18BCE080_PRAC9

Ishan Tewari

29/04/2021

Loading iris dataset

```
library(datasets)
data(iris)
summary(iris)
```

```
##   Sepal.Length    Sepal.Width     Petal.Length    Petal.Width   
##  Min.   :4.300   Min.   :2.000   Min.   :1.000   Min.   :0.100  
##  1st Qu.:5.100   1st Qu.:2.800   1st Qu.:1.600   1st Qu.:0.300  
##  Median :5.800   Median :3.000   Median :4.350   Median :1.300  
##  Mean   :5.843   Mean   :3.057   Mean   :3.758   Mean   :1.199  
##  3rd Qu.:6.400   3rd Qu.:3.300   3rd Qu.:5.100   3rd Qu.:1.800  
##  Max.   :7.900   Max.   :4.400   Max.   :6.900   Max.   :2.500  
##        Species  
##  setosa    :50  
##  versicolor:50  
##  virginica :50  
##                 
##                 
##                 
```

Loading necessary libraries for decision tree classifier

```
library(rpart)
library(rpart.plot)
```

```
v = iris['Species']
```

```
table(v)
```

```
## v
##     setosa versicolor  virginica 
##         50         50         50
```

```
set.seed(522)

# runif function returns a uniform distribution which can be further conditionally split into 75-25 ratio
iris[, 'train'] = ifelse(runif(nrow(iris)) < 0.75, 1, 0)

# Dividing the data into training and testing set
trainSet = iris[iris['train'] == 1,]
testSet = iris[iris['train'] == 0, ]

trainColNum = grep('train', names(trainSet))

trainSet = trainSet[, -trainColNum]
testSet = testSet[, -trainColNum]

print(trainSet)
```

```
##     Sepal.Length Sepal.Width Petal.Length Petal.Width    Species
## 1            5.1         3.5          1.4         0.2     setosa
## 2            4.9         3.0          1.4         0.2     setosa
## 4            4.6         3.1          1.5         0.2     setosa
## 5            5.0         3.6          1.4         0.2     setosa
## 6            5.4         3.9          1.7         0.4     setosa
## 7            4.6         3.4          1.4         0.3     setosa
## 9            4.4         2.9          1.4         0.2     setosa
## 10           4.9         3.1          1.5         0.1     setosa
## 12           4.8         3.4          1.6         0.2     setosa
## 14           4.3         3.0          1.1         0.1     setosa
## 15           5.8         4.0          1.2         0.2     setosa
## 16           5.7         4.4          1.5         0.4     setosa
```

```
## 18          5.1         3.5          1.4         0.3     setosa
## 19          5.7         3.8          1.7         0.3     setosa
## 20          5.1         3.8          1.5         0.3     setosa
## 21          5.4         3.4          1.7         0.2     setosa
## 22          5.1         3.7          1.5         0.4     setosa
## 24          5.1         3.3          1.7         0.5     setosa
## 25          4.8         3.4          1.9         0.2     setosa
## 27          5.0         3.4          1.6         0.4     setosa
## 28          5.2         3.5          1.5         0.2     setosa
## 29          5.2         3.4          1.4         0.2     setosa
## 30          4.7         3.2          1.6         0.2     setosa
## 32          5.4         3.4          1.5         0.4     setosa
## 33          5.2         4.1          1.5         0.1     setosa
## 34          5.5         4.2          1.4         0.2     setosa
## 36          5.0         3.2          1.2         0.2     setosa
## 38          4.9         3.6          1.4         0.1     setosa
## 39          4.4         3.0          1.3         0.2     setosa
## 42          4.5         2.3          1.3         0.3     setosa
## 43          4.4         3.2          1.3         0.2     setosa
## 45          5.1         3.8          1.9         0.4     setosa
## 46          4.8         3.0          1.4         0.3     setosa
## 47          5.1         3.8          1.6         0.2     setosa
## 48          4.6         3.2          1.4         0.2     setosa
## 49          5.3         3.7          1.5         0.2     setosa
## 50          5.0         3.3          1.4         0.2     setosa
## 52          6.4         3.2          4.5         1.5 versicolor
## 53          6.9         3.1          4.9         1.5 versicolor
## 54          5.5         2.3          4.0         1.3 versicolor
## 56          5.7         2.8          4.5         1.3 versicolor
## 57          6.3         3.3          4.7         1.6 versicolor
## 58          4.9         2.4          3.3         1.0 versicolor
## 59          6.6         2.9          4.6         1.3 versicolor
## 60          5.2         2.7          3.9         1.4 versicolor
## 63          6.0         2.2          4.0         1.0 versicolor
## 64          6.1         2.9          4.7         1.4 versicolor
## 66          6.7         3.1          4.4         1.4 versicolor
## 67          5.6         3.0          4.5         1.5 versicolor
```

