Machine Learning with WEKA

Eibe Frank

Department of Computer Science,
University of Waikato, New Zealand

- WEKA: A Machine Learning Toolkit
- The Explorer
  - Classification and Regression
  - Clustering
  - Association Rules
  - Attribute Selection
  - Data Visualization
- The Experimenter
- The Knowledge Flow GUI
- Conclusions

WEKA: the bird

Copyright: Martin Kramer (mkramer@wxs.nl)

WEKA: the software

- Machine learning/data mining software written in Java (distributed under the GNU Public License)
- Used for research, education, and applications
- Complements “Data Mining” by Witten & Frank
- Main features:
  - Comprehensive set of data pre-processing tools, learning algorithms and evaluation methods
  - Graphical user interfaces (incl. data visualization)
  - Environment for comparing learning algorithms

WEKA: versions

- There are several versions of WEKA:
  - WEKA 3.0: “book version” compatible with description in data mining book
  - WEKA 3.2: “GUI version” adds graphical user interfaces (book version is command-line only)
  - WEKA 3.3: “development version” with lots of improvements
- This talk is based on the latest snapshot of WEKA 3.3 (soon to be WEKA 3.4)

WEKA only deals with "flat" files

```
@relation heart-disease-simplified

@attribute age numeric
@attribute sex { female, male}
@attribute chest_pain_type { typ_angina, asympt, non_anginal, atyp_angina}
@attribute cholesterol numeric
@attribute exercise_induced_angina { no, yes}
@attribute class { present, not_present}

@data
63,male,typ_angina,233,no,not_present
67,male,asympt,286,yes,present
67,male,asympt,229,yes,present
38,female,non_anginal,?,no,not_present
...
```

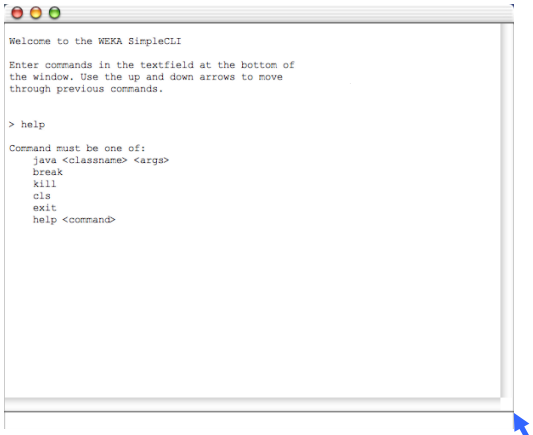
Flat file in ARFF format

WEKA only deals with "flat" files


```
@relation heart-disease-simplified

@attribute age numeric
@attribute sex { female, male}
@attribute chest_pain_type { typ_angina, asympt, non_anginal, atyp_angina}
@attribute cholesterol numeric
@attribute exercise_induced_angina { no, yes}
@attribute class { present, not_present}

@data
63,male,typ_angina,233,no,not_present
67,male,asympt,286,yes,present
67,male,asympt,229,yes,present
38,female,non_anginal,?,no,not_present
...
```


Welcome to the WEKA SimpleCLI
Enter commands in the textfield at the bottom of
the window. Use the up and down arrows to move
through previous commands.
> help
Command must be one of:
java <classname> <args>
break
kill
cls
exit
help <command>


Weka GUI Chooser
Waikato Environment for
Knowledge Analysis
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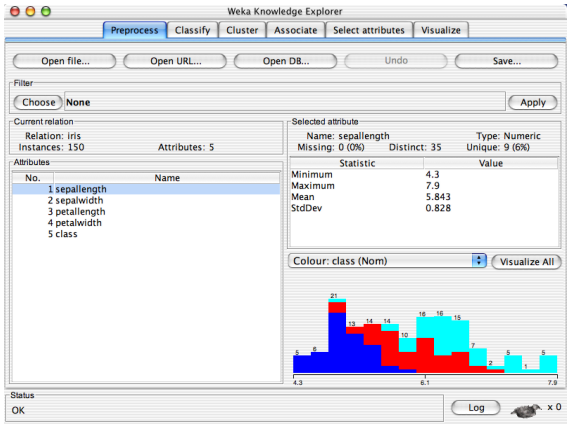
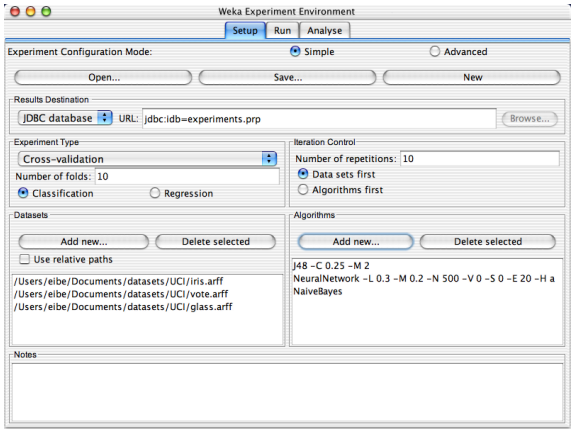
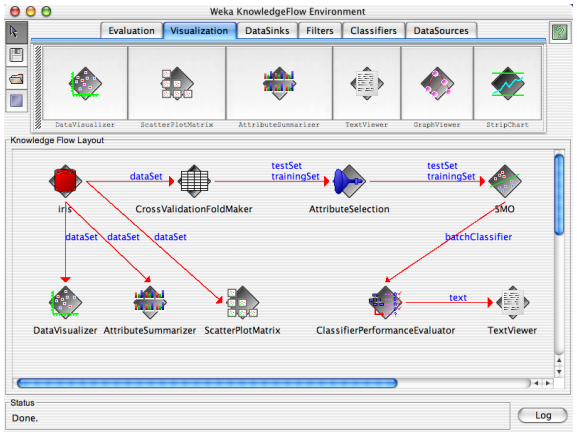
New Zealand
GUI
Simple CLI
Explorer
Experimenter
KnowledgeFlow


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
None
Apply
Current relation
Relation: iris
Instances: 150
Attributes: 5
Selected attribute
Name: sepallength
Type: Numeric
Missing: 0 (0%)
Distinct: 35
Unique: 9 (6%)
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Statistic
Value
Minimum
4.3
Maximum
7.9
Mean
5.843
StdDev
0.828
Colour: class (Nom)
Visualize All
Status
OK
Log
x 0


Weka Experiment Environment
Setup
Run
Analyse
Experiment Configuration Mode:
Simple
Advanced
Open...
Save...
New
Results Destination
JDBC database
URL:
jdbc:idb=experiments.prp
Browse...
Experiment Type
Cross-validation
Number of folds:
10
Classification
Regression
Iteration Control
Number of repetitions:
10
Data sets first
Algorithms first
Datasets
Add new...
Delete selected
Use relative paths
/Users/eibe/Documents/datasets/UCI/iris.arff
/Users/eibe/Documents/datasets/UCI/vote.arff
/Users/eibe/Documents/datasets/UCI/glass.arff
Algorithms
Add new...
Delete selected
J48 -C 0.25 -M 2
NeuralNetwork -L 0.3 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a
NaiveBayes
Notes


Weka KnowledgeFlow Environment
Evaluation
Visualization
DataSinks
Filters
Classifiers
DataSources
Knowledge Flow Layout
iris
dataSet
CrossValidationFoldMaker
testSet
trainingSet
AttributeSelection
SMO
batchClassifier
DataVisualizer
AttributeSummarizer
ScatterPlotMatrix
ClassifierPerformanceEvaluator
text
TextViewer
Status
Done.
Log


Welcome to the WEKA SimpleCLI
> help
Command must be one of:
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break
kill
cls
exit
help <command>


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GUI
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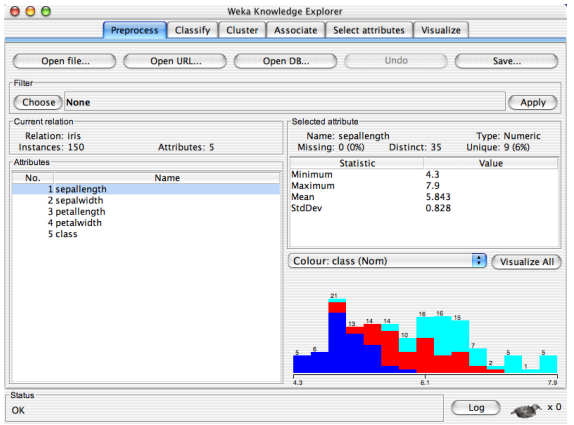
Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
None
Apply
Current relation
Relation: iris
Instances: 150
Attributes: 5
Selected attribute
Name: sepallength
Type: Numeric
Missing: 0 (0%)
Distinct: 35
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Attributes
No.
Name
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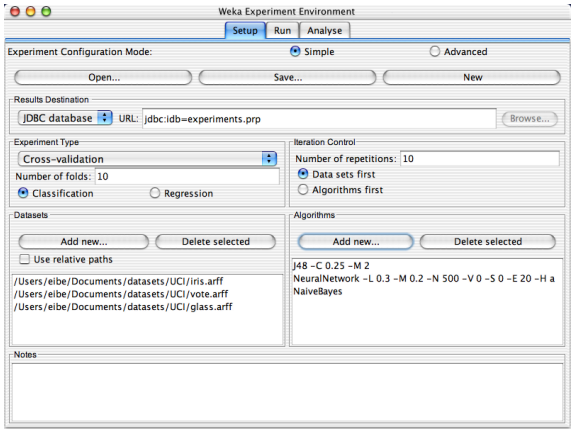
2 sepalwidth
3 petallength
4 petalwidth
5 class
Statistic
Value
Minimum 4.3
Maximum 7.9
Mean 5.843
StdDev 0.828
Colour: class (Nom)
Visualize All
Status
OK
Log
x 0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Analyse
Experiment Configuration Mode:
Simple
Advanced
Open...
Save...
New
Results Destination
JDBC database
URL:
jdbc:idb=experiments.prp
Browse...
Experiment Type
Cross-validation
Number of folds: 10
Classification
Regression
Iteration Control
Number of repetitions: 10
Data sets first
Algorithms first
Datasets
Add new...
Delete selected
Use relative paths
/Users/eibe/Documents/datasets/UCI/iris.arff
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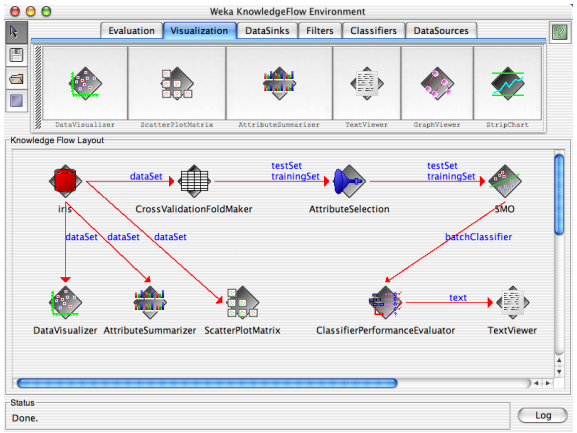
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ClassifierPerformanceEvaluator
TextViewer
dataSet
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trainingSet
batchClassifier
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Status
Done.
Log


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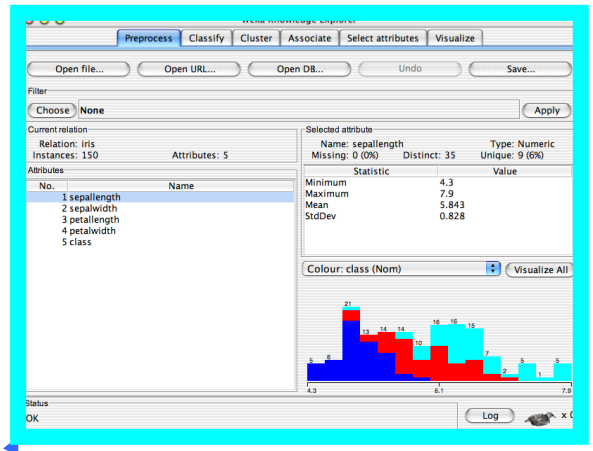
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
None
Apply
Current relation
Relation: iris
Instances: 150
Attributes: 5
Selected attribute
Name: sepallength
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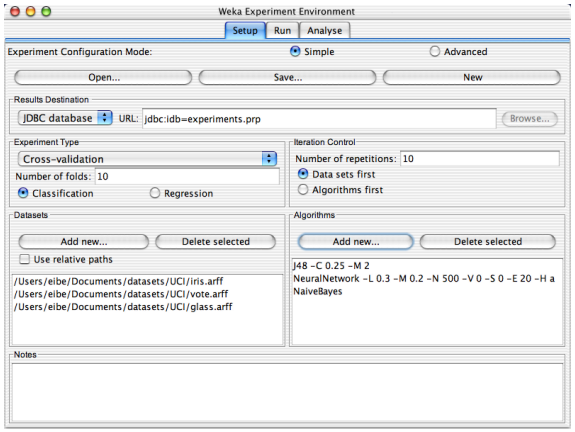
Unique: 9 (6%)
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Statistic
Value
Minimum 4.3
Maximum 7.9
Mean 5.843
StdDev 0.828
Colour: class (Nom)
Visualize All
Status
OK
Log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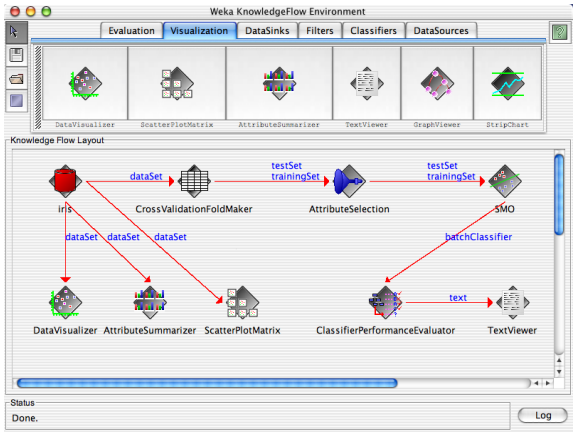
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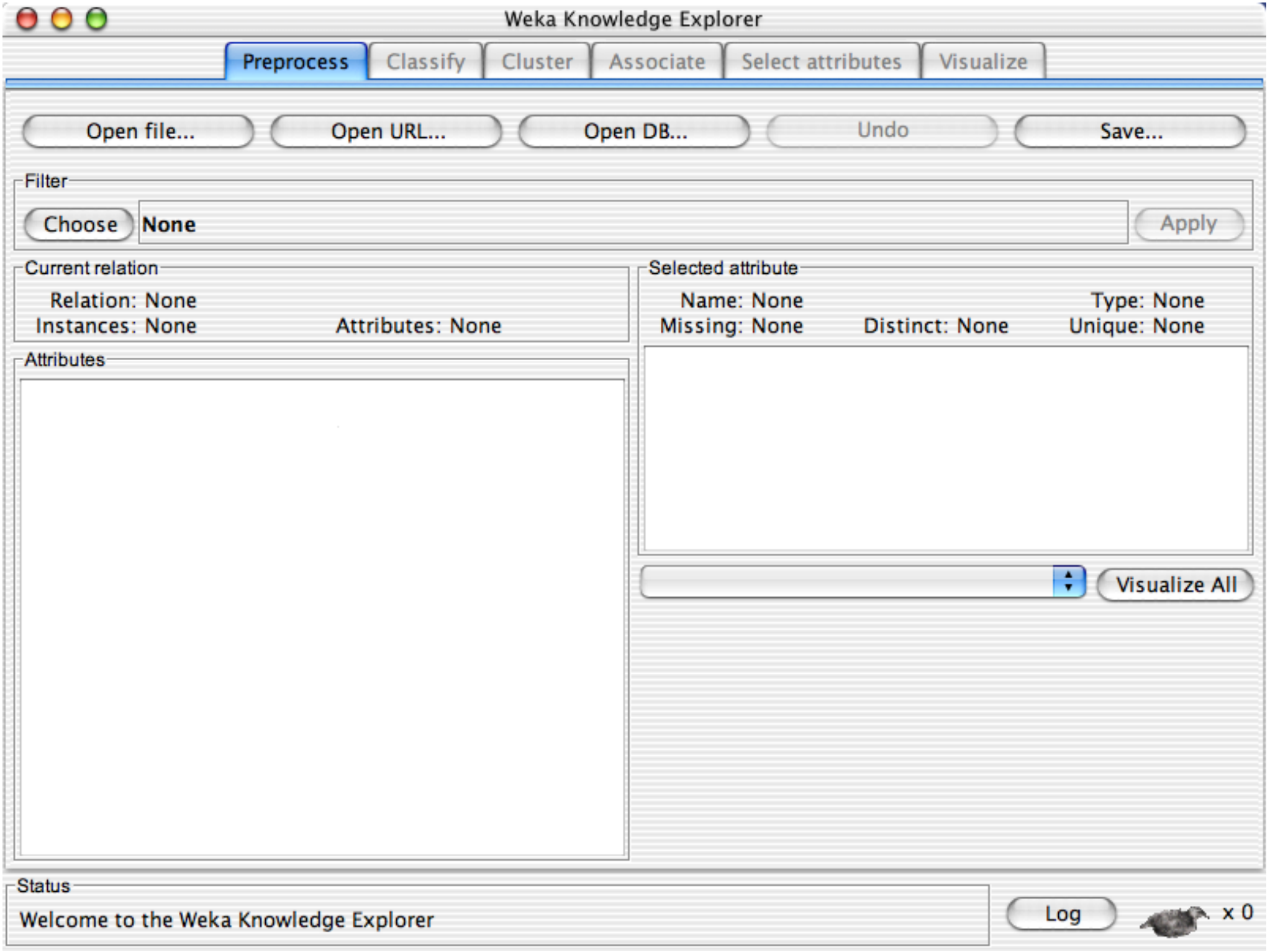
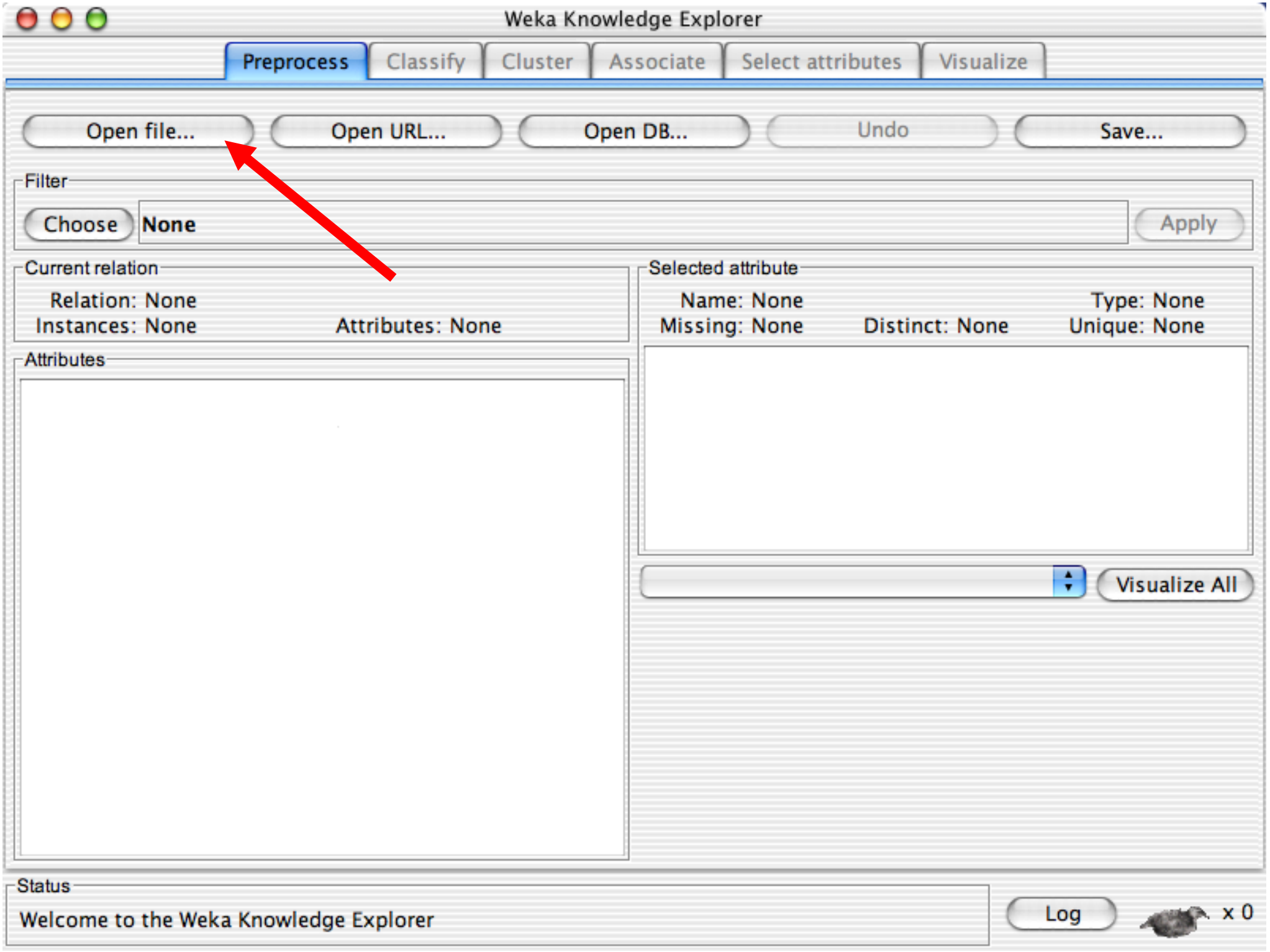
TextViewer
dataSet
testSet
trainingSet
batchClassifier
text
Status
Done.
Log

Explorer: pre-processing the data

- Data can be imported from a file in various formats: ARFF, CSV, C4.5, binary
- Data can also be read from a URL or from an SQL database (using JDBC)
- Pre-processing tools in WEKA are called “filters”
- WEKA contains filters for:
  - Discretization, normalization, resampling, attribute selection, transforming and combining attributes, …


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
None
Apply
Current relation
Relation: None
Instances: None
Attributes: None
Selected attribute
Name: None
Type: None
Missing: None
Distinct: None
Unique: None
Attributes
Visualize All
Status
Welcome to the Weka Knowledge Explorer
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
None
Apply
Current relation
Relation: None
Instances: None
Attributes: None
Selected attribute
Name: None
Type: None
Missing: None
Distinct: None
Unique: None
Attributes
Visualize All
Status
Welcome to the Weka Knowledge Explorer
Log
x 0

Weka Knowledge Explorer

Preprocess | Classify | Cluster | Associate | Select attributes | Visualize

Open file... | Open URL... | Open DB... | Undo | Save...

Filter

Choose **None** | Apply

Current relation

Relation: iris
Instances: 150 Attributes: 5

Attributes

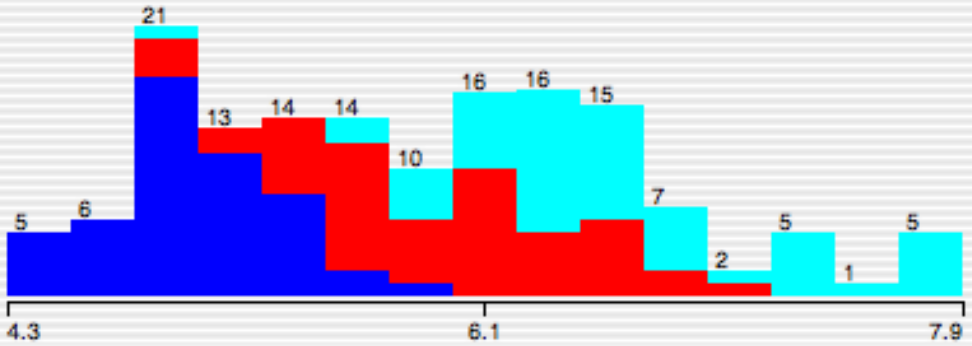
No.	Name
1	sepallength
2	sepalwidth
3	petallength
4	petalwidth
5	class

Selected attribute

Name: sepallength Type: Numeric
Missing: 0 (0%) Distinct: 35 Unique: 9 (6%)

Statistic	Value
Minimum	4.3
Maximum	7.9
Mean	5.843
StdDev	0.828

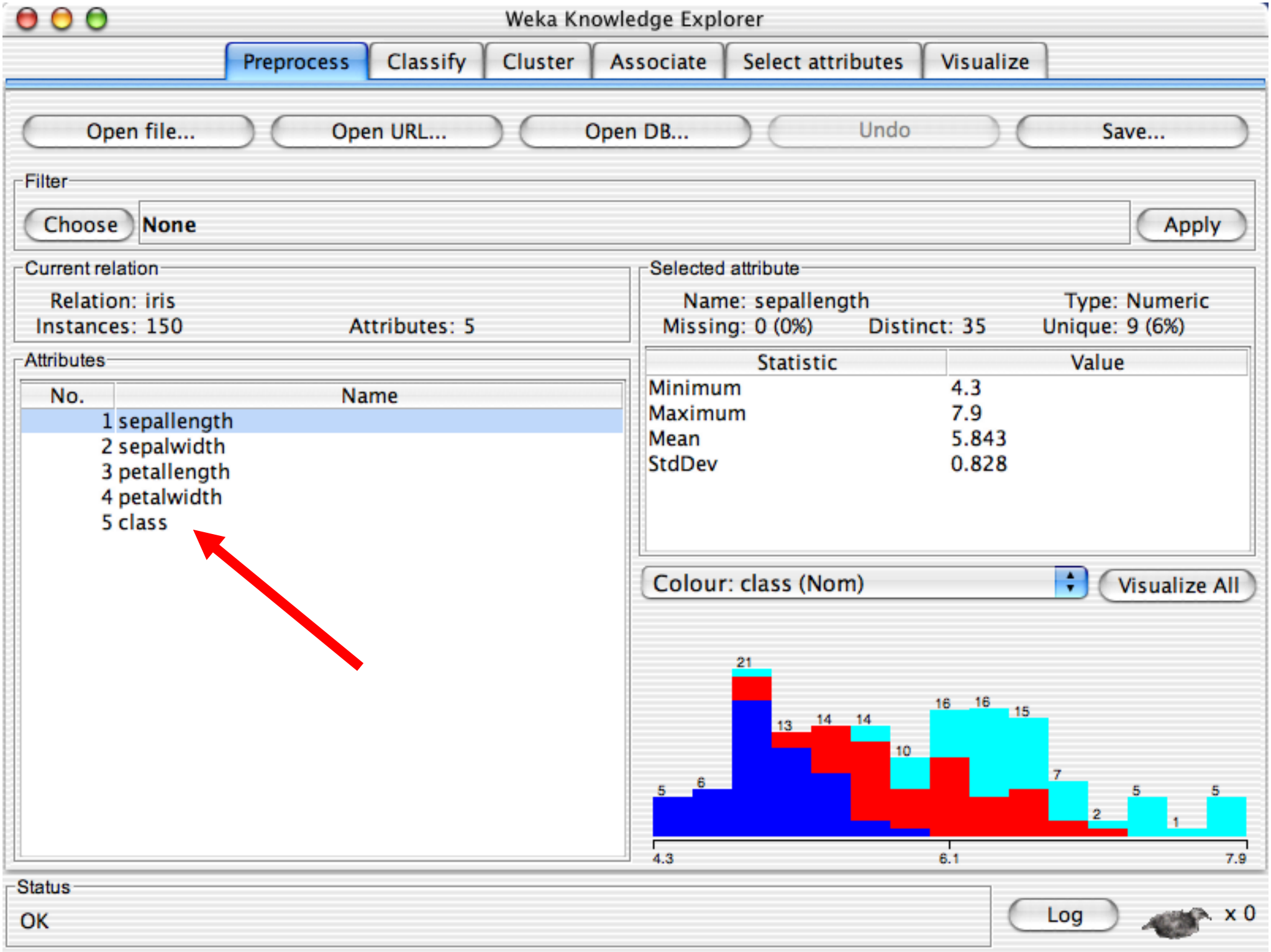
Colour: class (Nom) | Visualize All



Status

OK

Log x 0


Weka Knowledge Explorer
Preprocess
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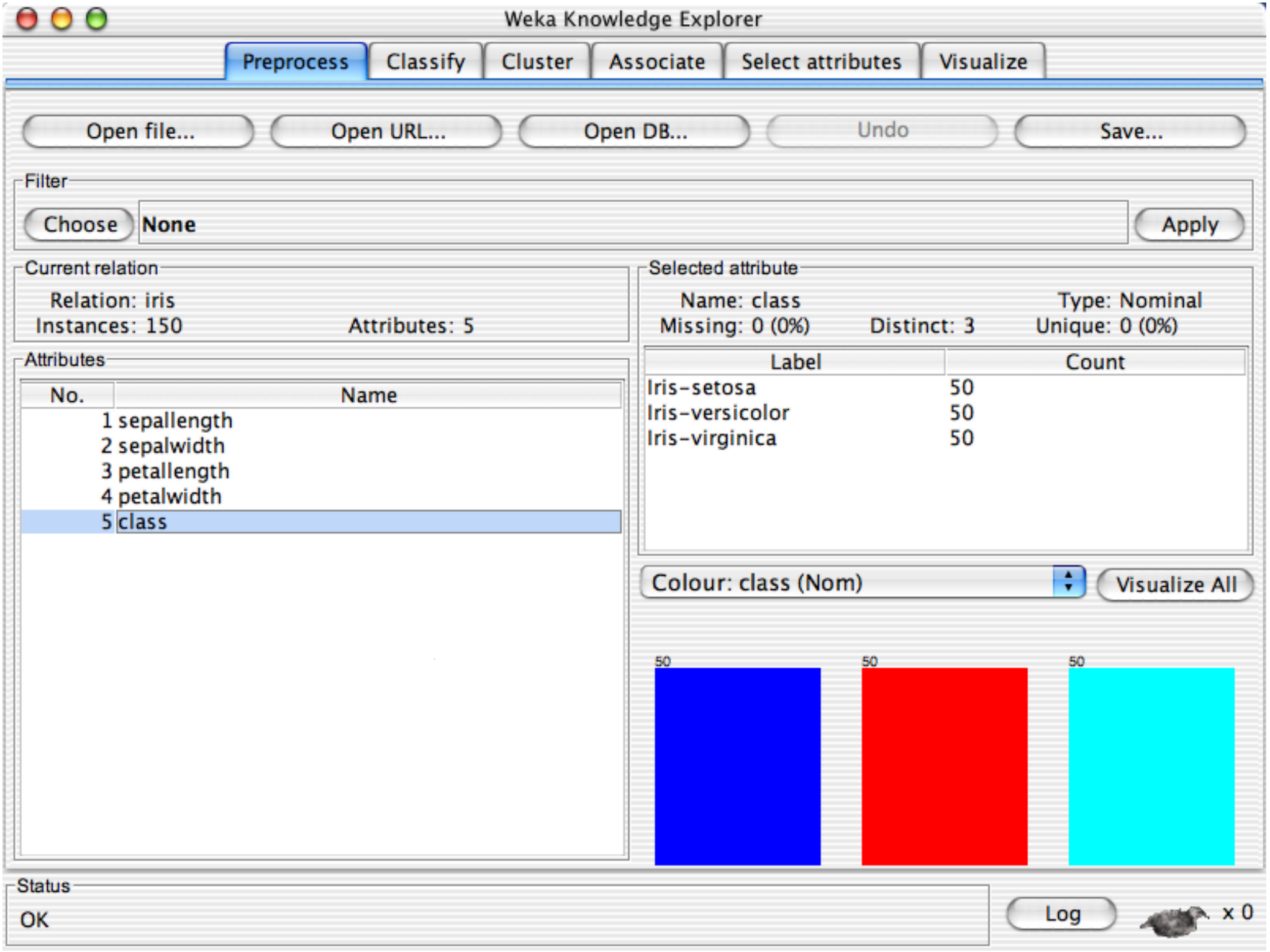
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
None
Apply
Current relation
Relation: iris
Instances: 150
Attributes: 5
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Selected attribute
Name: sepallength
Type: Numeric
Missing: 0 (0%)
Distinct: 35
Unique: 9 (6%)
Statistic
Value
Minimum
4.3
Maximum
7.9
Mean
5.843
StdDev
0.828
Colour: class (Nom)
Visualize All
21
5
6
13
14
14
10
16
16
15
7
2
5
1
5
4.3
6.1
7.9
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
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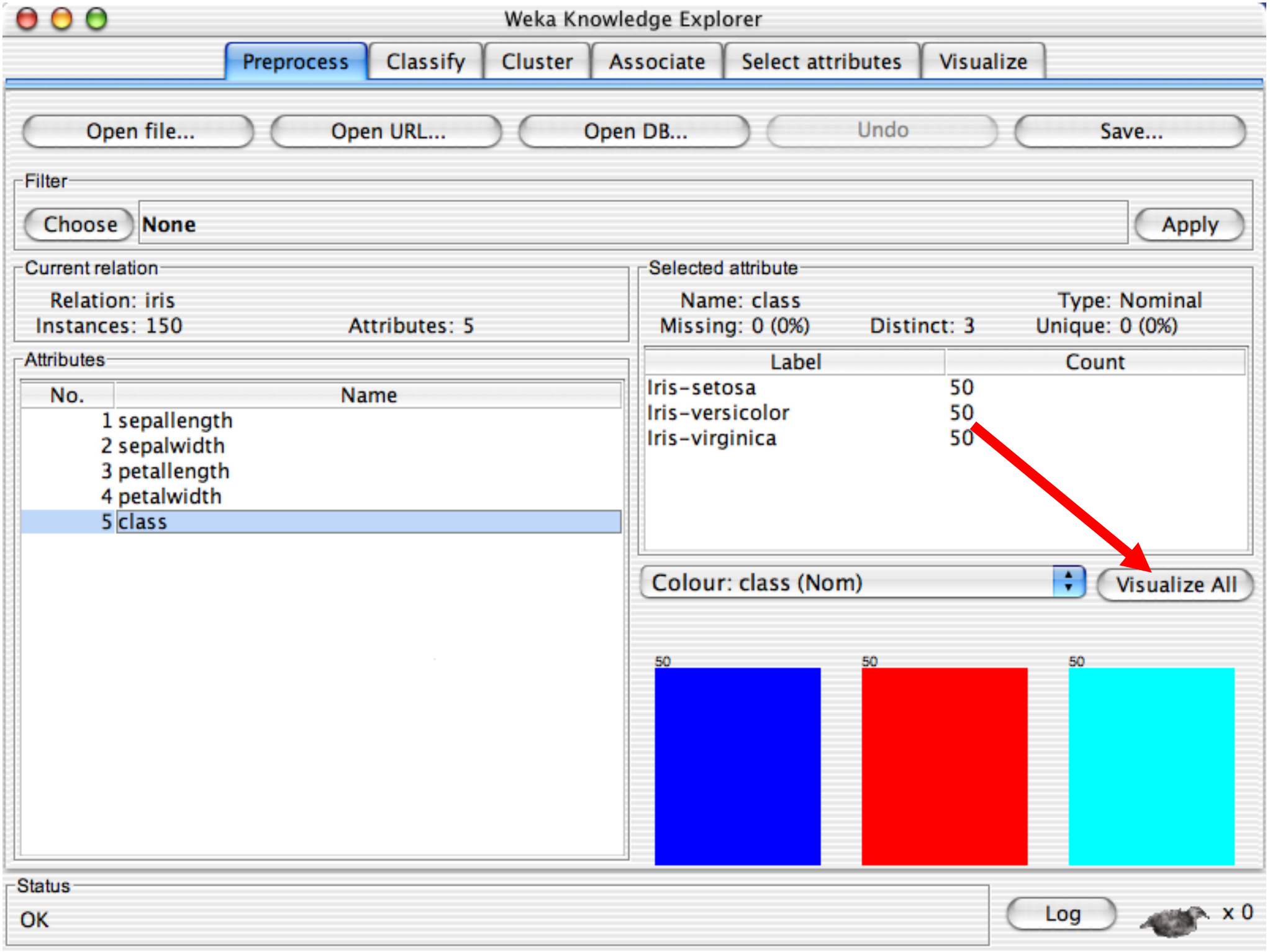
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
None
Apply
Current relation
Relation: iris
Instances: 150
Attributes: 5
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Selected attribute
Name: class
Type: Nominal
Missing: 0 (0%)
Distinct: 3
Unique: 0 (0%)
Label
Count
Iris-setosa 50
Iris-versicolor 50
Iris-virginica 50
Colour: class (Nom)
Visualize All
50
50
50
Status
OK
Log
x 0


