

## Activity 15

### Classifier – Bagging

Weka Explorer

Preprocess Classify Cluster Associate Select attributes Visualize

Classifier

Choose Bagging -P 100 -S 1 -num-slots 1 -I 10 -W weka.classifiers.trees.REPTree -- -M 2 -V 0.001 -N 3 -S 1 -L -I 0.0

Test options

☐ Use training set  
☐ Supplied test set Set...  
☒ Cross-validation Folds 10  
☐ Percentage split % 66  
More options...

(Nom) class

Start Stop

Result list (right-click for options)

- 18:39:08 - lazy Jk
- 18:41:48 - lazy Jk
- 18:43:00 - lazy Jk
- 18:46:26 - lazy Jk
- 18:47:02 - lazy Jk
- 18:48:49 - meta Bagging

Classifier output

```
Schema: weka.classifiers.meta.Bagging -P 100 -S 1 -num-slots 1 -I 10 -W weka.classifiers.trees.REPTree -- -M 2 -V 0.001 -N 3 -S 1 -L -I 0.0
Relation: iris
Instances: 150
Attributes: 5
    sepalwidth
    sepalwidth
    petalwidth
    petalwidth
    class
Test mode: 10-fold cross-validation

=== Classifier model (full training set) ===

Bagging with 10 iterations and base learner

weka.classifiers.trees.REPTree -M 2 -V 0.001 -N 3 -S 1 -L -I 0.0

Time taken to build model: 0.04 seconds

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

Correctly Classified Instances      141           94 %
Incorrectly Classified Instances     9             6 %
Kappa statistic                    0.91
Mean absolute error                 0.0529
Root mean squared error             0.1692
Relative absolute error             11.9007 %
Root relative squared error         35.9002 %
Total Number of Instances          150

=== Detailed Accuracy By Class ===

      TP Rate  FP Rate  Precision  Recall   F-Measure  MCC      ROC Area  PRC Area  Class
      1.000    0.000    1.000    1.000    1.000    1.000    1.000    1.000    Iris-setosa
      0.920    0.050    0.902    0.920    0.911    0.866    0.987    0.975    Iris-versicolor
      0.900    0.040    0.918    0.900    0.909    0.864    0.987    0.972    Iris-virginica
Weighted Avg.   0.940    0.030    0.940    0.940    0.940    0.910    0.992    0.983

=== 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
```

### Stacking

Weka Explorer

Preprocess Classify Cluster Associate Select attributes Visualize

**Classifier**

Choose **Stacking** -X 10 -M "weka.classifiers.rules.ZeroR" -S 1 -num-slots 1 -B "weka.classifiers.rules.ZeroR"

**Test options**

☐ Use training set  
☐ Supplied test set Set...  
☒ Cross-validation Folds **10**  
☐ Percentage split % 66  
 More options...

(Nom) class

Start Stop

**Result list (right-click for options)**

- 18:39:08 - lazyJbk
- 18:41:48 - lazyJbk
- 18:43:00 - lazyJbk
- 18:46:26 - lazyJbk
- 18:47:02 - lazyJbk
- 18:48:49 - meta.Bagging
- 19:08:21 - meta Stacking

**Classifier output**

```

class
Test mode: 10-fold cross-validation

=== Classifier model (full training set) ===

Stacking

Base classifiers

ZeroR predicts class value: Iris-setosa

Meta classifier

ZeroR predicts class value: Iris-setosa

Time taken to build model: 0.01 seconds

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

Correctly Classified Instances      50      33.3333 %
Incorrectly Classified Instances    100      66.6667 %
Kappa statistic                    0
Mean absolute error                 0.4444
Root mean squared error             0.4714
Relative absolute error             100 %
Root relative squared error         100 %
Total Number of Instances          150

=== Detailed Accuracy By Class ===

      TP Rate  FP Rate  Precision  Recall  F-Measure  MCC   ROC Area  PRC Area  Class
      1.000    1.000    0.333     1.000    0.500     ?    0.500    0.333    Iris-setosa
      0.000    0.000    ?         0.000    ?         ?    0.500    0.333    Iris-versicolor
      0.000    0.000    ?         0.000    ?         ?    0.500    0.333    Iris-virginica
Weighted Avg.   0.333    0.333    ?         0.333    ?         ?    0.500    0.333

=== Confusion Matrix ===

  a  b  c  <-- classified as
50  0  0 | a = Iris-setosa
50  0  0 | b = Iris-versicolor
50  0  0 | c = Iris-virginica
  
```

Multilayer perceptron

Weka Explorer

Preprocess Classify Cluster Associate Select attributes Visualize

**Classifier**

Choose **MultilayerPerceptron** -L 0.3 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a

