Assignment 7

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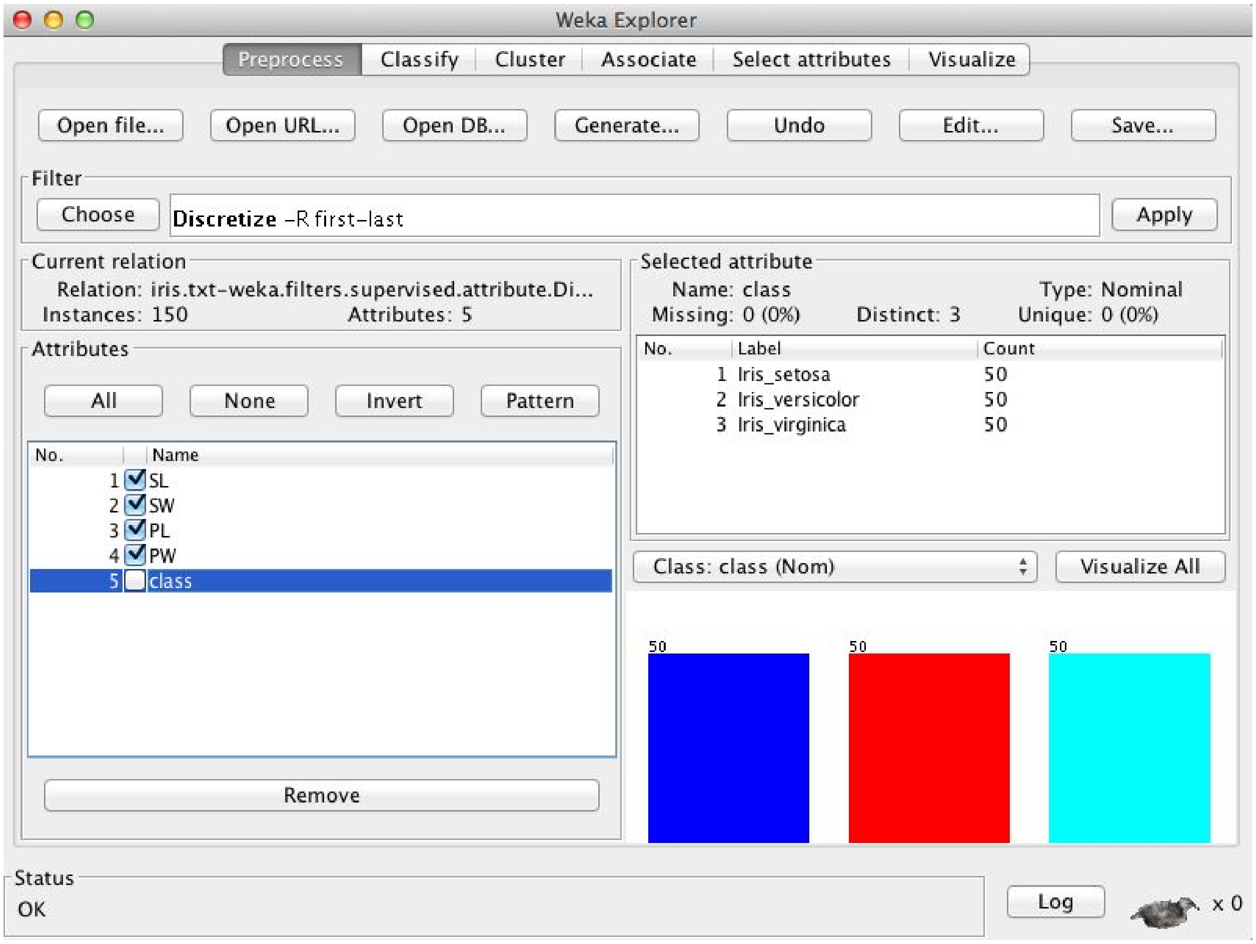
Classification of iris flowers

Firstly we cleaned up the data and discretized it.



Filter

Discretize -R first-last

Current relation

Relation: iris.txt-weka.filters.supervised.attribute.Di...

Instances: 150 Attributes: 5

Attributes

No.		Name
1	☑	SL
2	☑	SW
3	☑	PL
4	☑	PW
5	□	class

Selected attribute

Name: class Type: Nominal

Missing: 0 (0%) Distinct: 3 Unique: 0 (0%)

No.	Label	Count
1	Iris_setosa	50
2	Iris_versicolor	50
3	Iris_virginica	50

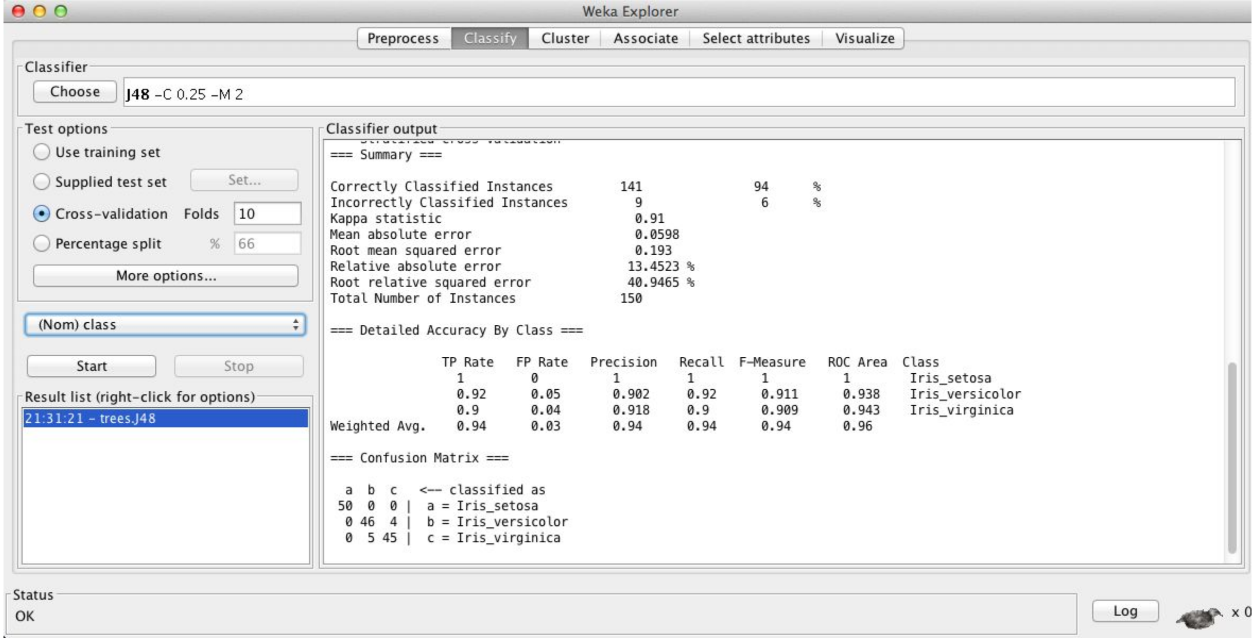
Class: class (Nom)