Weka Knowledge Explorer
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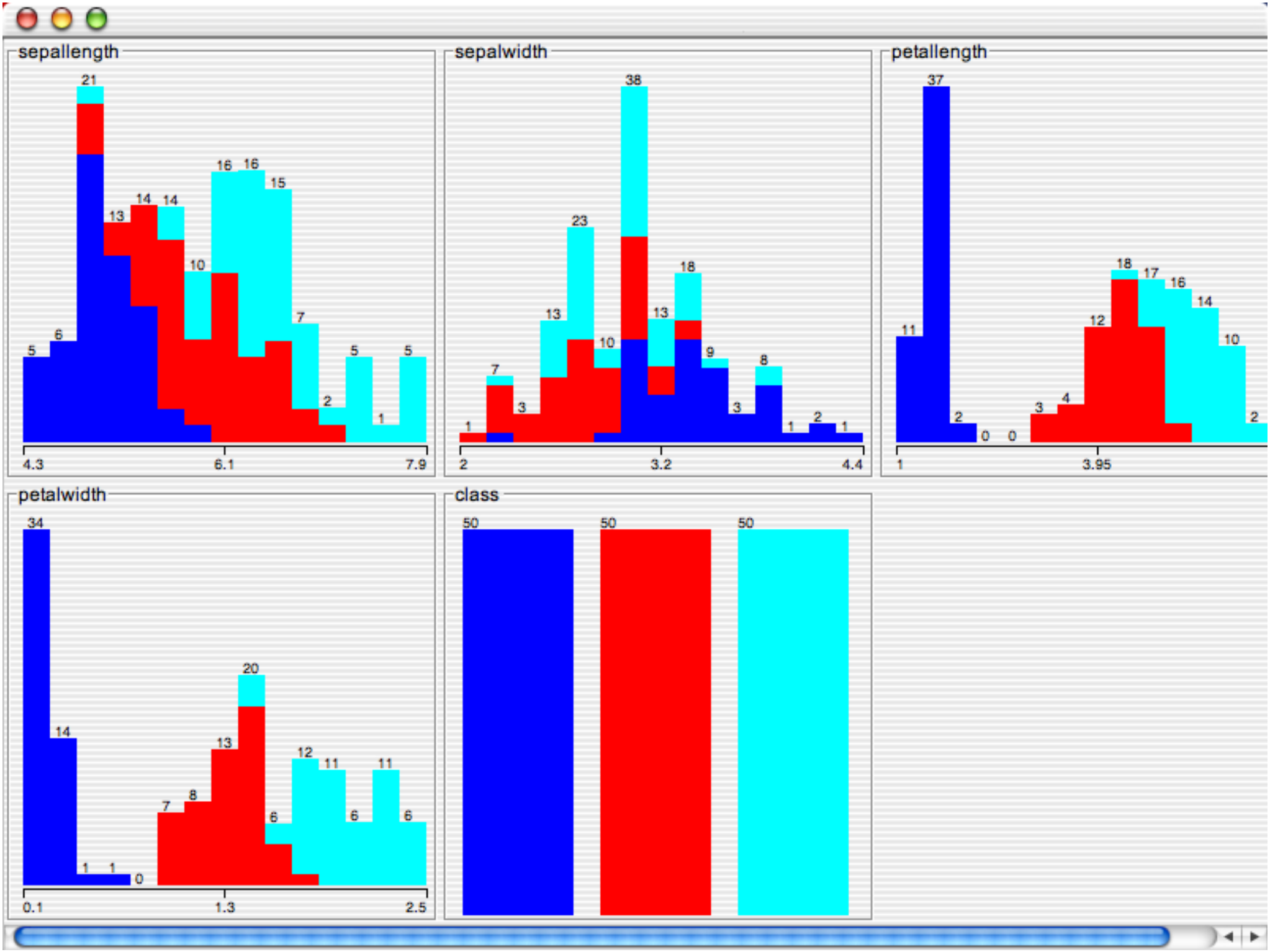
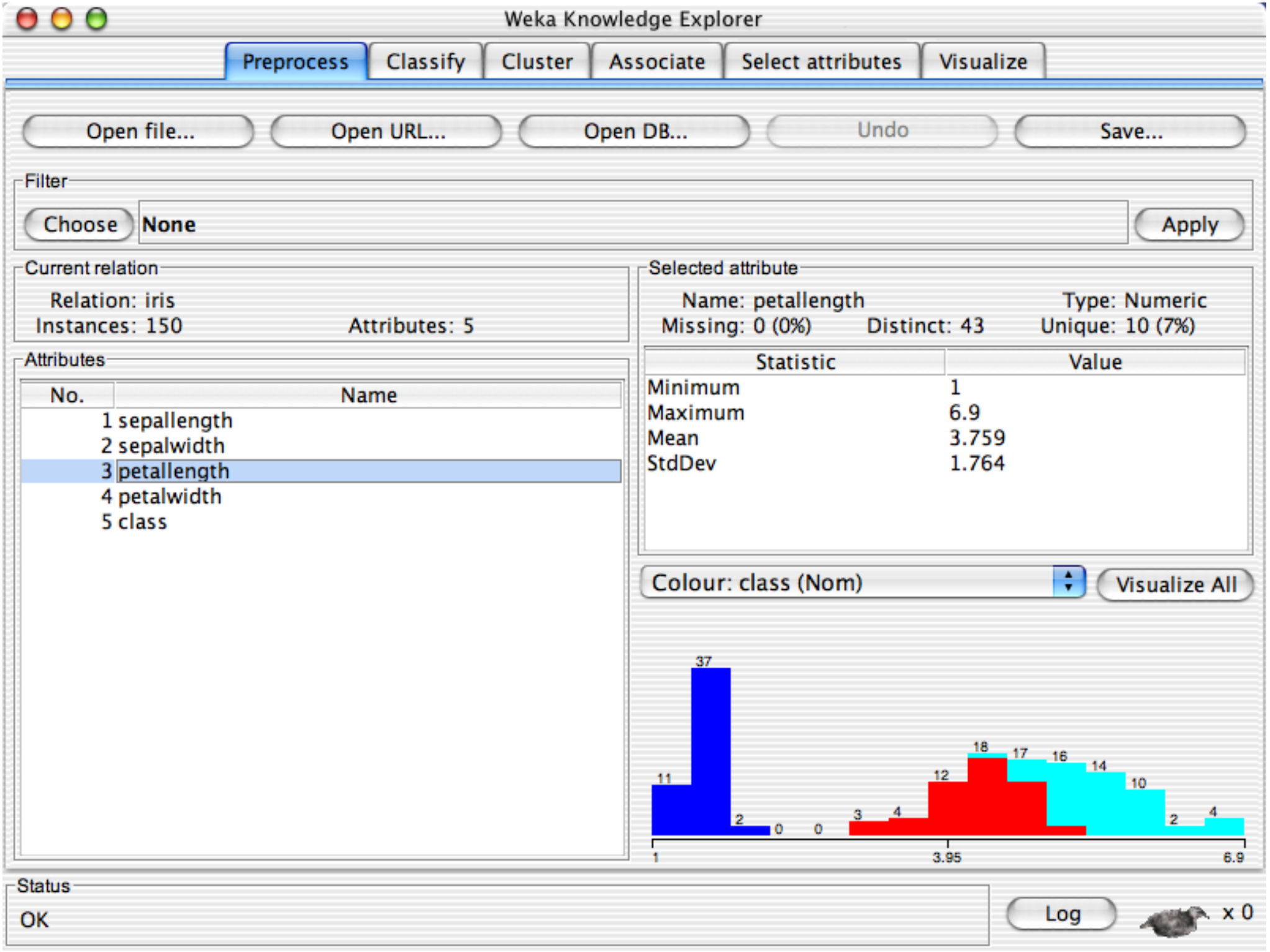
Relation: iris
Instances: 150
Attributes: 5
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Selected attribute
Name: class
Type: Nominal
Missing: 0 (0%)
Distinct: 3
Unique: 0 (0%)
Label
Count
Iris-setosa
50
Iris-versicolor
50
Iris-virginica
50
Colour: class (Nom)
Visualize All
50
50
50
Status
OK
Log
x 0


sepallength
21
16 16
15
14 14
13
10
7
6
5
5 5
2
1
4.3
6.1
7.9
sepalwidth
38
23
18
13 13
10
9
8
7
3
3
1 2 1
2
3.2
4.4
petallength
37
18
17
16
14
12
11
10
3 4
2
2
0 0
1
3.95
petalwidth
34
20
14
13
12
11 11
8
7
6 6 6
1 1
0
0.1
1.3
2.5
class
50
50
50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None
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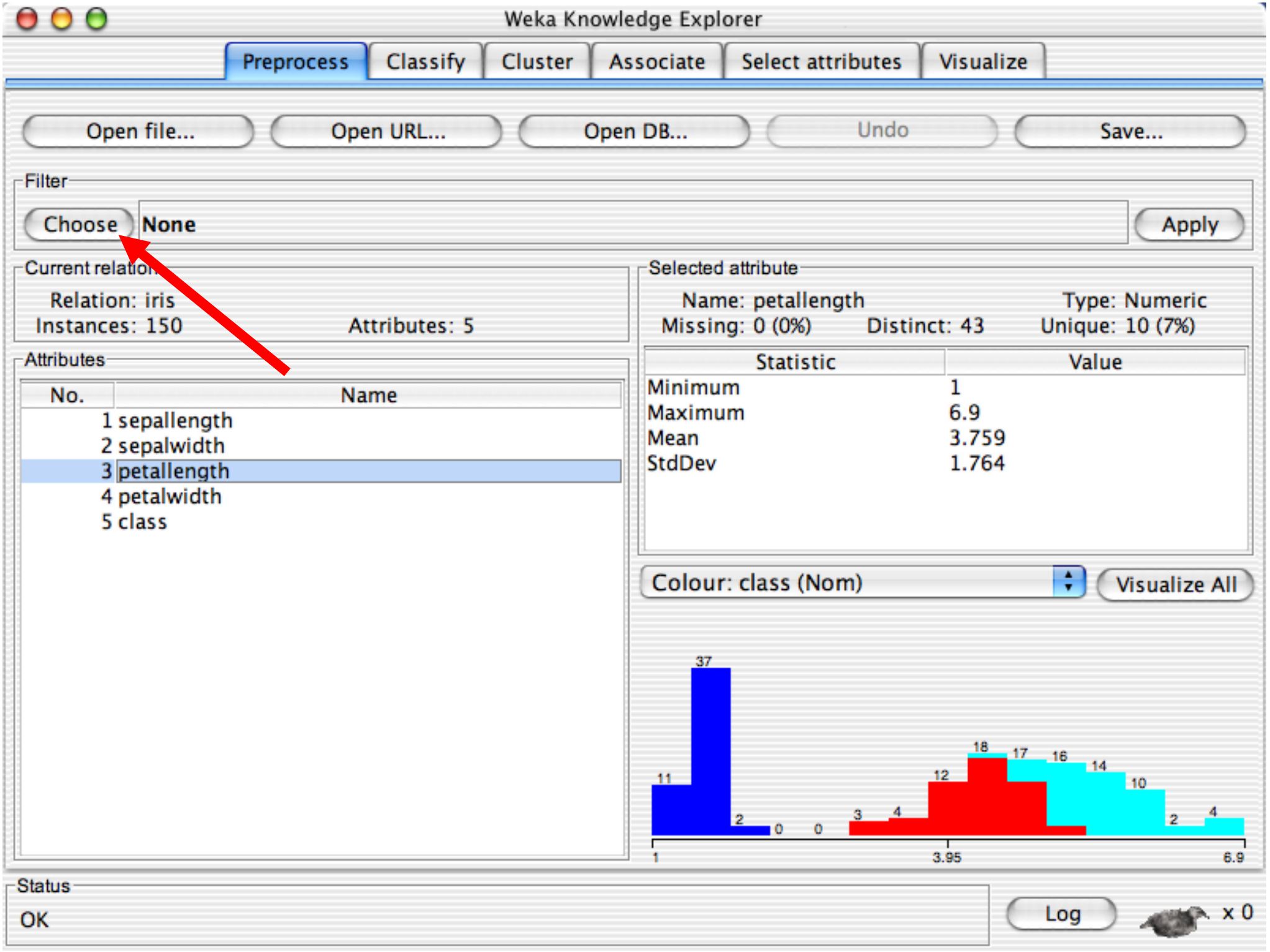
Current relation
Relation: iris
Instances: 150
Attributes: 5
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Selected attribute
Name: petallength
Type: Numeric
Missing: 0 (0%)
Distinct: 43
Unique: 10 (7%)
Statistic
Value
Minimum
1
Maximum
6.9
Mean
3.759
StdDev
1.764
Colour: class (Nom)
Visualize All
37
11
2
0
0
3
4
12
18
17
16
14
10
2
4
1
3.95
6.9
Status
OK
Log
x 0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2
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0
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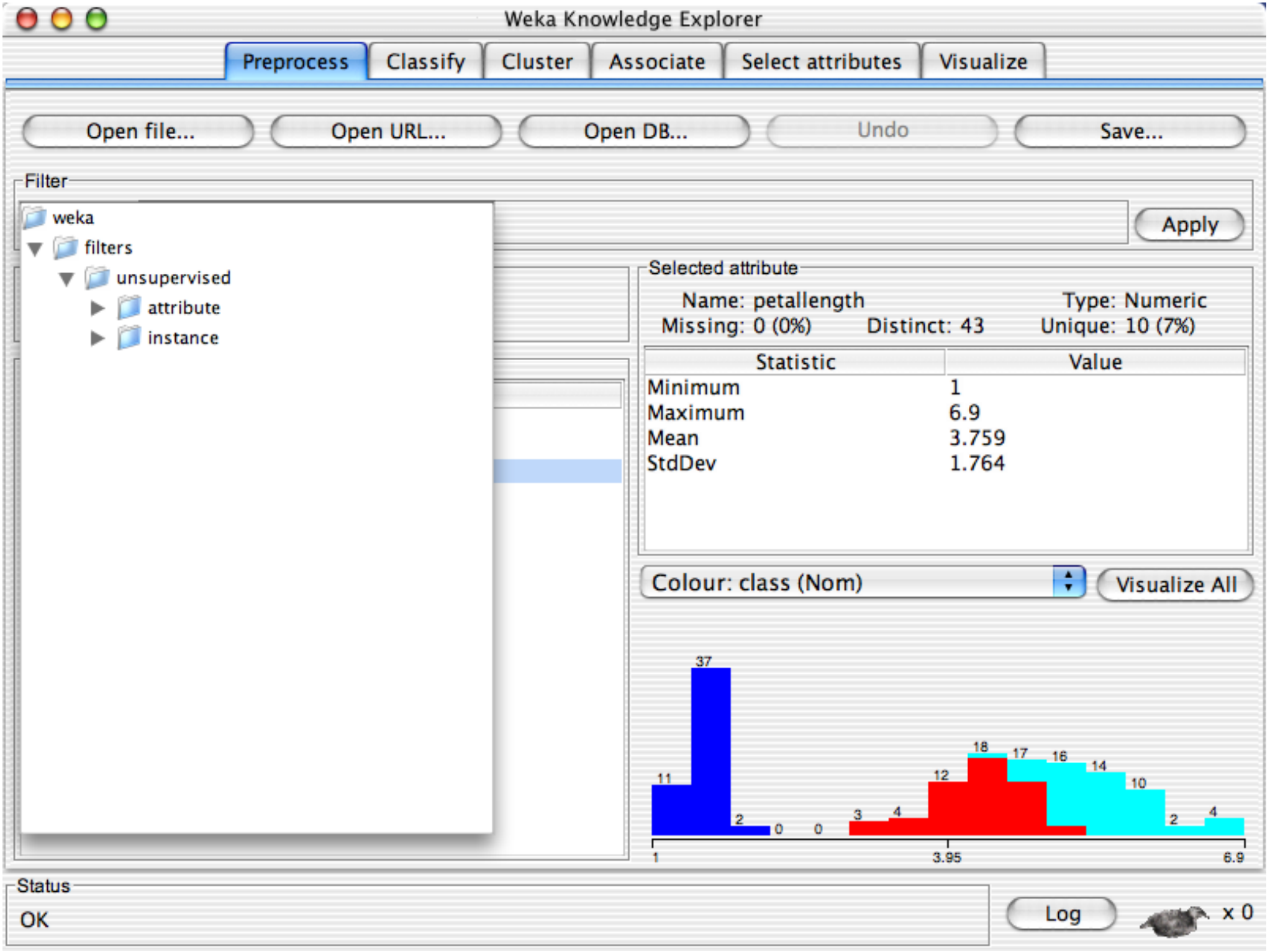
Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
weka
filters
unsupervised
attribute
instance
Apply
Selected attribute
Name: petallength
Type: Numeric
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Unique: 10 (7%)
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11
2
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0
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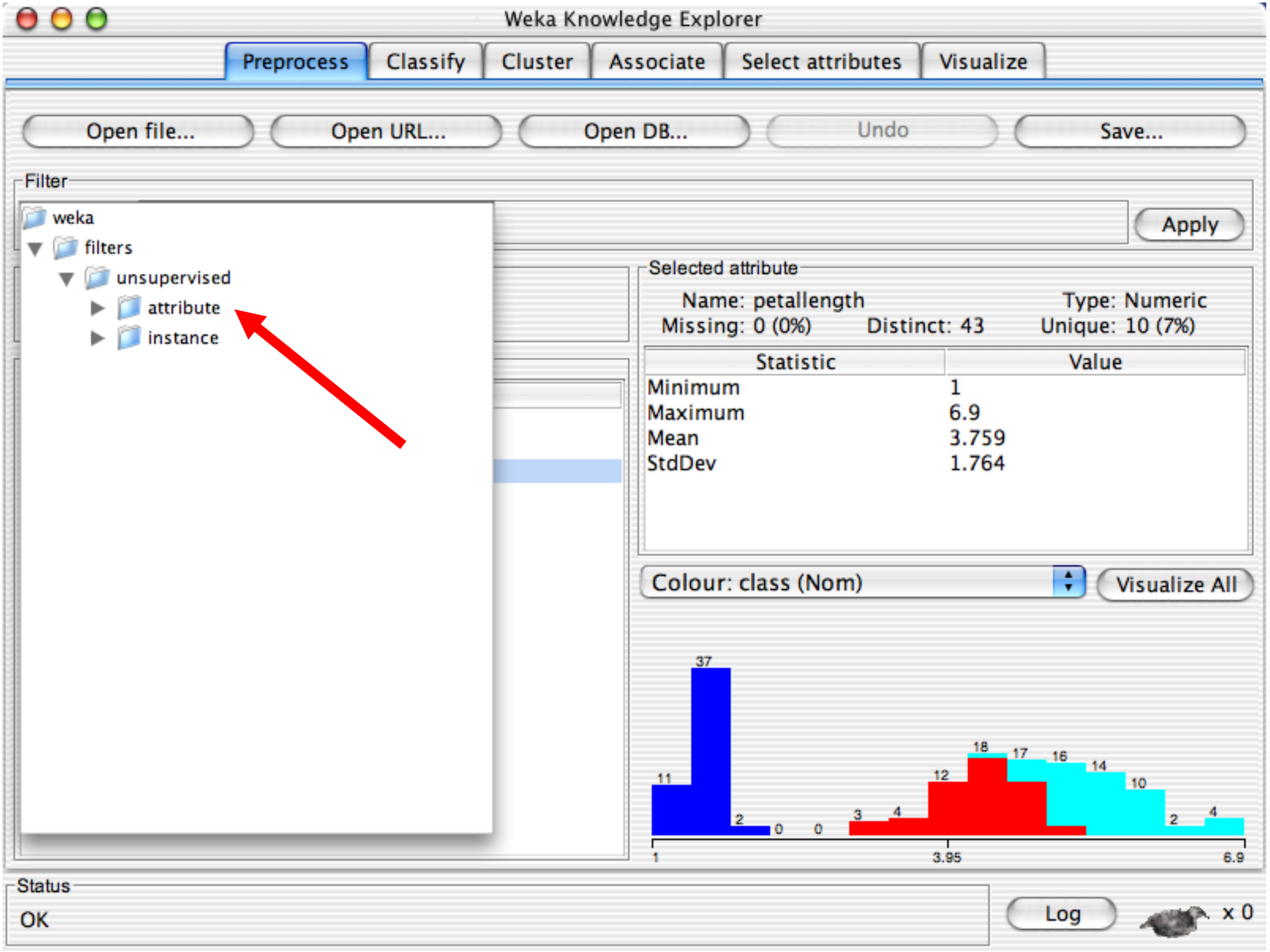
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weka
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attribute
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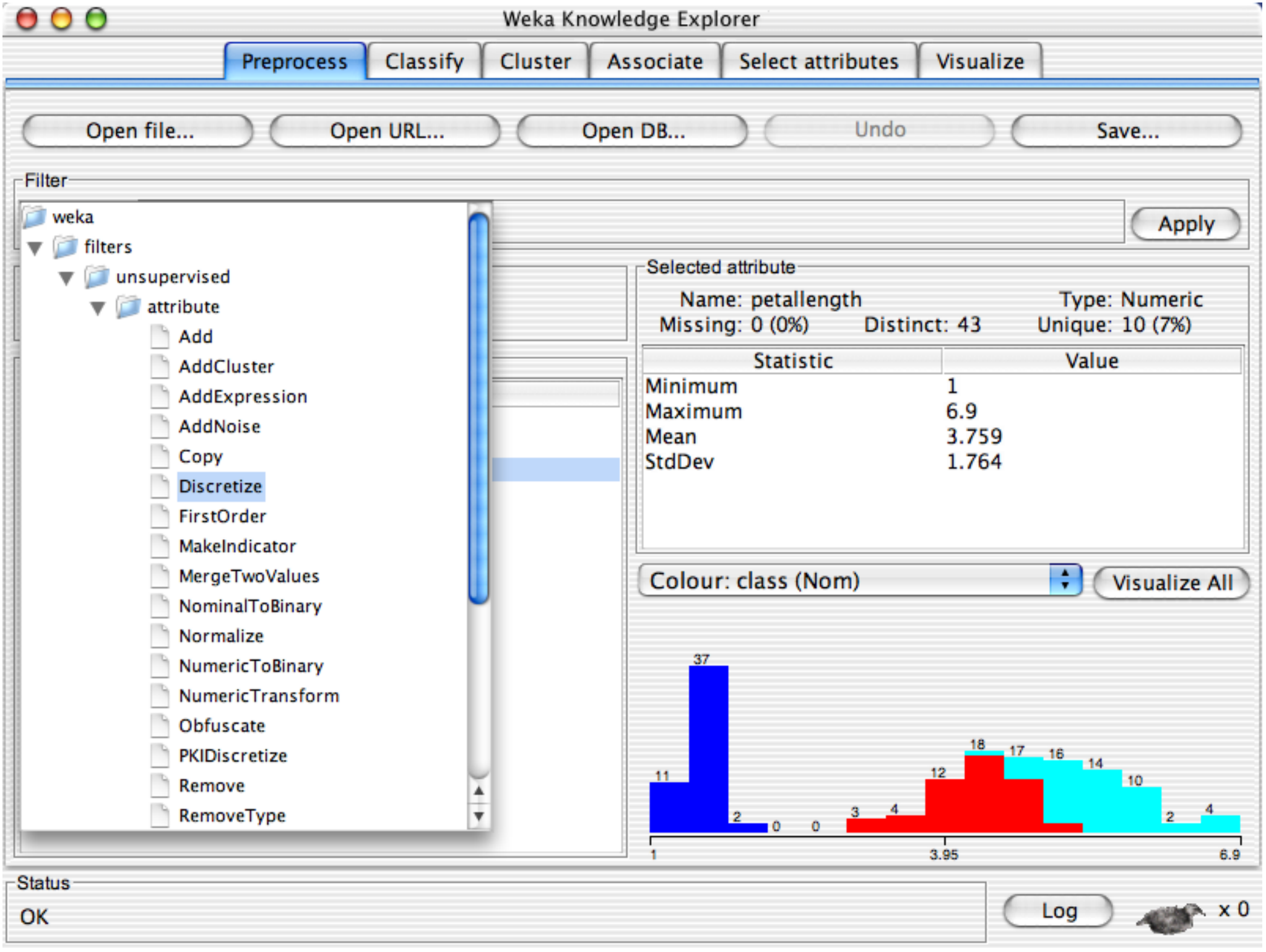
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
weka
filters
unsupervised
attribute
Add
AddCluster
AddExpression
AddNoise
Copy
Discretize
FirstOrder
MakeIndicator
MergeTwoValues
NominalToBinary
Normalize
NumericToBinary
NumericTransform
Obfuscate
PKIDiscretize
Remove
RemoveType
Apply
Selected attribute
Name: petallength
Type: Numeric
Missing: 0 (0%)
Distinct: 43
Unique: 10 (7%)
Statistic
Value
Minimum
1
Maximum
6.9
Mean
3.759
StdDev
1.764
Colour: class (Nom)
Visualize All
37
11
2
0
0
3
4
12
18
17
16
14
10
2
4
1
3.95
6.9
Status
OK
Log
x 0

Weka Knowledge Explorer

Preprocess | Classify | Cluster | Associate | Select attributes | Visualize

Open file... | Open URL... | Open DB... | Undo | Save...

Filter

Choose **Discretize** -B 10 -R first-last | Apply

Current relation

Relation: iris
Instances: 150 Attributes: 5

Attributes

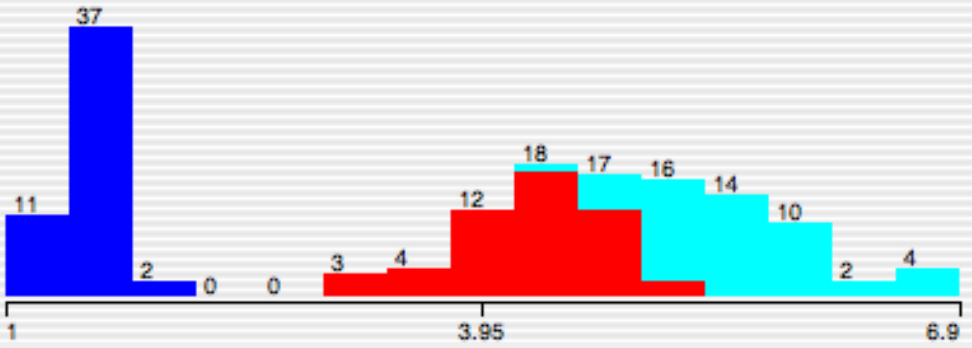
No.	Name
1	sepallength
2	sepalwidth
3	petallength
4	petalwidth
5	class

Selected attribute

Name: petallength Type: Numeric
Missing: 0 (0%) Distinct: 43 Unique: 10 (7%)

Statistic	Value
Minimum	1
Maximum	6.9
Mean	3.759
StdDev	1.764

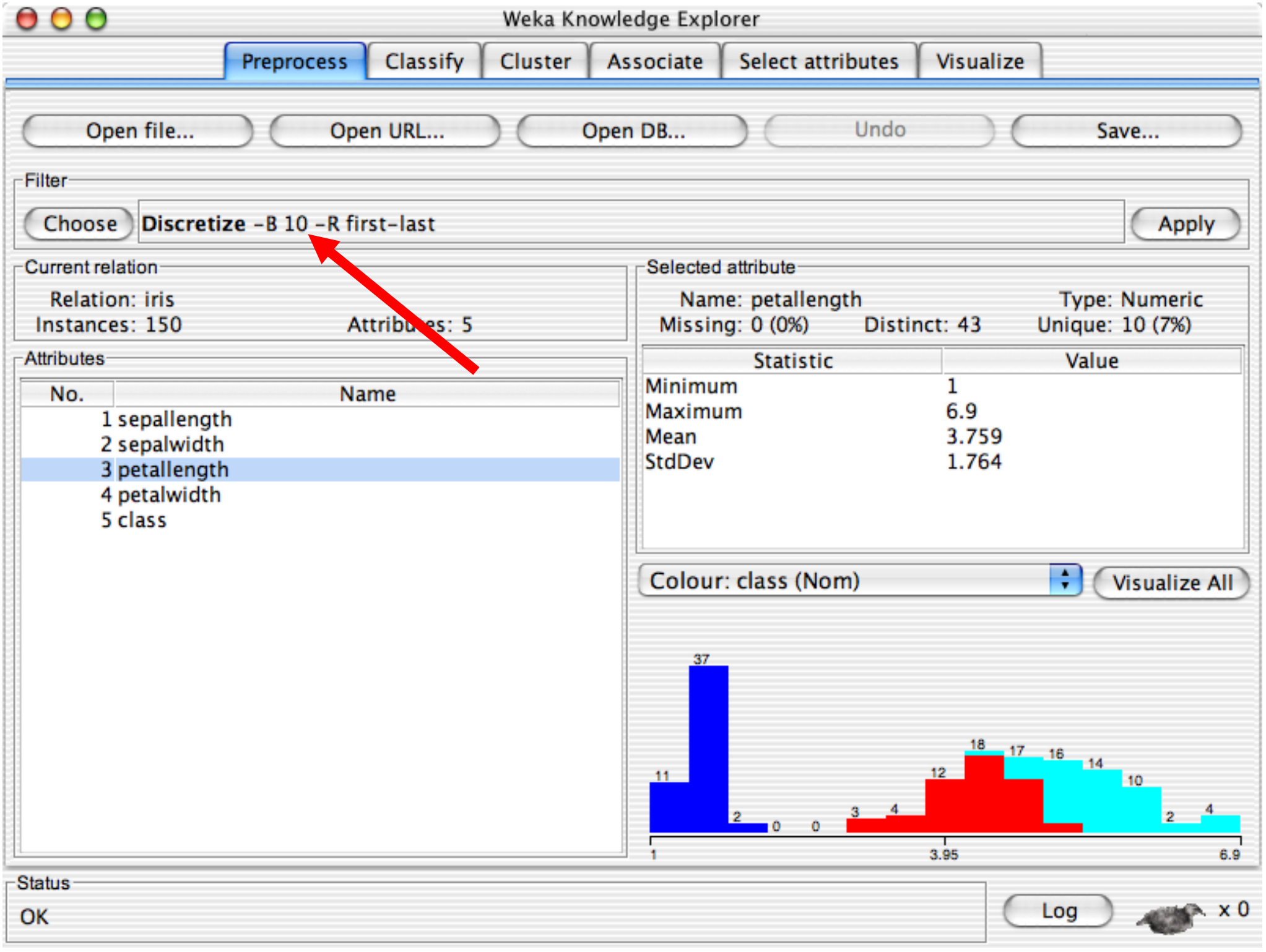
Colour: class (Nom) | Visualize All

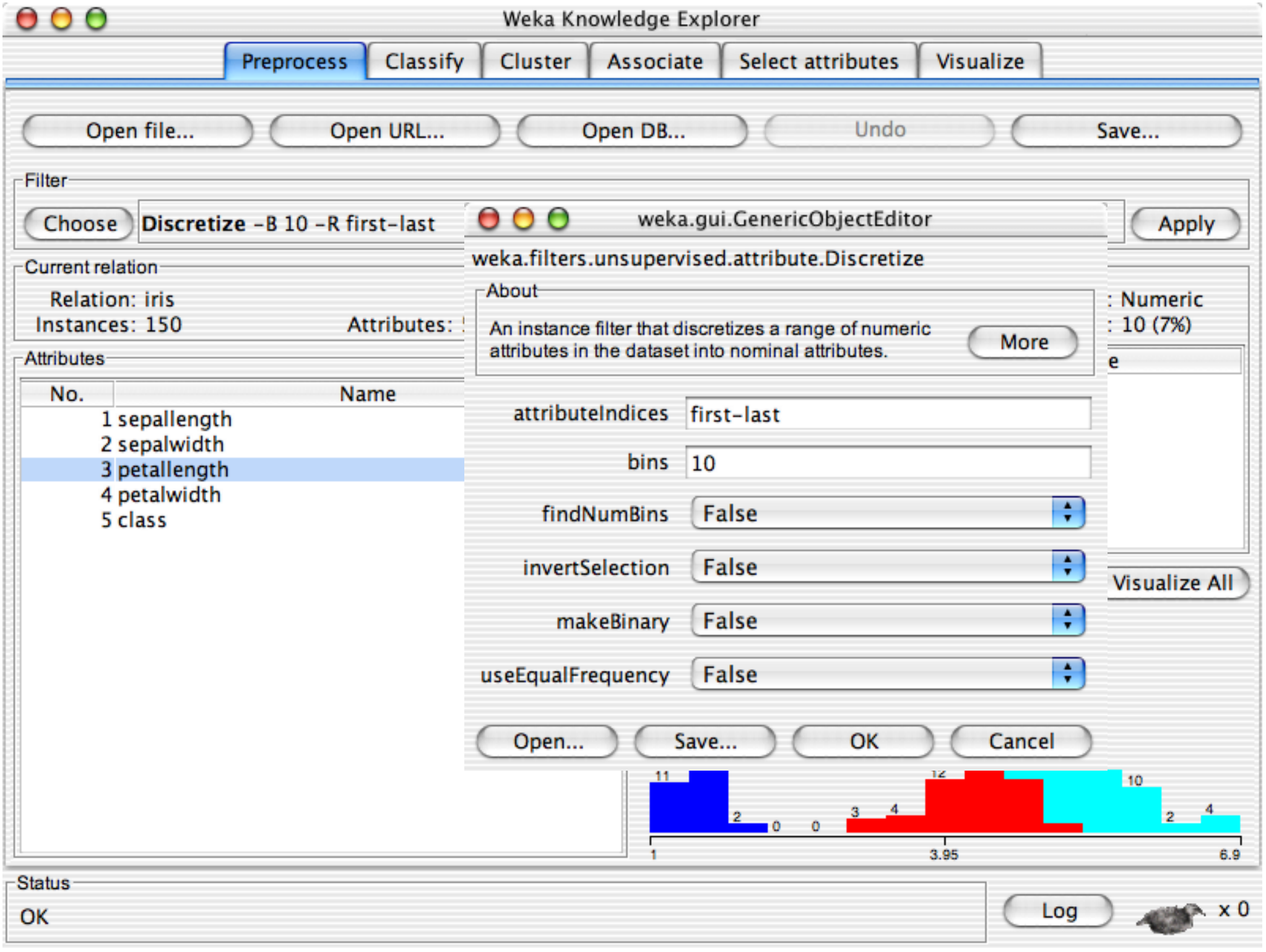


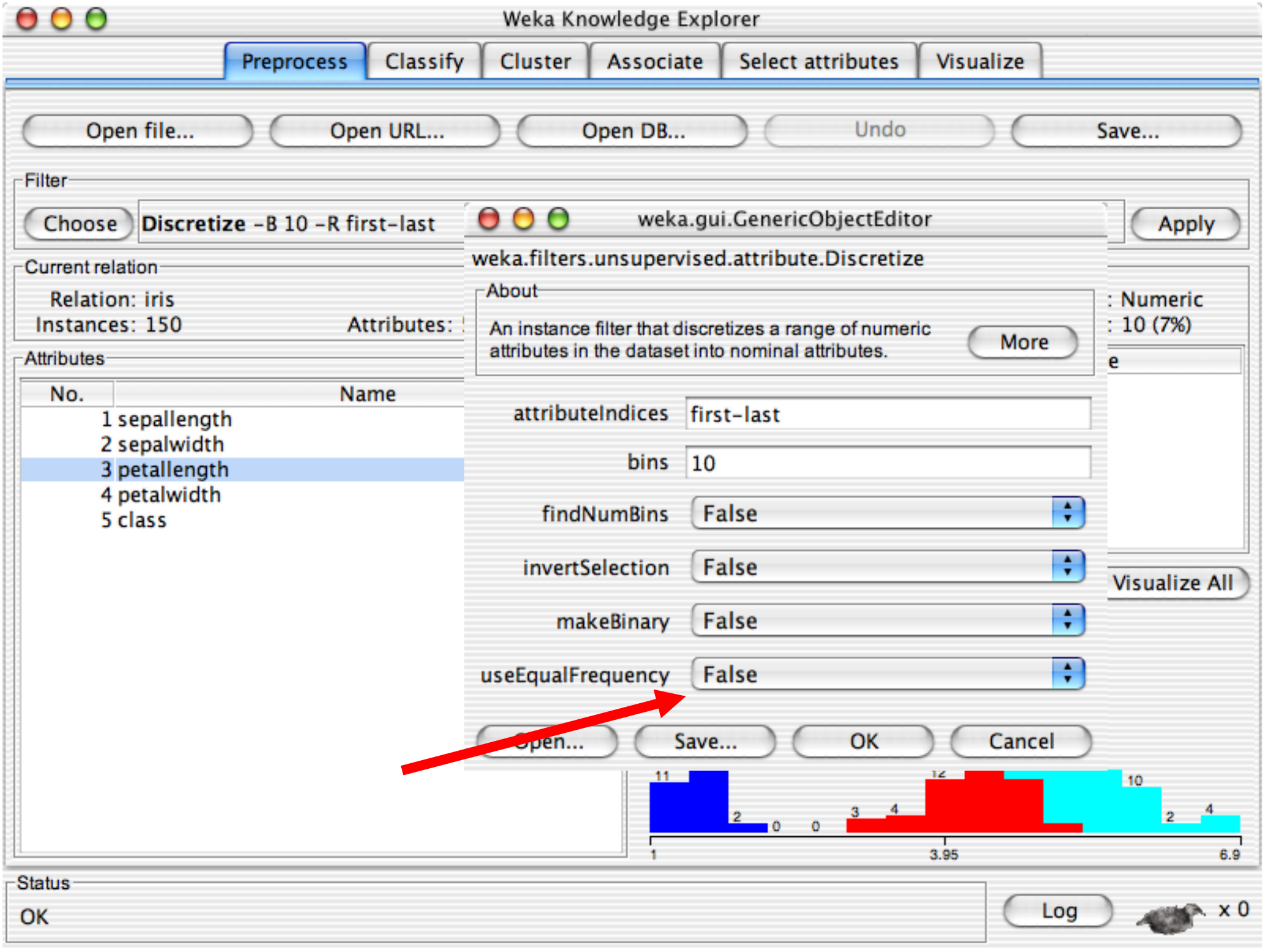
Status

OK

Log x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
Discretize -B 10 -R first-last
Apply
Current relation
Relation: iris
Instances: 150
Attributes: 5
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Selected attribute
Name: petallength
Type: Numeric
Missing: 0 (0%)
Distinct: 43
Unique: 10 (7%)
Statistic
Value
Minimum
1
Maximum
6.9
Mean
3.759
StdDev
1.764
Colour: class (Nom)
Visualize All
37
11
2
0
0
3
4
12
18
17
16
14
10
2
4
1
3.95
6.9
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
Discretize -B 10 -R first-last
Apply
Current relation
Relation: iris
Instances: 150
Attributes:
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
weka.gui.GenericObjectEditor
weka.filters.unsupervised.attribute.Discretize
About
An instance filter that discretizes a range of numeric attributes in the dataset into nominal attributes.
More
attributeIndices
first-last
bins
10
findNumBins
False
invertSelection
False
makeBinary
False
useEqualFrequency
False
Open...
Save...
OK
Cancel
: Numeric
: 10 (7%)
e
Visualize All
11
2
0
0
3
4
12
10
2
4
1
3.95
6.9
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
Discretize -B 10 -R first-last
Apply
Current relation
Relation: iris
Instances: 150
Attributes:
Attributes
No.
Name
1 sepallength
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3 petallength
4 petalwidth
5 class
weka.gui.GenericObjectEditor
weka.filters.unsupervised.attribute.Discretize
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An instance filter that discretizes a range of numeric attributes in the dataset into nominal attributes.
More
attributeIndices
first-last
bins
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findNumBins
False
invertSelection
False
makeBinary
False
useEqualFrequency
False
Open...
Save...
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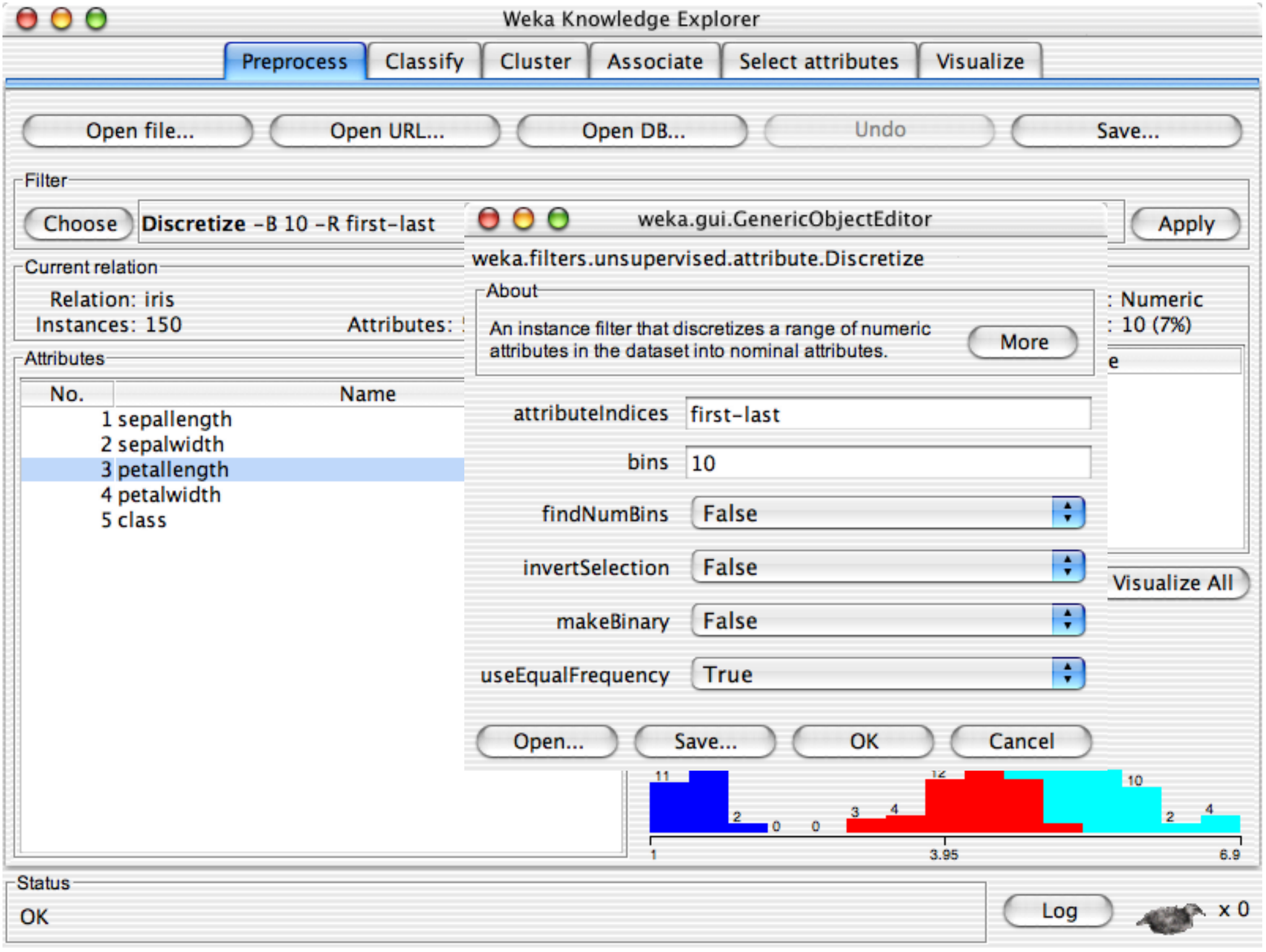
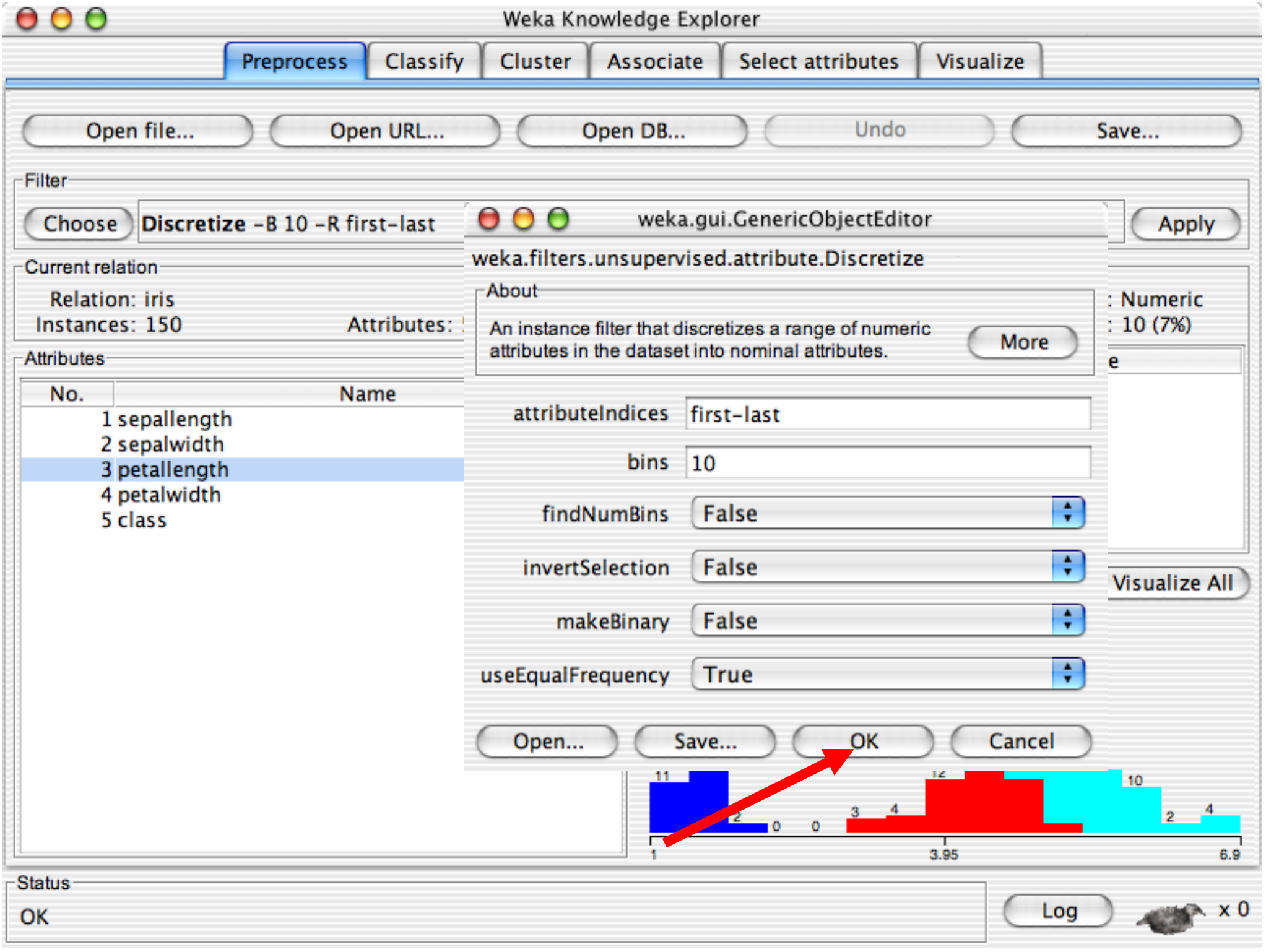
Cancel
: Numeric
: 10 (7%)
Visualize All
11
2
0
0
3
4
12
10
2
4
1
3.95
6.9
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
Discretize -B 10 -R first-last
Apply
Current relation
Relation: iris
Instances: 150
Attributes:
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
weka.gui.GenericObjectEditor
weka.filters.unsupervised.attribute.Discretize
About
An instance filter that discretizes a range of numeric attributes in the dataset into nominal attributes.
More
attributeIndices
first-last
bins
10
findNumBins
False
invertSelection
False
makeBinary
False
useEqualFrequency
True
Open...
Save...
OK
Cancel
: Numeric
: 10 (7%)
e
Visualize All
11
2
0
0
3
4
12
10
2
4
1
3.95
6.9
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
Discretize -B 10 -R first-last
Apply
Current relation
Relation: iris
Instances: 150
Attributes:
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
weka.gui.GenericObjectEditor
weka.filters.unsupervised.attribute.Discretize
About
An instance filter that discretizes a range of numeric attributes in the dataset into nominal attributes.
More
attributeIndices
first-last
bins
10
findNumBins
False
invertSelection
False
makeBinary
False
useEqualFrequency
True
Open...
Save...
OK
Cancel
: Numeric
: 10 (7%)
e
Visualize All
11
2
0
0
3
4
12
2
10
4
1
3.95
6.9
Status
OK
Log
x 0

Weka Knowledge Explorer

Preprocess | Classify | Cluster | Associate | Select attributes | Visualize

Open file... | Open URL... | Open DB... | Undo | Save...