```
## 68           5.8         2.7          4.1         1.0 versicolor
## 70           5.6         2.5          3.9         1.1 versicolor
## 72           6.1         2.8          4.0         1.3 versicolor
## 73           6.3         2.5          4.9         1.5 versicolor
## 74           6.1         2.8          4.7         1.2 versicolor
## 76           6.6         3.0          4.4         1.4 versicolor
## 77           6.8         2.8          4.8         1.4 versicolor
## 78           6.7         3.0          5.0         1.7 versicolor
## 79           6.0         2.9          4.5         1.5 versicolor
## 80           5.7         2.6          3.5         1.0 versicolor
## 81           5.5         2.4          3.8         1.1 versicolor
## 82           5.5         2.4          3.7         1.0 versicolor
## 84           6.0         2.7          5.1         1.6 versicolor
## 85           5.4         3.0          4.5         1.5 versicolor
## 86           6.0         3.4          4.5         1.6 versicolor
## 87           6.7         3.1          4.7         1.5 versicolor
## 88           6.3         2.3          4.4         1.3 versicolor
## 89           5.6         3.0          4.1         1.3 versicolor
## 90           5.5         2.5          4.0         1.3 versicolor
## 91           5.5         2.6          4.4         1.2 versicolor
## 94           5.0         2.3          3.3         1.0 versicolor
## 95           5.6         2.7          4.2         1.3 versicolor
## 96           5.7         3.0          4.2         1.2 versicolor
## 98           6.2         2.9          4.3         1.3 versicolor
## 99           5.1         2.5          3.0         1.1 versicolor
## 101          6.3         3.3          6.0         2.5  virginica
## 102          5.8         2.7          5.1         1.9  virginica
## 104          6.3         2.9          5.6         1.8  virginica
## 105          6.5         3.0          5.8         2.2  virginica
## 106          7.6         3.0          6.6         2.1  virginica
## 108          7.3         2.9          6.3         1.8  virginica
## 110          7.2         3.6          6.1         2.5  virginica
## 111          6.5         3.2          5.1         2.0  virginica
## 113          6.8         3.0          5.5         2.1  virginica
## 114          5.7         2.5          5.0         2.0  virginica
## 115          5.8         2.8          5.1         2.4  virginica
## 117          6.5         3.0          5.5         1.8  virginica
```

```
## 118          7.7         3.8          6.7         2.2  virginica
## 119          7.7         2.6          6.9         2.3  virginica
## 121          6.9         3.2          5.7         2.3  virginica
## 122          5.6         2.8          4.9         2.0  virginica
## 123          7.7         2.8          6.7         2.0  virginica
## 124          6.3         2.7          4.9         1.8  virginica
## 126          7.2         3.2          6.0         1.8  virginica
## 127          6.2         2.8          4.8         1.8  virginica
## 128          6.1         3.0          4.9         1.8  virginica
## 130          7.2         3.0          5.8         1.6  virginica
## 131          7.4         2.8          6.1         1.9  virginica
## 132          7.9         3.8          6.4         2.0  virginica
## 135          6.1         2.6          5.6         1.4  virginica
## 137          6.3         3.4          5.6         2.4  virginica
## 138          6.4         3.1          5.5         1.8  virginica
## 139          6.0         3.0          4.8         1.8  virginica
## 140          6.9         3.1          5.4         2.1  virginica
## 141          6.7         3.1          5.6         2.4  virginica
## 142          6.9         3.1          5.1         2.3  virginica
## 143          5.8         2.7          5.1         1.9  virginica
## 144          6.8         3.2          5.9         2.3  virginica
## 146          6.7         3.0          5.2         2.3  virginica
## 147          6.3         2.5          5.0         1.9  virginica
## 148          6.5         3.0          5.2         2.0  virginica
## 150          5.9         3.0          5.1         1.8  virginica
```

```
print(testSet)
```

