Tree_Visualizer_vignette

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Tree Visualizer

The package Rpart has a very high quality visualization suite, but it is only compatible with Rpart objects, which have a very complex structure. This limits interoperability with decision trees produced by other software or by hand.

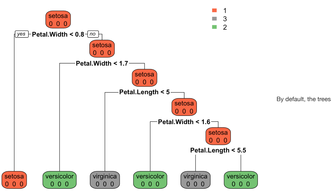
By contrast, the structure used by the randomForest package is user-friendly and clear. Therefore, this package provides an adapter between the randomForest tree object and the rpart object.

Let's demonstrate this with the iris dataset

```
data(iris)
iris_rpart = rpart(Species ~ .,data = iris)
iris_rf = randomForest(Species ~ .,data = iris)
iris_tree = iris_rf %>% getTree(k = 5,labelVar=T)  %>% as.data.frame()

iris_adapted = adapt_rf2rpart(iris_tree,add_data=F)
rpart.plot(iris_rpart,extra = 1,type = 2)
```

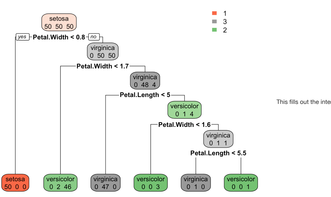

```
rpart.plot(iris_adapted,extra = 1,type = 2)
```



By default, the trees returned by adapt_rf2rpart are empty. It is worth noting that all intermediate nodes default to the first factor level, provided it is a classification tree

The tree can be populated by any dataset by setting add_data = T and supplying data, or later using fill_tree_data()

```
iris_adapted = adapt_rf2rpart(iris_tree,add_data=T,X = iris[,-5],y = iris[,5])
rpart.plot(iris_adapted,extra = 1,type = 2)
```



This fills out the intermediate nodes, providing additional insight into how a dataset is being classified by the tree.