Status

OK

1. Cross-validation: folds = 10, Classifier = J48

Accuracy rate：94%



Classifier: J48 -C 0.25 -M 2

Test options
○ Use training set
○ Supplied test set
● Cross-validation Folds 10
○ Percentage split % 66

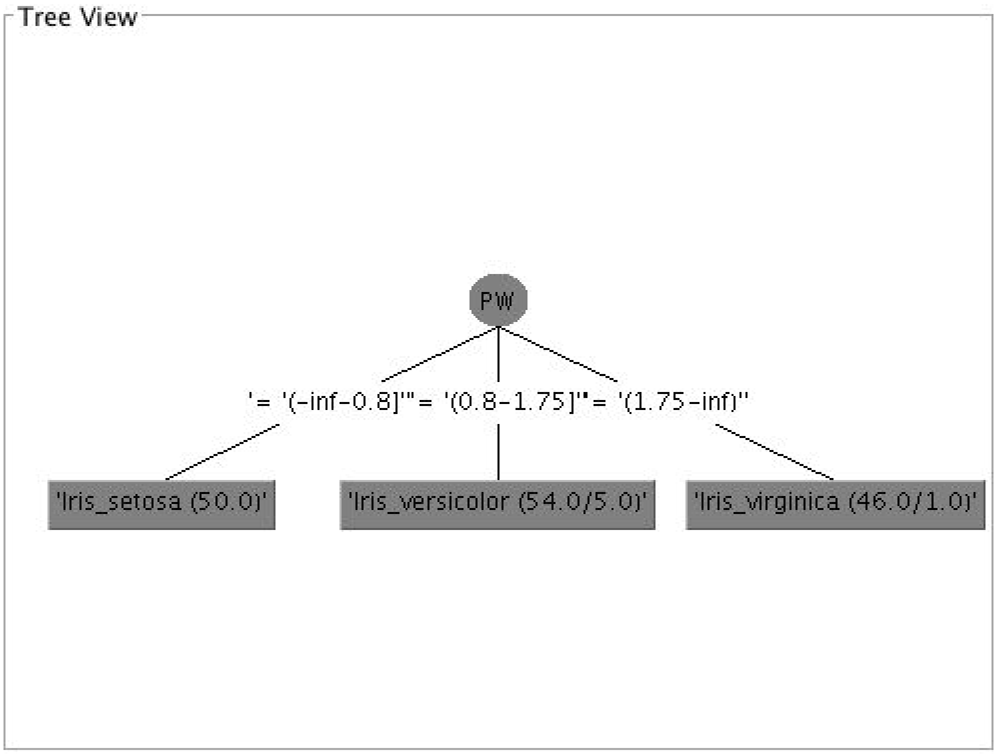
(Nom) class

Result list (right-click for options)
21:31:21 - trees.J48

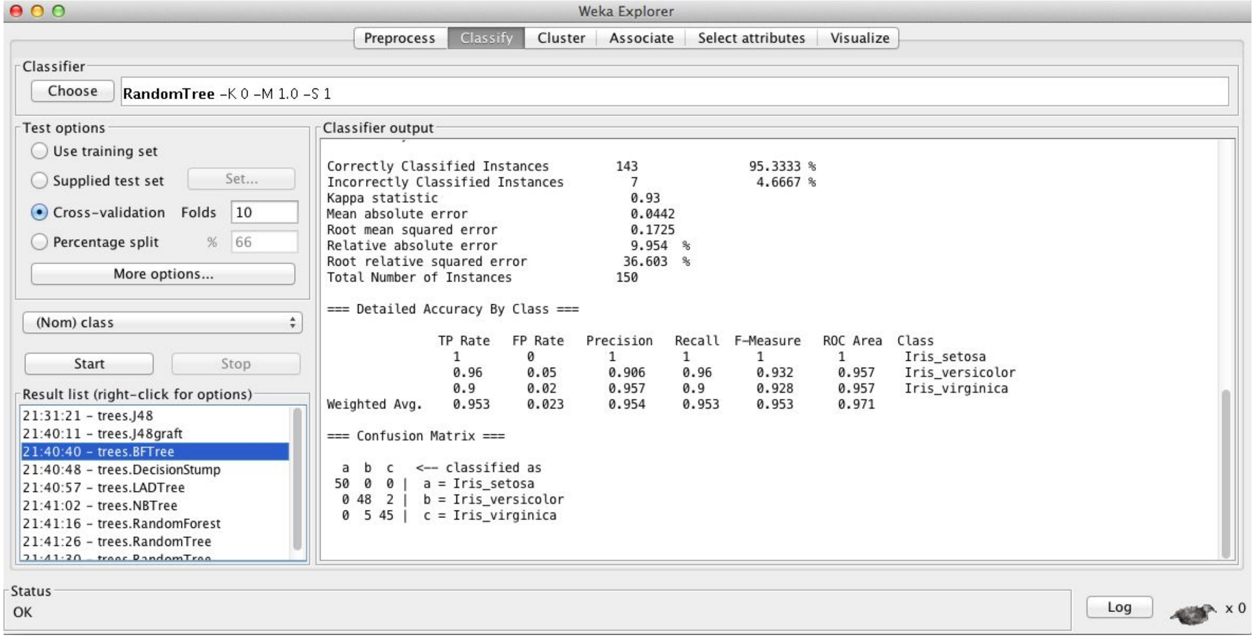
Classifier output

```
=== Summary ===

Correctly Classified Instances         141               94      %
Incorrectly Classified Instances         9                6      %
Kappa statistic                          0.91
Mean absolute error                      0.0598
Root mean squared error                  0.193
Relative absolute error                 13.4523 %
Root relative squared error             40.9465 %
Total Number of Instances              150

=== Detailed Accuracy By Class ===

               TP Rate   FP Rate   Precision   Recall  F-Measure   ROC Area  Class
                 1         0          1         1         1          1        Iris_setosa
                 0.92      0.05       0.902     0.92      0.911      0.938    Iris_versicolor
                 0.9       0.04       0.918     0.9       0.909      0.943    Iris_virginica
Weighted Avg.    0.94      0.03       0.94      0.94      0.94       0.96

=== Confusion Matrix ===

  a  b  c   <-- classified as
 50  0  0 |  a = Iris_setosa
  0 46  4 |  b = Iris_versicolor
  0  5 45 |  c = Iris_virginica
```

Status
OK



2. Cross-validation: folds = 10, Use training set: Classifier = BFTree
   Accuracy rate：95.33%



RandomTree -K 0 -M 1.0 -S 1

○ Use training set
○ Supplied test set
● Cross-validation Folds 10
○ Percentage split % 66