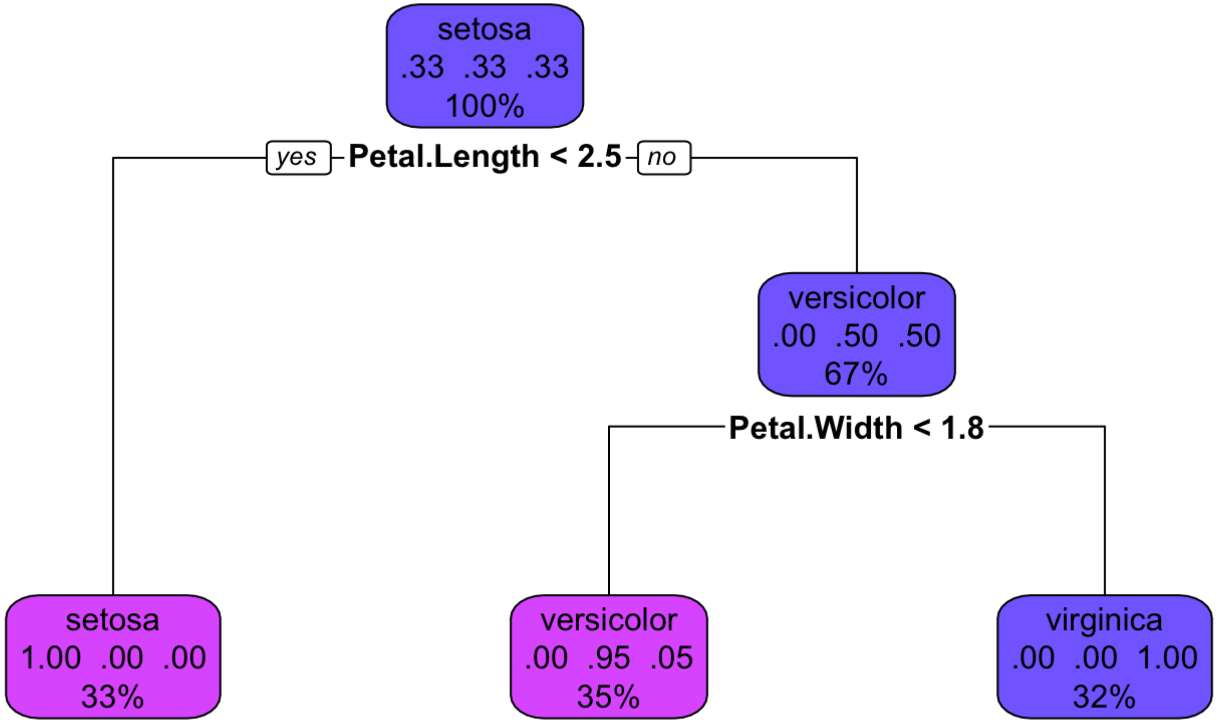
```
##     Sepal.Length Sepal.Width Petal.Length Petal.Width    Species
## 3            4.7         3.2          1.3         0.2     setosa
## 8            5.0         3.4          1.5         0.2     setosa
## 11           5.4         3.7          1.5         0.2     setosa
## 13           4.8         3.0          1.4         0.1     setosa
## 17           5.4         3.9          1.3         0.4     setosa
## 23           4.6         3.6          1.0         0.2     setosa
## 26           5.0         3.0          1.6         0.2     setosa
```

```
## 31          4.8         3.1         1.6         0.2     setosa
## 35          4.9         3.1         1.5         0.2     setosa
## 37          5.5         3.5         1.3         0.2     setosa
## 40          5.1         3.4         1.5         0.2     setosa
## 41          5.0         3.5         1.3         0.3     setosa
## 44          5.0         3.5         1.6         0.6     setosa
## 51          7.0         3.2         4.7         1.4 versicolor
## 55          6.5         2.8         4.6         1.5 versicolor
## 61          5.0         2.0         3.5         1.0 versicolor
## 62          5.9         3.0         4.2         1.5 versicolor
## 65          5.6         2.9         3.6         1.3 versicolor
## 69          6.2         2.2         4.5         1.5 versicolor
## 71          5.9         3.2         4.8         1.8 versicolor
## 75          6.4         2.9         4.3         1.3 versicolor
## 83          5.8         2.7         3.9         1.2 versicolor
## 92          6.1         3.0         4.6         1.4 versicolor
## 93          5.8         2.6         4.0         1.2 versicolor
## 97          5.7         2.9         4.2         1.3 versicolor
## 100         5.7         2.8         4.1         1.3 versicolor
## 103         7.1         3.0         5.9         2.1  virginica
## 107         4.9         2.5         4.5         1.7  virginica
## 109         6.7         2.5         5.8         1.8  virginica
## 112         6.4         2.7         5.3         1.9  virginica
## 116         6.4         3.2         5.3         2.3  virginica
## 120         6.0         2.2         5.0         1.5  virginica
## 125         6.7         3.3         5.7         2.1  virginica
## 129         6.4         2.8         5.6         2.1  virginica
## 133         6.4         2.8         5.6         2.2  virginica
## 134         6.3         2.8         5.1         1.5  virginica
## 136         7.7         3.0         6.1         2.3  virginica
## 145         6.7         3.3         5.7         2.5  virginica
## 149         6.2         3.4         5.4         2.3  virginica
```

```
treeFit = rpart(Species~.,data=trainSet,method = 'class')
print(treeFit)
```

```