Filter

Choose **Discretize** -F -B 10 -R first-last | Apply

Current relation

Relation: iris
Instances: 150 Attributes: 5

Attributes

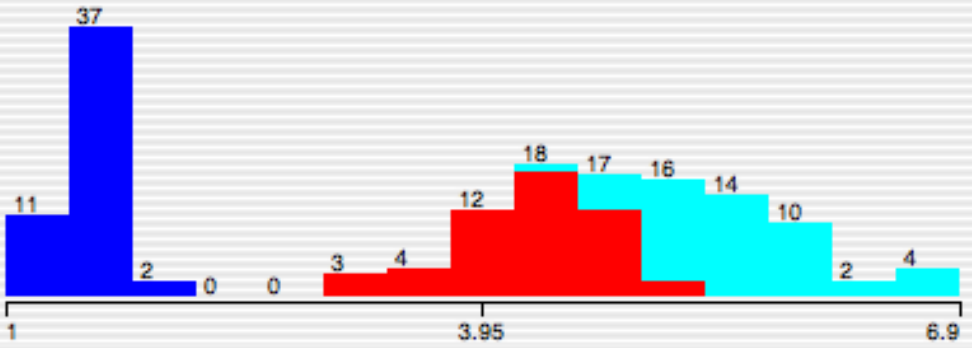
No.	Name
1	sepallength
2	sepalwidth
3	petallength
4	petalwidth
5	class

Selected attribute

Name: petallength Type: Numeric
Missing: 0 (0%) Distinct: 43 Unique: 10 (7%)

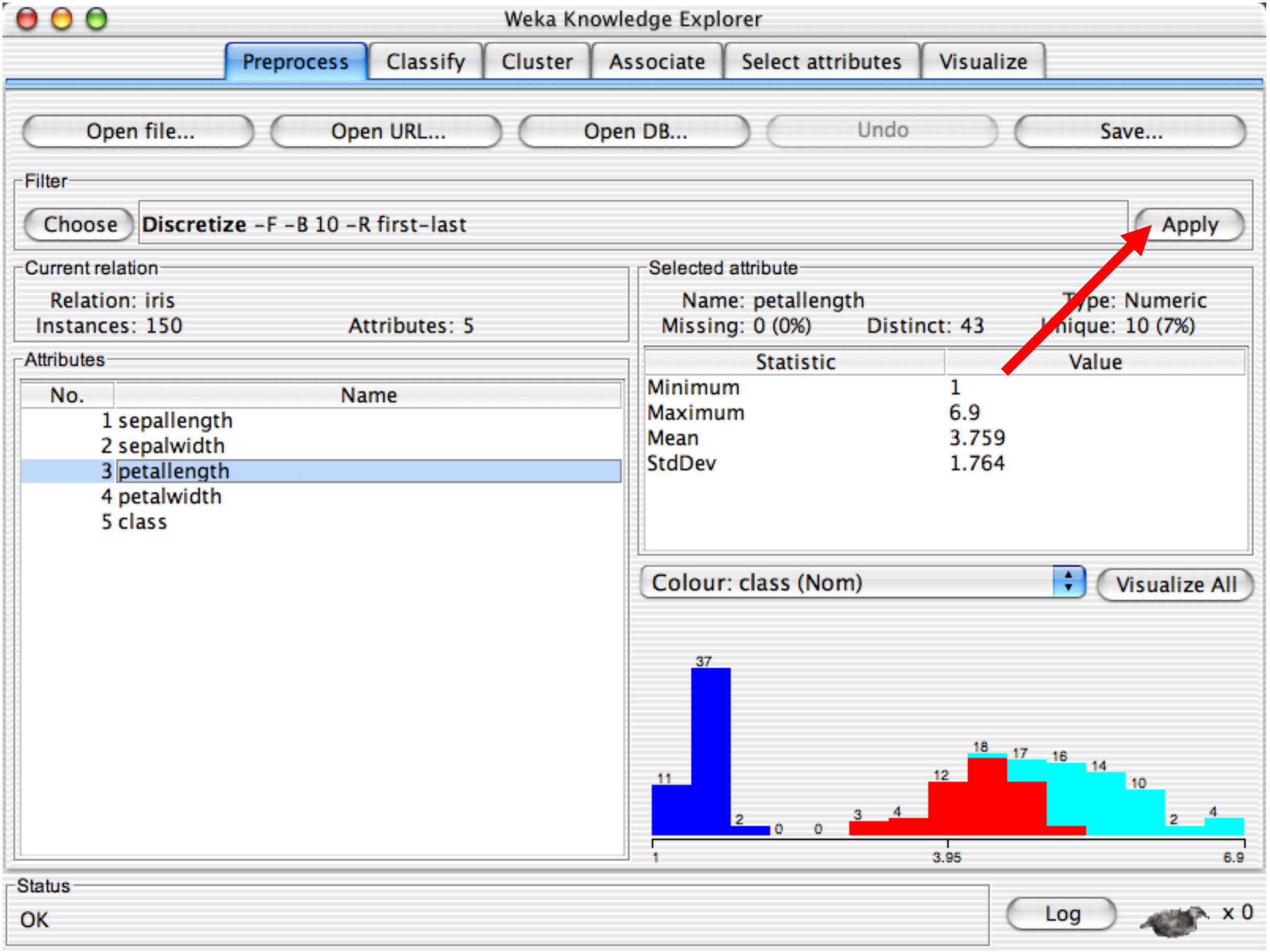
Statistic	Value
Minimum	1
Maximum	6.9
Mean	3.759
StdDev	1.764

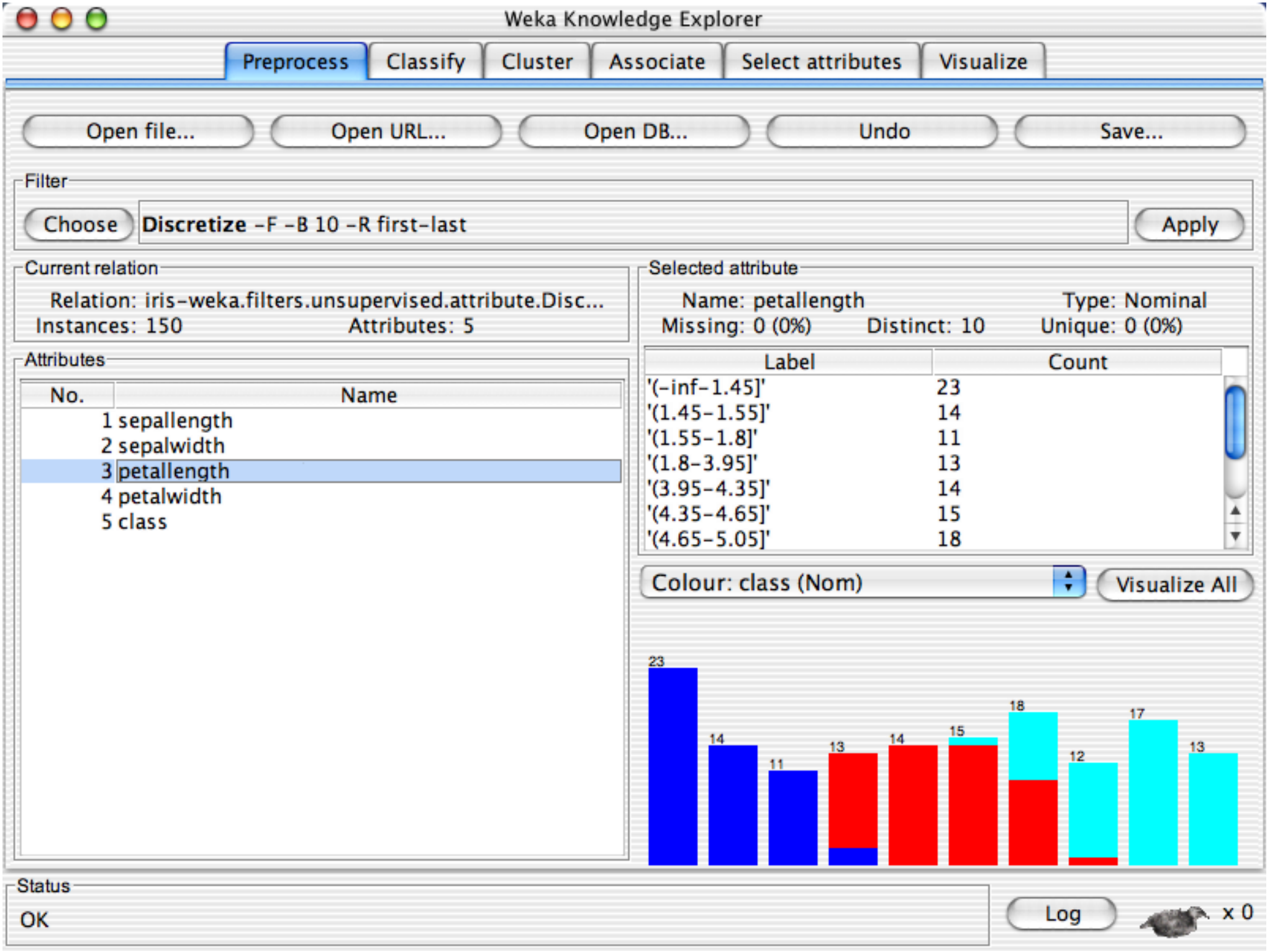
Colour: class (Nom) | Visualize All



Status

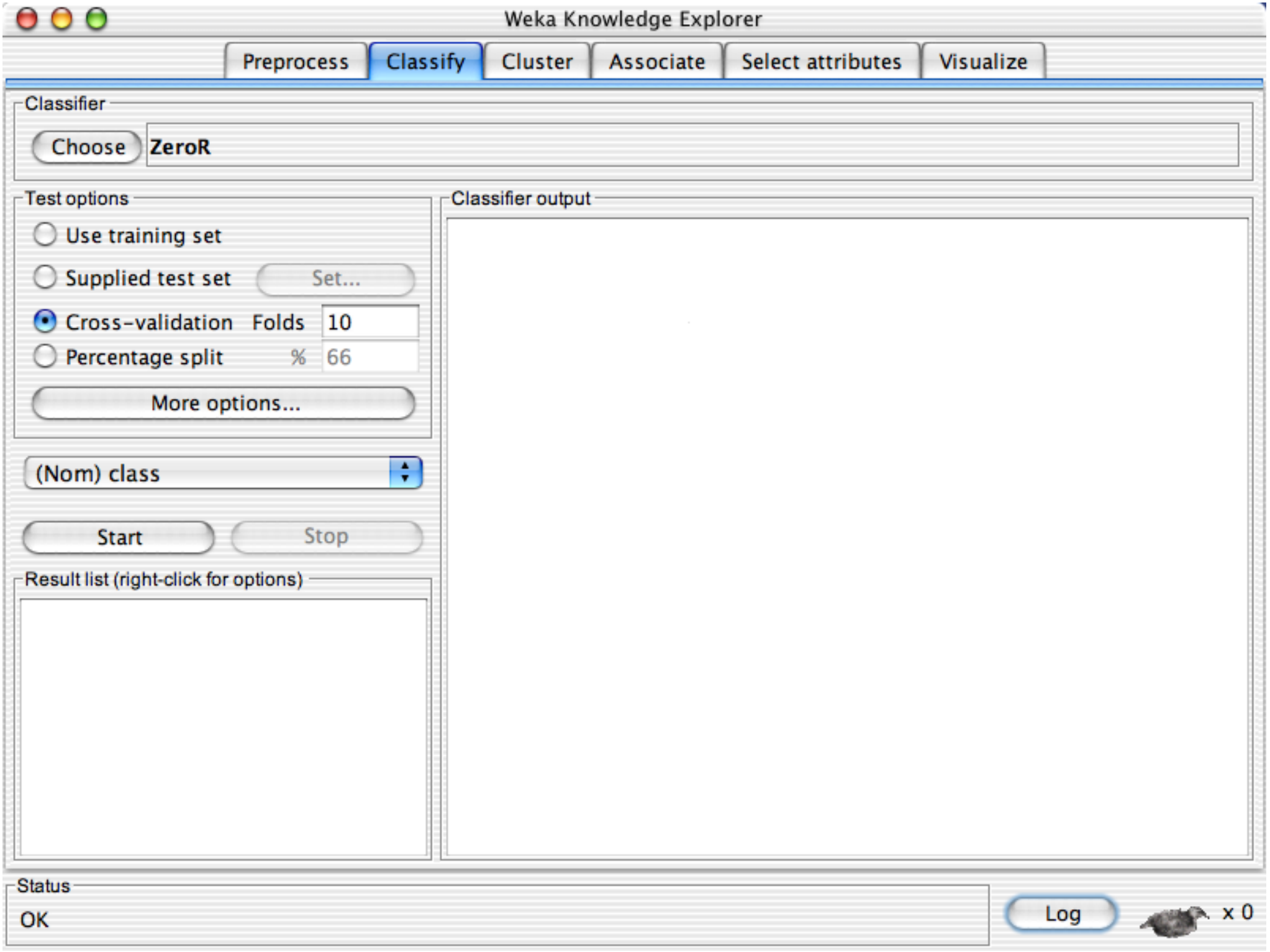
OK | Log | x 0

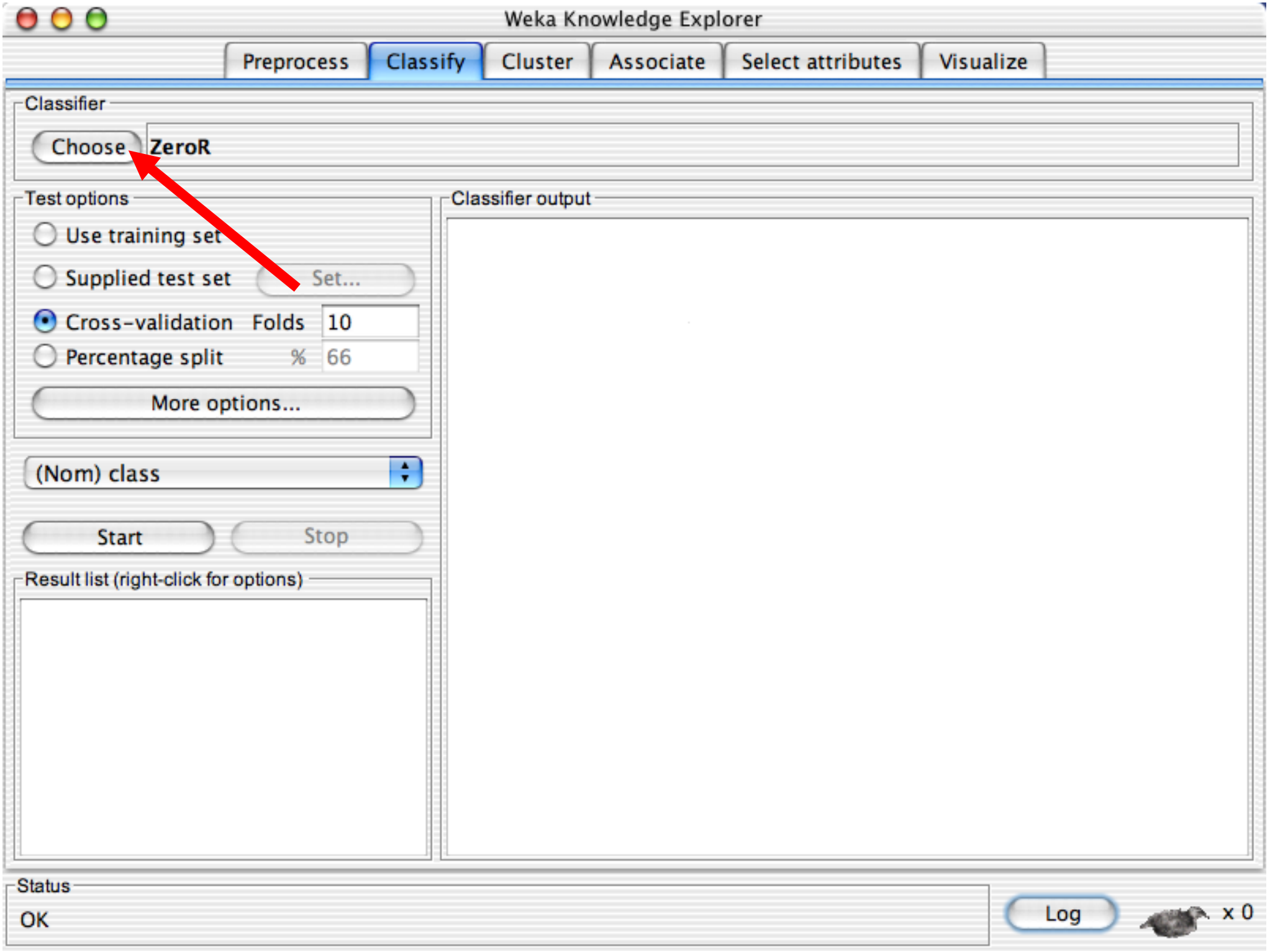

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
Discretize -F -B 10 -R first-last
Apply
Current relation
Relation: iris
Instances: 150
Attributes: 5
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Selected attribute
Name: petallength
Type: Numeric
Missing: 0 (0%)
Distinct: 43
Unique: 10 (7%)
Statistic
Value
Minimum
1
Maximum
6.9
Mean
3.759
StdDev
1.764
Colour: class (Nom)
Visualize All
37
11
2
0
0
3
4
12
18
17
16
14
10
2
4
1
3.95
6.9
Status
OK
Log
x 0

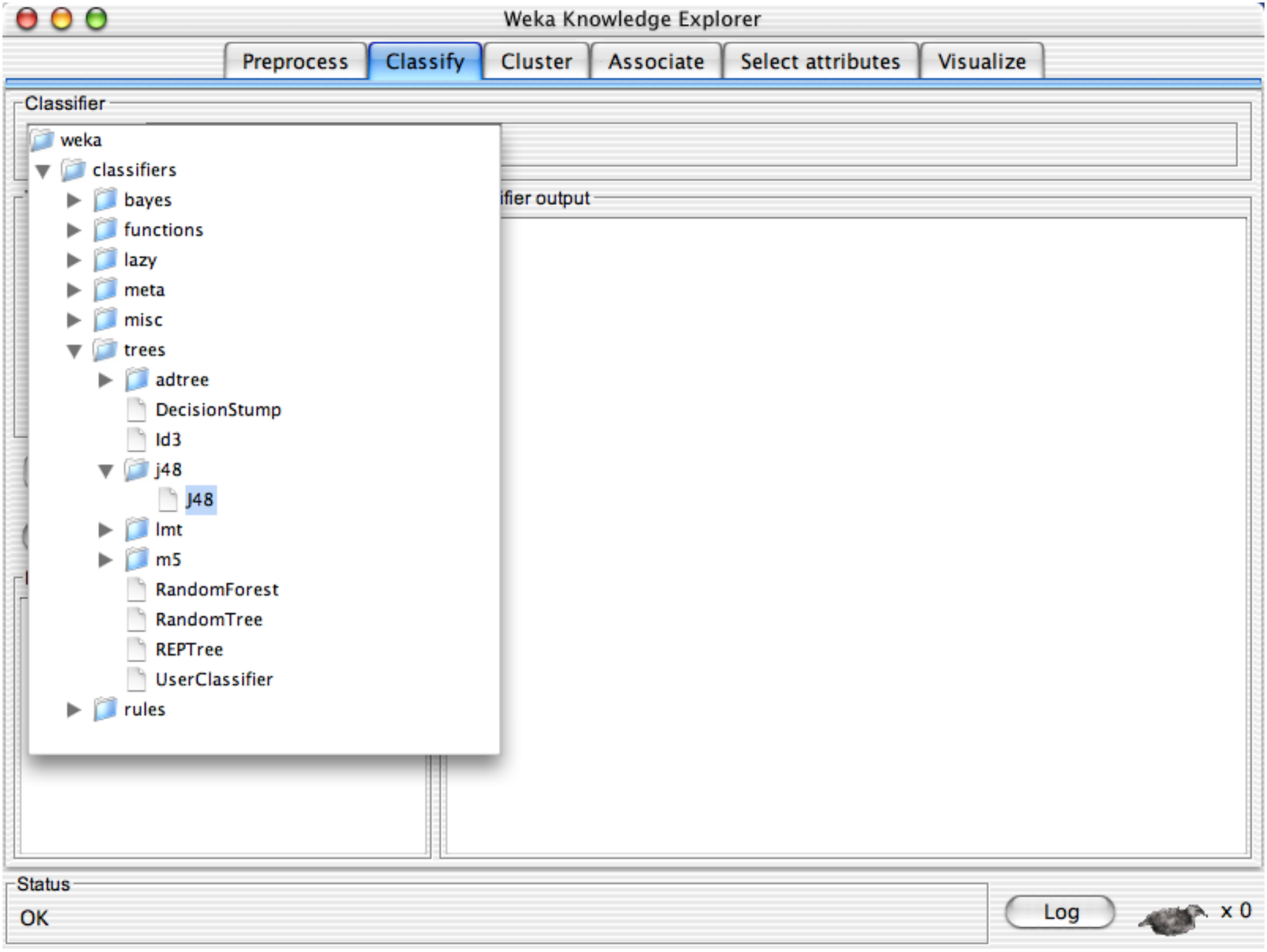

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Undo
Save...
Filter
Choose
Discretize -F -B 10 -R first-last
Apply
Current relation
Relation: iris-weka.filters.unsupervised.attribute.Disc...
Instances: 150
Attributes: 5
Attributes
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Selected attribute
Name: petallength
Type: Nominal
Missing: 0 (0%)
Distinct: 10
Unique: 0 (0%)
Label
Count
'(-inf-1.45]' 23
'(1.45-1.55]' 14
'(1.55-1.8]' 11
'(1.8-3.95]' 13
'(3.95-4.35]' 14
'(4.35-4.65]' 15
'(4.65-5.05]' 18
Colour: class (Nom)
Visualize All
23
14
11
13
14
15
18
12
17
13
Status
OK
Log
x 0

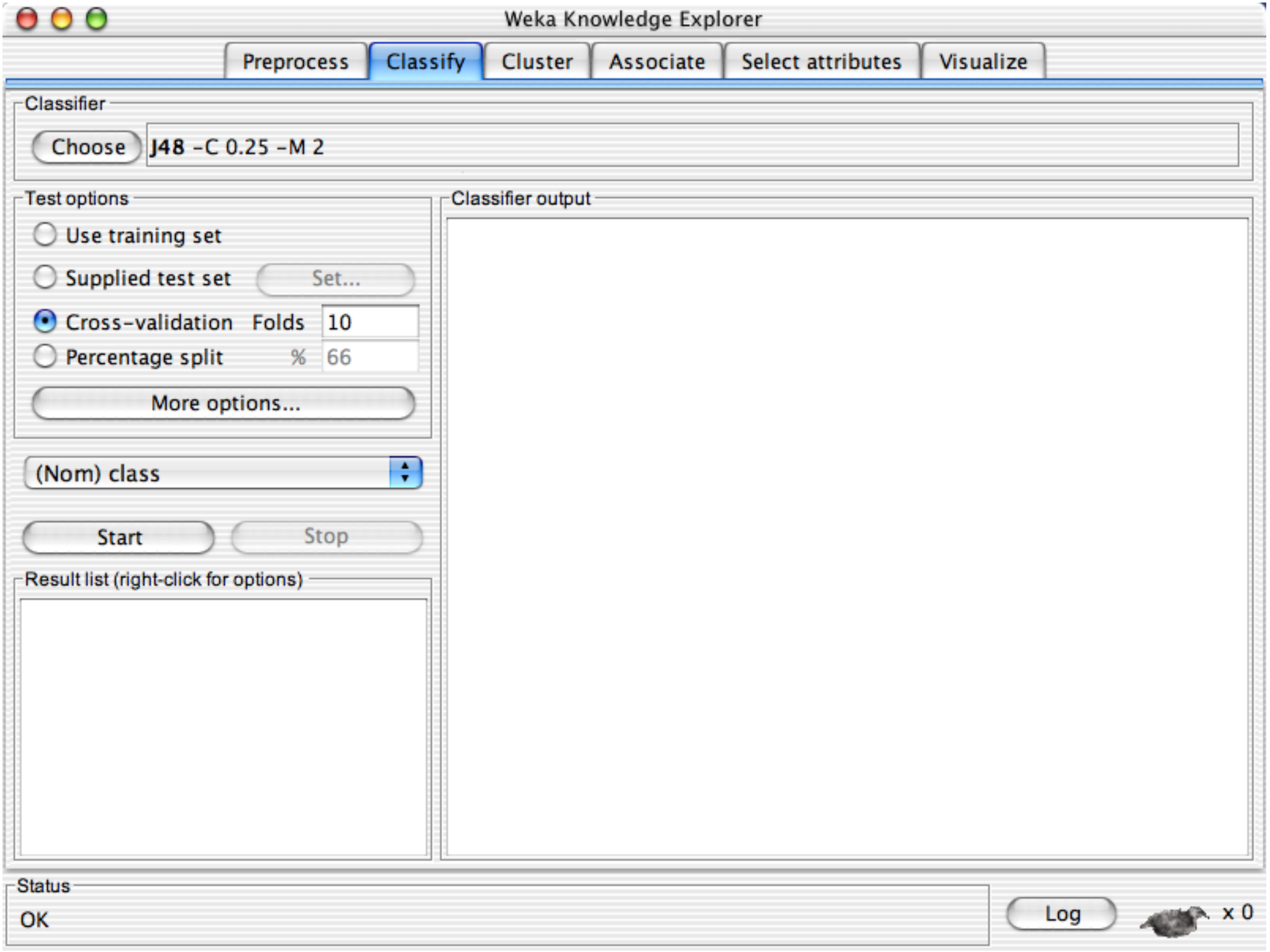
Explorer: building "classifiers"

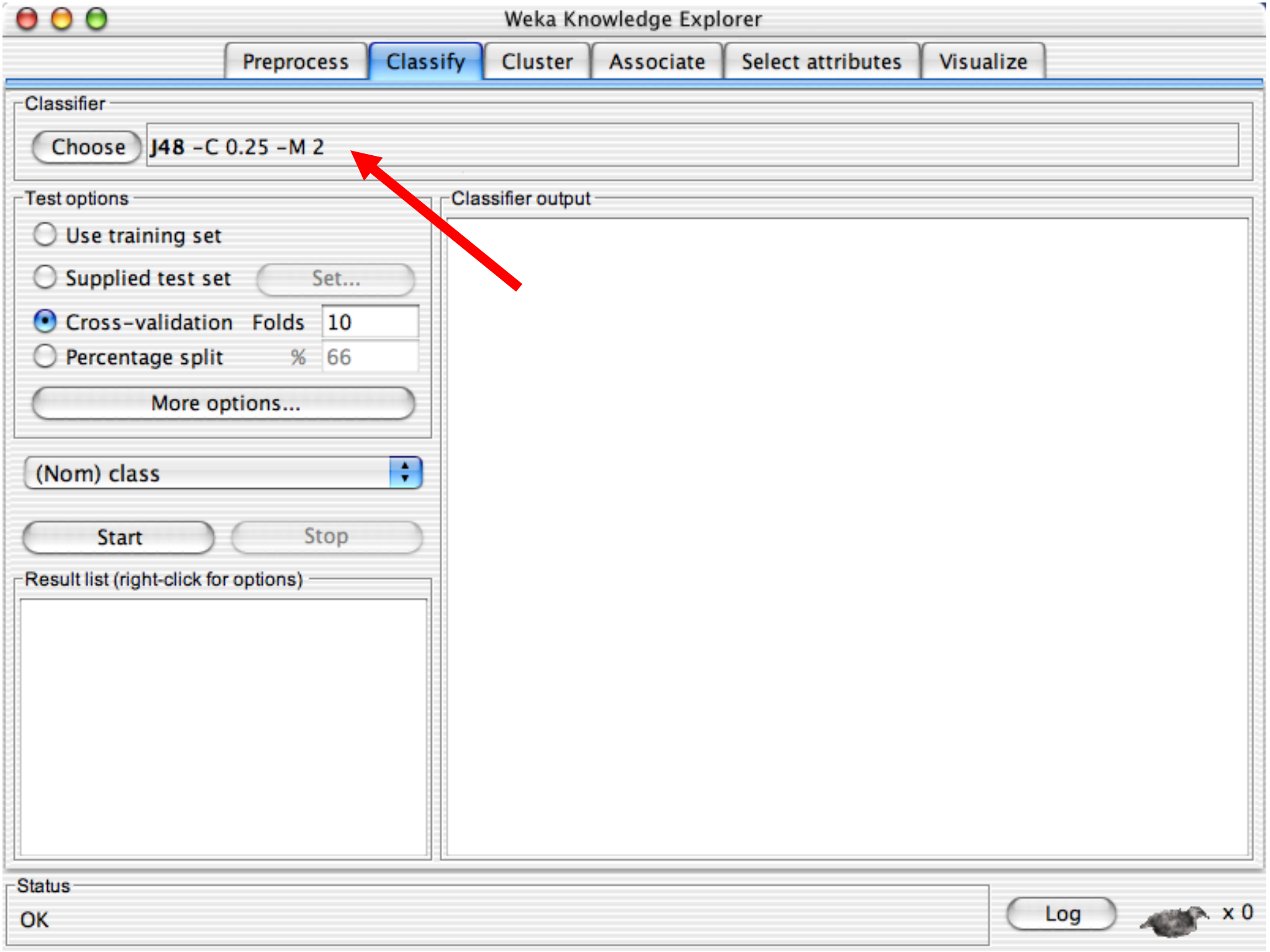
- Classifiers in WEKA are models for predicting nominal or numeric quantities
- Implemented learning schemes include:
  - Decision trees and lists, instance-based classifiers, support vector machines, multi-layer perceptrons, logistic regression, Bayes' nets, …
- "Meta"-classifiers include:
  - Bagging, boosting, stacking, error-correcting output codes, locally weighted learning, …

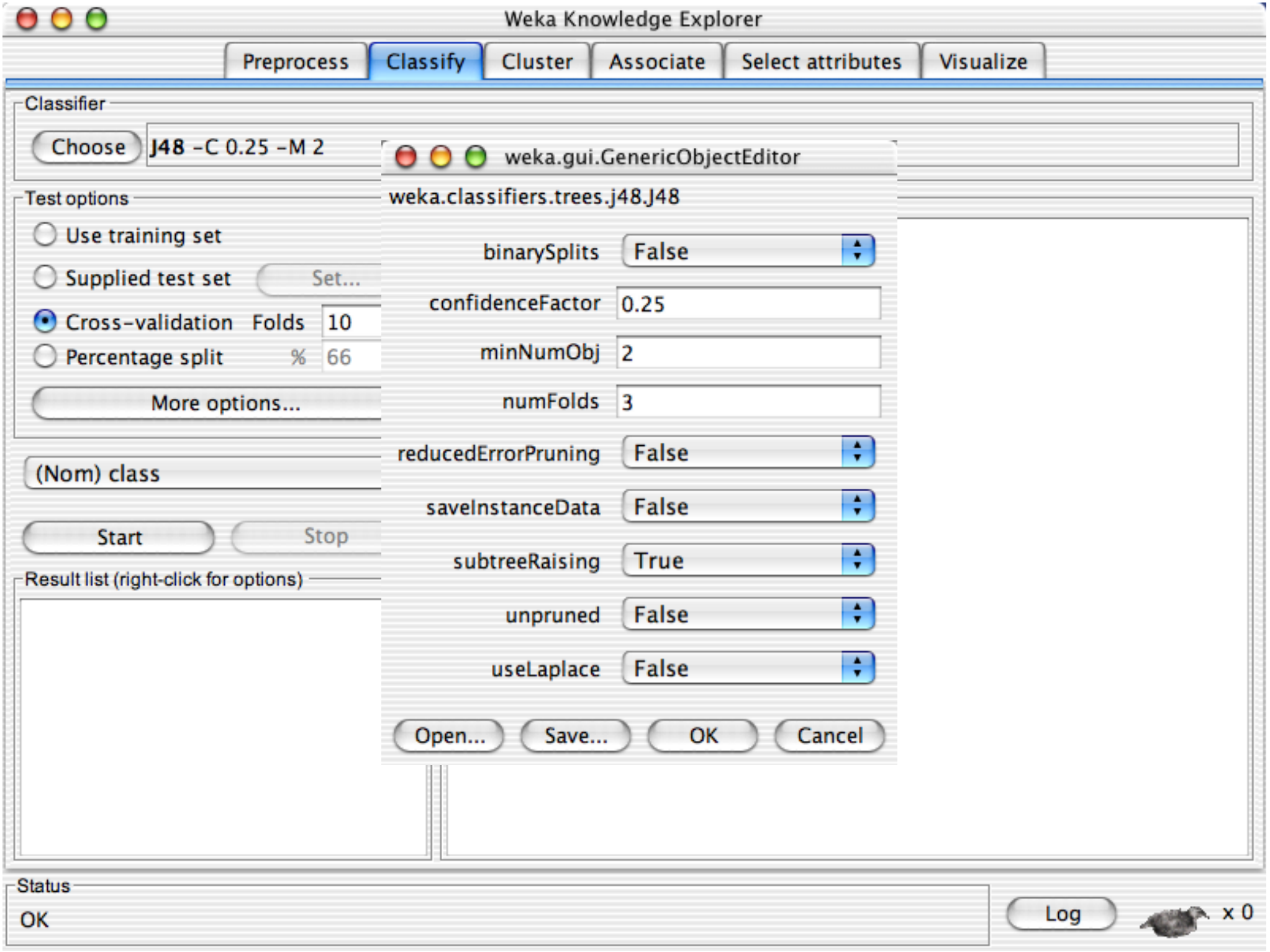

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
ZeroR
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
Classifier output
(Nom) class
Start
Stop
Result list (right-click for options)
Status
OK
Log
x 0