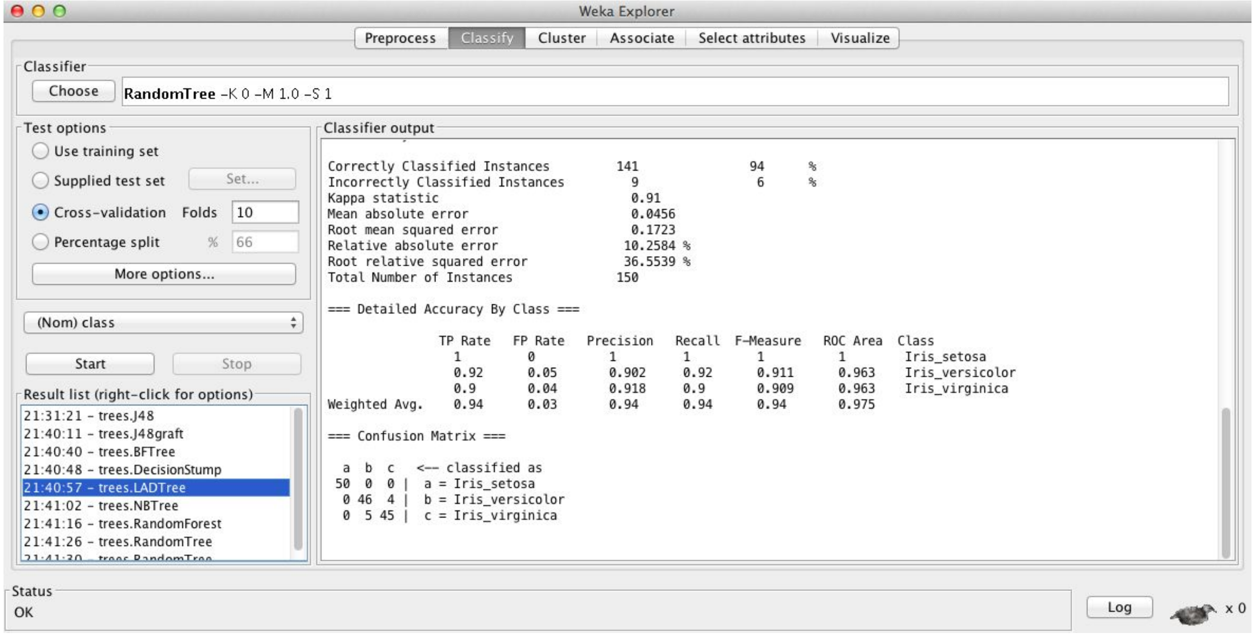
(Nom) class

Result list (right-click for options)
- 21:31:21 - trees.J48
- 21:40:11 - trees.J48graft
- 21:40:40 - trees.BFTree
- 21:40:48 - trees.DecisionStump
- 21:40:57 - trees.LADTree
- 21:41:02 - trees.NBTree
- 21:41:16 - trees.RandomForest
- 21:41:26 - trees.RandomTree
- 21:41:30 - trees.RandomTree

```
Correctly Classified Instances         143               95.3333 %
Incorrectly Classified Instances         7                4.6667 %
Kappa statistic                          0.93
Mean absolute error                      0.0442
Root mean squared error                  0.1725
Relative absolute error                  9.954  %
Root relative squared error             36.603  %
Total Number of Instances              150

=== Detailed Accuracy By Class ===

               TP Rate   FP Rate   Precision   Recall  F-Measure   ROC Area  Class
                 1         0          1         1         1          1        Iris_setosa
                 0.96      0.05       0.906     0.96      0.932      0.957    Iris_versicolor
                 0.9       0.02       0.957     0.9       0.928      0.957    Iris_virginica
Weighted Avg.    0.953     0.023      0.954     0.953     0.953      0.971

=== Confusion Matrix ===

  a  b  c   <-- classified as
 50  0  0 |  a = Iris_setosa
  0 48  2 |  b = Iris_versicolor
  0  5 45 |  c = Iris_virginica
```

Status
OK

3. Cross-validation: folds = 10, Classifier = LADTree
   Accuracy rate = 94%



RandomTree -K 0 -M 1.0 -S 1

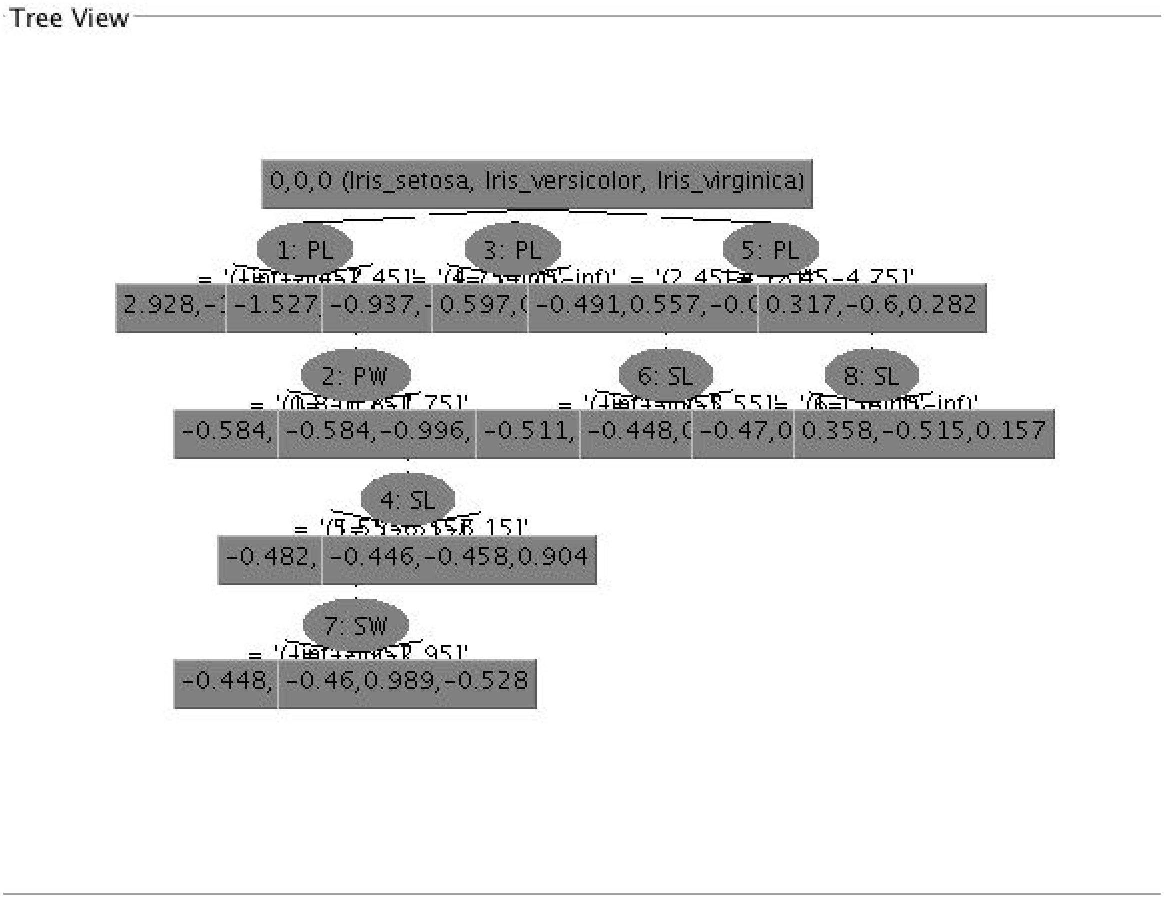
○ Use training set
○ Supplied test set
● Cross-validation Folds 10
○ Percentage split % 66