## n= 111
##
## node), split, n, loss, yval, (yprob)
##       * denotes terminal node
##
## 1) root 111 74 setosa (0.33333333 0.33333333 0.33333333)
##   2) Petal.Length< 2.45 37  0 setosa (1.00000000 0.00000000 0.00000000) *
##   3) Petal.Length>=2.45 74 37 versicolor (0.00000000 0.50000000 0.50000000)
##     6) Petal.Width< 1.75 39  2 versicolor (0.00000000 0.94871795 0.05128205) *
##     7) Petal.Width>=1.75 35  0 virginica (0.00000000 0.00000000 1.00000000) *
```

```
rpart.plot(treeFit, box.col=c("lightslateblue", "mediumorchid1"))
```




```
Prediction1 = predict(treeFit,newdata=testSet[-5],type = 'class')
```

```
print(Prediction1)
```

```
##          3          8         11         13         17         23         26
##     setosa     setosa     setosa     setosa     setosa     setosa     setosa
##         31         35         37         40         41         44         51
##     setosa     setosa     setosa     setosa     setosa     setosa versicolor
```

```
##        55         61         62         65         69         71         75
## versicolor versicolor versicolor versicolor versicolor  virginica versicolor
##        83         92         93         97        100        103        107
## versicolor versicolor versicolor versicolor versicolor  virginica versicolor
##       109        112        116        120        125        129        133
##  virginica  virginica  virginica versicolor  virginica  virginica  virginica
##       134        136        145        149
## versicolor  virginica  virginica  virginica
## Levels: setosa versicolor virginica
```

```r
library(caret)
```

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

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

```r
confusionMatrix(Prediction1,testSet$Species)
```

```
## Confusion Matrix and Statistics
##
##             Reference
## Prediction   setosa versicolor virginica
##   setosa         13          0         0
##   versicolor      0         12         3
##   virginica       0          1        10
##
## Overall Statistics
##
##                Accuracy : 0.8974
##                  95% CI : (0.7578, 0.9713)
##     No Information Rate : 0.3333
##     P-Value [Acc > NIR] : 3.435e-13
##
##                   Kappa : 0.8462
```

```
##
##  Mcnemar's Test P-Value : NA
##
## Statistics by Class:
##
##                      Class: setosa Class: versicolor Class: virginica
## Sensitivity                 1.0000            0.9231           0.7692
## Specificity                 1.0000            0.8846           0.9615
## Pos Pred Value              1.0000            0.8000           0.9091
## Neg Pred Value              1.0000            0.9583           0.8929
## Prevalence                  0.3333            0.3333           0.3333
## Detection Rate              0.3333            0.3077           0.2564
## Detection Prevalence        0.3333            0.3846           0.2821
## Balanced Accuracy           1.0000            0.9038           0.8654
```