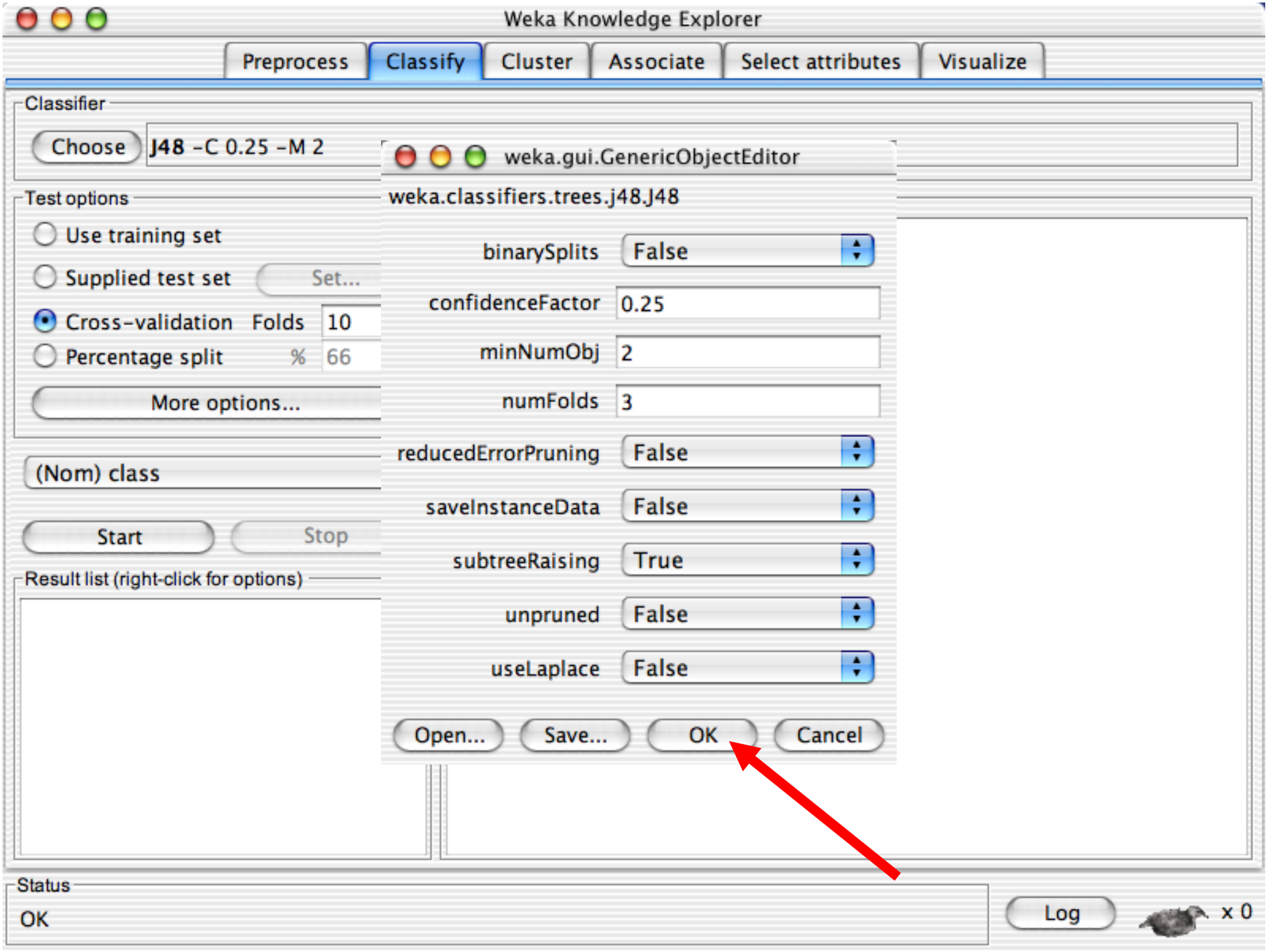

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
ZeroR
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
Classifier output
(Nom) class
Start
Stop
Result list (right-click for options)
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
weka
classifiers
bayes
functions
lazy
meta
misc
trees
adtree
DecisionStump
Id3
j48
J48
lmt
m5
RandomForest
RandomTree
REPTree
UserClassifier
rules
ifier output
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
Classifier output
(Nom) class
Start
Stop
Result list (right-click for options)
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
Classifier output
(Nom) class
Start
Stop
Result list (right-click for options)
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
weka.gui.GenericObjectEditor
weka.classifiers.trees.j48.J48
binarySplits
False
confidenceFactor
0.25
minNumObj
2
numFolds
3
reducedErrorPruning
False
saveInstanceData
False
subtreeRaising
True
unpruned
False
useLaplace
False
Open...
Save...
OK
Cancel
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)
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
weka.gui.GenericObjectEditor
weka.classifiers.trees.j48.J48
binarySplits
False
confidenceFactor
0.25
minNumObj
2
numFolds
3
reducedErrorPruning
False
saveInstanceData
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subtreeRaising
True
unpruned
False
useLaplace
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Open...
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OK
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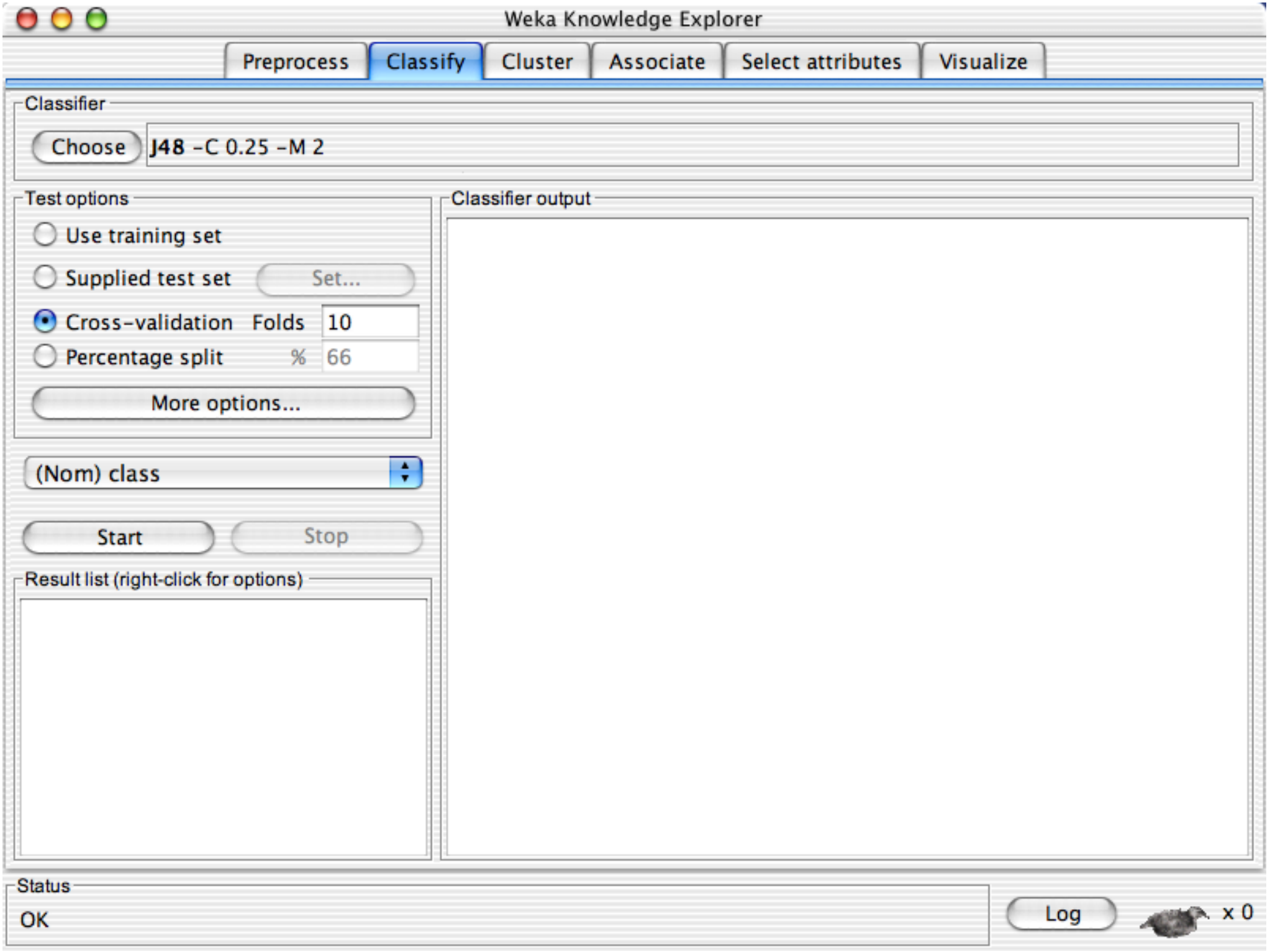
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
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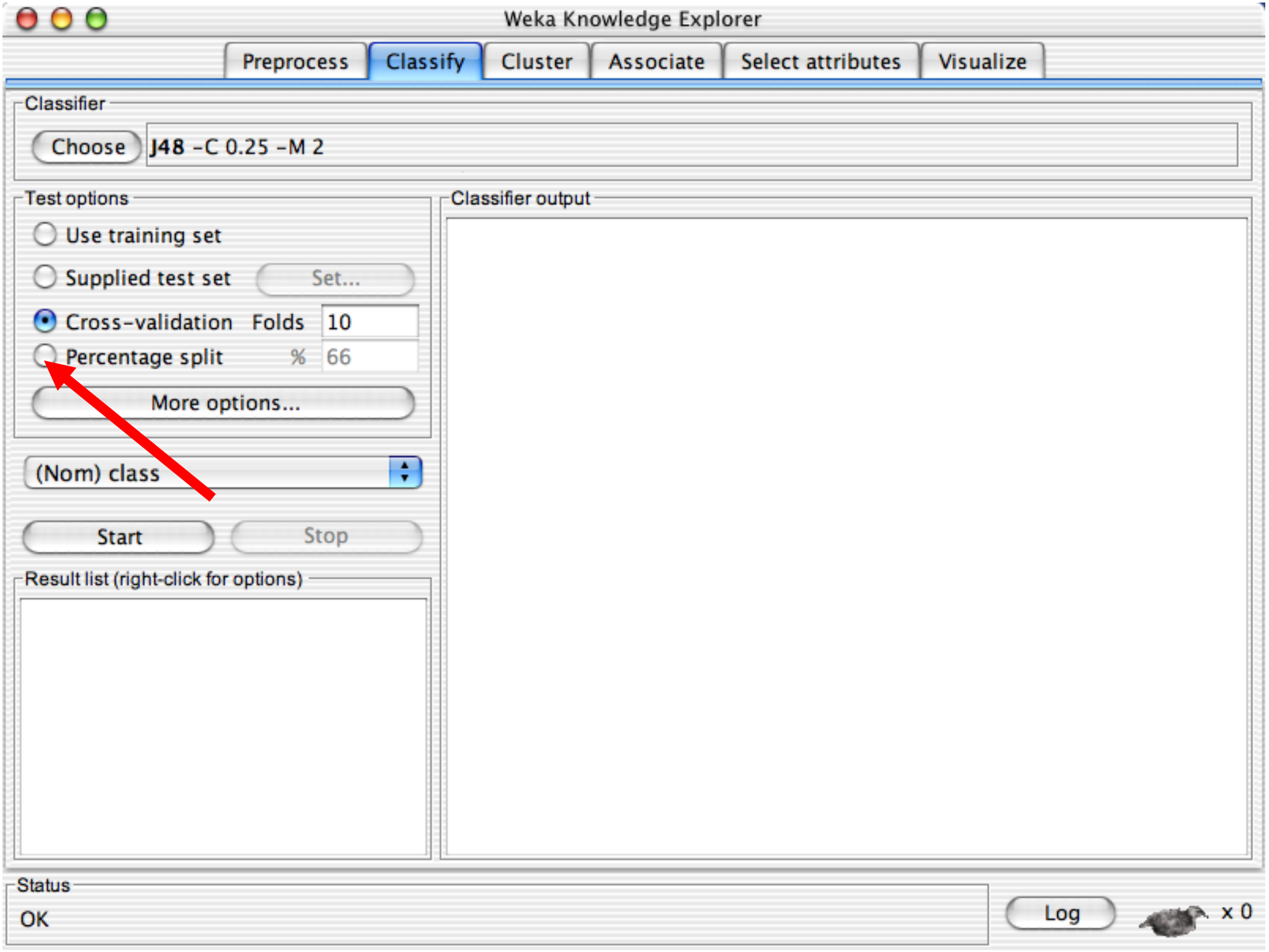
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
Classifier output
(Nom) class
Start
Stop
Result list (right-click for options)
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
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Select attributes
Visualize
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Test options
Use training set
Supplied test set
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Cross-validation
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Percentage split
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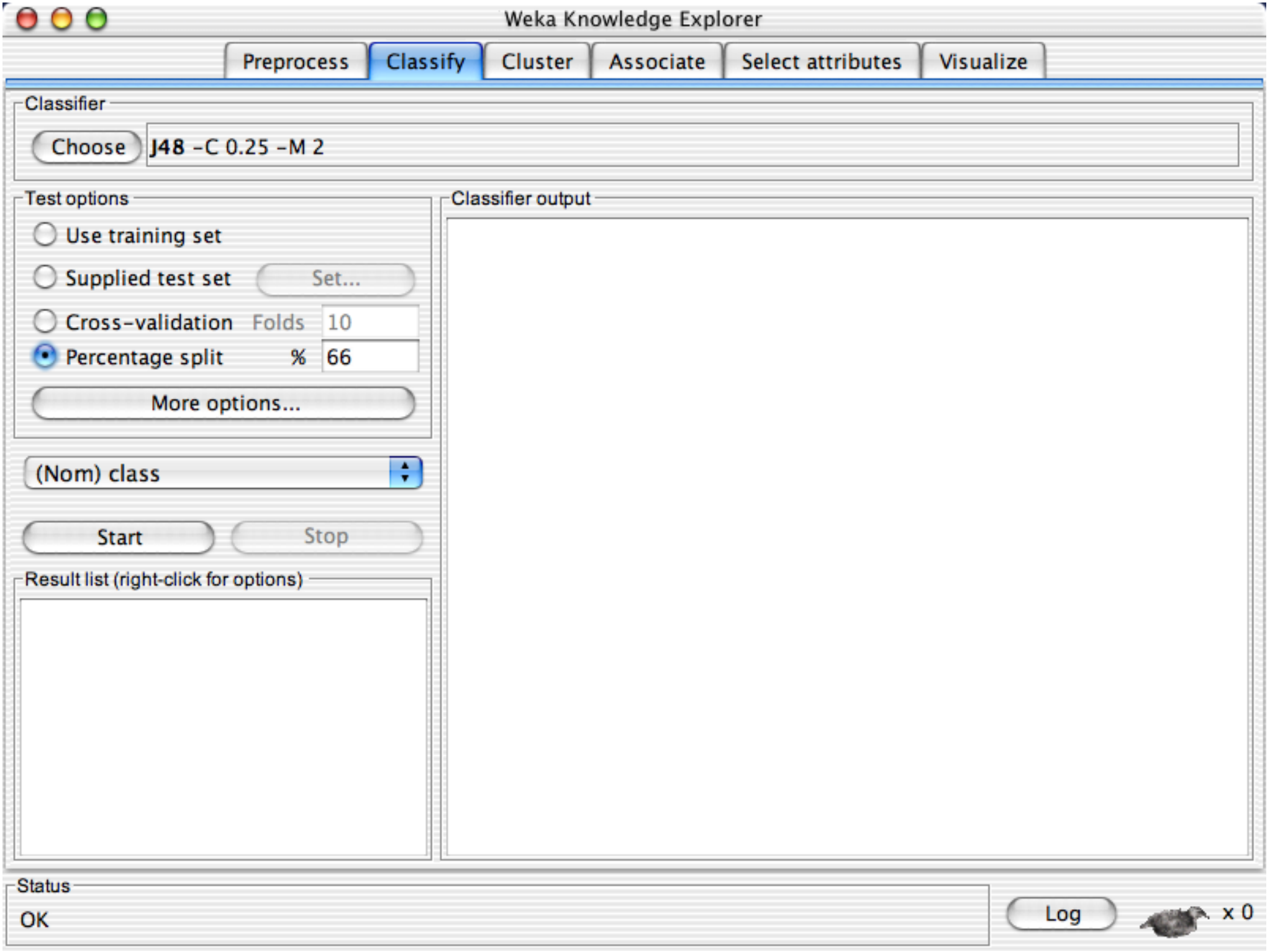
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
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Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
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Cross-validation
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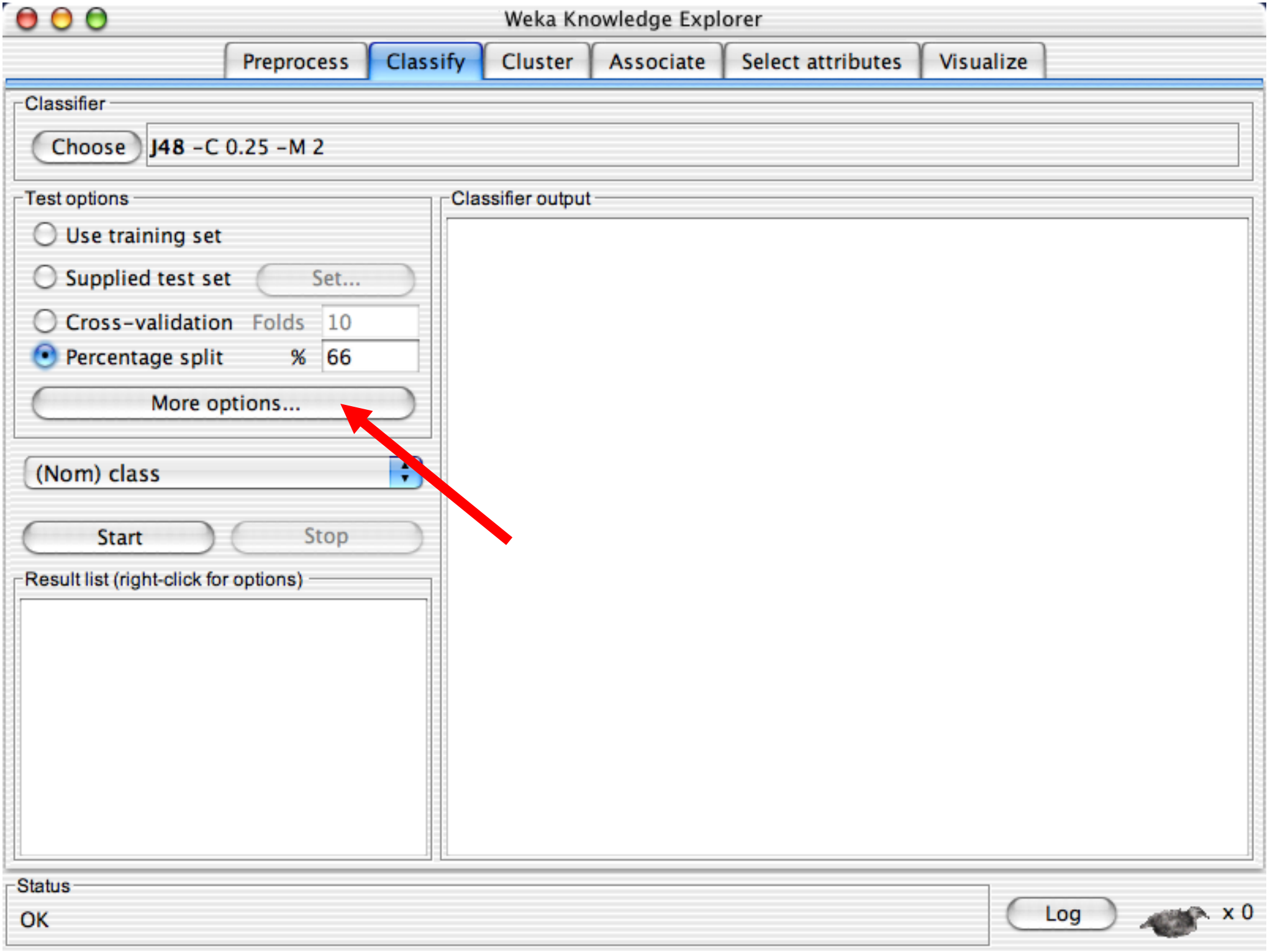
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
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66
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Classifier output
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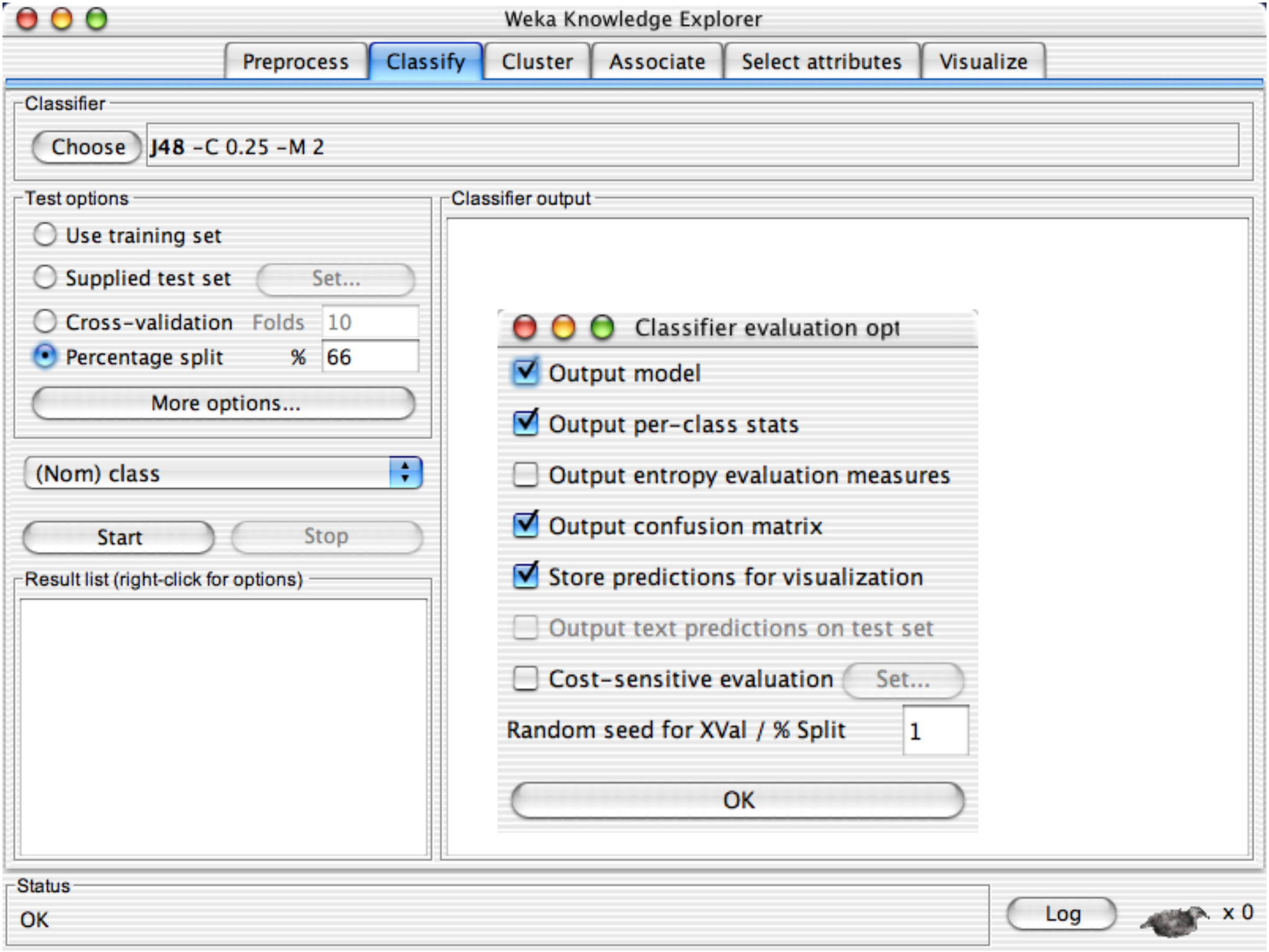
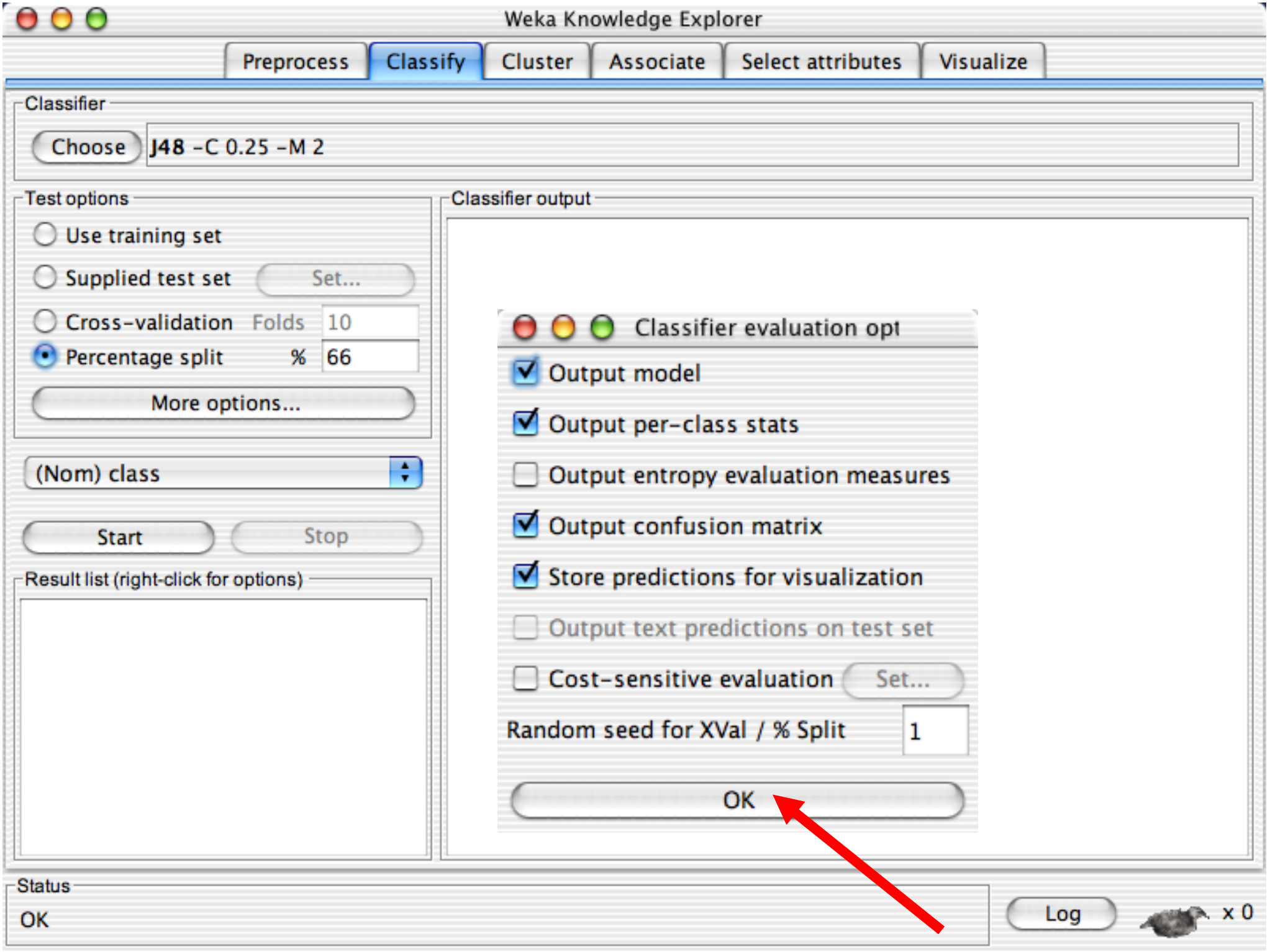
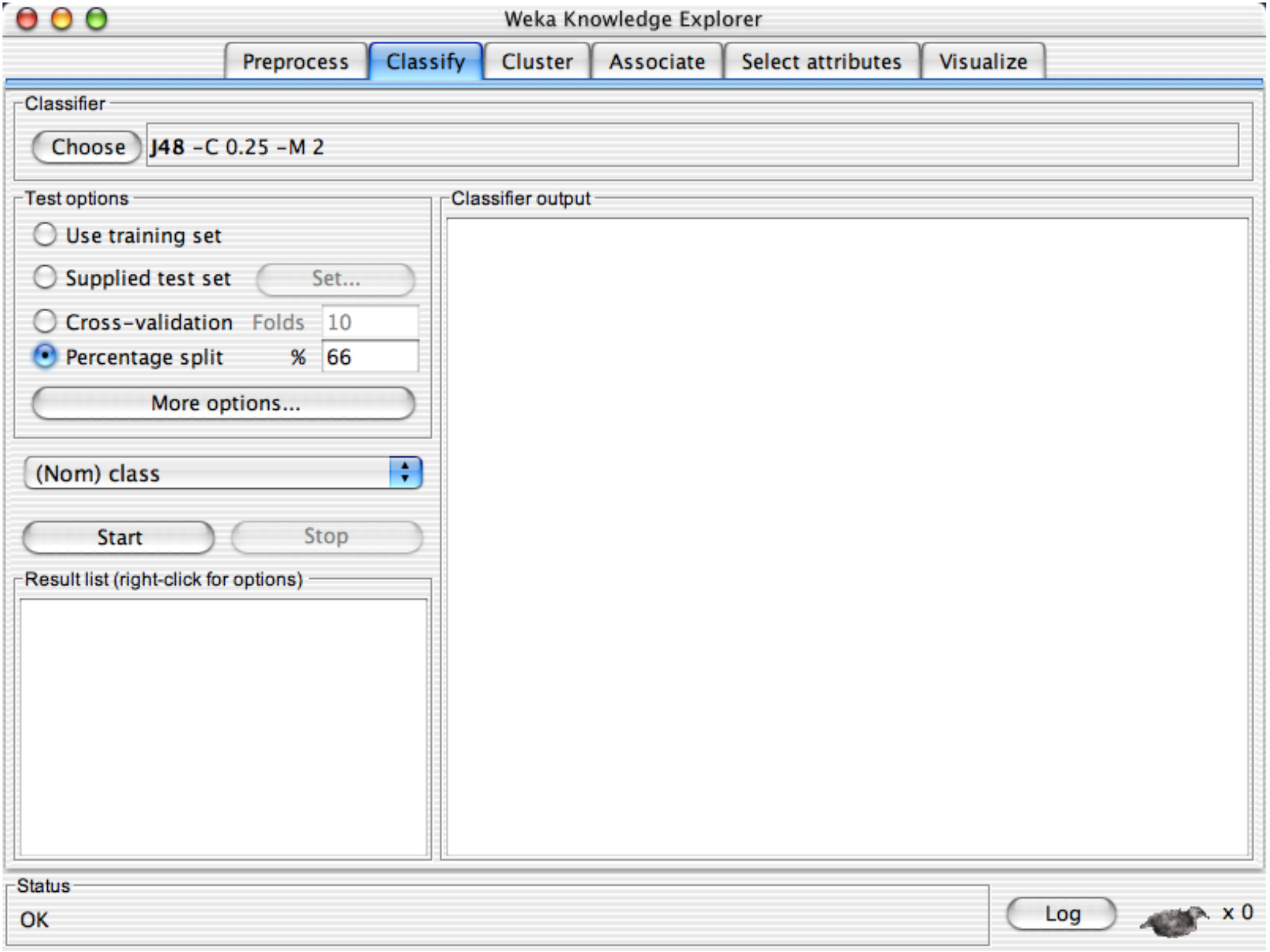
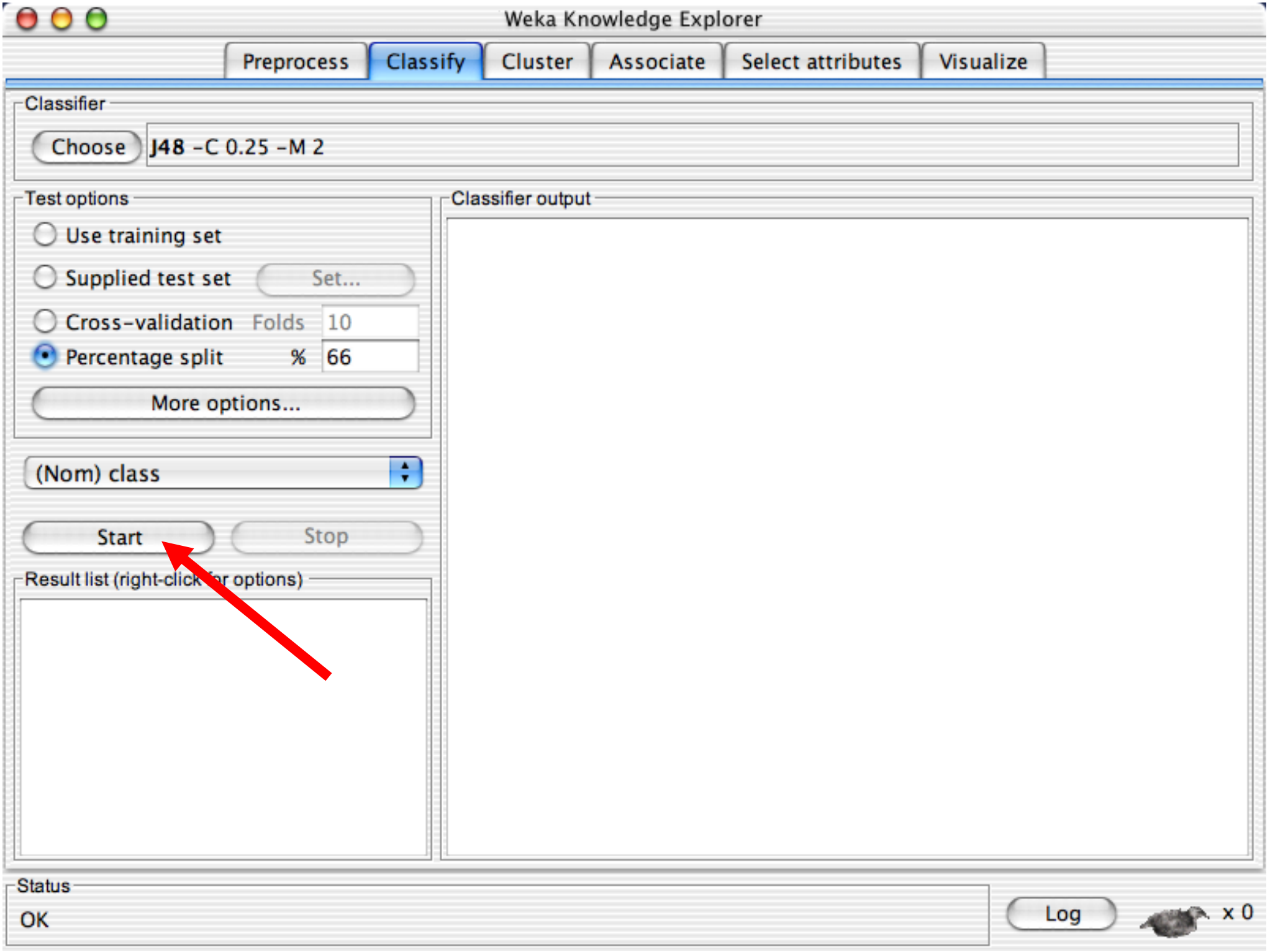
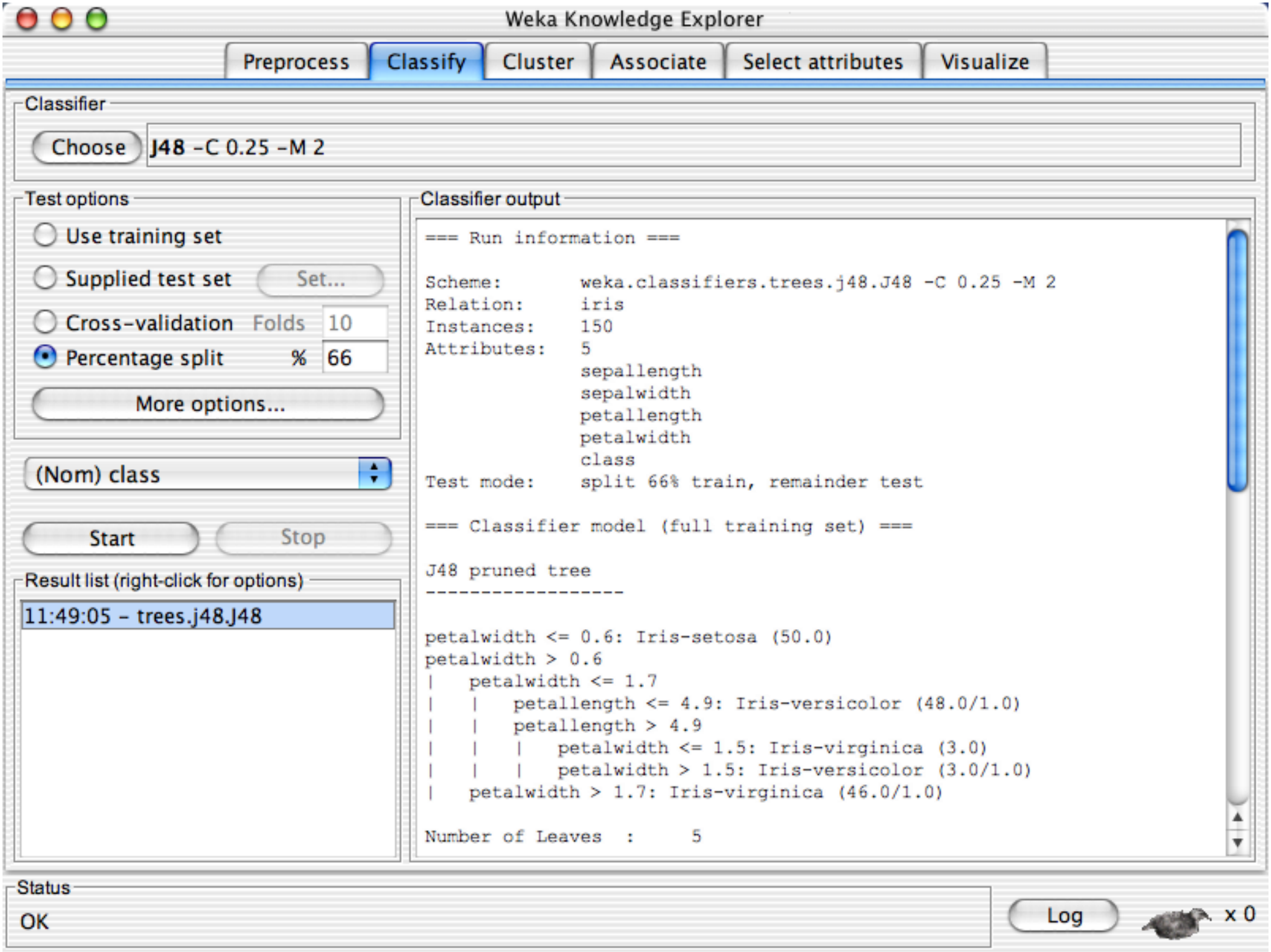
x 0

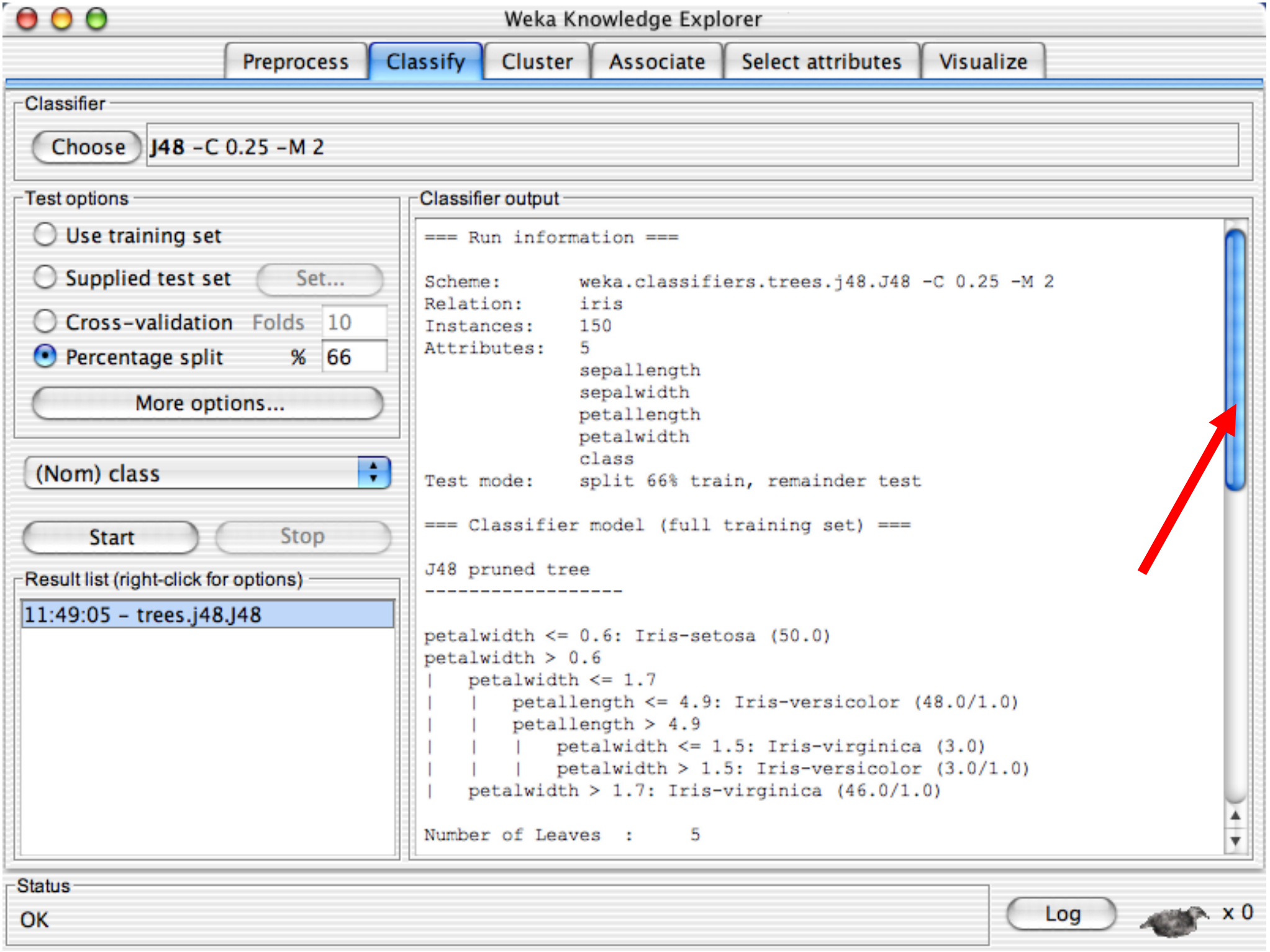

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
Classifier output
Classifier evaluation opt
Output model
Output per-class stats
Output entropy evaluation measures
Output confusion matrix
Store predictions for visualization
Output text predictions on test set
Cost-sensitive evaluation
Set...
Random seed for XVal / % Split
1
OK
Status
OK
Log
x 0

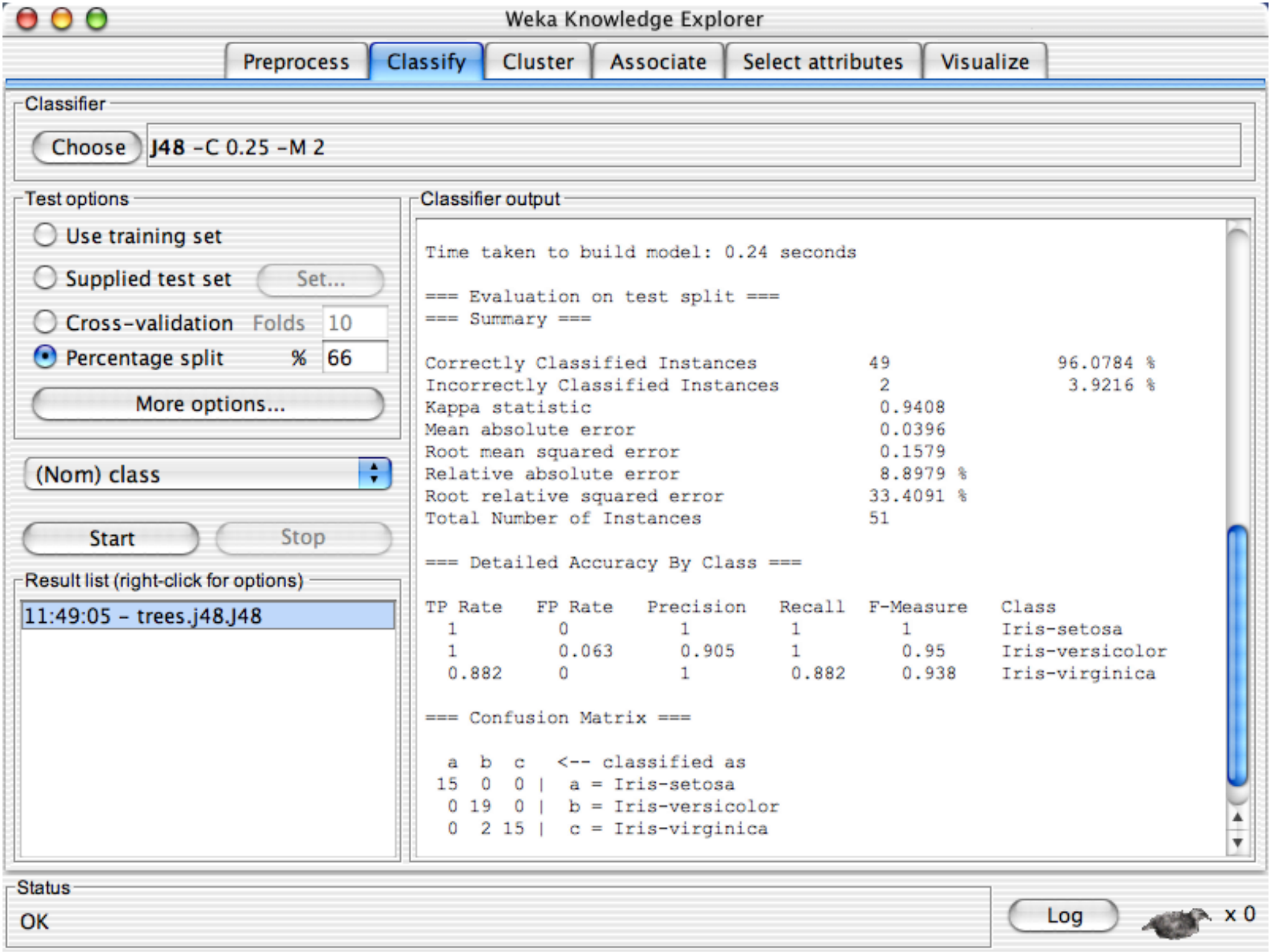

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
Classifier output
Classifier evaluation opt
Output model
Output per-class stats
Output entropy evaluation measures
Output confusion matrix
Store predictions for visualization
Output text predictions on test set
Cost-sensitive evaluation
Set...
Random seed for XVal / % Split
1
OK
Status
OK
Log
x 0