(Nom) class

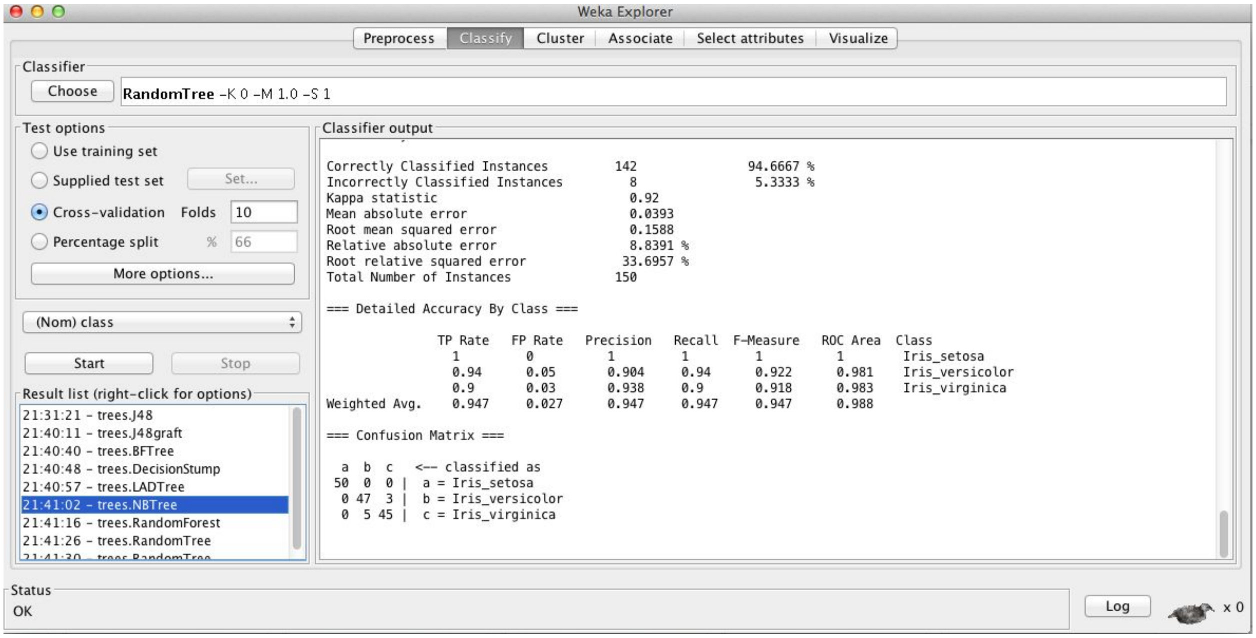
Result list (right-click for options)
- 21:31:21 - trees.J48
- 21:40:11 - trees.J48graft
- 21:40:40 - trees.BFTree
- 21:40:48 - trees.DecisionStump
- 21:40:57 - trees.LADTree
- 21:41:02 - trees.NBTree
- 21:41:16 - trees.RandomForest
- 21:41:26 - trees.RandomTree
- 21:41:30 - trees.RandomTree

```
Correctly Classified Instances         141               94      %
Incorrectly Classified Instances         9                6      %
Kappa statistic                          0.91
Mean absolute error                      0.0456
Root mean squared error                  0.1723
Relative absolute error                 10.2584 %
Root relative squared error             36.5539 %
Total Number of Instances              150

=== Detailed Accuracy By Class ===

               TP Rate   FP Rate   Precision   Recall  F-Measure   ROC Area  Class
                 1         0          1         1         1          1        Iris_setosa
                 0.92      0.05       0.902     0.92      0.911      0.963    Iris_versicolor
                 0.9       0.04       0.918     0.9       0.909      0.963    Iris_virginica
Weighted Avg.    0.94      0.03       0.94      0.94      0.94       0.975

=== Confusion Matrix ===

  a  b  c   <-- classified as
 50  0  0 |  a = Iris_setosa
  0 46  4 |  b = Iris_versicolor
  0  5 45 |  c = Iris_virginica
```

Status
OK



4. Cross-validation: folds = 10, Classifier = NBTree
   Accuracy rate = 94.6667%



Classifier

RandomTree -K 0 -M 1.0 -S 1

Test options

○ Use training set
○ Supplied test set
● Cross-validation Folds 10
○ Percentage split % 66

(Nom) class

Result list (right-click for options)