**Test options**

☐ Use training set  
☐ Supplied test set   
☒ Cross-validation Folds   
☐ Percentage split %

(Nom) class

**Result list (right-click for options)**

- 18:39:08 - lazyJbk
- 18:41:48 - lazyJbk
- 18:43:00 - lazyJbk
- 18:46:26 - lazyJbk
- 18:47:02 - lazyJbk
- 18:48:49 - metaBagging
- 19:08:21 - metaStacking
- 19:08:58 - functions.MultilayerPerceptron**

**Classifier output**

```

Inputs      Weights
Threshold    -7.496091023618097
Attrib sepalength  -1.2158878822058794
Attrib sepalwidth  -3.5332821317534946
Attrib petallength  8.401834252274107
Attrib petalwidth  9.460215580472836

Class Iris-setosa
Input
Node 0
Class Iris-versicolor
Input
Node 1
Class Iris-virginica
Input
Node 2

Time taken to build model: 0.34 seconds

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

Correctly Classified Instances      146           97.3333 %
Incorrectly Classified Instances      4           2.6667 %
Kappa statistic                    0.96
Mean absolute error                 0.0327
Root mean squared error             0.1291
Relative absolute error              7.3555 %
Root relative squared error         27.3796 %
Total Number of Instances           150

=== Detailed Accuracy By Class ===

          TP Rate  FP Rate  Precision  Recall   F-Measure  MCC     ROC Area  PRC Area  Class
          1.000    0.000    1.000     1.000    1.000     1.000    1.000    1.000    Iris-setosa
          0.960    0.020    0.960     0.960    0.960     0.940    0.996    0.993    Iris-versicolor
          0.960    0.020    0.960     0.960    0.960     0.940    0.996    0.993    Iris-virginica
Weighted Avg.   0.973    0.013    0.973     0.973    0.973     0.960    0.998    0.995

=== Confusion Matrix ===

  a  b  c  <-- classified as
50  0  0 | a = Iris-setosa
 0 48  2 | b = Iris-versicolor
 0  2 48 | c = Iris-virginica

```

Hoeffding tree

## Classifier

Choose **HoeffdingTree** -L 2 -S 1 -E 1.0E-7 -H 0.05 -M 0.01 -G 200.0 -N 0.0

## Test options

- ☐ Use training set
- ☐ Supplied test set
- ☒ Cross-validation Folds
- ☐ Percentage split %
- 

(Nom) class

## Result list (right-click for options)

18:39:08 - lazyJbk  
18:41:48 - lazyJbk  
18:43:00 - lazyJbk  
18:46:26 - lazyJbk  
18:47:02 - lazyJbk  
18:48:49 - meta.Bagging  
19:08:21 - meta.Stacking  
19:08:58 - functions.MultilayerPerceptron  
19:10:11 - trees.HoeffdingTree

## Classifier output

=== Run information ===

Scheme: weka.classifiers.trees.HoeffdingTree -L 2 -S 1 -E 1.0E-7 -H 0.05 -M 0.01 -G 200.0 -N 0.0  
Relation: iris  
Instances: 150  
Attributes: 5

sepalwidth  
sepalwidth  
petalwidth  
petalwidth  
class

Test mode: 10-fold cross-validation

=== Classifier model (full training set) ===

Iris-setosa (51.000) NB1 NB adaptive1

Time taken to build model: 0.02 seconds

=== Stratified cross-validation ===

=== Summary ===

Correctly Classified Instances	143	95.3333 %
Incorrectly Classified Instances	7	4.6667 %
Kappa statistic	0.93	
Mean absolute error	0.0373	
Root mean squared error	0.1543	
Relative absolute error	8.3884 %	
Root relative squared error	32.735 %	
Total Number of Instances	150	

=== Detailed Accuracy By Class ===

	TP Rate	FP Rate	Precision	Recall	F-Measure	MCC	ROC Area	PRC Area	Class
	1.000	0.000	1.000	1.000	1.000	1.000	1.000	1.000	Iris-setosa
	0.940	0.040	0.922	0.940	0.931	0.896	0.991	0.982	Iris-versicolor
	0.920	0.030	0.939	0.920	0.929	0.895	0.991	0.985	Iris-virginica
Weighted Avg.	0.953	0.023	0.953	0.953	0.953	0.930	0.994	0.989	

=== Confusion Matrix ===

a b c <-- classified as  
50 0 0 | a = Iris-setosa  
0 47 3 | b = Iris-versicolor  
0 4 46 | c = Iris-virginica