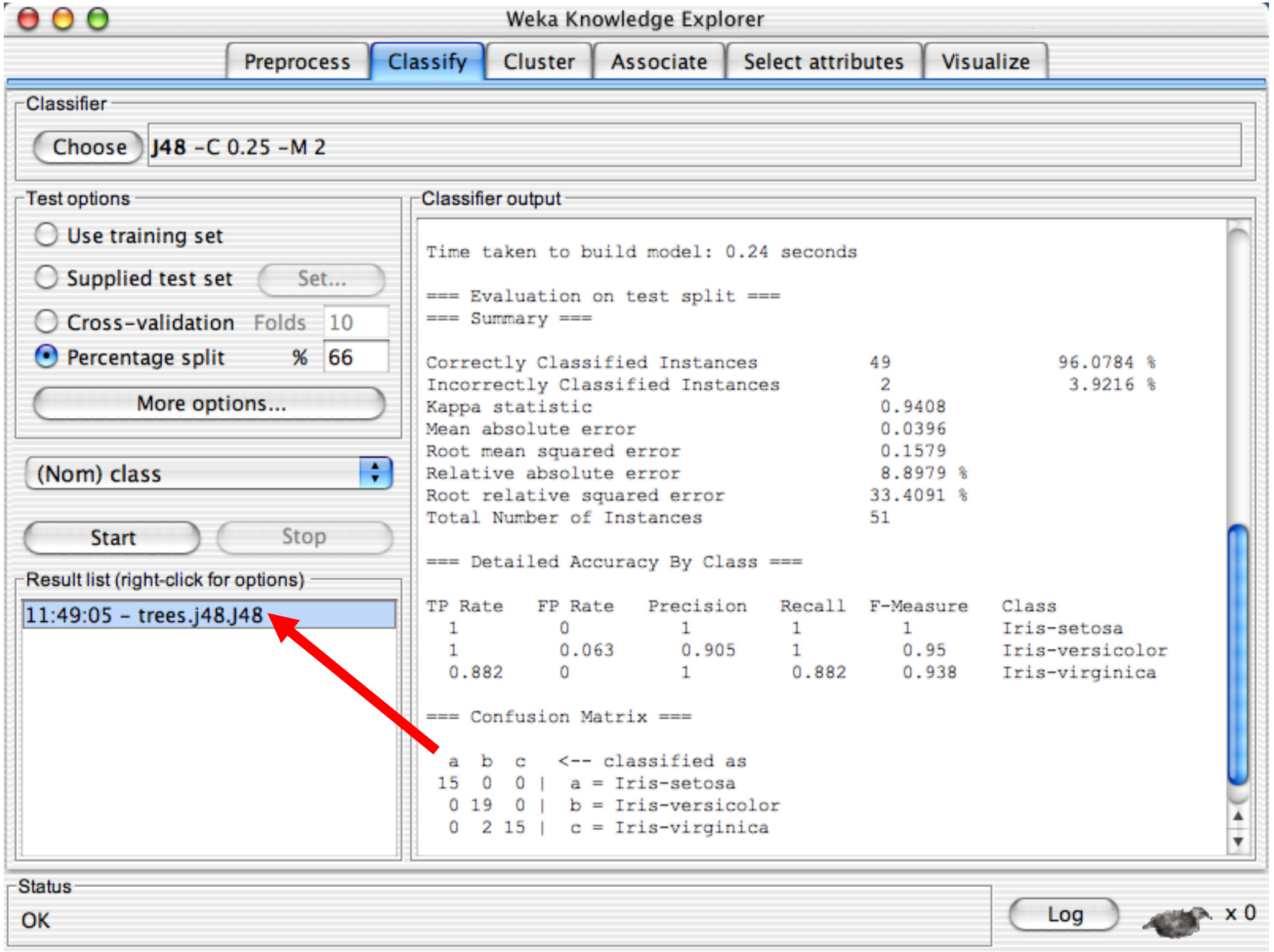

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
Classifier output
(Nom) class
Start
Stop
Result list (right-click for options)
Status
OK
Log
x 0

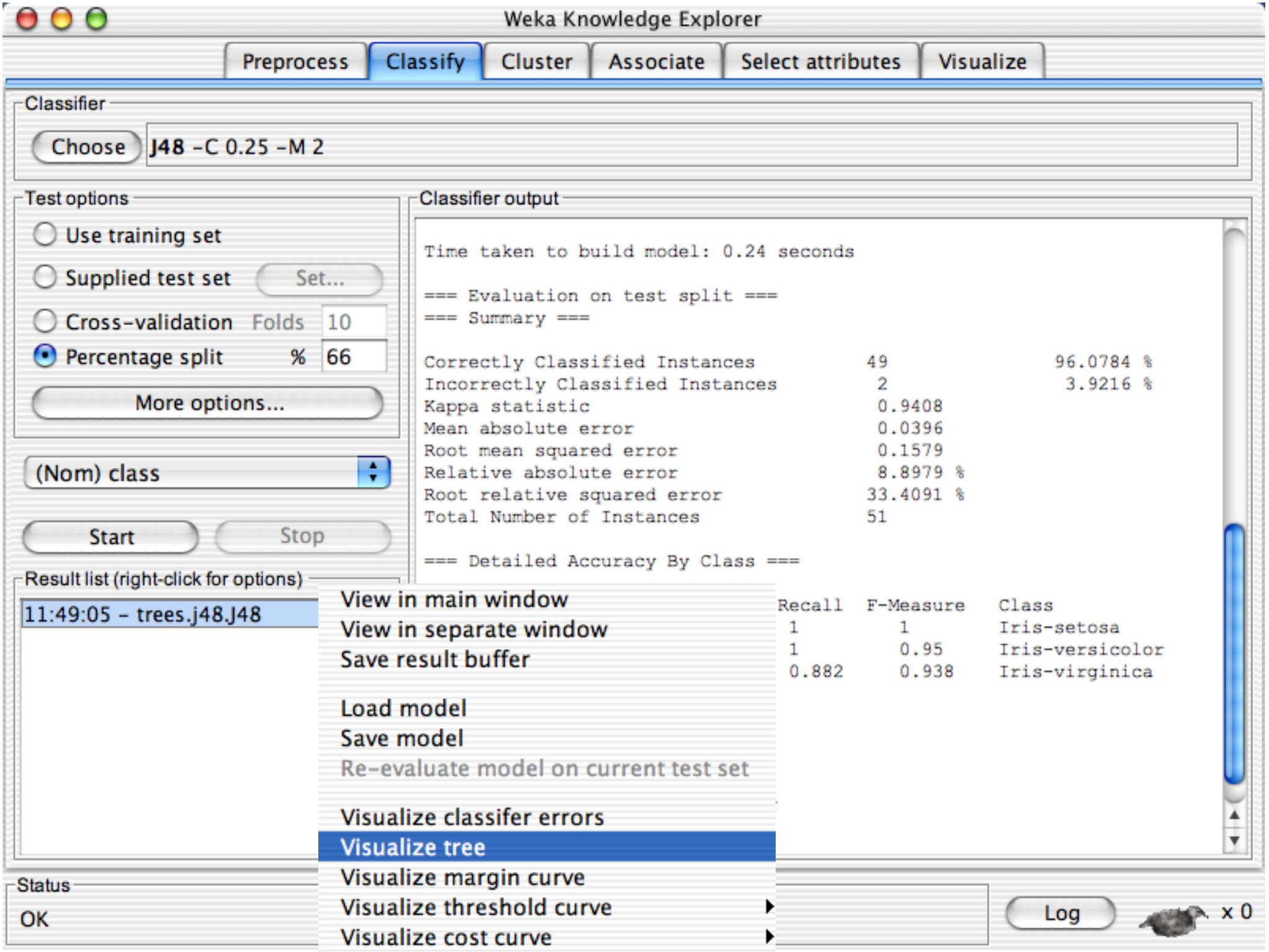

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
Classifier output
(Nom) class
Start
Stop
Result list (right-click for options)
Status
OK
Log
x 0

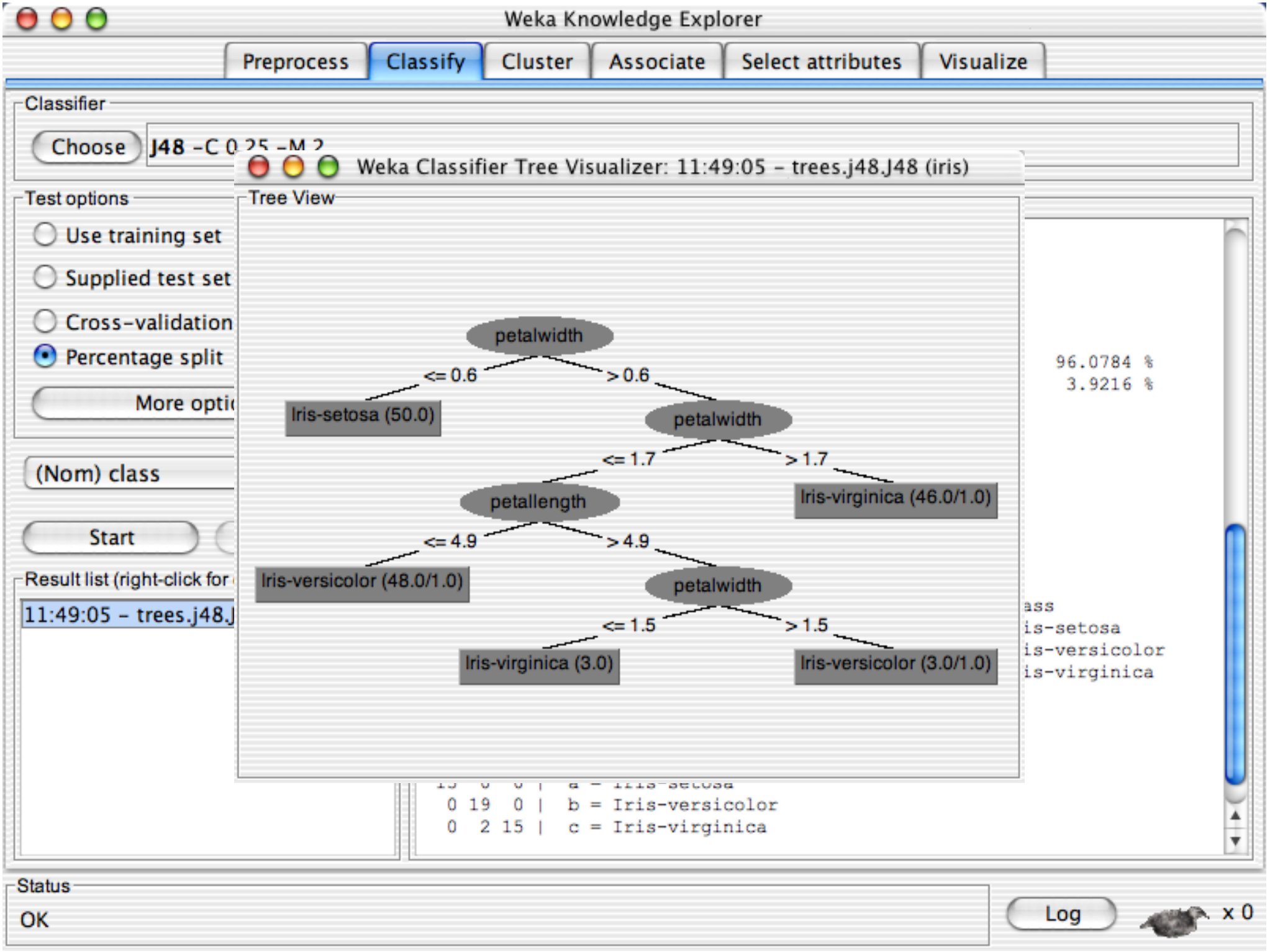

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
Classifier output
=== Run information ===
Scheme: weka.classifiers.trees.j48.J48 -C 0.25 -M 2
Relation: iris
Instances: 150
Attributes: 5
sepallength
sepalwidth
petallength
petalwidth
class
Test mode: split 66% train, remainder test
=== Classifier model (full training set) ===
J48 pruned tree
petalwidth <= 0.6: Iris-setosa (50.0)
petalwidth > 0.6
| petalwidth <= 1.7
| | petallength <= 4.9: Iris-versicolor (48.0/1.0)
| | petallength > 4.9
| | | petalwidth <= 1.5: Iris-virginica (3.0)
| | | petalwidth > 1.5: Iris-versicolor (3.0/1.0)
| petalwidth > 1.7: Iris-virginica (46.0/1.0)
Number of Leaves : 5
Status
OK
Log
x 0

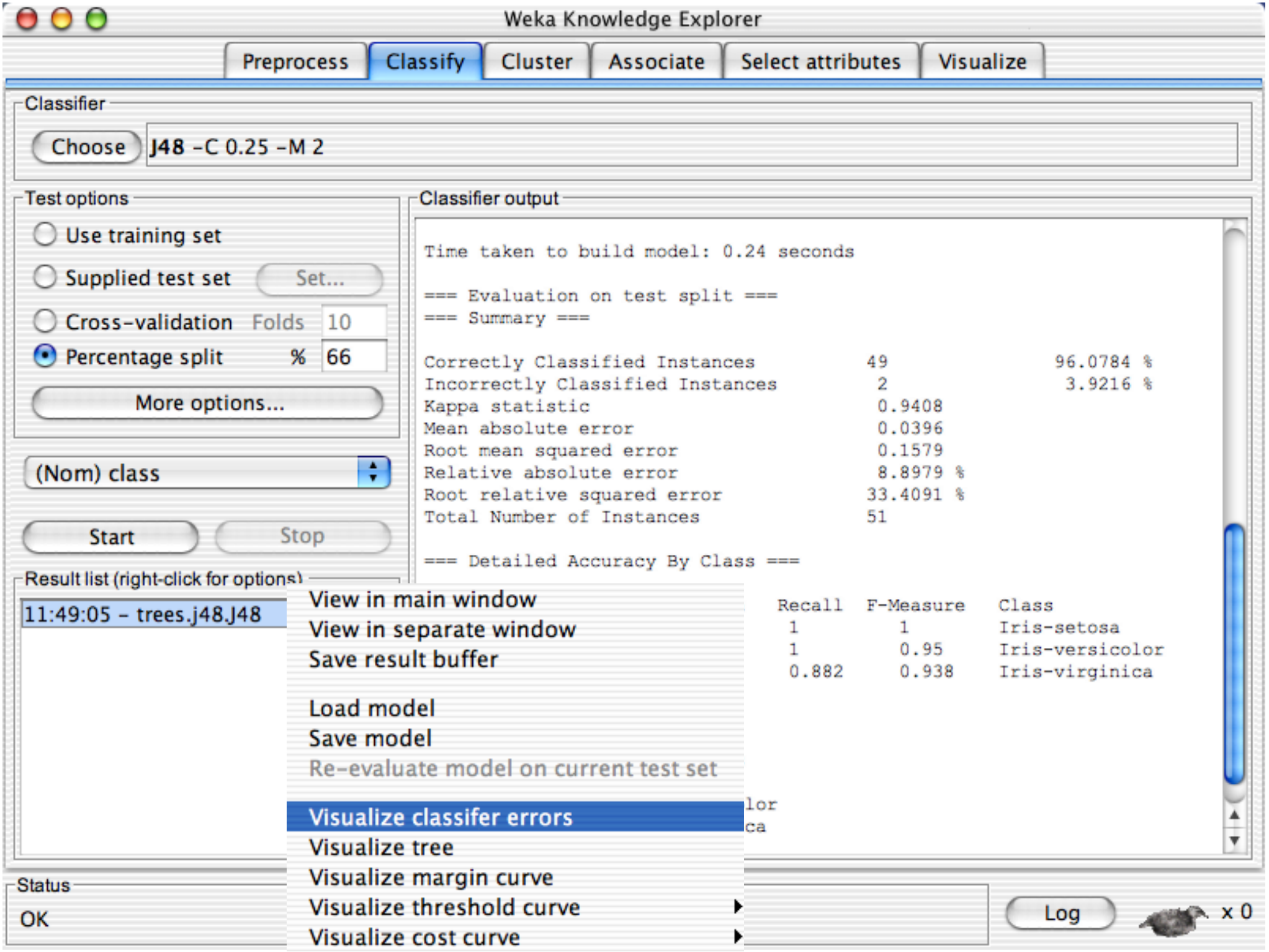

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
Classifier output
=== Run information ===
Scheme: weka.classifiers.trees.j48.J48 -C 0.25 -M 2
Relation: iris
Instances: 150
Attributes: 5
sepallength
sepalwidth
petallength
petalwidth
class
Test mode: split 66% train, remainder test
=== Classifier model (full training set) ===
J48 pruned tree
----
petalwidth <= 0.6: Iris-setosa (50.0)
petalwidth > 0.6
| petalwidth <= 1.7
| | petallength <= 4.9: Iris-versicolor (48.0/1.0)
| | petallength > 4.9
| | | petalwidth <= 1.5: Iris-virginica (3.0)
| | | petalwidth > 1.5: Iris-versicolor (3.0/1.0)
| petalwidth > 1.7: Iris-virginica (46.0/1.0)
Number of Leaves : 5
Status
OK
Log
x 0

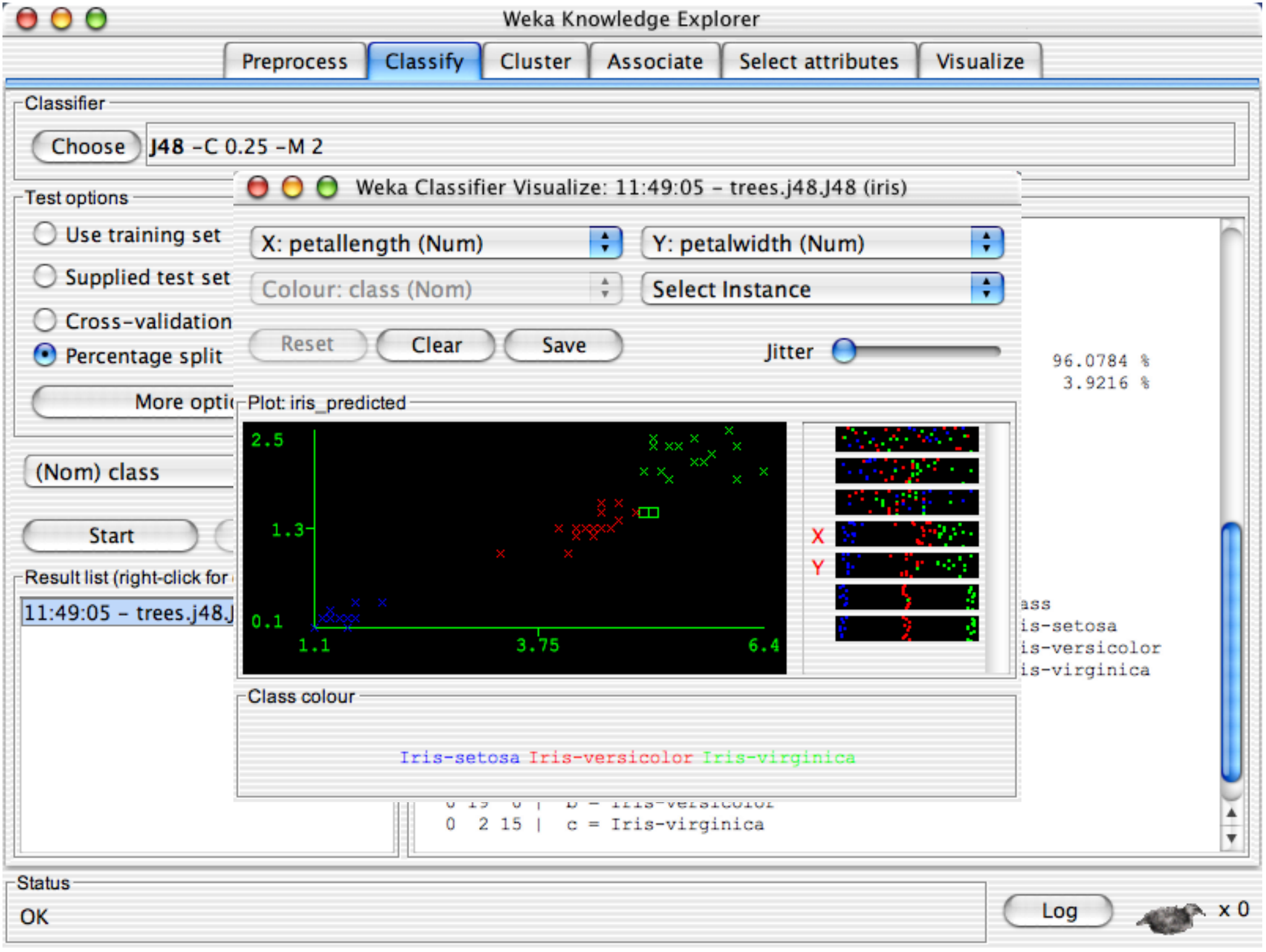

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
Classifier output
Time taken to build model: 0.24 seconds
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 49 96.0784 %
Incorrectly Classified Instances 2 3.9216 %
Kappa statistic 0.9408
Mean absolute error 0.0396
Root mean squared error 0.1579
Relative absolute error 8.8979 %
Root relative squared error 33.4091 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
TP Rate FP Rate Precision Recall F-Measure Class
1 0 1 1 1 Iris-setosa
1 0.063 0.905 1 0.95 Iris-versicolor
0.882 0 1 0.882 0.938 Iris-virginica
=== Confusion Matrix ===
a b c <-- classified as
15 0 0 | a = Iris-setosa
0 19 0 | b = Iris-versicolor
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0

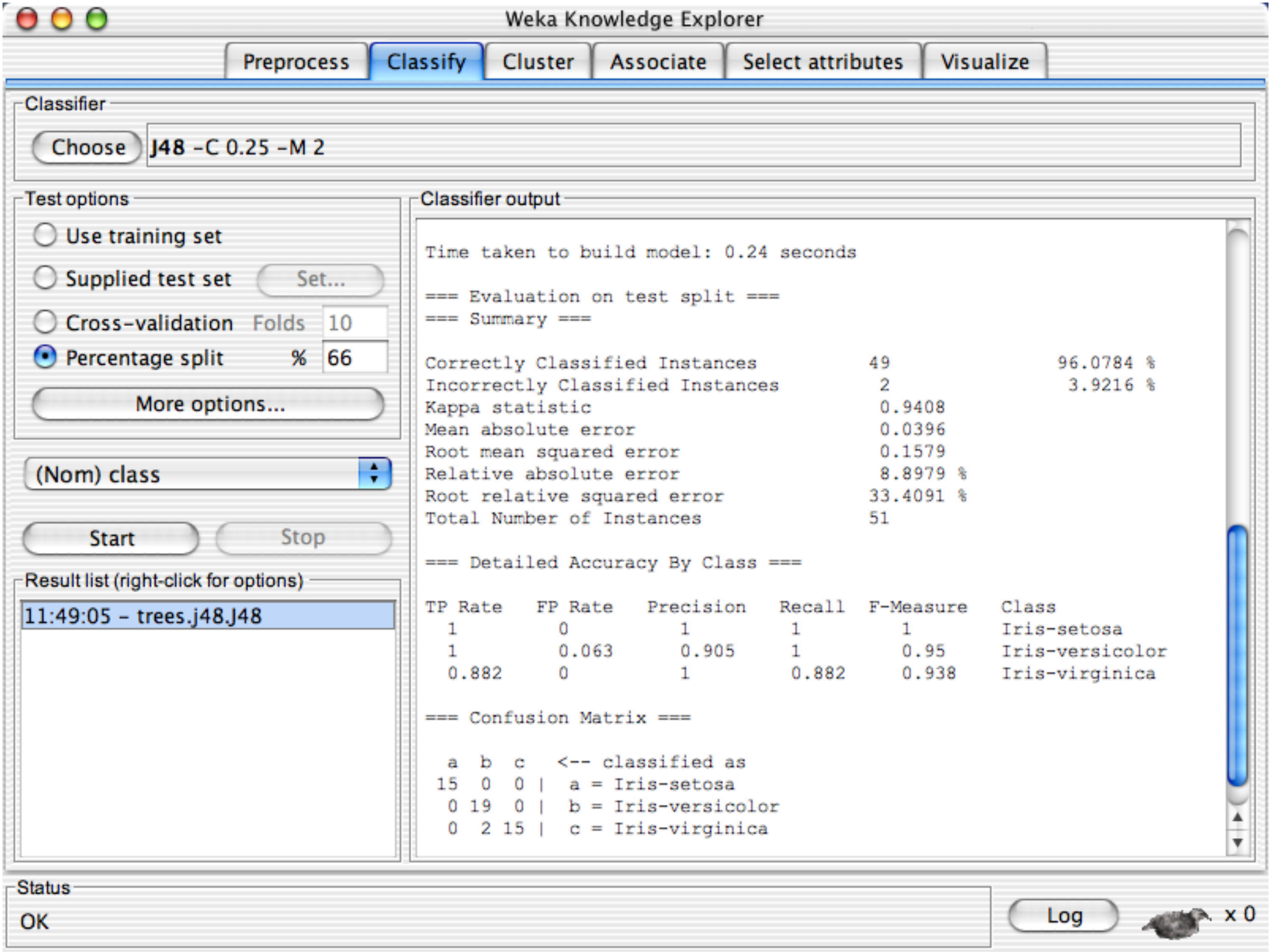

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
Classifier output
Time taken to build model: 0.24 seconds
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 49 96.0784 %
Incorrectly Classified Instances 2 3.9216 %
Kappa statistic 0.9408
Mean absolute error 0.0396
Root mean squared error 0.1579
Relative absolute error 8.8979 %
Root relative squared error 33.4091 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
TP Rate FP Rate Precision Recall F-Measure Class
1 0 1 1 1 Iris-setosa
1 0.063 0.905 1 0.95 Iris-versicolor
0.882 0 1 0.882 0.938 Iris-virginica
=== Confusion Matrix ===
a b c <-- classified as
15 0 0 | a = Iris-setosa
0 19 0 | b = Iris-versicolor
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0

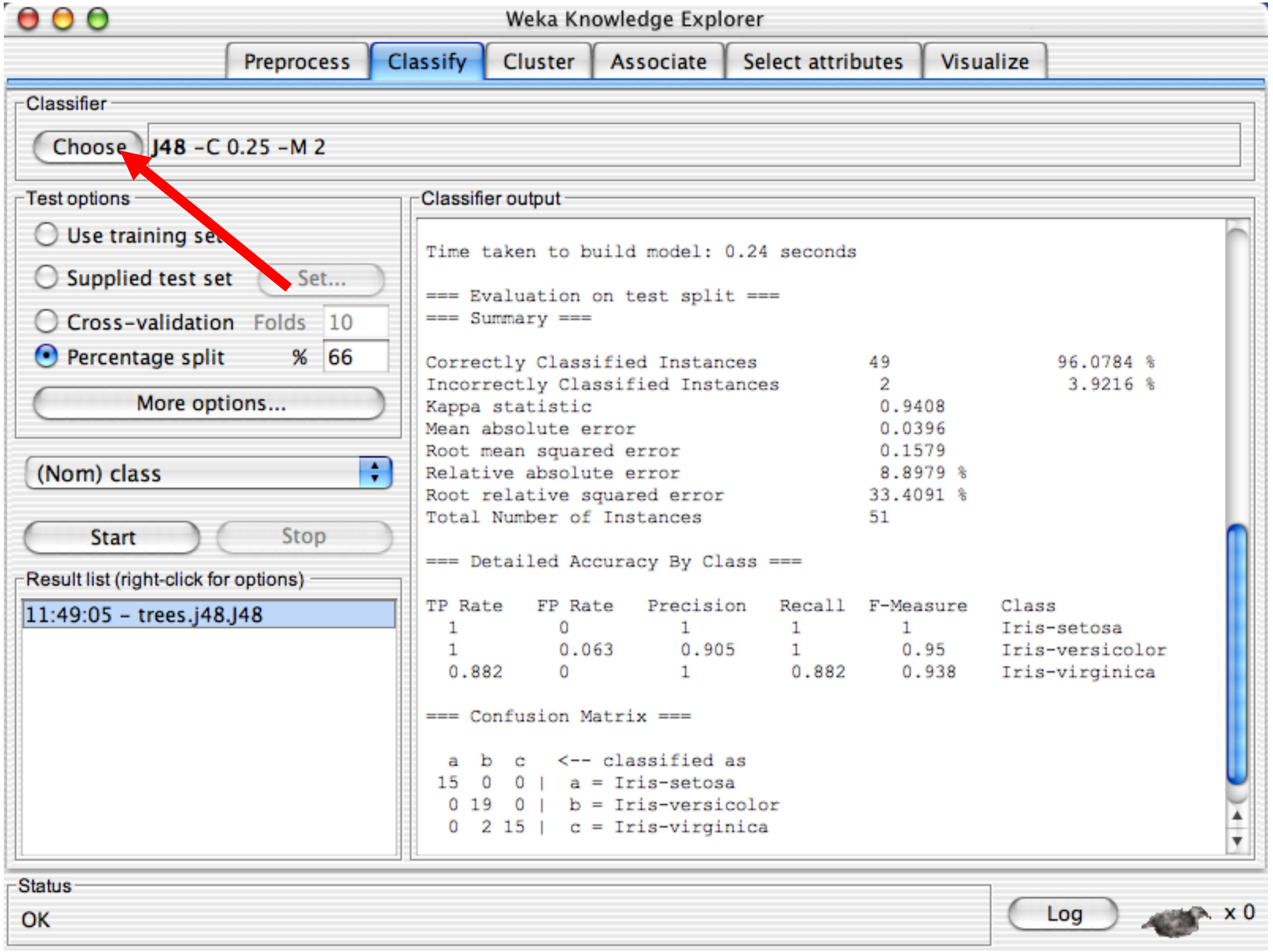

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
Classifier output
Time taken to build model: 0.24 seconds
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 49 96.0784 %
Incorrectly Classified Instances 2 3.9216 %
Kappa statistic 0.9408
Mean absolute error 0.0396
Root mean squared error 0.1579
Relative absolute error 8.8979 %
Root relative squared error 33.4091 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
Recall F-Measure Class
1 1 Iris-setosa
1 0.95 Iris-versicolor
0.882 0.938 Iris-virginica
View in main window
View in separate window
Save result buffer
Load model
Save model
Re-evaluate model on current test set
Visualize classifer errors
Visualize tree
Visualize margin curve
Visualize threshold curve
Visualize cost curve
Status
OK
Log
x 0

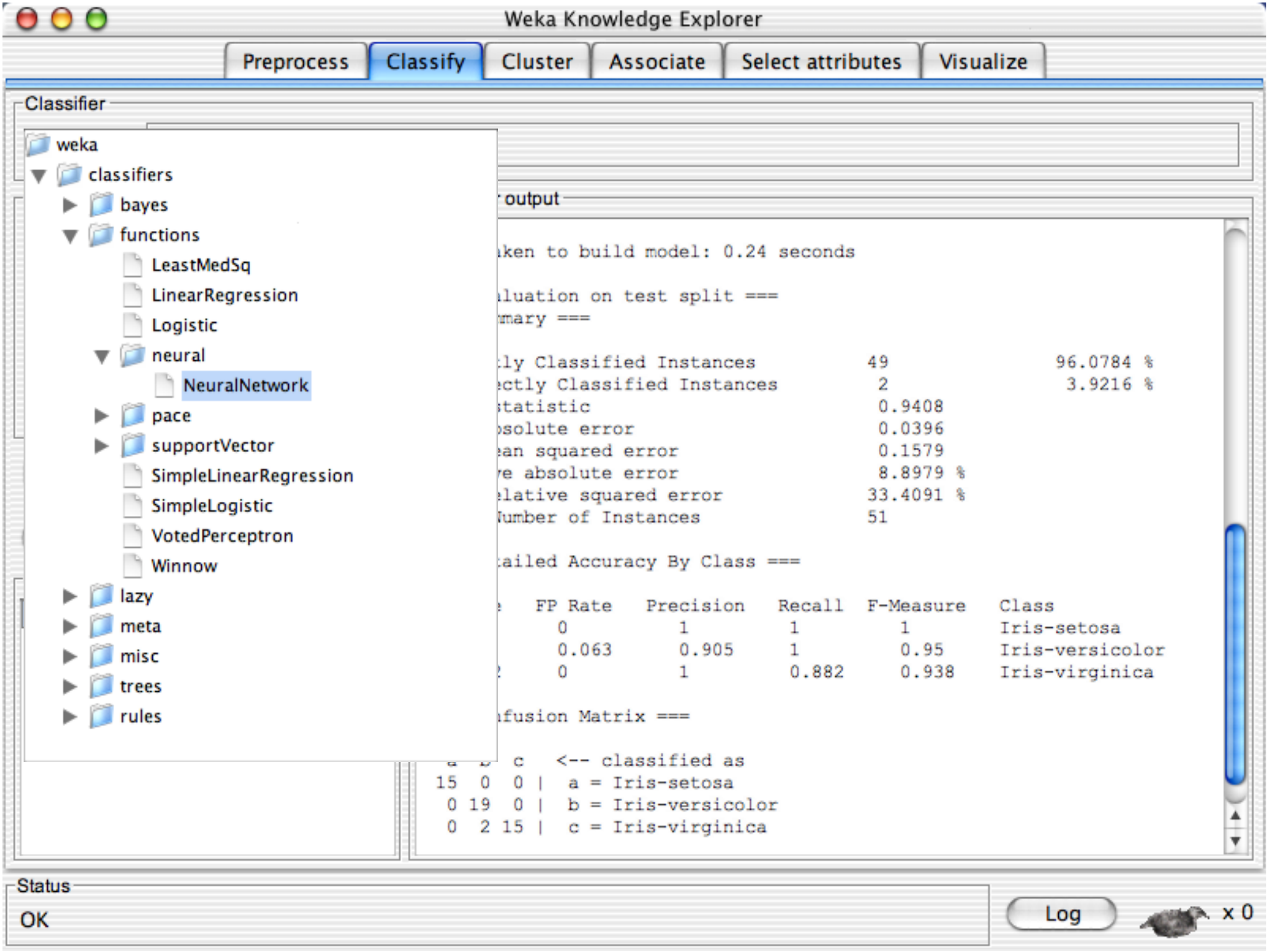

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Cross-validation
Percentage split
More optic
(Nom) class
Start
Result list (right-click for
11:49:05 - trees.j48.J
Weka Classifier Tree Visualizer: 11:49:05 - trees.j48.J48 (iris)
Tree View
petalwidth
<= 0.6
> 0.6
Iris-setosa (50.0)
petalwidth
<= 1.7
> 1.7
petallength
Iris-virginica (46.0/1.0)
<= 4.9
> 4.9
Iris-versicolor (48.0/1.0)
petalwidth
<= 1.5
> 1.5
Iris-virginica (3.0)
Iris-versicolor (3.0/1.0)
96.0784 %
3.9216 %
ass
is-setosa
is-versicolor
is-virginica
0 19 0 | b = Iris-versicolor
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0

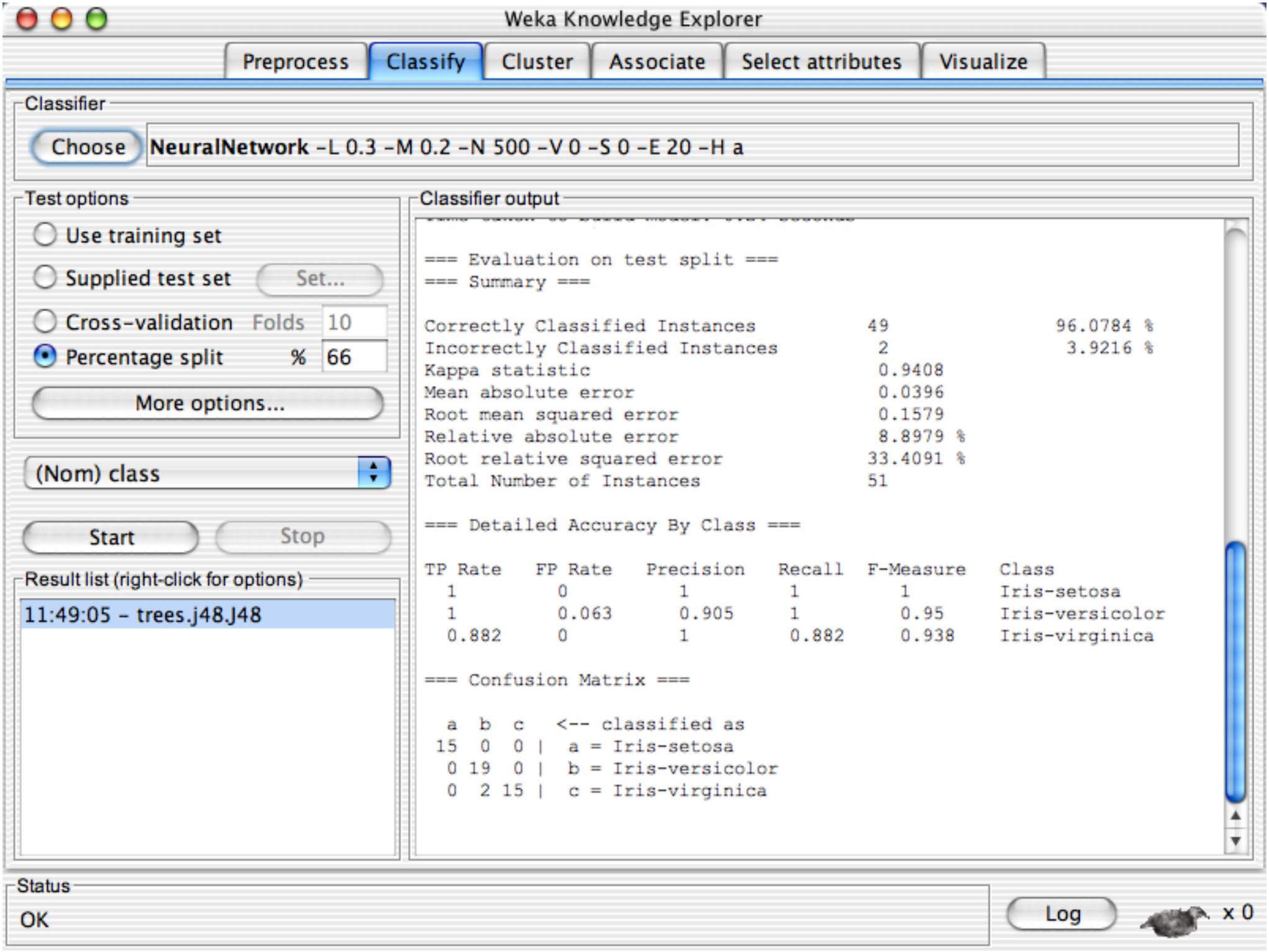

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
Classifier output
Time taken to build model: 0.24 seconds
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 49 96.0784 %
Incorrectly Classified Instances 2 3.9216 %
Kappa statistic 0.9408
Mean absolute error 0.0396
Root mean squared error 0.1579
Relative absolute error 8.8979 %
Root relative squared error 33.4091 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
Recall F-Measure Class
1 1 Iris-setosa
1 0.95 Iris-versicolor
0.882 0.938 Iris-virginica
View in main window
View in separate window
Save result buffer
Load model
Save model
Re-evaluate model on current test set
Visualize classifer errors
Visualize tree
Visualize margin curve
Visualize threshold curve
Visualize cost curve
Status
OK
Log
x 0