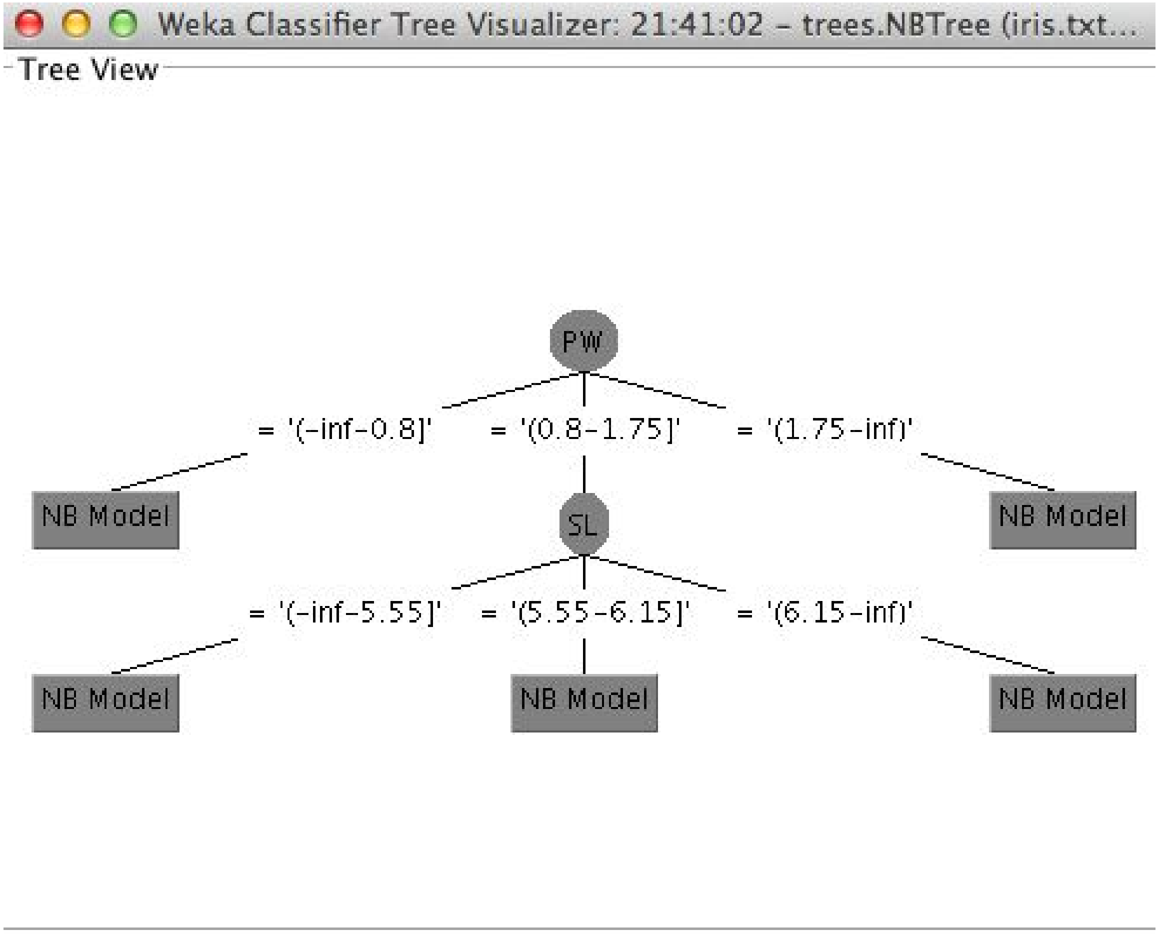
```
21:31:21 - trees.J48
21:40:11 - trees.J48graft
21:40:40 - trees.BFTree
21:40:48 - trees.DecisionStump
21:40:57 - trees.LADTree
21:41:02 - trees.NBTree
21:41:16 - trees.RandomForest
21:41:26 - trees.RandomTree
21:41:30 - trees.RandomTree
```

Classifier output

```
Correctly Classified Instances         142               94.6667 %
Incorrectly Classified Instances         8                5.3333 %
Kappa statistic                          0.92
Mean absolute error                      0.0393
Root mean squared error                  0.1588
Relative absolute error                  8.8391 %
Root relative squared error             33.6957 %
Total Number of Instances              150

=== Detailed Accuracy By Class ===

               TP Rate   FP Rate   Precision   Recall  F-Measure   ROC Area  Class
                 1         0          1         1         1          1        Iris_setosa
                 0.94      0.05       0.904     0.94      0.922      0.981    Iris_versicolor
                 0.9       0.03       0.938     0.9       0.918      0.983    Iris_virginica
Weighted Avg.    0.947     0.027      0.947     0.947     0.947      0.988

=== Confusion Matrix ===

  a  b  c   <-- classified as
 50  0  0 |  a = Iris_setosa
  0 47  3 |  b = Iris_versicolor
  0  5 45 |  c = Iris_virginica
```

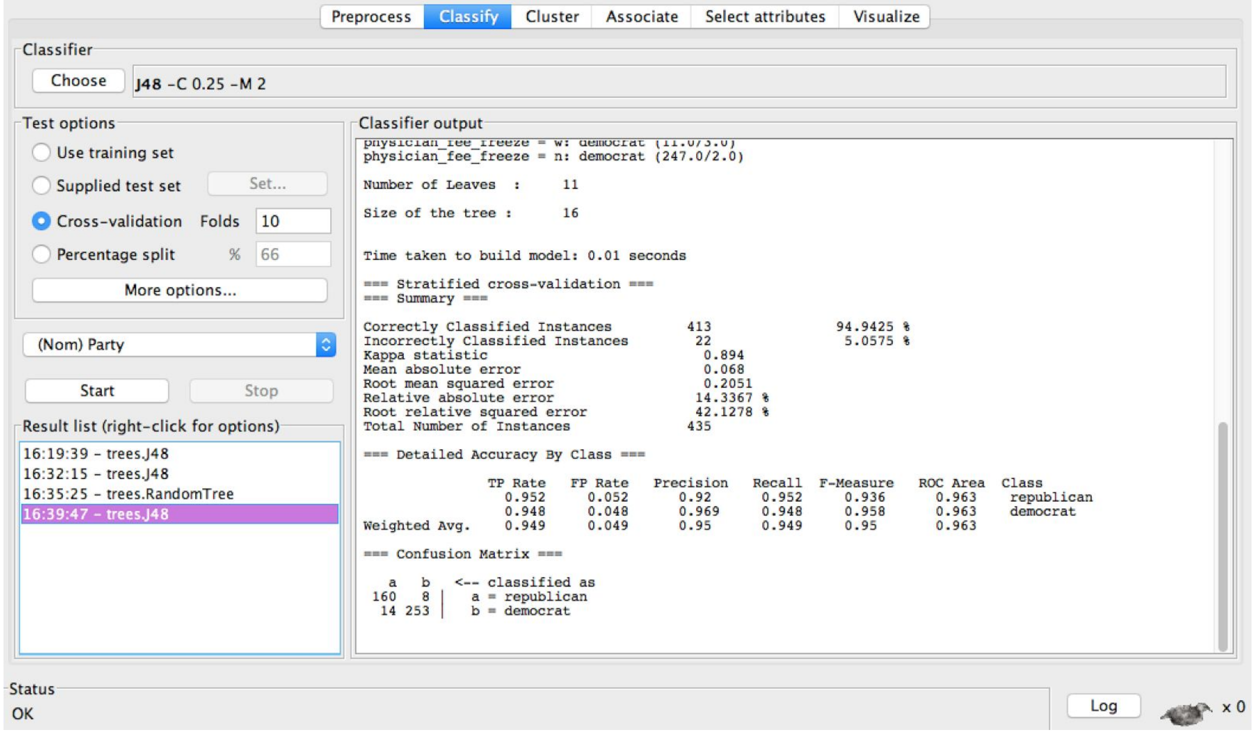
Status

OK



Classification of congressmen

1. Cross-validation: folds = 10, Classifier = J48
   Accuracy rate：94.9425%



J48 -C 0.25 -M 2

○ Use training set
○ Supplied test set
● Cross-validation Folds 10
○ Percentage split % 66