In addition to the plotting adapter, the package provides a function for evaluating tree performance. This can be used to either evaluate a decision tree, or identify which trees within a random forest may be best to plot, for example

```
## $tree_info
##    left daughter right daughter    split var split point status prediction
## 1              2              3  Petal.Width        0.80      1       <NA>
## 2              0              0         <NA>        0.00     -1     setosa
## 3              4              5  Petal.Width        1.65      1       <NA>
## 4              6              7 Petal.Length        4.95      1       <NA>
## 5              0              0         <NA>        0.00     -1  virginica
## 6              0              0         <NA>        0.00     -1 versicolor
## 7              8              9  Petal.Width        1.55      1       <NA>
## 8              0              0         <NA>        0.00     -1  virginica
## 9             10             11 Petal.Length        5.45      1       <NA>
## 10             0              0         <NA>        0.00     -1 versicolor
## 11             0              0         <NA>        0.00     -1  virginica
##    setosa virginica versicolor bin    purity
## 1       0         0          0   0 0.0000000
## 2      50         0          0  50 1.0000000
## 3       0         0          0   0 0.0000000
## 4       0         0          0   0 0.0000000
## 5       0        46          2  48 0.9583333
## 6       0         0         47  47 1.0000000
## 7       0         0          0   0 0.0000000
## 8       0         3          0   3 1.0000000
## 9       0         0          0   0 0.0000000
## 10      0         0          1   1 1.0000000
## 11      0         1          0   1 1.0000000
##
## $conf_mat
##       predicta true_val
##   [1,]        0        0
##   [2,]        0        0
##   [3,]        0        0
##   [4,]        0        0
##   [5,]        0        0
##   [6,]        0        0
##   [7,]        0        0
##   [8,]        0        0
##   [9,]        0        0
##  [10,]        0        0
##  [11,]        0        0
##  [12,]        0        0
##  [13,]        0        0
##  [14,]        0        0
##  [15,]        0        0
##  [16,]        0        0
##  [17,]        0        0
##  [18,]        0        0
##  [19,]        0        0
##  [20,]        0        0
##  [21,]        0        0
##  [22,]        0        0
##  [23,]        0        0
##  [24,]        0        0
##  [25,]        0        0
##  [26,]        0        0
##  [27,]        0        0
##  [28,]        0        0
##  [29,]        0        0
##  [30,]        0        0
##  [31,]        0        0
##  [32,]        0        0
##  [33,]        0        0
##  [34,]        0        0
##  [35,]        0        0
##  [36,]        0        0
##  [37,]        0        0
##  [38,]        0        0
##  [39,]        0        0
##  [40,]        0        0
##  [41,]        0        0
##  [42,]        0        0
##  [43,]        0        0
##  [44,]        0        0
##  [45,]        0        0
##  [46,]        0        0
##  [47,]        0        0
##  [48,]        0        0
##  [49,]        0        0
##  [50,]        0        0
##  [51,]        2        2
##  [52,]        2        2
##  [53,]        2        2
##  [54,]        2        2
##  [55,]        2        2
##  [56,]        2        2
##  [57,]        2        2
##  [58,]        2        2
##  [59,]        2        2
##  [60,]        2        2
##  [61,]        2        2
##  [62,]        2        2
##  [63,]        2        2
##  [64,]        2        2
##  [65,]        2        2
##  [66,]        2        2
##  [67,]        2        2
##  [68,]        2        2
##  [69,]        2        2
##  [70,]        2        2
##  [71,]        2        2
##  [72,]        2        2
##  [73,]        2        2
##  [74,]        2        2
##  [75,]        2        2
##  [76,]        2        2
##  [77,]        2        2
##  [78,]        2        2
##  [79,]        2        2
##  [80,]        2        2
##  [81,]        2        2
##  [82,]        2        2
##  [83,]        2        2
##  [84,]        2        2
##  [85,]        2        2
##  [86,]        2        2
##  [87,]        2        2
##  [88,]        2        2
##  [89,]        2        2
##  [90,]        2        2
##  [91,]        2        2
##  [92,]        2        2
##  [93,]        2        2
##  [94,]        2        2
##  [95,]        2        2
##  [96,]        2        2
##  [97,]        2        1
##  [98,]        2        1
##  [99,]        1        1
## [100,]        1        1
## [101,]        1        1
## [102,]        1        1
## [103,]        1        1
## [104,]        1        1
## [105,]        1        1
## [106,]        1        1
## [107,]        1        1
## [108,]        1        1
## [109,]        1        1
## [110,]        1        1
## [111,]        1        1
## [112,]        1        1
## [113,]        1        1
## [114,]        1        1
## [115,]        1        1
## [116,]        1        1
## [117,]        1        1
## [118,]        1        1
## [119,]        1        1
## [120,]        1        1
## [121,]        1        1
## [122,]        1        1
## [123,]        1        1
## [124,]        1        1
## [125,]        1        1
## [126,]        1        1
## [127,]        1        1
## [128,]        1        1
## [129,]        1        1
## [130,]        1        1
## [131,]        1        1
## [132,]        1        1
## [133,]        1        1
## [134,]        1        1
## [135,]        1        1
## [136,]        1        1
## [137,]        1        1
## [138,]        1        1
## [139,]        1        1
## [140,]        1        1
## [141,]        1        1
## [142,]        1        1
## [143,]        1        1
## [144,]        1        1
## [145,]        1        1
## [146,]        2        2
## [147,]        2        2
## [148,]        2        2
## [149,]        1        1
## [150,]        2        2
##
## $sensitivity
## [1] 0.96
##
## $specificity
## [1] 1
##
## $precision
## [1] 1
##
## $npv
## [1] 1
##
## $fpr
## [1] 0
##
## $fdr
## [1] 0
##
## $fnr
## [1] 0
##
## $f1
## [1] 0.9795918
##
## $accuracy
## [1] 0.4533333
```

Overall, this is a simple software package designed to expand the usability of rpart's plotting software.

Currently this has only been rigorously tested on classification trees. Behavior on regression trees may not work as expected. I may expand this functionality in the future.