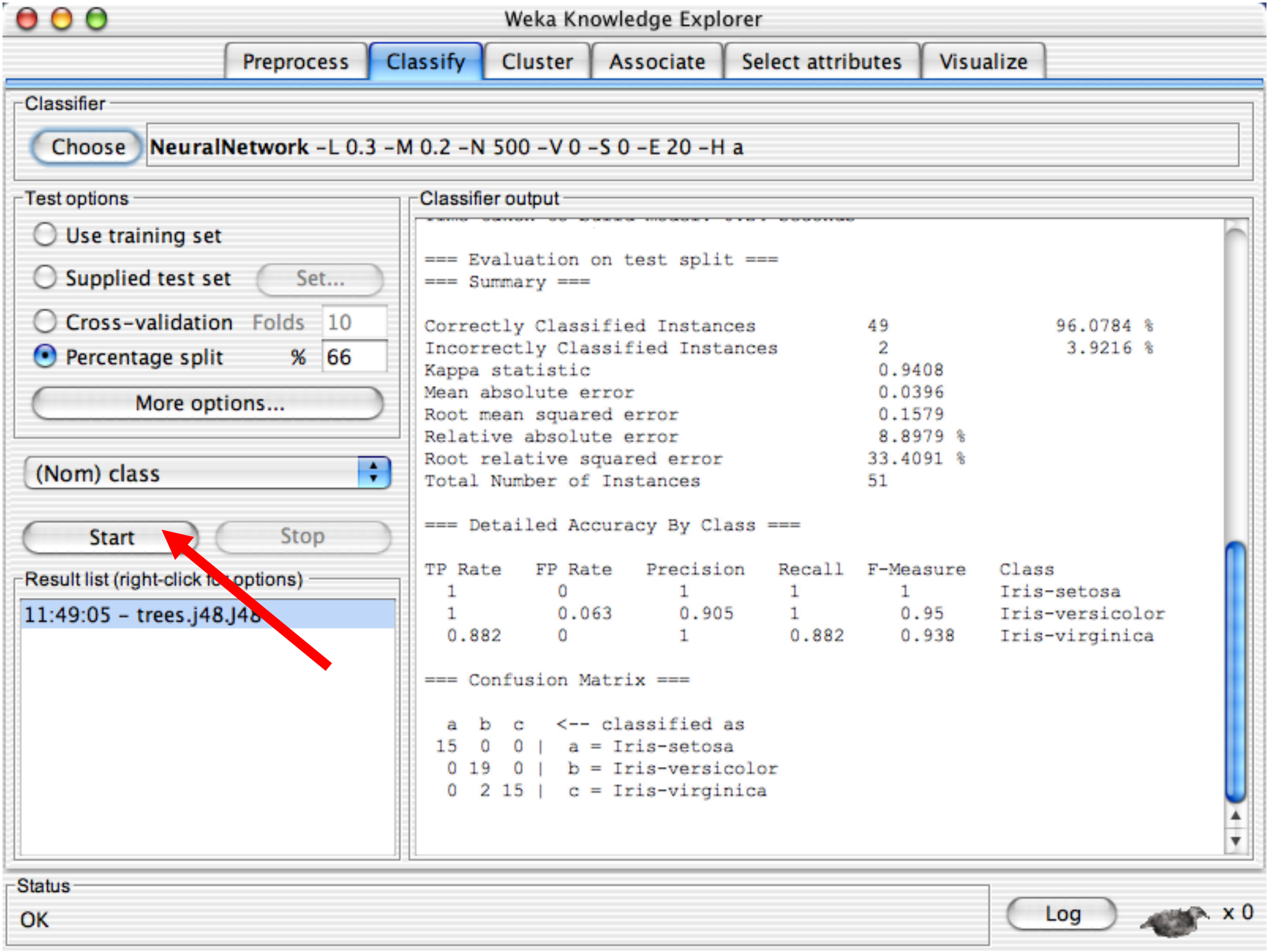

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Cross-validation
Percentage split
More optic
(Nom) class
Start
Result list (right-click for
11:49:05 - trees.j48.J
Weka Classifier Visualize: 11:49:05 - trees.j48.J48 (iris)
X: petallength (Num)
Y: petalwidth (Num)
Colour: class (Nom)
Select Instance
Reset
Clear
Save
Jitter
Plot: iris_predicted
2.5
1.3
0.1
1.1
3.75
6.4
X
Y
Class colour
Iris-setosa Iris-versicolor Iris-virginica
96.0784 %
3.9216 %
ass
is-setosa
is-versicolor
is-virginica
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0

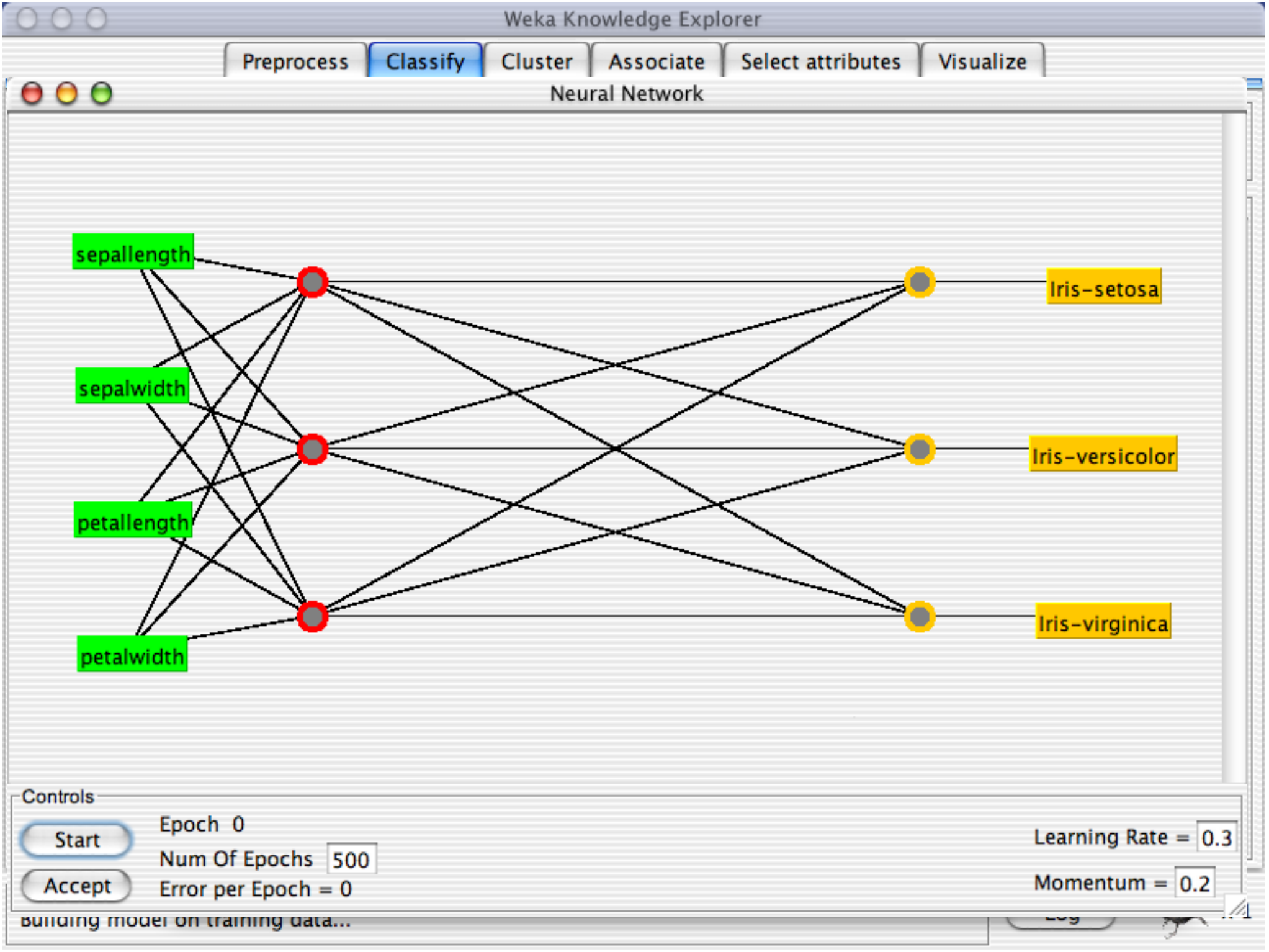

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
Classifier output
Time taken to build model: 0.24 seconds
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 49 96.0784 %
Incorrectly Classified Instances 2 3.9216 %
Kappa statistic 0.9408
Mean absolute error 0.0396
Root mean squared error 0.1579
Relative absolute error 8.8979 %
Root relative squared error 33.4091 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
TP Rate FP Rate Precision Recall F-Measure Class
1 0 1 1 1 Iris-setosa
1 0.063 0.905 1 0.95 Iris-versicolor
0.882 0 1 0.882 0.938 Iris-virginica
=== Confusion Matrix ===
a b c <-- classified as
15 0 0 | a = Iris-setosa
0 19 0 | b = Iris-versicolor
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0

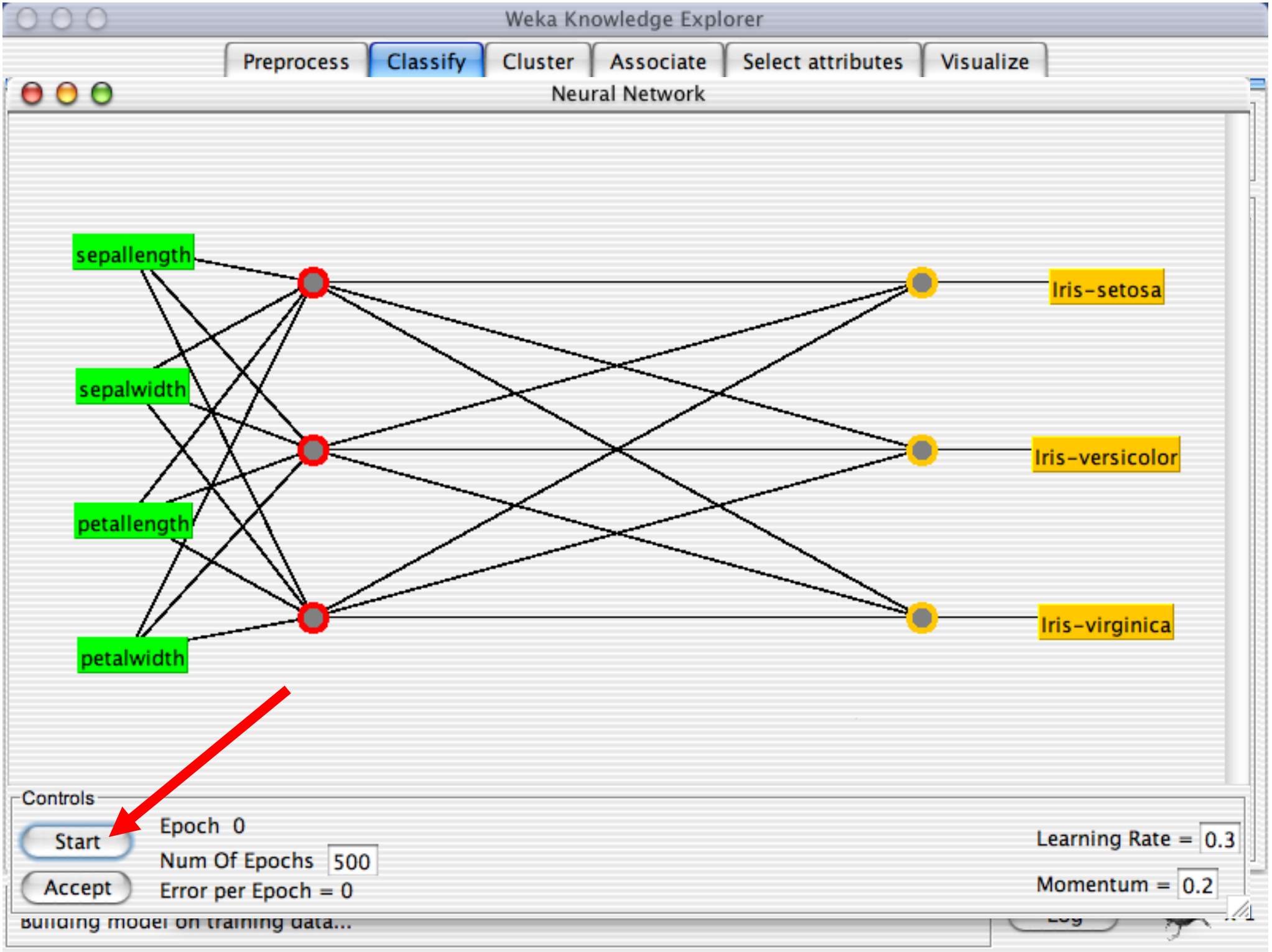

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
J48 -C 0.25 -M 2
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
Classifier output
Time taken to build model: 0.24 seconds
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 49 96.0784 %
Incorrectly Classified Instances 2 3.9216 %
Kappa statistic 0.9408
Mean absolute error 0.0396
Root mean squared error 0.1579
Relative absolute error 8.8979 %
Root relative squared error 33.4091 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
TP Rate FP Rate Precision Recall F-Measure Class
1 0 1 1 1 Iris-setosa
1 0.063 0.905 1 0.95 Iris-versicolor
0.882 0 1 0.882 0.938 Iris-virginica
=== Confusion Matrix ===
a b c <-- classified as
15 0 0 | a = Iris-setosa
0 19 0 | b = Iris-versicolor
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0

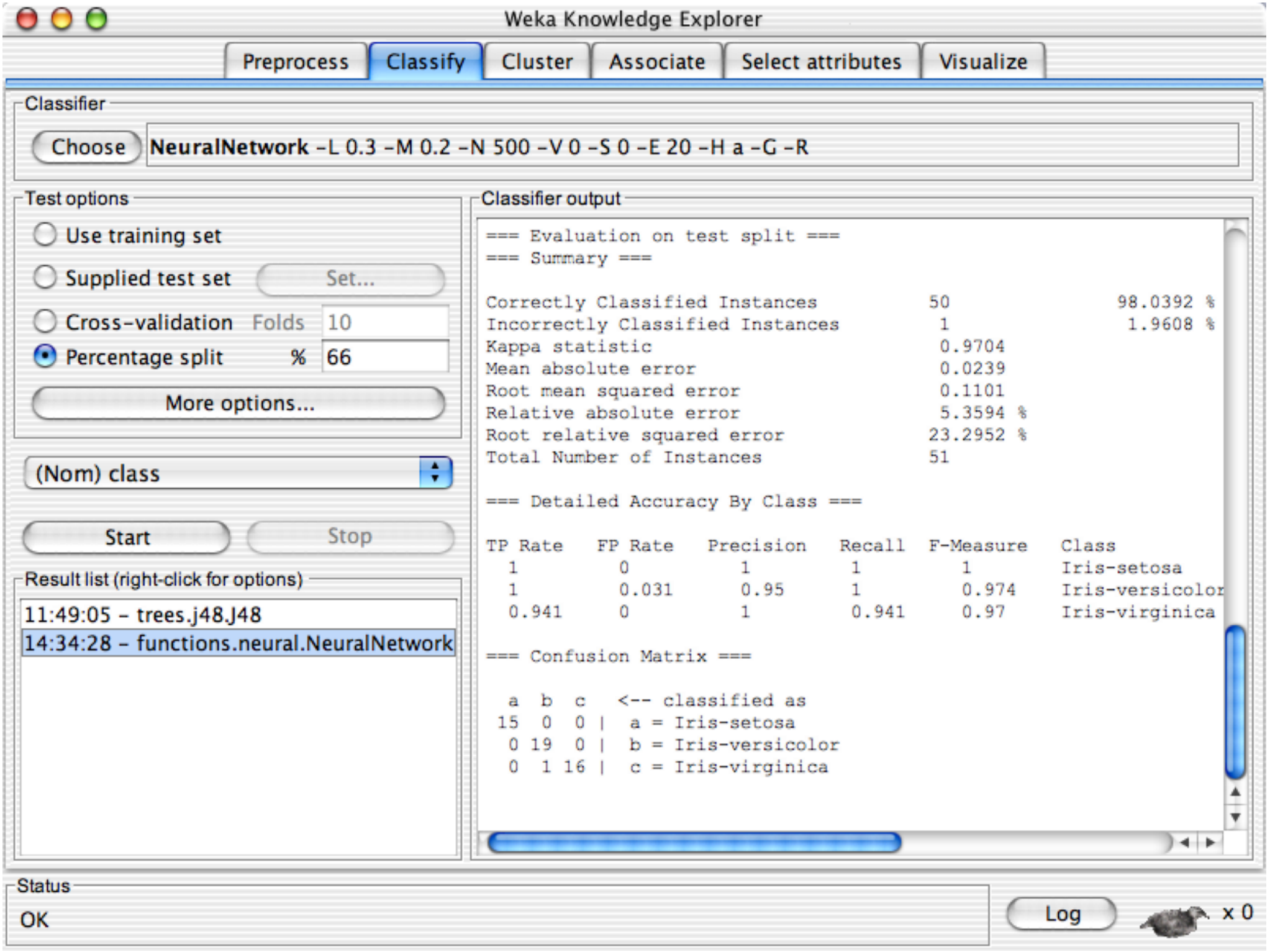

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
weka
classifiers
bayes
functions
LeastMedSq
LinearRegression
Logistic
neural
NeuralNetwork
pace
supportVector
SimpleLinearRegression
SimpleLogistic
VotedPerceptron
Winnow
lazy
meta
misc
trees
rules
output
ken to build model: 0.24 seconds
luation on test split ===
mary ===
ly Classified Instances 49 96.0784 %
ctly Classified Instances 2 3.9216 %
statistic 0.9408
solute error 0.0396
an squared error 0.1579
e absolute error 8.8979 %
lative squared error 33.4091 %
Number of Instances 51
ailed Accuracy By Class ===
FP Rate Precision Recall F-Measure Class
0 1 1 1 Iris-setosa
0.063 0.905 1 0.95 Iris-versicolor
0 1 0.882 0.938 Iris-virginica
fusion Matrix ===
c <-- classified as
15 0 0 | a = Iris-setosa
0 19 0 | b = Iris-versicolor
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0

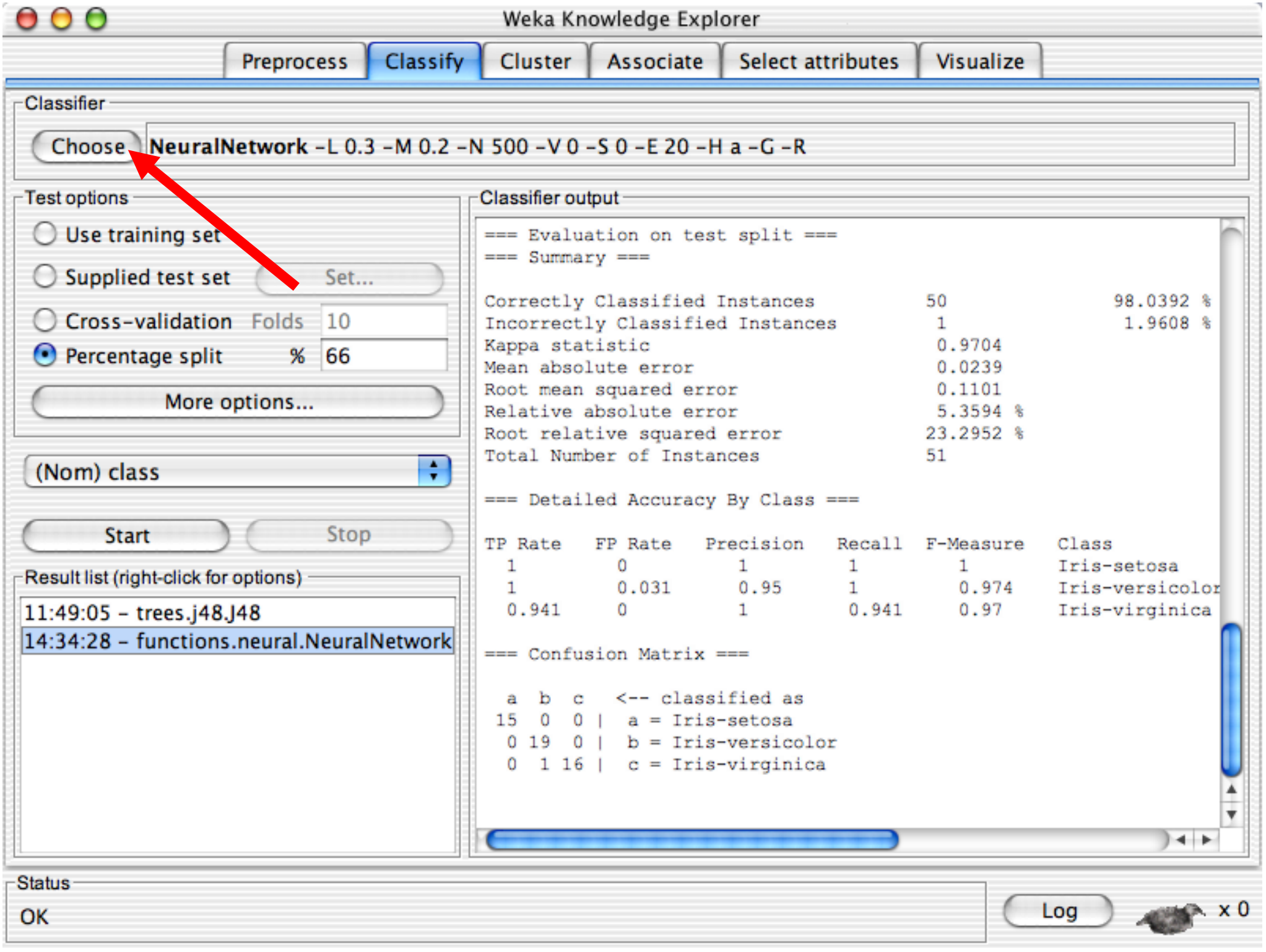

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NeuralNetwork -L 0.3 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
Classifier output
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 49 96.0784 %
Incorrectly Classified Instances 2 3.9216 %
Kappa statistic 0.9408
Mean absolute error 0.0396
Root mean squared error 0.1579
Relative absolute error 8.8979 %
Root relative squared error 33.4091 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
TP Rate FP Rate Precision Recall F-Measure Class
1 0 1 1 1 Iris-setosa
1 0.063 0.905 1 0.95 Iris-versicolor
0.882 0 1 0.882 0.938 Iris-virginica
=== Confusion Matrix ===
a b c <-- classified as
15 0 0 | a = Iris-setosa
0 19 0 | b = Iris-versicolor
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0

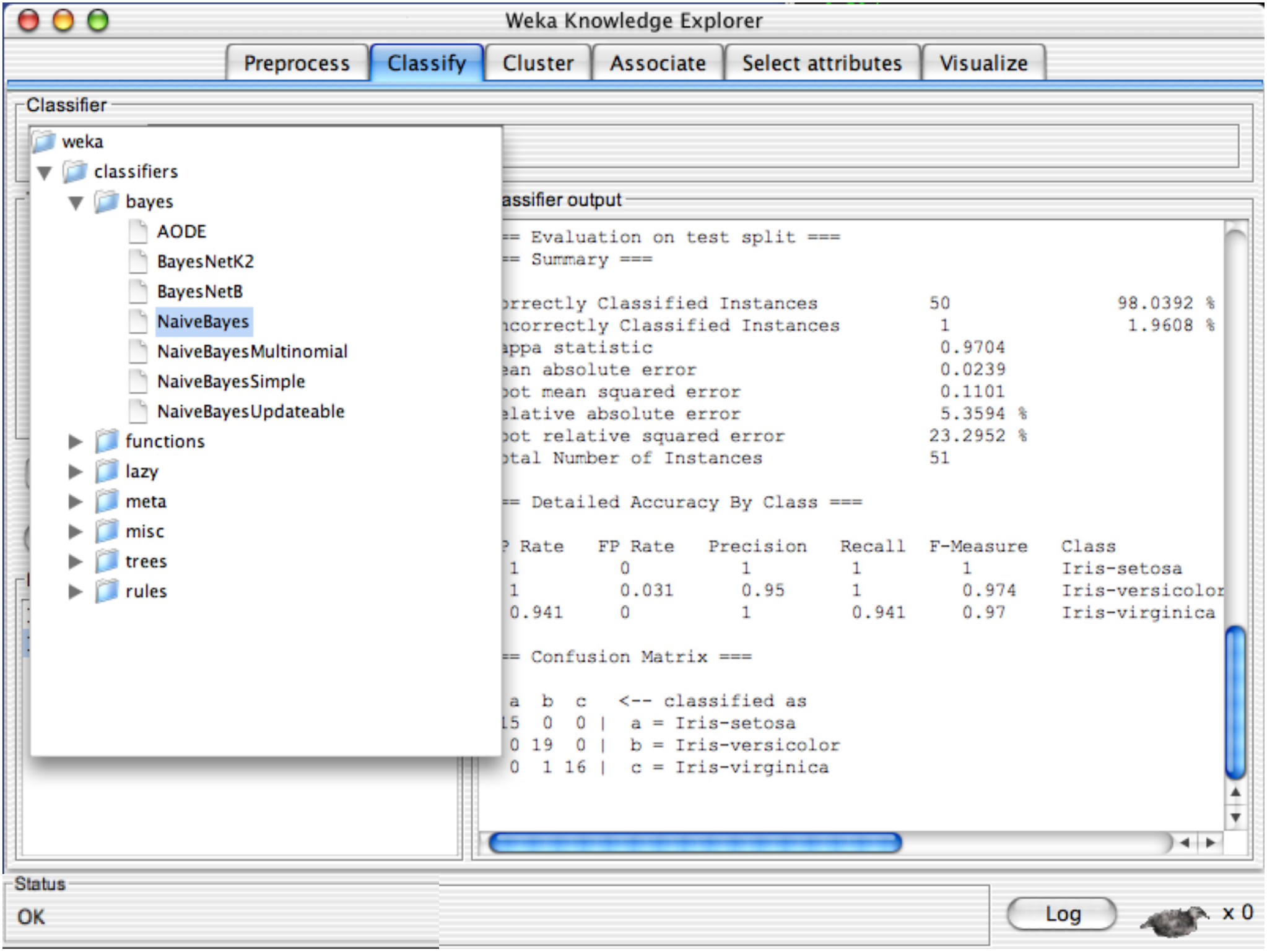

Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NeuralNetwork -L 0.3 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
Classifier output
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 49 96.0784 %
Incorrectly Classified Instances 2 3.9216 %
Kappa statistic 0.9408
Mean absolute error 0.0396
Root mean squared error 0.1579
Relative absolute error 8.8979 %
Root relative squared error 33.4091 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
TP Rate FP Rate Precision Recall F-Measure Class
1 0 1 1 1 Iris-setosa
1 0.063 0.905 1 0.95 Iris-versicolor
0.882 0 1 0.882 0.938 Iris-virginica
=== Confusion Matrix ===
a b c <-- classified as
15 0 0 | a = Iris-setosa
0 19 0 | b = Iris-versicolor
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Neural Network
sepallength
sepalwidth
petallength
petalwidth
Iris-setosa
Iris-versicolor
Iris-virginica
Controls
Start
Accept
Epoch 0
Num Of Epochs 500
Error per Epoch = 0
Learning Rate = 0.3
Momentum = 0.2
Building model on training data...


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Neural Network
sepallength
sepalwidth
petallength
petalwidth
Iris-setosa
Iris-versicolor
Iris-virginica
Controls
Start
Accept
Epoch 0
Num Of Epochs 500
Error per Epoch = 0
Learning Rate = 0.3
Momentum = 0.2