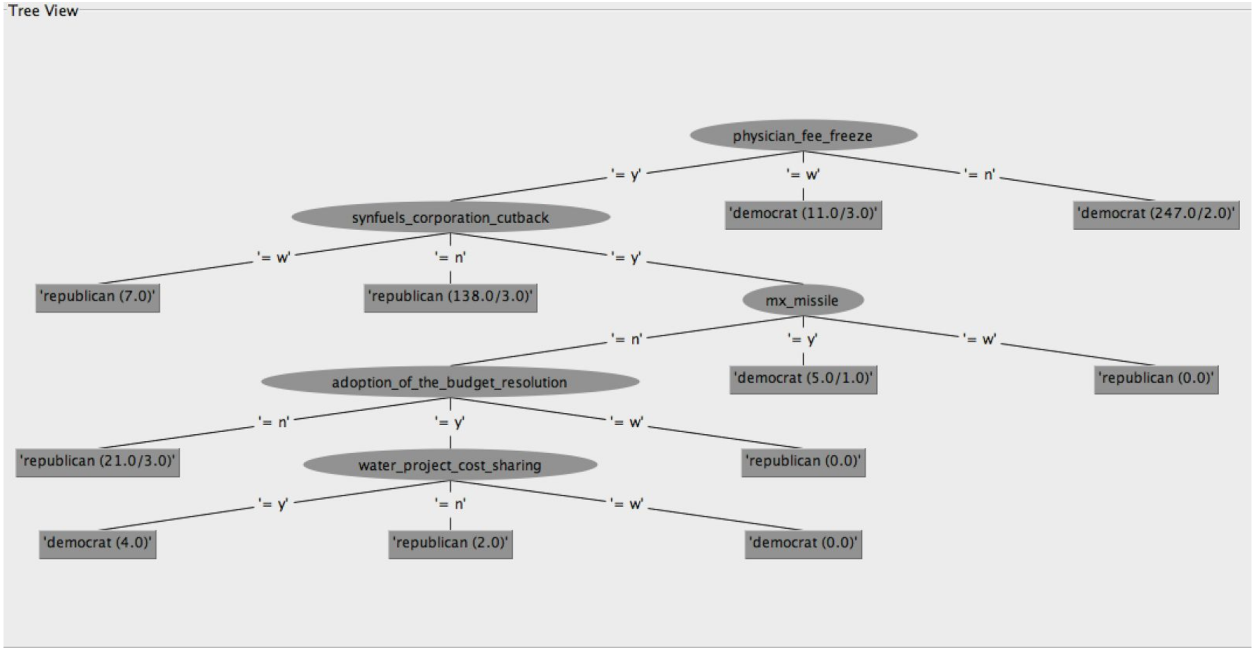
(Nom) Party

Result list (right-click for options)

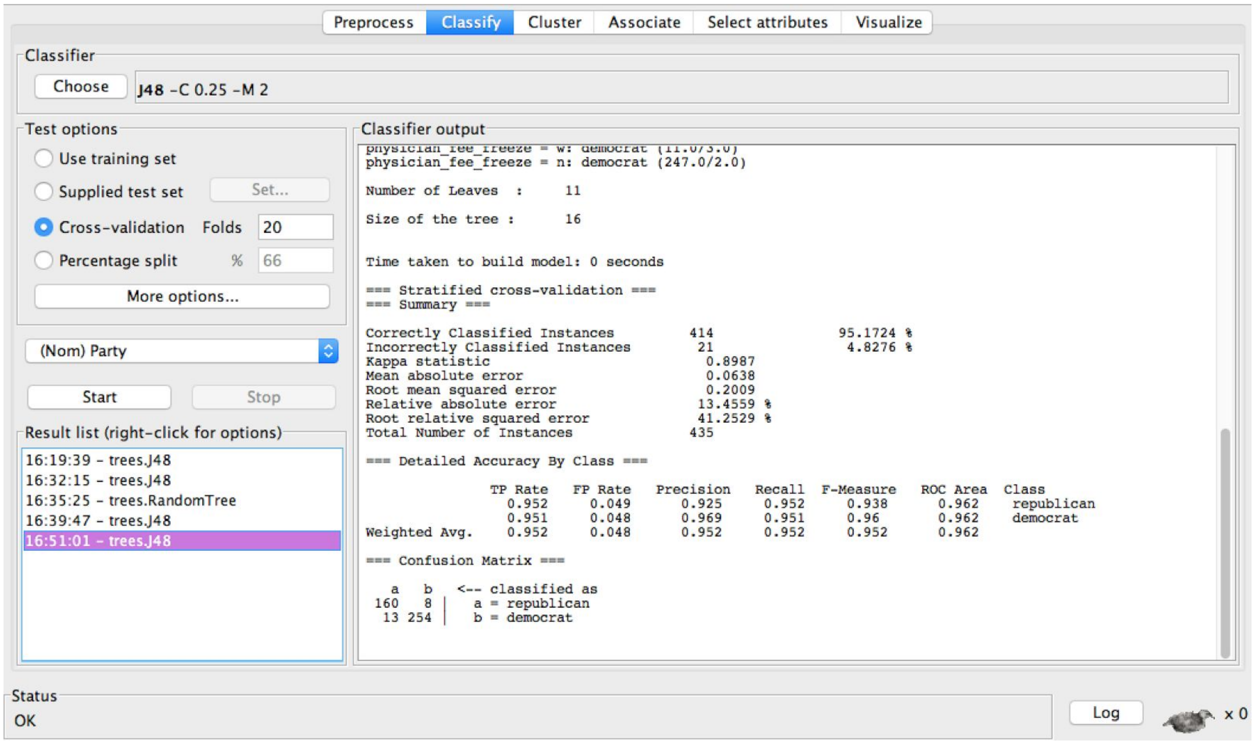
```
16:19:39 - trees.J48
16:32:15 - trees.J48
16:35:25 - trees.RandomTree
16:39:47 - trees.J48
```

```
physician_fee_freeze = w: democrat (11.0/3.0)
physician_fee_freeze = n: democrat (247.0/2.0)

Number of Leaves  :      11

Size of the tree :       16


Time taken to build model: 0.01 seconds

=== Stratified cross-validation ===
=== Summary ===

Correctly Classified Instances         413               94.9425 %
Incorrectly Classified Instances        22                5.0575 %
Kappa statistic                          0.894
Mean absolute error                      0.068
Root mean squared error                  0.2051
Relative absolute error                 14.3367 %
Root relative squared error             42.1278 %
Total Number of Instances              435

=== Detailed Accuracy By Class ===

               TP Rate   FP Rate   Precision   Recall  F-Measure   ROC Area  Class
                 0.952     0.052      0.92      0.952     0.936      0.963    republican
                 0.948     0.048      0.969     0.948     0.958      0.963    democrat
Weighted Avg.    0.949     0.049      0.95      0.949     0.95       0.963

=== Confusion Matrix ===

   a   b   <-- classified as
 160   8 |   a = republican
  14 253 |   b = democrat
```

Status
OK



2. Cross-validation: folds = 10, Classifier = J48
   Accuracy rate : 95.1724%



Classifier

Choose J48 -C 0.25 -M 2

Test options

○ Use training set

○ Supplied test set   Set...

● Cross-validation   Folds 20

○ Percentage split   % 66

More options...

