, 29)

for(s in 2:30){
  error[s - 1] <- kfold_val(k = 10, 4, wdbc = wdbc, idx = 1, val=s)$error
}

s <- which.max(1 - error)
1 - error[s]

newmodel <- nnet(V2~., wdbc[train,], size = s + 1, linout=FALSE)
#summary(newmodel)
newpredV2 <- predict(newmodel, newdata=wdbc[-train,], type='class')
confmatrix(wdbc$V2[-train], newpredV2)
title=paste('Neural Network of wdbc.data set with size = ',s + 1)
plot(newmodel, main=title)

phat <- predict(newmodel,newdata=wdbc[-train,],type='raw')[,1]
idx <- as.numeric(1 * (wdbc$V2[-train] == 'M'))
roc_curve <- roc(idx, phat)
title=paste('ROC curve: area = ', roc_curve$auc)
plot(roc_curve, main=title)
```