Decision Tree

Example- Company Data

```
'data.frame':  400 obs. of  11 variables:
 $ Sales      : num  9.5 11.22 10.06 7.4 4.15 ...
 $ CompPrice  : int  138 111 113 117 141 124 115 136 132 132 ...
 $ Income     : int  73 48 35 100 64 113 105 81 110 113 ...
 $ Advertising: int  11 16 10 4 3 13 0 15 0 0 ...
 $ Population : int  276 260 269 466 340 501 45 425 108 131 ...
 $ Price      : int  120 83 80 97 128 72 108 120 124 124 ...
 $ ShelveLoc  : Factor w/ 3 levels "Bad","Good","Medium": 1 2 3 3 1 1 3 2 3 3
...
 $ Age        : int  42 65 59 55 38 78 71 67 76 76 ...
 $ Education  : int  17 10 12 14 13 16 15 10 10 17 ...
 $ Urban      : Factor w/ 2 levels "No","Yes": 2 2 2 2 2 1 2 2 1 1 ...
 $ US         : Factor w/ 2 levels "No","Yes": 2 2 2 2 1 2 1 2 1 2 ...
```

From above data frame, 3 variables are factor and rest all are numeric.

Out of this we need to find which records can be considered for high sales.

To classify, we consider Sales into 3 categories as Low, Medium and High and will give equal weightage to all categories based on cutoff values.

Data classification using variable Sales ➔

So, we have 33.3 % records each with low, medium and high, so we consider top 33.3% of sales value as high and rest 66.6% as low.

Based on this sorting we are getting cutoff value as 8.67, so sales above than 8.5 will be considered as high sales value.

Now, based on cutoff value we will create another variable as "SalesC" with levels High and Low.

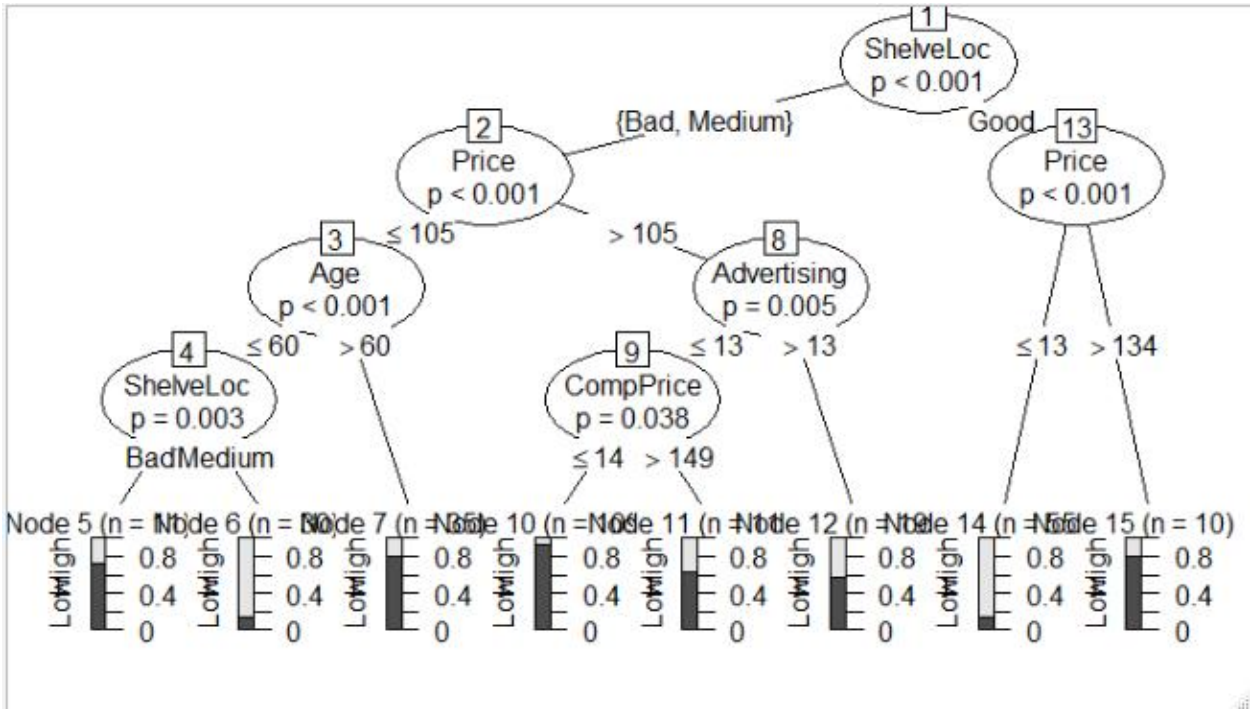
Now sales ratio of High:Low is 1:3 which is kind of imbalanced, so we required to balance it if we find any difficulty in classification.

Model-1 ➔ All the variables with function “ctree” from library “party”

Confusion Matrix

Actual	Predicted High	Predicted Low
High	18	21
Low	8	73

Accuracy ➔0.75833



Model-2 ➔All variables with function “C5.0” from library “C50”

Confusion Matrix

	pred2 High	pred2 Low
High	25	14
Low	10	71

Accuracy ➔0.80

Using boosting technique, we are getting 85% accuracy. So model C5.0 with boosting is our best final model.