(Nom) Party

Start   Stop

Result list (right-click for options)

16:19:39 - trees.J48
16:32:15 - trees.J48
16:35:25 - trees.RandomTree
16:39:47 - trees.J48
16:51:01 - trees.J48

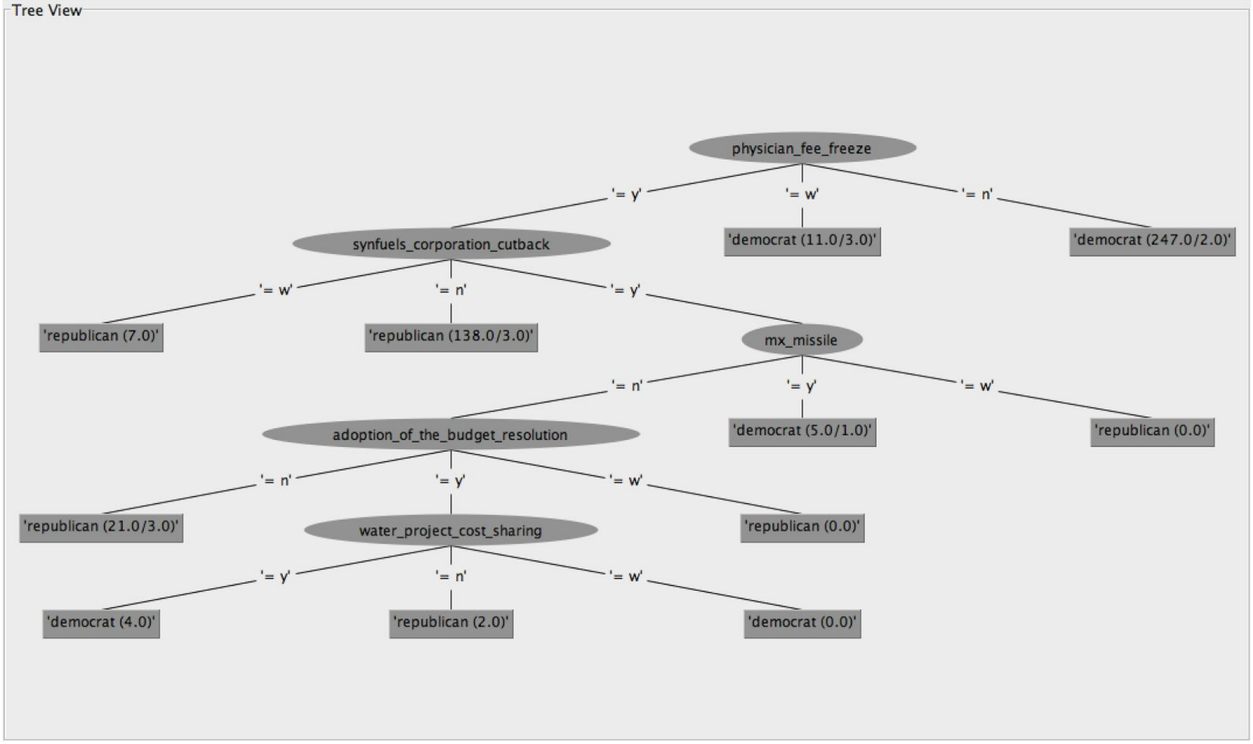
Classifier output

```
physician_fee_freeze = w: democrat (11.0/3.0)
physician_fee_freeze = n: democrat (247.0/2.0)

Number of Leaves  :     11

Size of the tree :      16


Time taken to build model: 0 seconds

=== Stratified cross-validation ===
=== Summary ===

Correctly Classified Instances         414               95.1724 %
Incorrectly Classified Instances        21                4.8276 %
Kappa statistic                          0.8987
Mean absolute error                      0.0638
Root mean squared error                  0.2009
Relative absolute error                 13.4559 %
Root relative squared error             41.2529 %
Total Number of Instances              435

=== Detailed Accuracy By Class ===

               TP Rate   FP Rate   Precision   Recall  F-Measure   ROC Area  Class
                 0.952     0.049      0.925     0.952     0.938      0.962    republican
                 0.951     0.048      0.969     0.951     0.96       0.962    democrat
Weighted Avg.    0.952     0.048      0.952     0.952     0.952      0.962

=== Confusion Matrix ===

   a   b   <-- classified as
 160   8 |   a = republican
  13 254 |   b = democrat
```

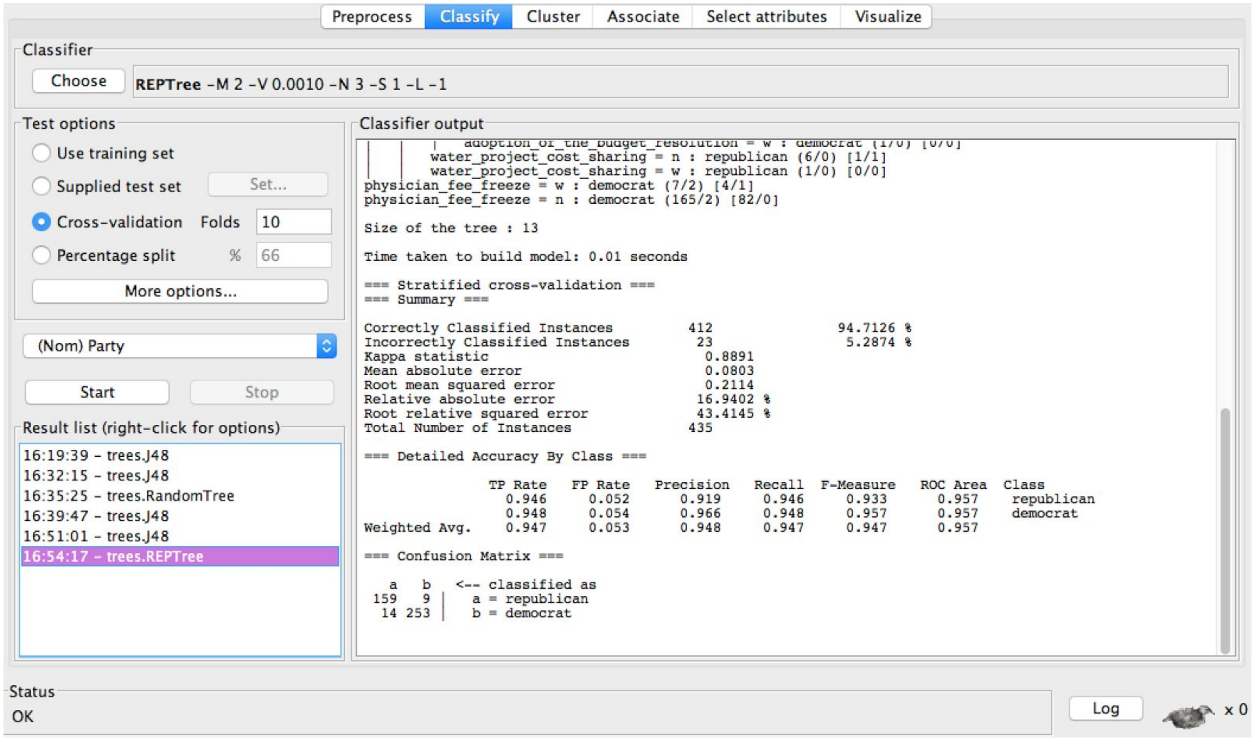
Status

OK

Tree View



3. Cross-validation: folds = 10, Classifier = REPTree
   Accuracy rate：94.7126%



Classifier

REPTree -M 2 -V 0.0010 -N 3 -S 1 -L -1

Test options

○ Use training set

○ Supplied test set

● Cross-validation Folds 10

○ Percentage split % 66

(Nom) Party

Result list (right-click for options)