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NeuralNetwork -L 0.3 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a -G -R
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)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
Classifier output
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 50 98.0392 %
Incorrectly Classified Instances 1 1.9608 %
Kappa statistic 0.9704
Mean absolute error 0.0239
Root mean squared error 0.1101
Relative absolute error 5.3594 %
Root relative squared error 23.2952 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
TP Rate FP Rate Precision Recall F-Measure Class
1 0 1 1 1 Iris-setosa
1 0.031 0.95 1 0.974 Iris-versicolor
0.941 0 1 0.941 0.97 Iris-virginica
=== Confusion Matrix ===
a b c <-- classified as
15 0 0 | a = Iris-setosa
0 19 0 | b = Iris-versicolor
0 1 16 | c = Iris-virginica
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NeuralNetwork -L 0.3 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a -G -R
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)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
Classifier output
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 50 98.0392 %
Incorrectly Classified Instances 1 1.9608 %
Kappa statistic 0.9704
Mean absolute error 0.0239
Root mean squared error 0.1101
Relative absolute error 5.3594 %
Root relative squared error 23.2952 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
TP Rate FP Rate Precision Recall F-Measure Class
1 0 1 1 1 Iris-setosa
1 0.031 0.95 1 0.974 Iris-versicolor
0.941 0 1 0.941 0.97 Iris-virginica
=== Confusion Matrix ===
a b c <-- classified as
15 0 0 | a = Iris-setosa
0 19 0 | b = Iris-versicolor
0 1 16 | c = Iris-virginica
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
weka
classifiers
bayes
AODE
BayesNetK2
BayesNetB
NaiveBayes
NaiveBayesMultinomial
NaiveBayesSimple
NaiveBayesUpdateable
functions
lazy
meta
misc
trees
rules
assifier output
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oot mean squared error 0.1101
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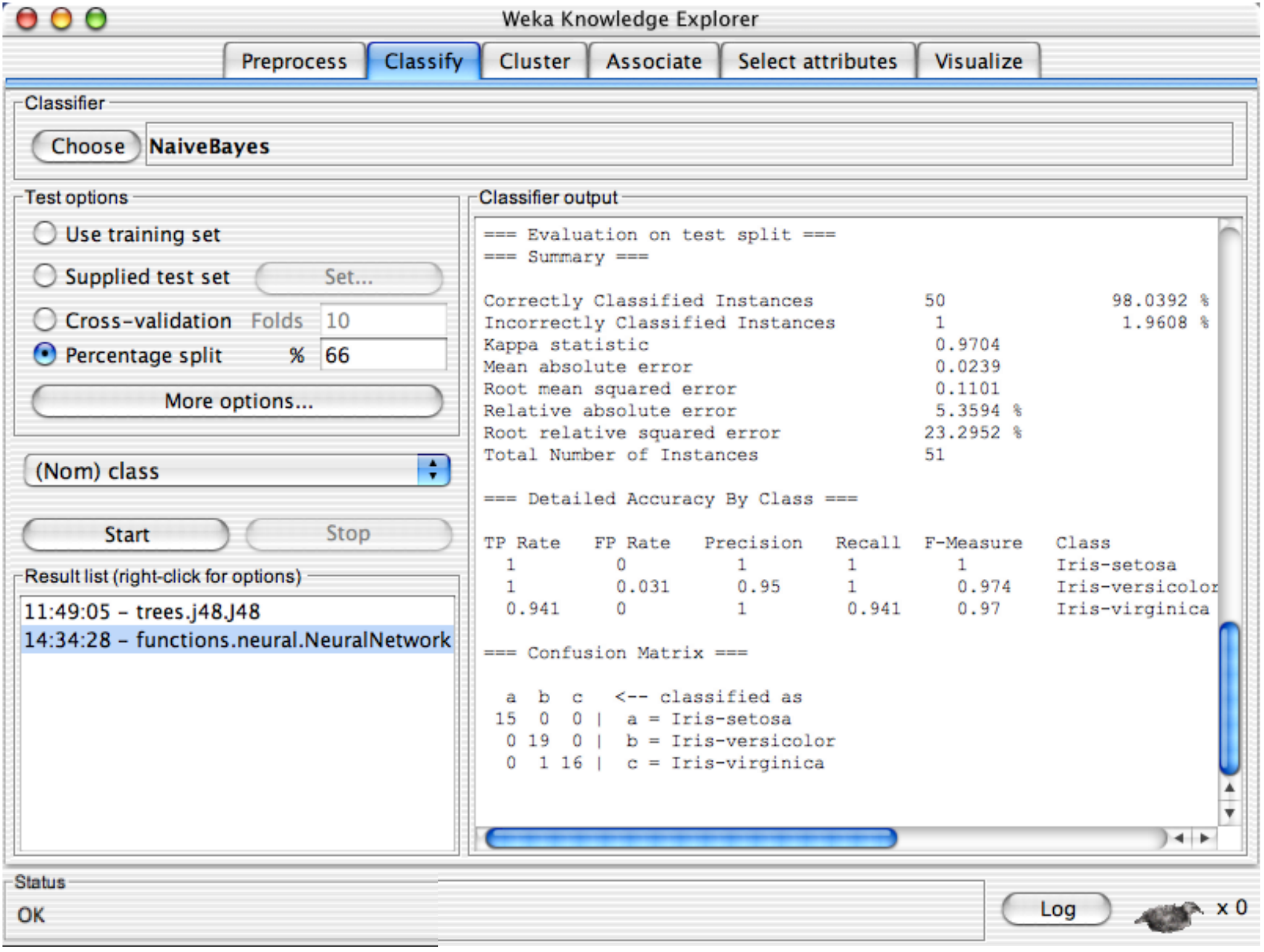
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NaiveBayes
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)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
Classifier output
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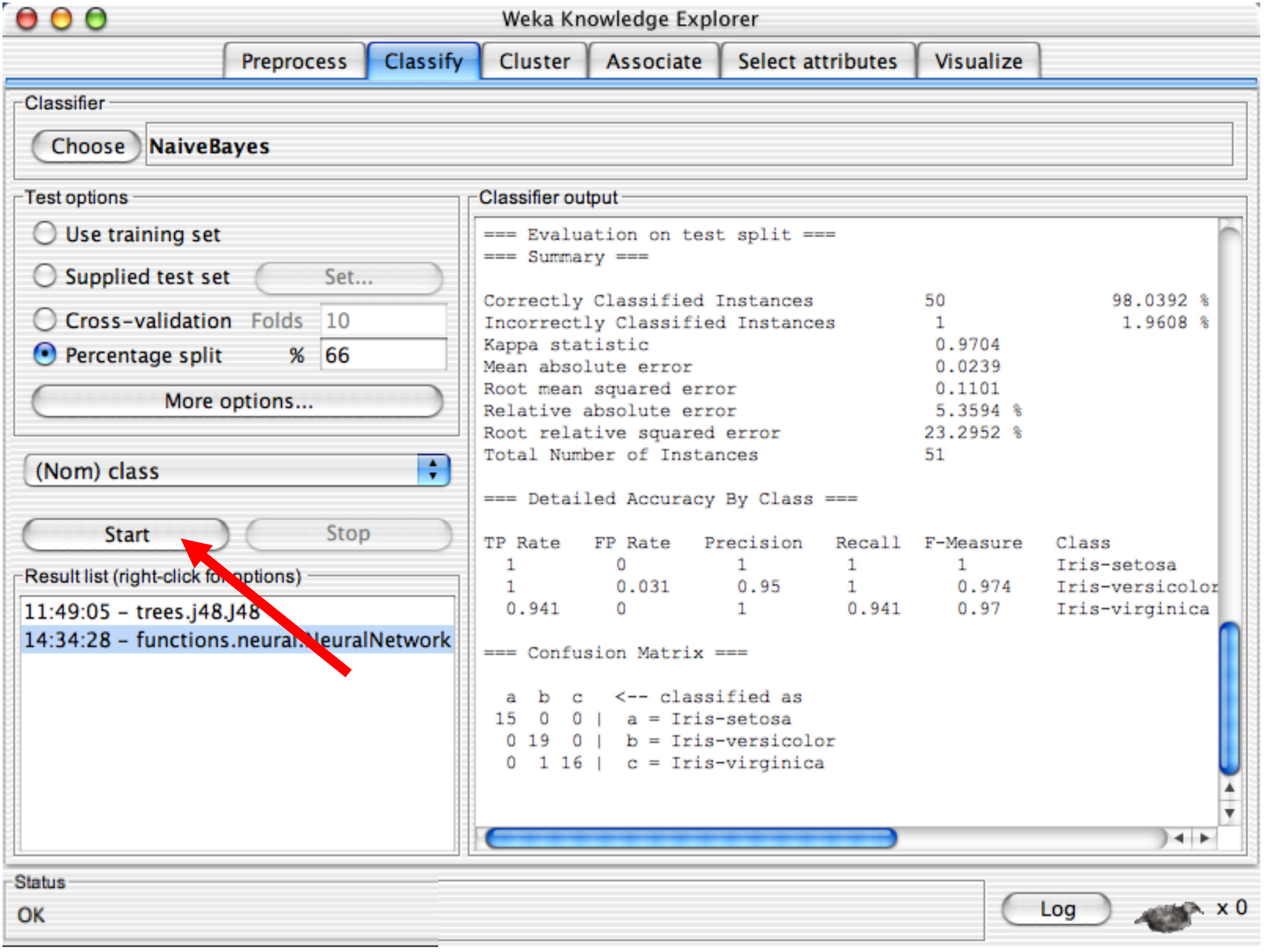
0 1 16 | c = Iris-virginica
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NaiveBayes
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)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
Classifier output
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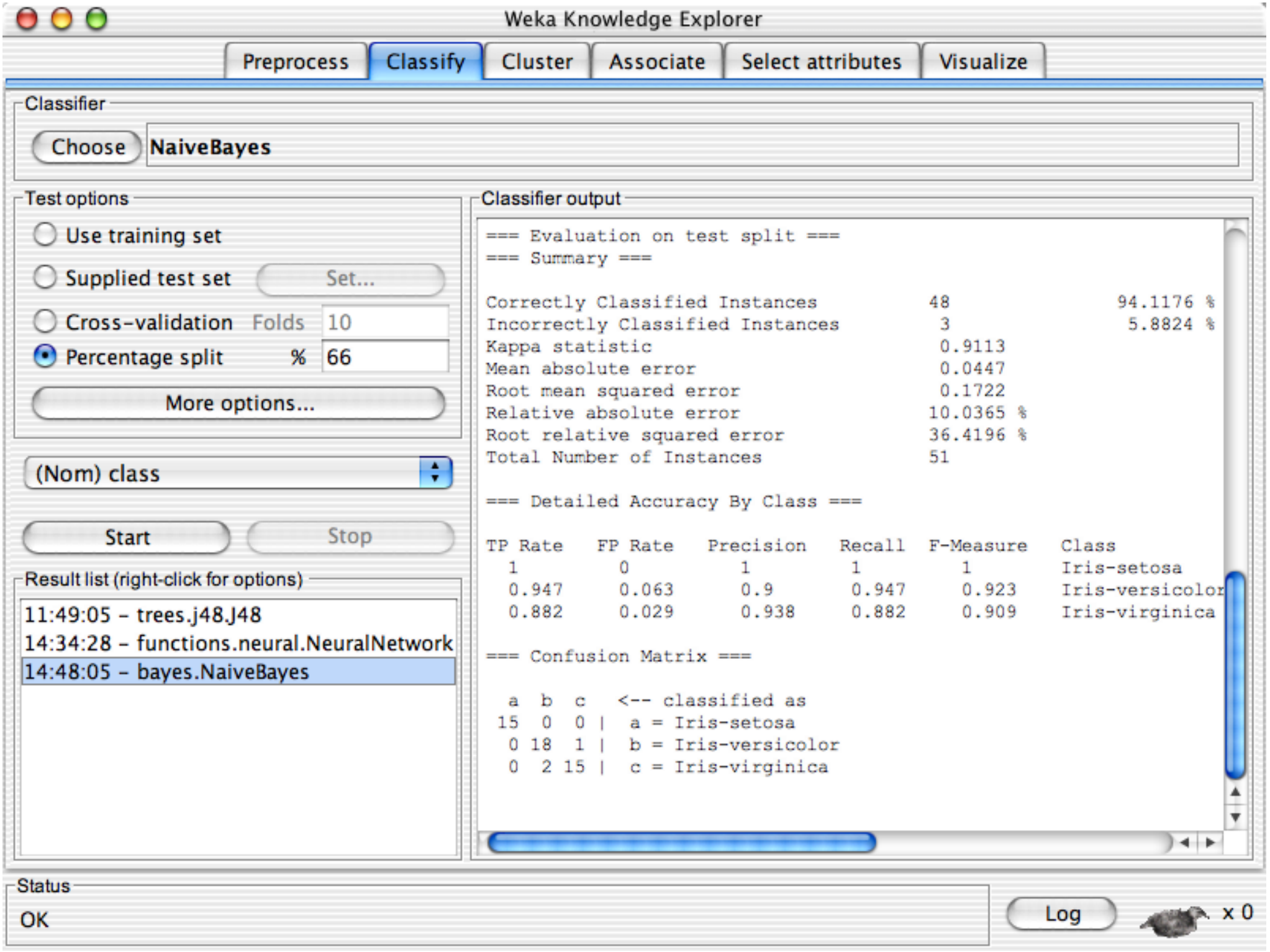
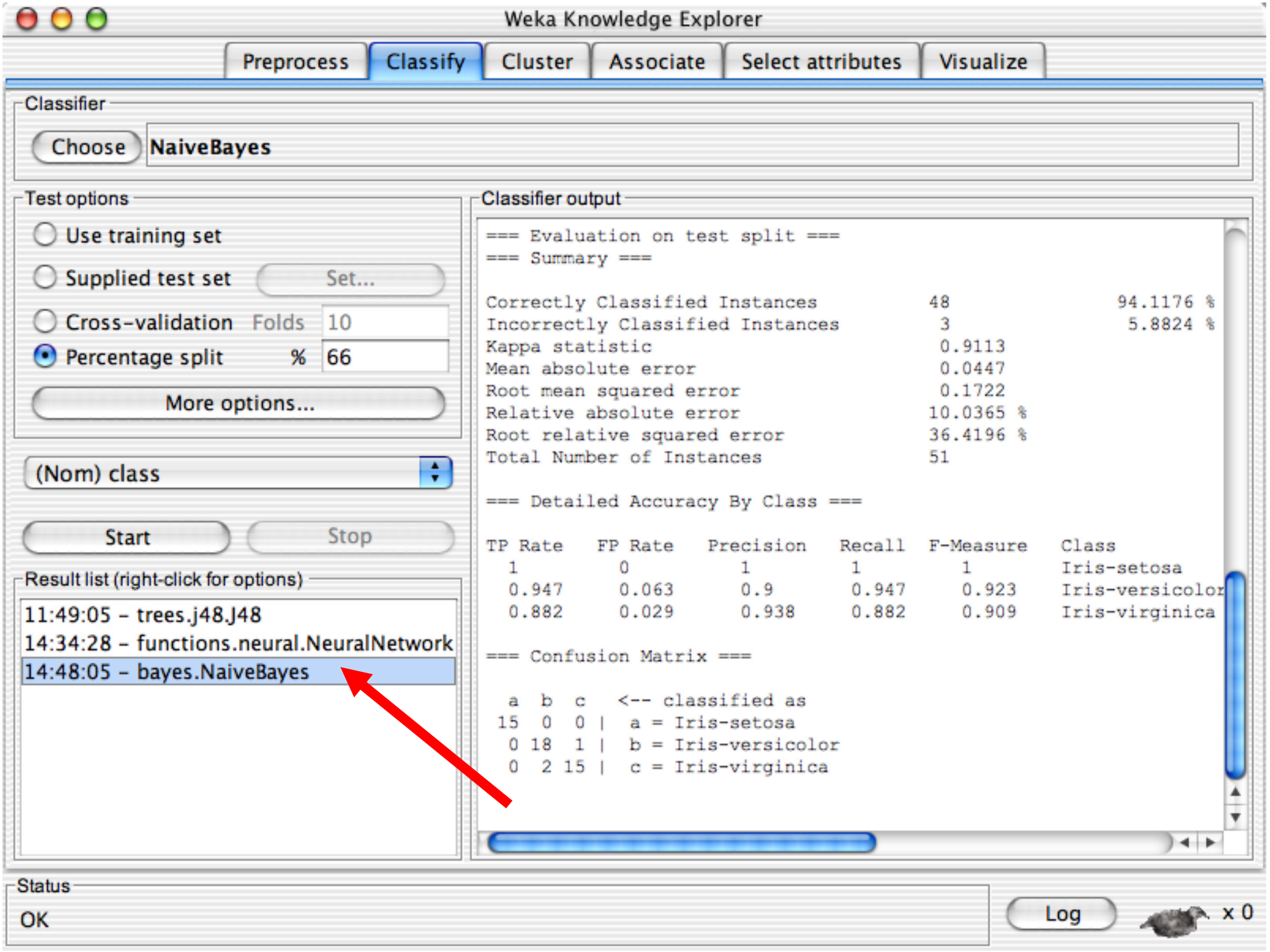
a b c <-- classified as
15 0 0 | a = Iris-setosa
0 19 0 | b = Iris-versicolor
0 1 16 | c = Iris-virginica
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NaiveBayes
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)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
14:48:05 - bayes.NaiveBayes
Classifier output
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 48 94.1176 %
Incorrectly Classified Instances 3 5.8824 %
Kappa statistic 0.9113
Mean absolute error 0.0447
Root mean squared error 0.1722
Relative absolute error 10.0365 %
Root relative squared error 36.4196 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
TP Rate FP Rate Precision Recall F-Measure Class
1 0 1 1 1 Iris-setosa
0.947 0.063 0.9 0.947 0.923 Iris-versicolor
0.882 0.029 0.938 0.882 0.909 Iris-virginica
=== Confusion Matrix ===
a b c <-- classified as
15 0 0 | a = Iris-setosa
0 18 1 | b = Iris-versicolor
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NaiveBayes
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)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
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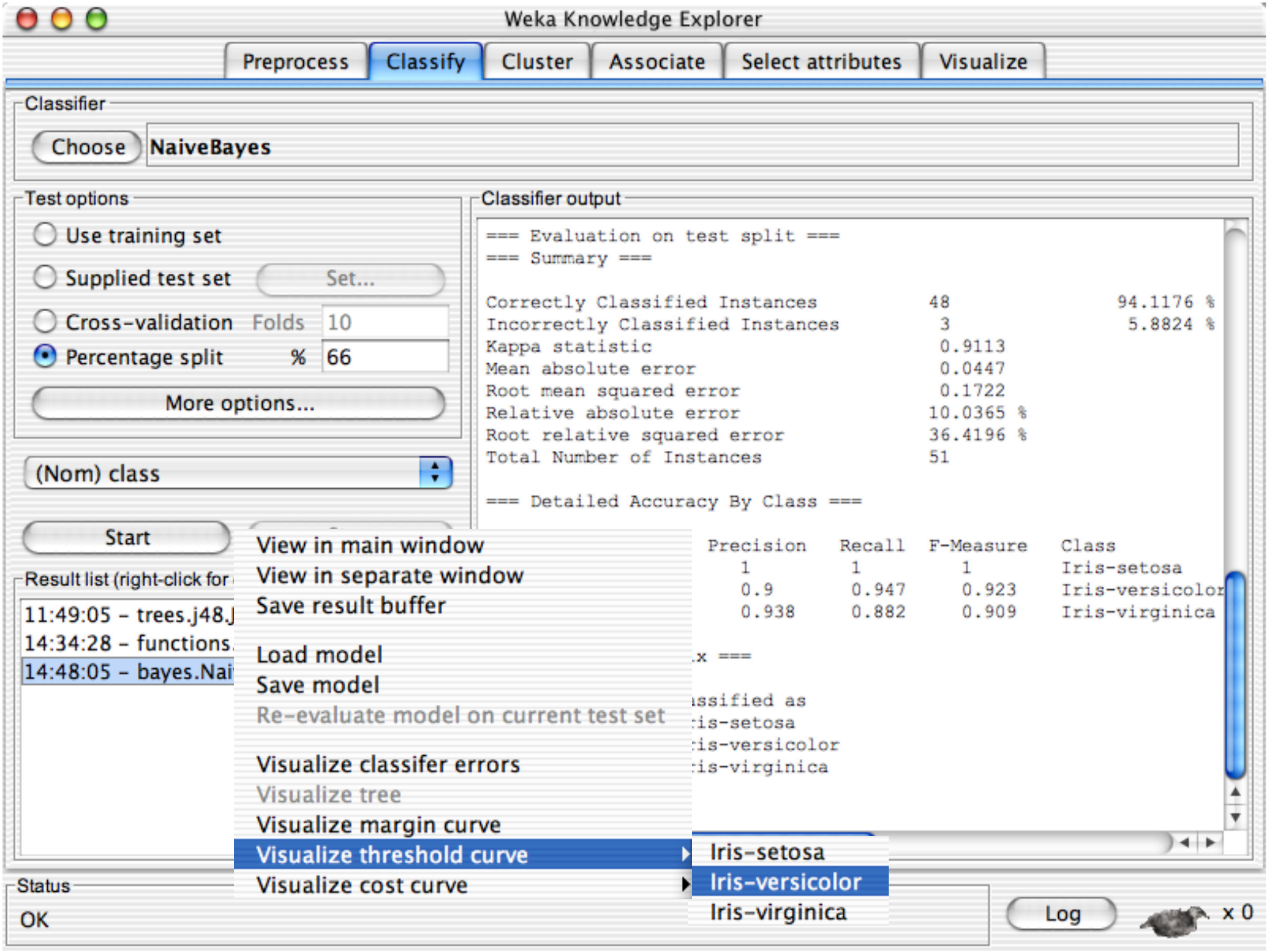
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NaiveBayes
Test options
Use training set
Supplied test set
Set...
Cross-validation
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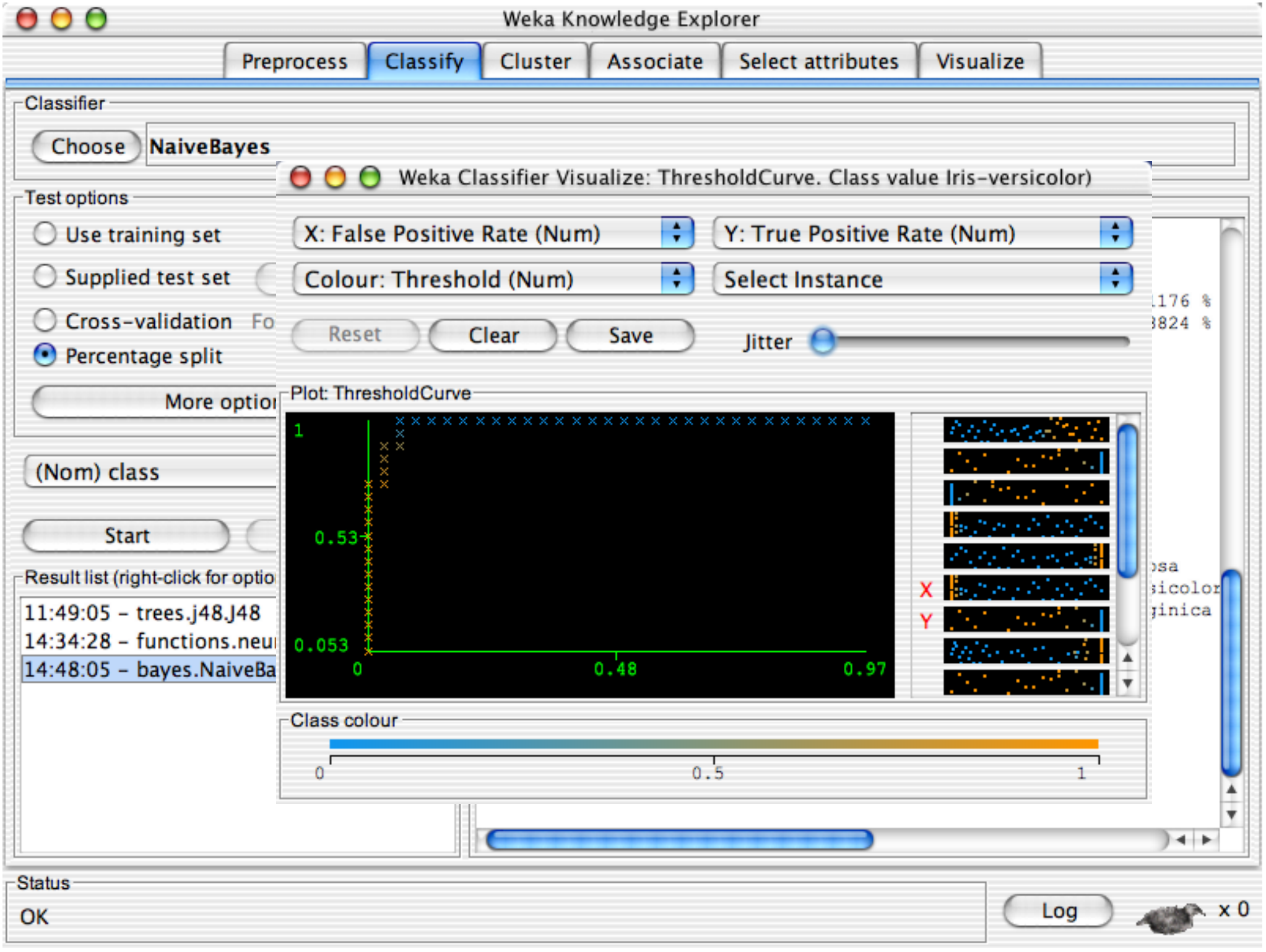
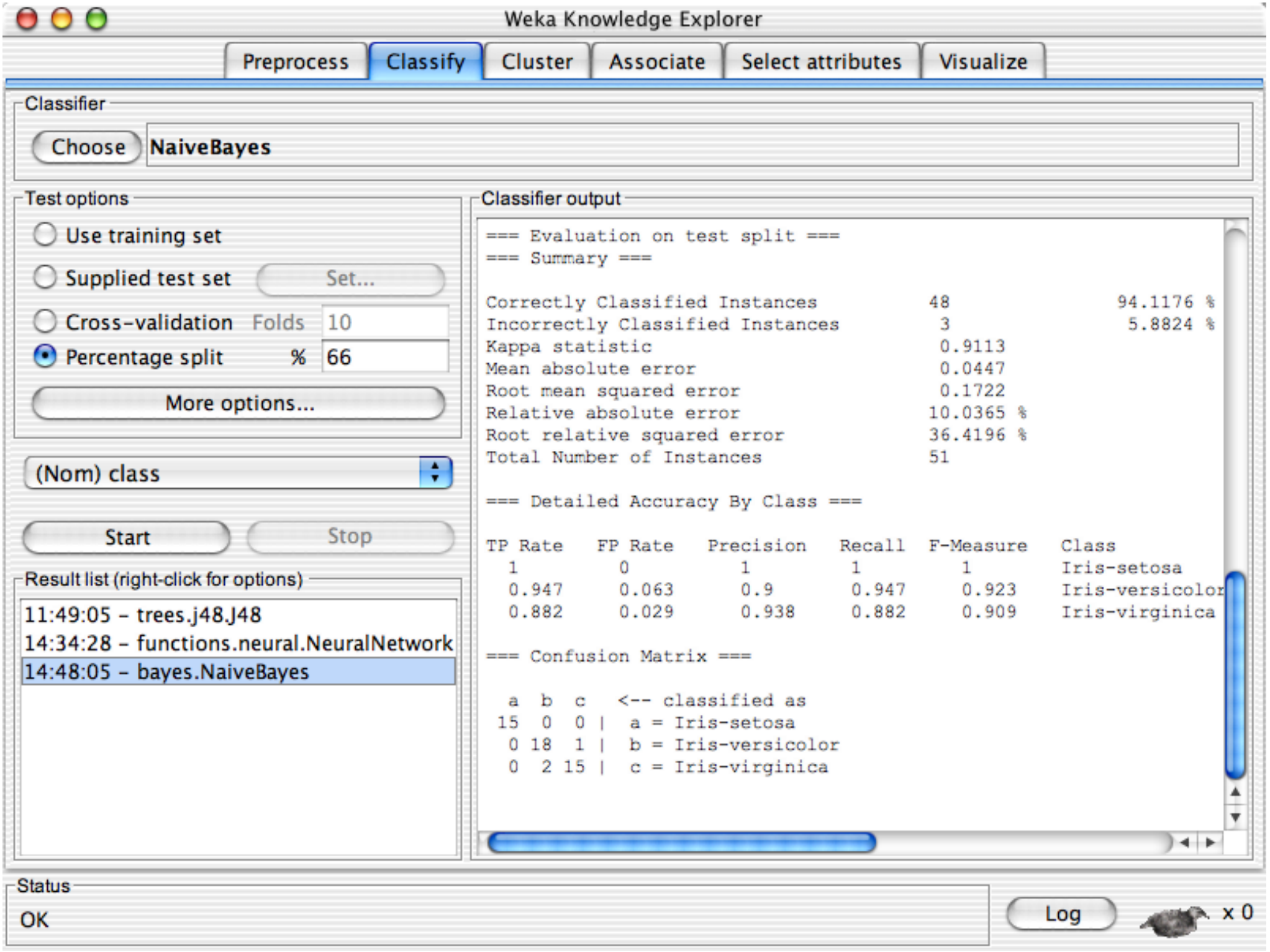
Precision Recall F-Measure Class
1 1 1 Iris-setosa
0.9 0.947 0.923 Iris-versicolor
0.938 0.882 0.909 Iris-virginica
(Nom) class
Start
Result list (right-click for
11:49:05 - trees.j48.J
14:34:28 - functions.
14:48:05 - bayes.Nai
View in main window
View in separate window
Save result buffer
Load model
Save model
Re-evaluate model on current test set
Visualize classifer errors
Visualize tree
Visualize margin curve
Visualize threshold curve
Visualize cost curve
Iris-setosa
Iris-versicolor
Iris-virginica
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NaiveBayes
Test options
Use training set
Supplied test set
Cross-validation
Percentage split
More optio
(Nom) class
Start
Result list (right-click for optio
11:49:05 - trees.j48.J48
14:34:28 - functions.neu
14:48:05 - bayes.NaiveBa
Weka Classifier Visualize: ThresholdCurve. Class value Iris-versicolor)
X: False Positive Rate (Num)
Y: True Positive Rate (Num)
Colour: Threshold (Num)
Select Instance
Reset
Clear
Save
Jitter
Plot: ThresholdCurve
1
0.53
0.053
0
0.48
0.97
X
Y
Class colour
0
0.5
1
Status
OK
Log
x 0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Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NaiveBayes
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)
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14:34:28 - functions.neural.NeuralNetwork
14:48:05 - bayes.NaiveBayes
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0.882 0.029 0.938 0.882 0.909 Iris-virginica
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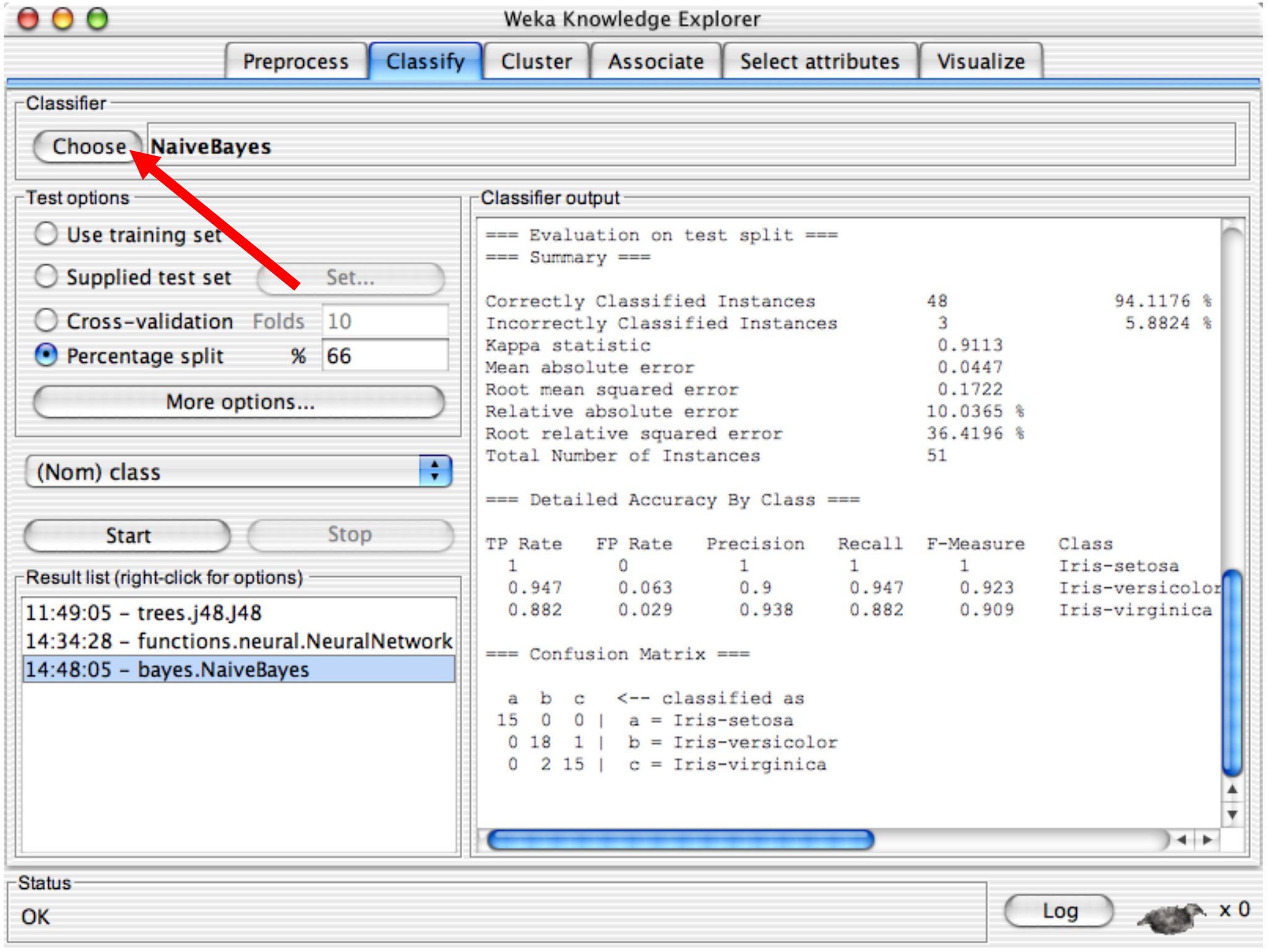
0 18 1 | b = Iris-versicolor
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
NaiveBayes
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)
11:49:05 - trees.j48.J48
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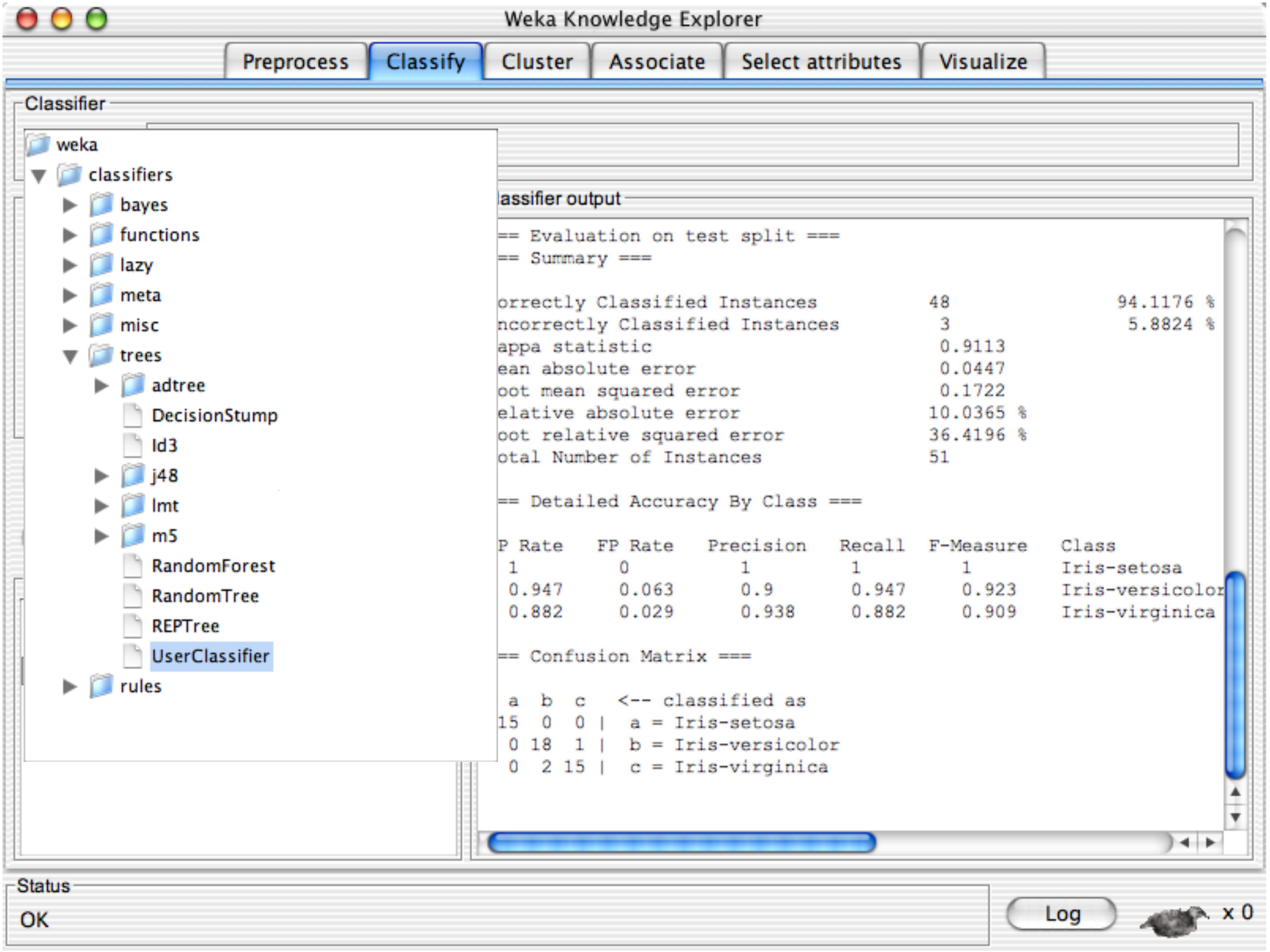
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
weka
classifiers
bayes
functions
lazy
meta
misc
trees
adtree
DecisionStump
Id3
j48
lmt
m5
RandomForest
RandomTree
REPTree
UserClassifier
rules
assifier output
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0.947 0.063 0.9 0.947 0.923 Iris-versicolor
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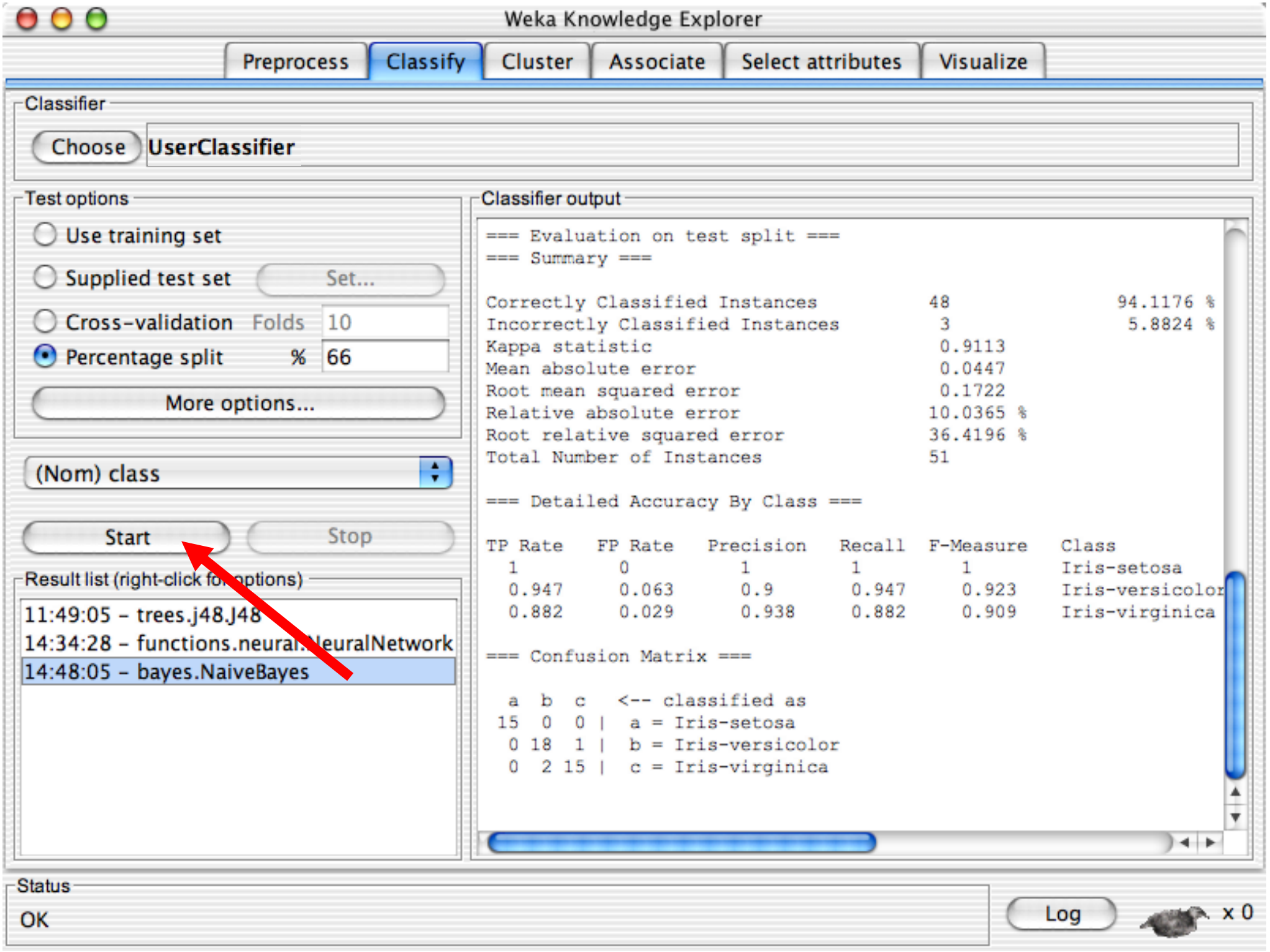
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
UserClassifier
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)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
14:48:05 - bayes.NaiveBayes
Classifier output
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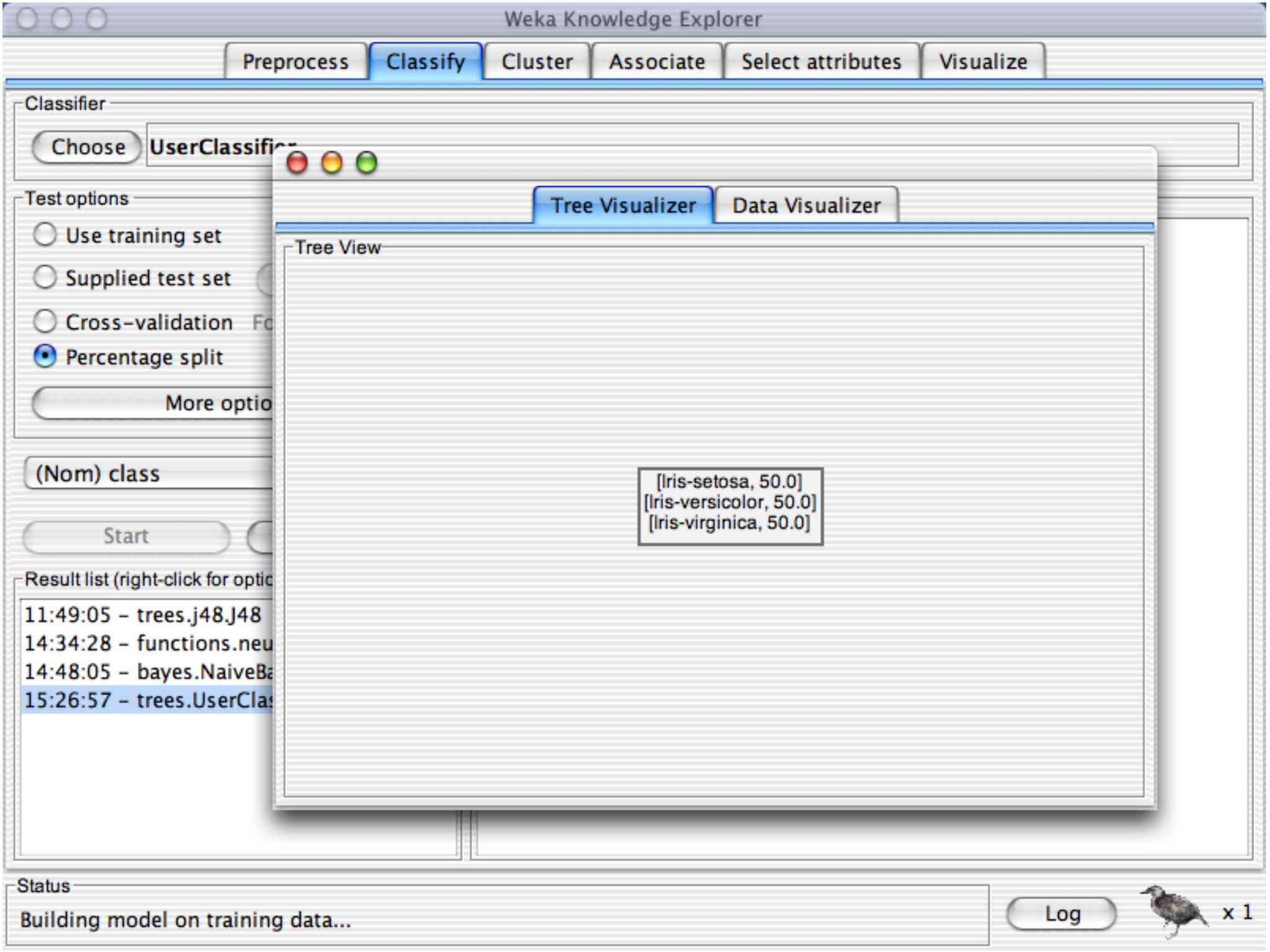
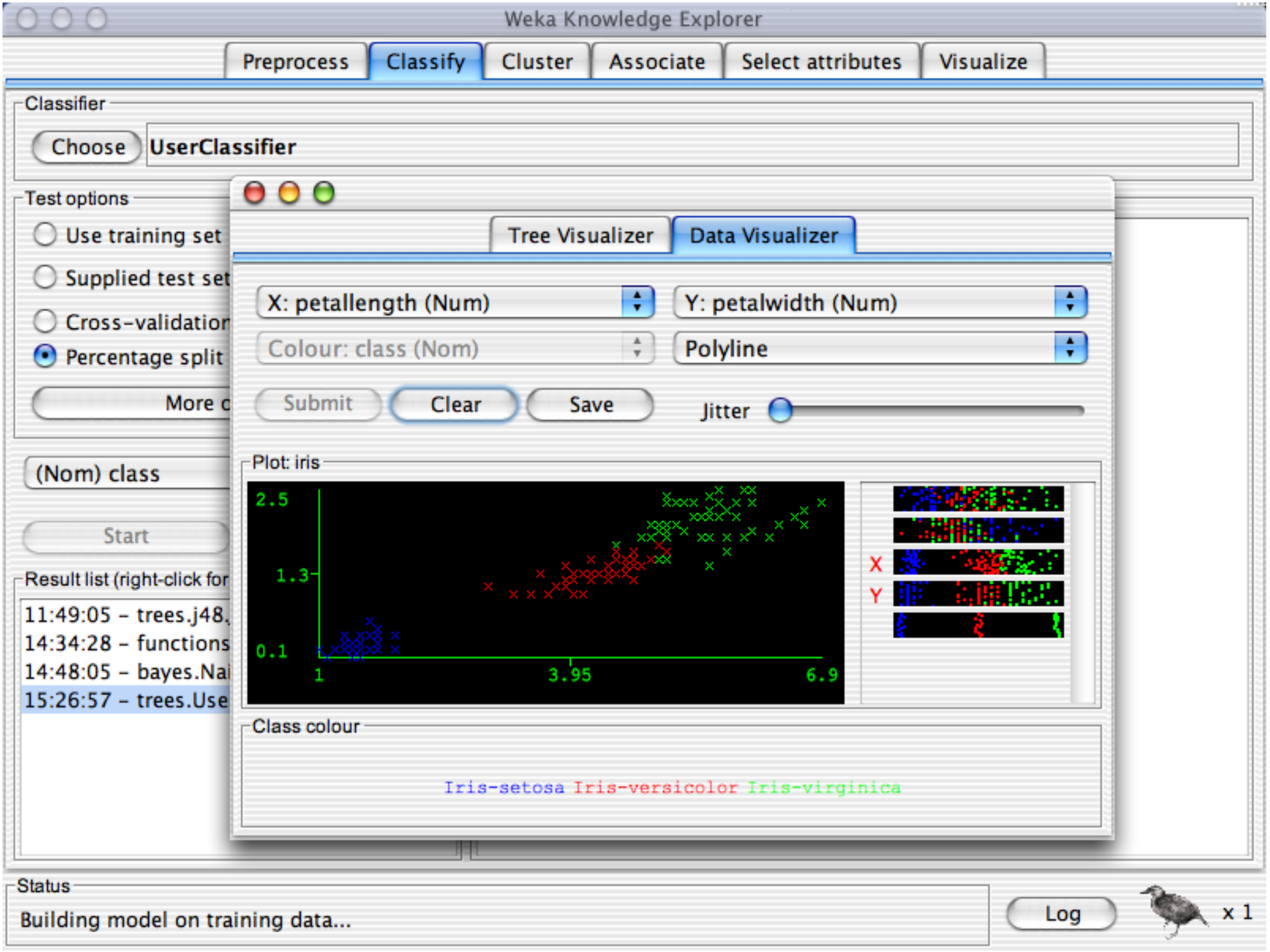
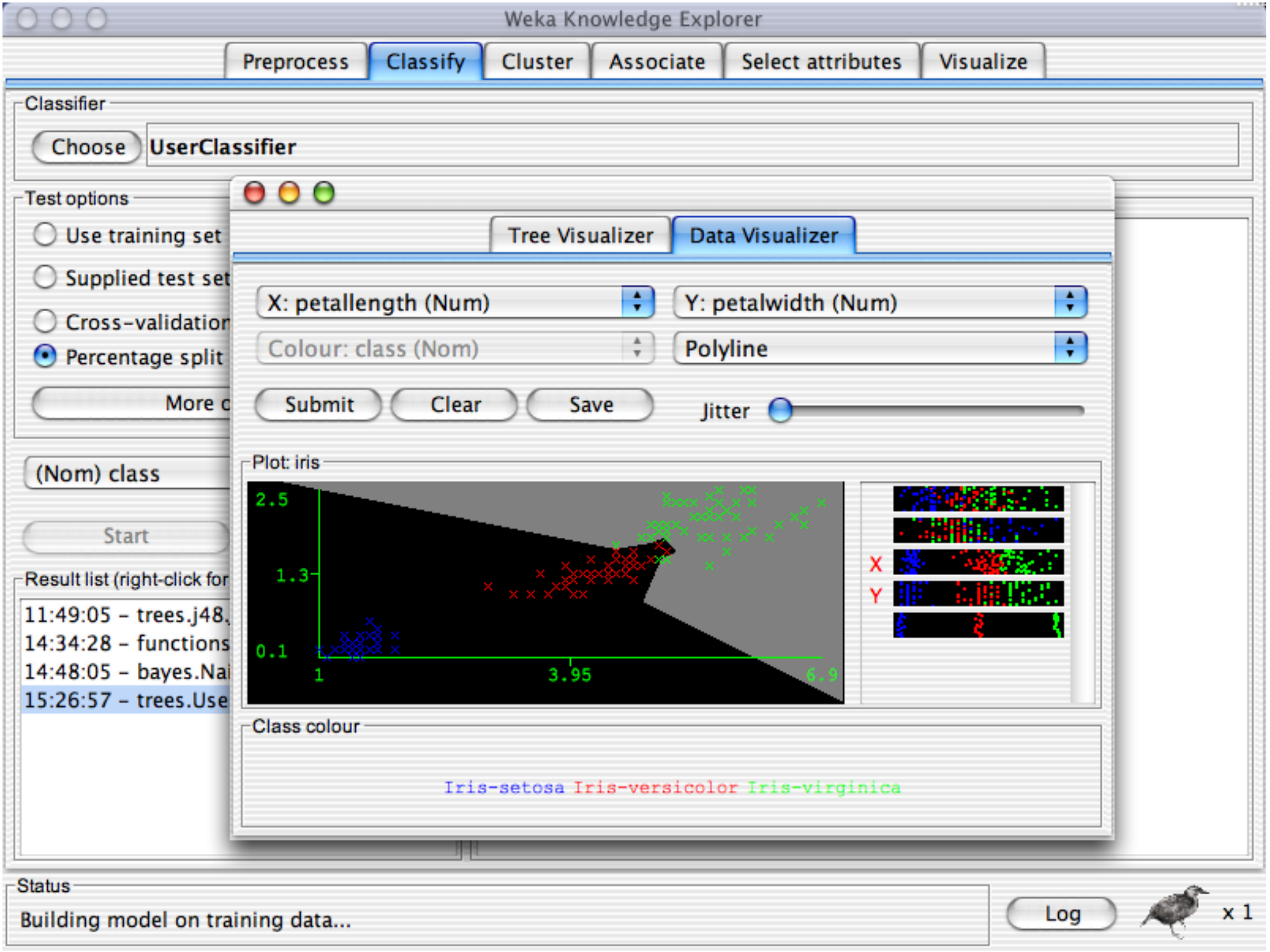
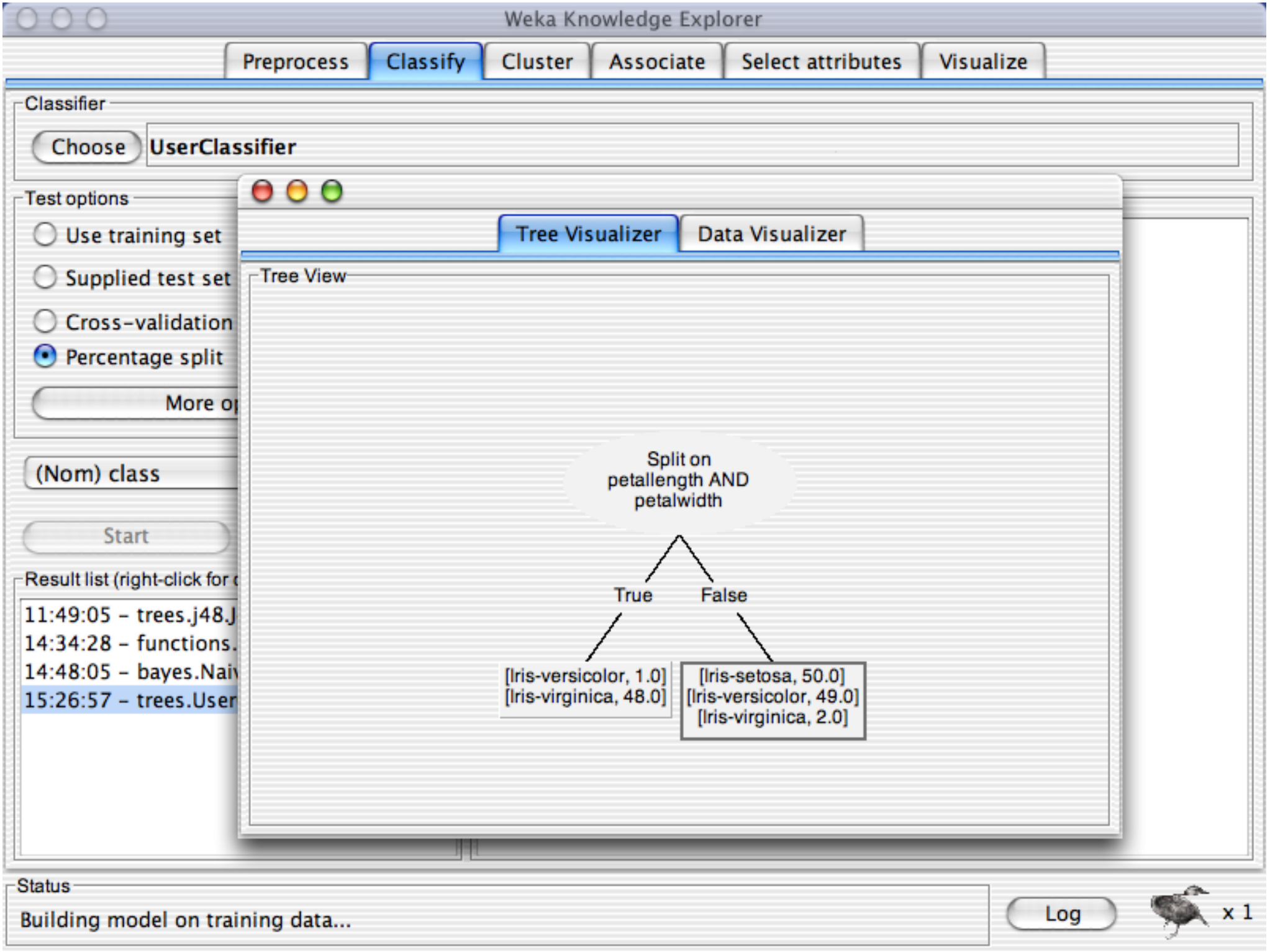
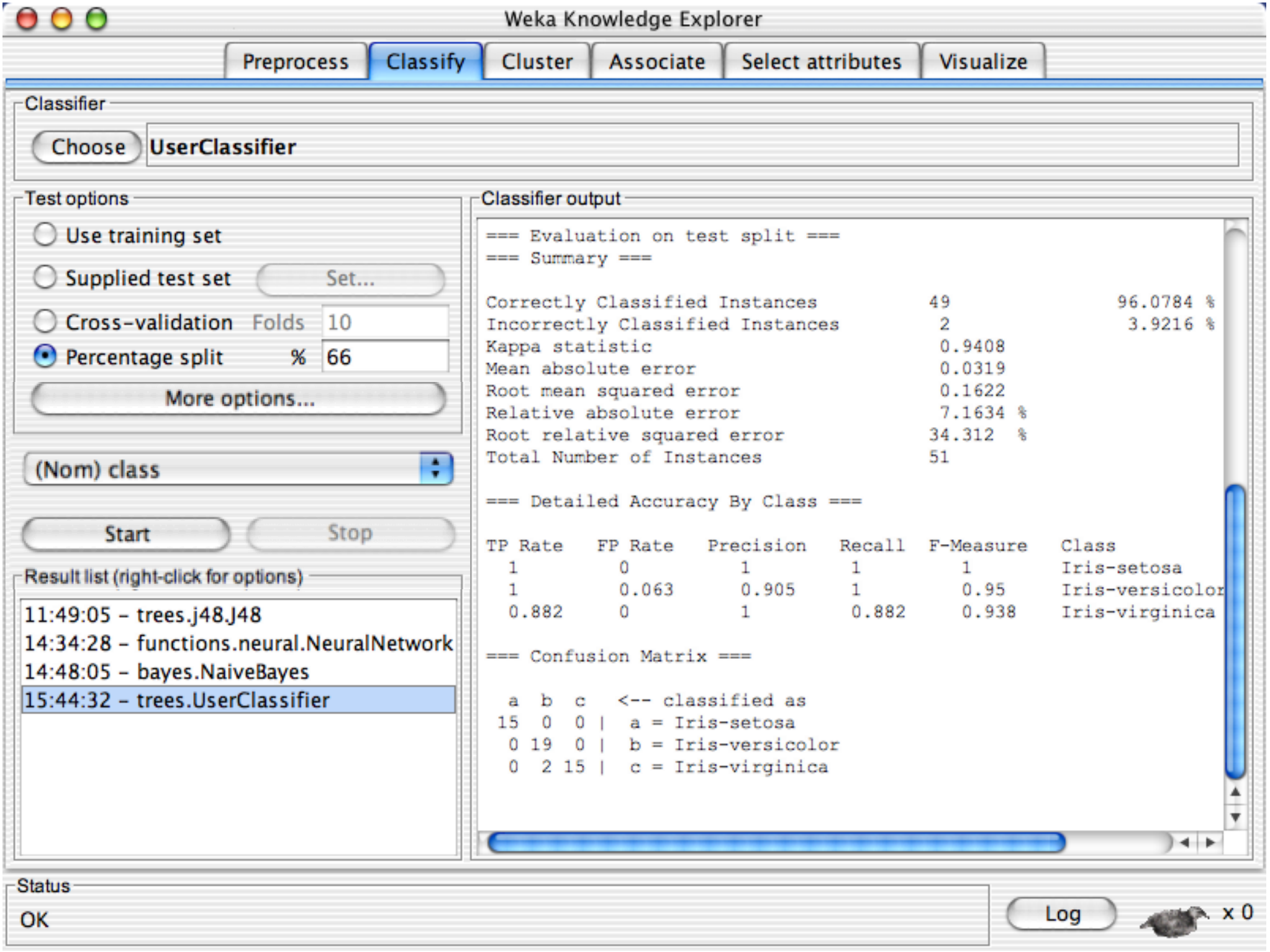
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
UserClassifier
Test options
Use training set
Supplied test set
Cross-validation
Percentage split
More optio
(Nom) class
Start
Result list (right-click for optic
11:49:05 - trees.j48.J48
14:34:28 - functions.neu
14:48:05 - bayes.NaiveBa
15:26:57 - trees.UserCla
Tree Visualizer
Data Visualizer
Tree View
[Iris-setosa, 50.0]
[Iris-versicolor, 50.0]
[Iris-virginica, 50.0]
Status
Building model on training data...
Log
x 1