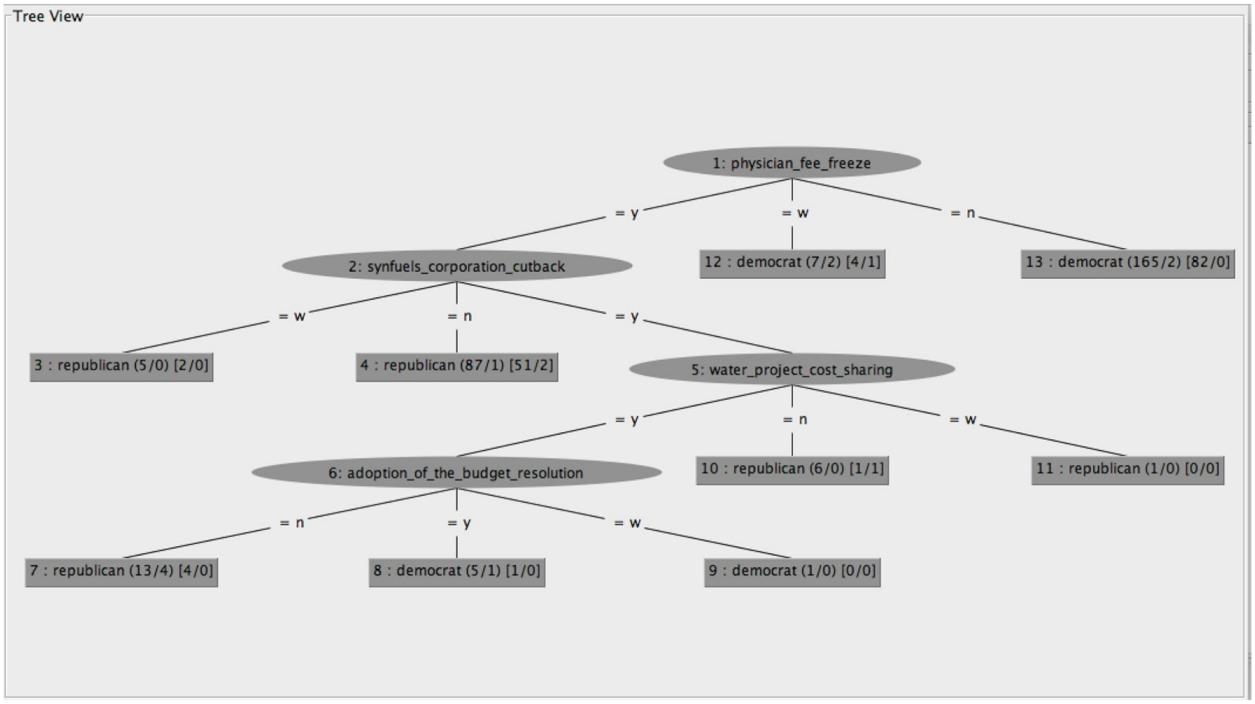
16:19:39 - trees.J48
16:32:15 - trees.J48
16:35:25 - trees.RandomTree
16:39:47 - trees.J48
16:51:01 - trees.J48
16:54:17 - trees.REPTree

Classifier output

```
|   |   |   adoption_of_the_budget_resolution = w : democrat (1/0) [0/0]
|   |   water_project_cost_sharing = n : republican (6/0) [1/1]
|   |   water_project_cost_sharing = w : republican (1/0) [0/0]
physician_fee_freeze = w : democrat (7/2) [4/1]
physician_fee_freeze = n : democrat (165/2) [82/0]

Size of the tree : 13

Time taken to build model: 0.01 seconds

=== Stratified cross-validation ===
=== Summary ===

Correctly Classified Instances         412               94.7126 %
Incorrectly Classified Instances        23                5.2874 %
Kappa statistic                          0.8891
Mean absolute error                      0.0803
Root mean squared error                  0.2114
Relative absolute error                 16.9402 %
Root relative squared error             43.4145 %
Total Number of Instances              435

=== Detailed Accuracy By Class ===

               TP Rate   FP Rate   Precision   Recall  F-Measure   ROC Area  Class
                 0.946     0.052      0.919     0.946     0.933      0.957    republican
                 0.948     0.054      0.966     0.948     0.957      0.957    democrat
Weighted Avg.    0.947     0.053      0.948     0.947     0.947      0.957

=== Confusion Matrix ===

   a   b   <-- classified as
 159   9 |   a = republican
  14 253 |   b = democrat
```

Status

OK


Tree View
1: physician_fee_freeze
= y
= w
= n
2: synfuels_corporation_cutback
12 : democrat (7/2) [4/1]
13 : democrat (165/2) [82/0]
= w
= n
= y
3 : republican (5/0) [2/0]
4 : republican (87/1) [51/2]
5: water_project_cost_sharing
= y
= n
= w
6: adoption_of_the_budget_resolution
10 : republican (6/0) [1/1]
11 : republican (1/0) [0/0]
= n
= y
= w
7 : republican (13/4) [4/0]
8 : democrat (5/1) [1/0]
9 : democrat (1/0) [0/0]

Summary

Iris flower

We used four classification methods - J48, BFTree, LADTree, NBTree, to analyze the iris flower data. The BFTree has best accuracy but it does not have Tree view. The second best tree is NBTree (94.6667% accuracy). From those Tree views, we can see the variable PW may be an important factor. It might have decisive influence on the overall result in the Iris flower data.

Congressmen

It is easy to see that no matter what algorithm we used (J48 or REPTree), physician_fee_freeze is always the most important factor to classify democrat and republican, followed by synfueis_corporation_cutback. The result from classification done with J48 has an additional mx_missle factor, compared with the result from REPTree algorithm. Both algorithms consider adoption_of_the_budget_resolution and water_project_cost_sharing important factors to classify democrat and republican, nevertheless result from J48 puts adoption_of_the_budget_resolution ahead of water_projection_cost_sharing while result from REPTree interprets the other way. To sum up, J48 algorithm achieved a more reliable result judging from the accuracy rate.