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
UserClassifier
Test options
Use training set
Supplied test set
Cross-validation
Percentage split
More c
(Nom) class
Start
Result list (right-click for
11:49:05 - trees.j48.
14:34:28 - functions
14:48:05 - bayes.Nai
15:26:57 - trees.Use
Tree Visualizer
Data Visualizer
X: petallength (Num)
Y: petalwidth (Num)
Colour: class (Nom)
Polyline
Submit
Clear
Save
Jitter
Plot: iris
2.5
1.3
0.1
1
3.95
6.9
X
Y
Class colour
Iris-setosa Iris-versicolor Iris-virginica
Status
Building model on training data...
Log
x 1


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
UserClassifier
Test options
Use training set
Supplied test set
Cross-validation
Percentage split
More o
(Nom) class
Start
Result list (right-click for
11:49:05 - trees.j48.
14:34:28 - functions
14:48:05 - bayes.Nai
15:26:57 - trees.Use
Tree Visualizer
Data Visualizer
X: petallength (Num)
Y: petalwidth (Num)
Colour: class (Nom)
Polyline
Submit
Clear
Save
Jitter
Plot: iris
2.5
1.3
0.1
1
3.95
6.9
X
Y
Class colour
Iris-setosa Iris-versicolor Iris-virginica
Status
Building model on training data...
Log
x 1


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
UserClassifier
Test options
Use training set
Supplied test set
Cross-validation
Percentage split
More op
(Nom) class
Start
Result list (right-click for
11:49:05 - trees.j48.J
14:34:28 - functions.
14:48:05 - bayes.Naiv
15:26:57 - trees.User
Tree Visualizer
Data Visualizer
Tree View
Split on
petallength AND
petalwidth
True
False
[Iris-versicolor, 1.0]
[Iris-virginica, 48.0]
[Iris-setosa, 50.0]
[Iris-versicolor, 49.0]
[Iris-virginica, 2.0]
Status
Building model on training data...
Log
x 1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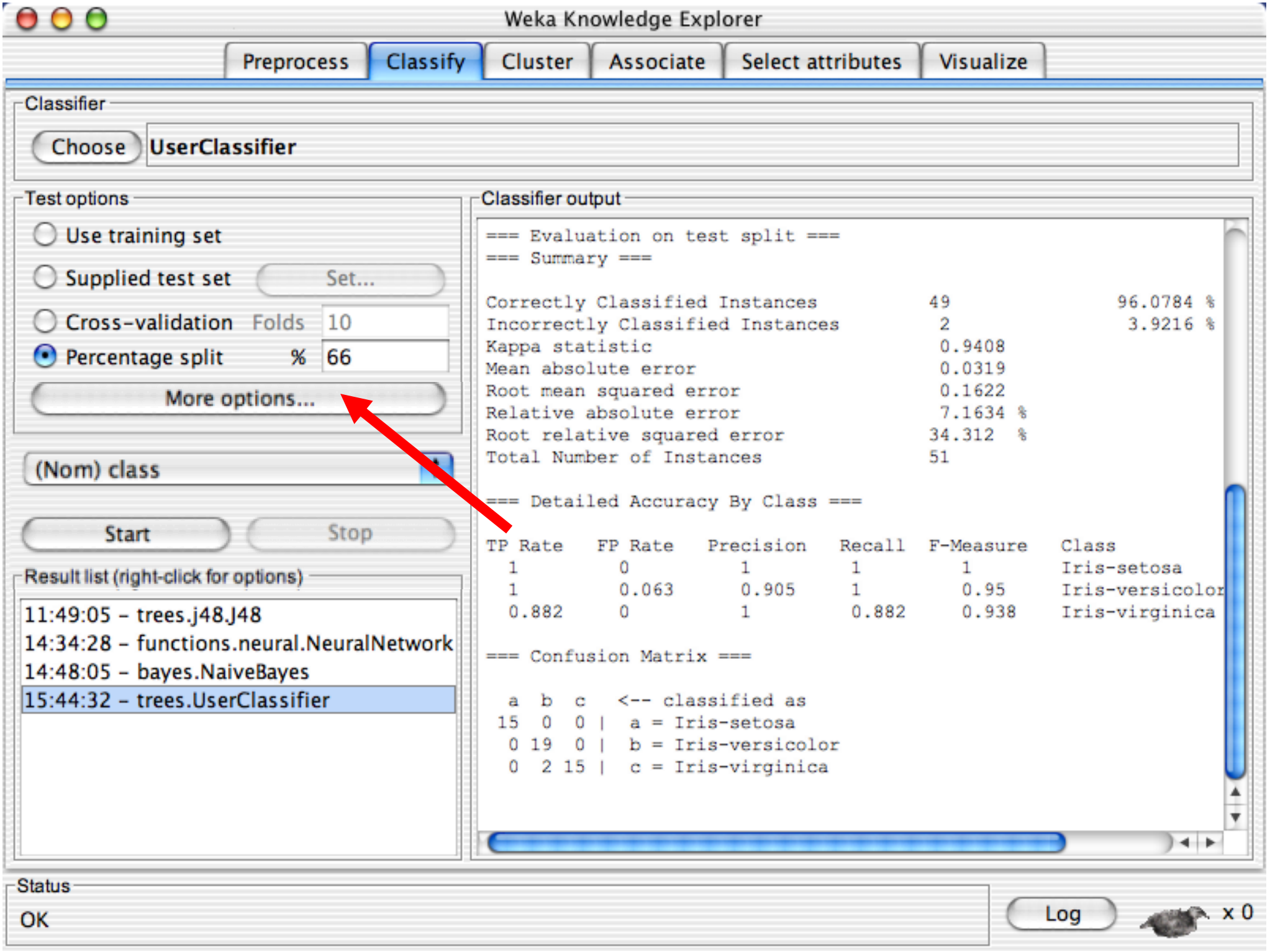
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
UserClassifier
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Nom) class
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
14:48:05 - bayes.NaiveBayes
15:44:32 - trees.UserClassifier
Classifier output
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 49 96.0784 %
Incorrectly Classified Instances 2 3.9216 %
Kappa statistic 0.9408
Mean absolute error 0.0319
Root mean squared error 0.1622
Relative absolute error 7.1634 %
Root relative squared error 34.312 %
Total Number of Instances 51
=== Detailed Accuracy By Class ===
TP Rate FP Rate Precision Recall F-Measure Class
1 0 1 1 1 Iris-setosa
1 0.063 0.905 1 0.95 Iris-versicolor
0.882 0 1 0.882 0.938 Iris-virginica
=== Confusion Matrix ===
a b c <-- classified as
15 0 0 | a = Iris-setosa
0 19 0 | b = Iris-versicolor
0 2 15 | c = Iris-virginica
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
UserClassifier
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)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
14:48:05 - bayes.NaiveBayes
15:44:32 - trees.UserClassifier
Classifier output
=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances 49 96.0784 %
Incorrectly Classified Instances 2 3.9216 %
Kappa statistic 0.9408
Mean absolute error 0.0319
Root mean squared error 0.1622
Relative absolute error 7.1634 %
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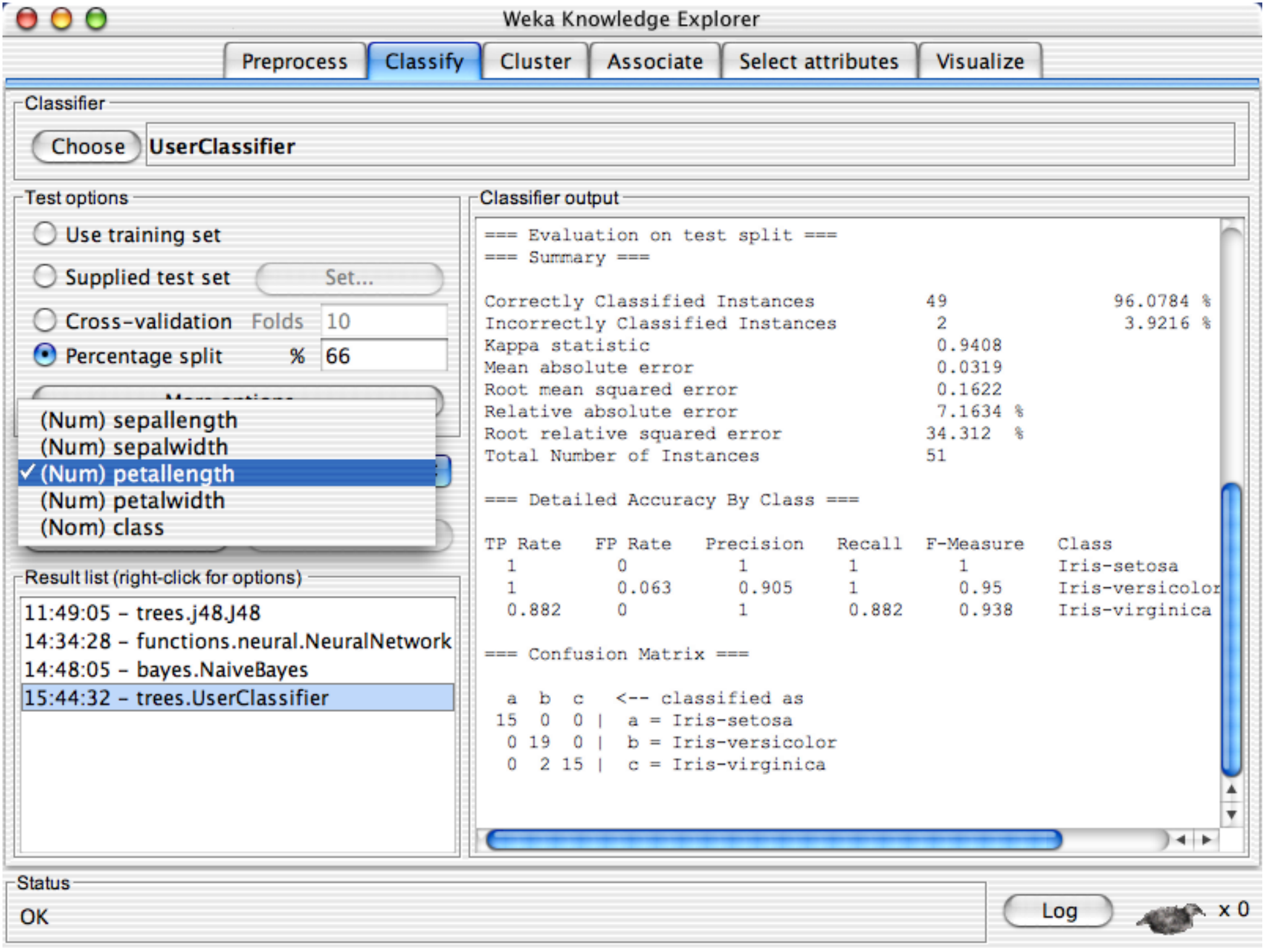
Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
UserClassifier
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
(Num) sepallength
(Num) sepalwidth
(Num) petallength
(Num) petalwidth
(Nom) class
Result list (right-click for options)
11:49:05 - trees.j48.J48
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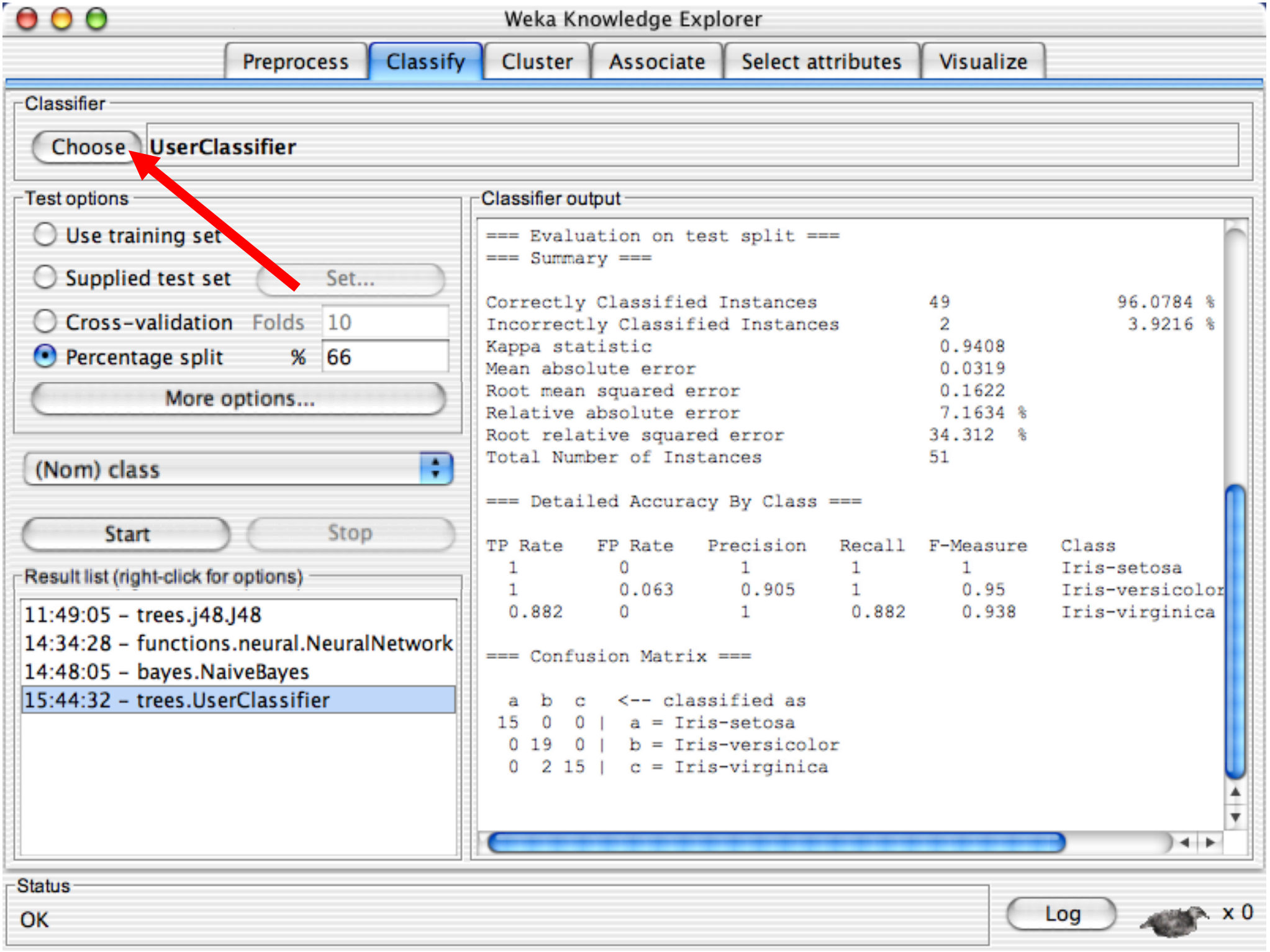
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
UserClassifier
Test options
Use training set
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Set...
Cross-validation
Folds
10
Percentage split
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More options...
(Nom) class
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Stop
Result list (right-click for options)
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Classifier output
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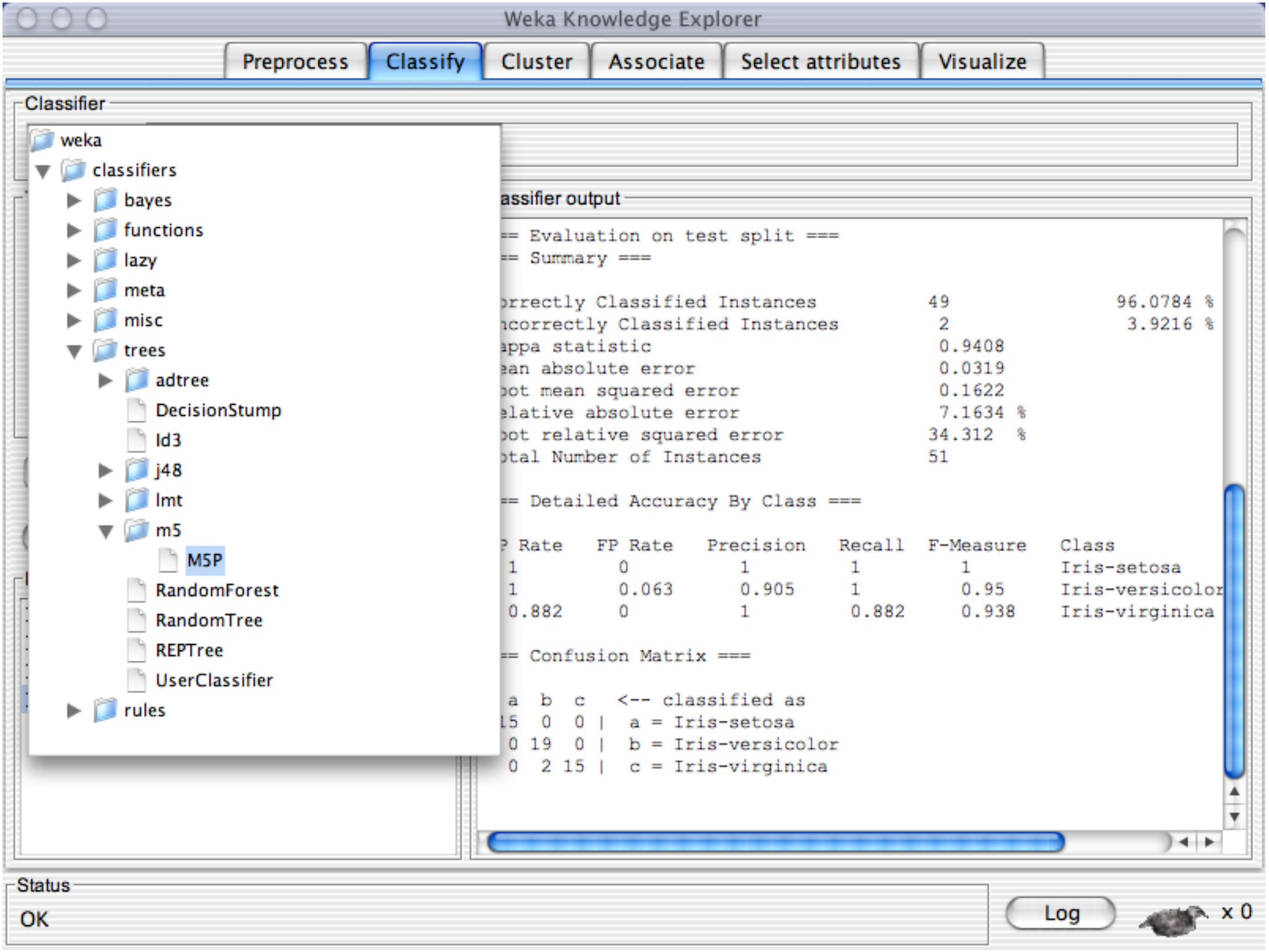
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
weka
classifiers
bayes
functions
lazy
meta
misc
trees
adtree
DecisionStump
Id3
j48
lmt
m5
M5P
RandomForest
RandomTree
REPTree
UserClassifier
rules
assifier output
== Evaluation on test split ===
== Summary ===
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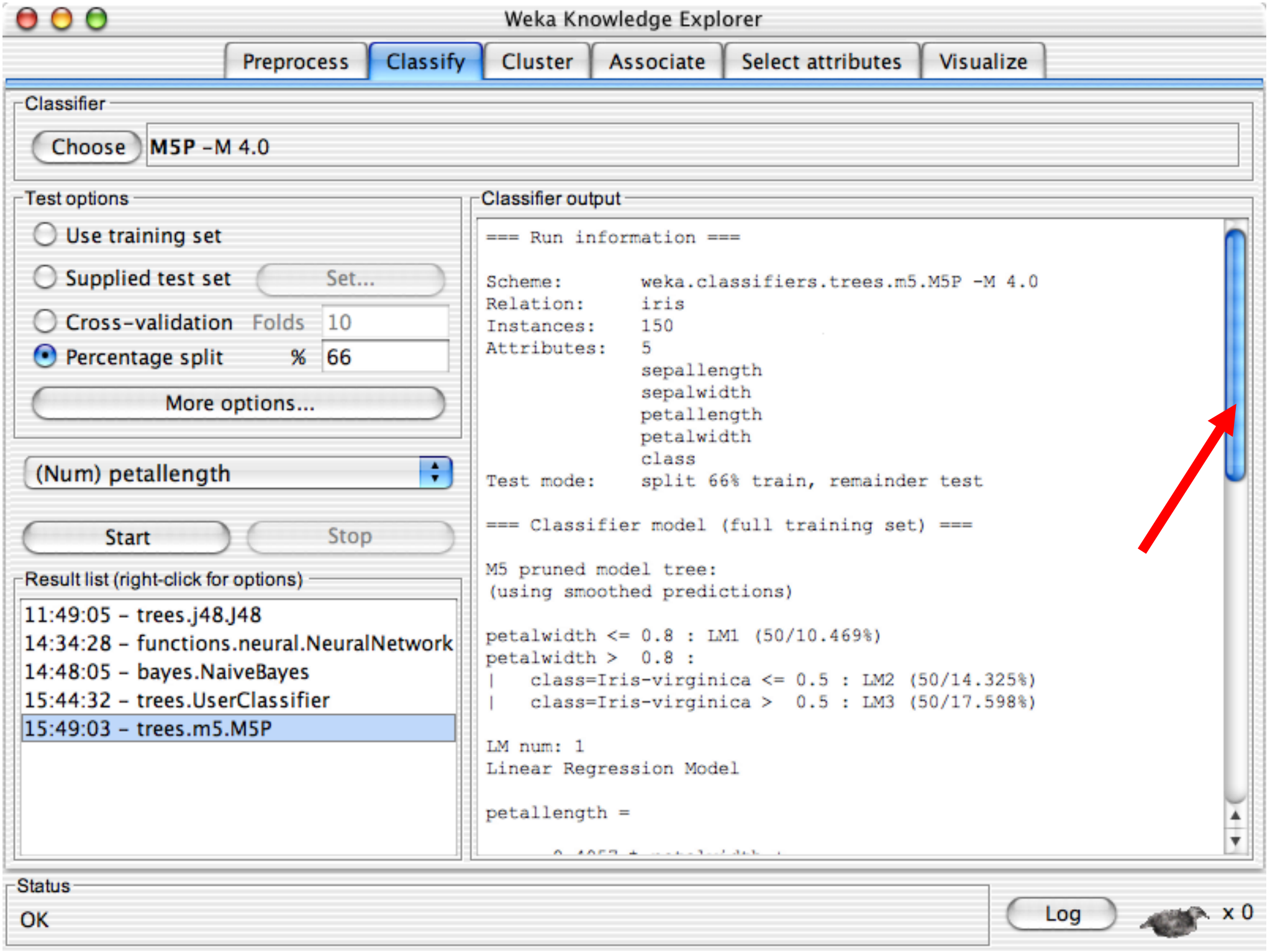
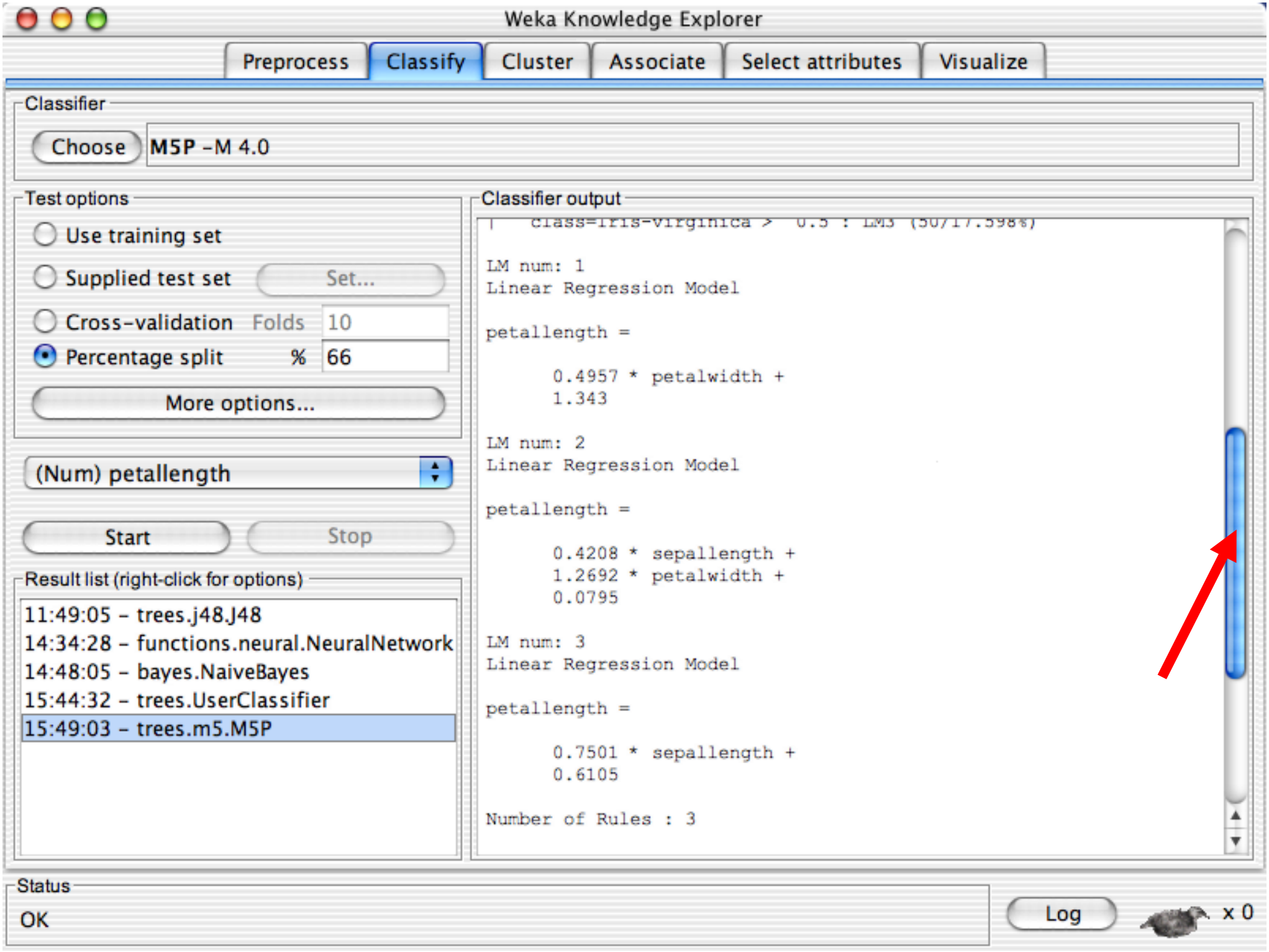
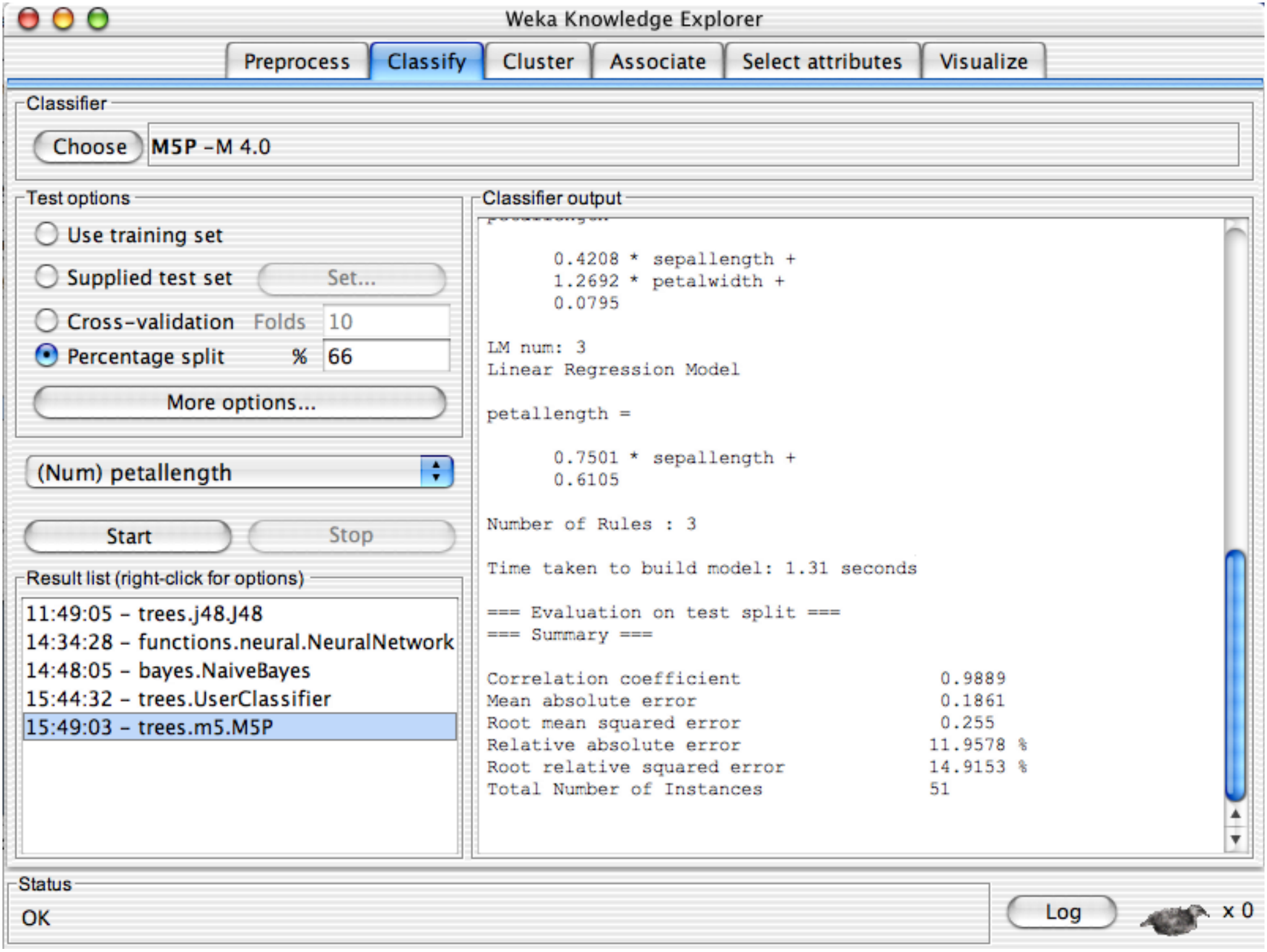
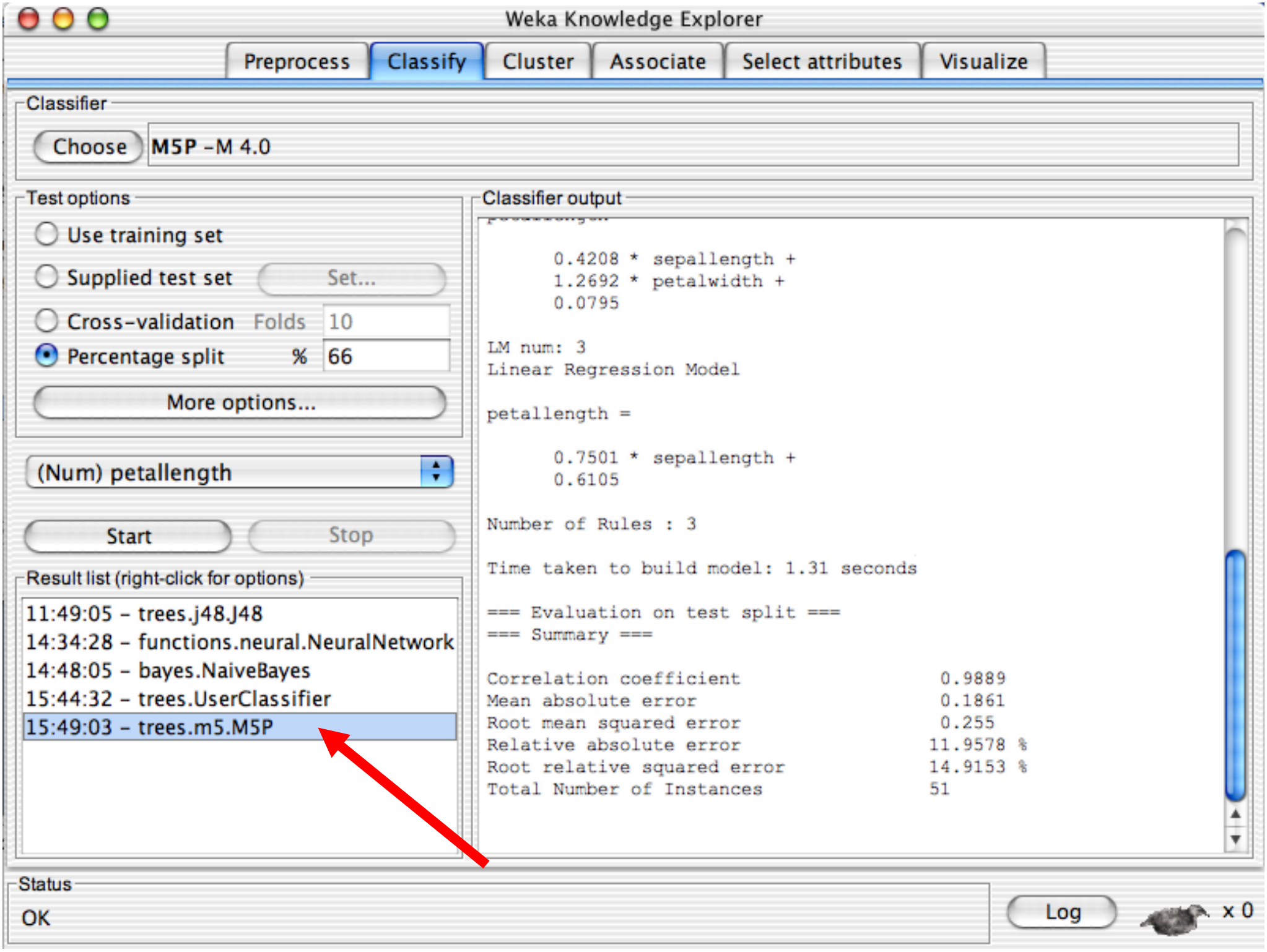
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
M5P -M 4.0
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Num) petallength
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
14:48:05 - bayes.NaiveBayes
15:44:32 - trees.UserClassifier
15:49:03 - trees.m5.M5P
Classifier output
=== Run information ===
Scheme: weka.classifiers.trees.m5.M5P -M 4.0
Relation: iris
Instances: 150
Attributes: 5
sepallength
sepalwidth
petallength
petalwidth
class
Test mode: split 66% train, remainder test
=== Classifier model (full training set) ===
M5 pruned model tree:
(using smoothed predictions)
petalwidth <= 0.8 : LM1 (50/10.469%)
petalwidth > 0.8 :
| class=Iris-virginica <= 0.5 : LM2 (50/14.325%)
| class=Iris-virginica > 0.5 : LM3 (50/17.598%)
LM num: 1
Linear Regression Model
petallength =
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
M5P -M 4.0
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Num) petallength
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
14:48:05 - bayes.NaiveBayes
15:44:32 - trees.UserClassifier
15:49:03 - trees.m5.M5P
Classifier output
| class=Iris-virginica > 0.5 : LM3 (50/17.598%)
LM num: 1
Linear Regression Model
petallength =
0.4957 * petalwidth +
1.343
LM num: 2
Linear Regression Model
petallength =
0.4208 * sepallength +
1.2692 * petalwidth +
0.0795
LM num: 3
Linear Regression Model
petallength =
0.7501 * sepallength +
0.6105
Number of Rules : 3
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
M5P -M 4.0
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Num) petallength
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
14:34:28 - functions.neural.NeuralNetwork
14:48:05 - bayes.NaiveBayes
15:44:32 - trees.UserClassifier
15:49:03 - trees.m5.M5P
Classifier output
0.4208 * sepallength +
1.2692 * petalwidth +
0.0795
LM num: 3
Linear Regression Model
petallength =
0.7501 * sepallength +
0.6105
Number of Rules : 3
Time taken to build model: 1.31 seconds
=== Evaluation on test split ===
=== Summary ===
Correlation coefficient 0.9889
Mean absolute error 0.1861
Root mean squared error 0.255
Relative absolute error 11.9578 %
Root relative squared error 14.9153 %
Total Number of Instances 51
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
M5P -M 4.0
Test options
Use training set
Supplied test set
Set...
Cross-validation
Folds
10
Percentage split
%
66
More options...
(Num) petallength
Start
Stop
Result list (right-click for options)
11:49:05 - trees.j48.J48
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15:44:32 - trees.UserClassifier
15:49:03 - trees.m5.M5P
Classifier output
0.4208 * sepallength +
1.2692 * petalwidth +
0.0795
LM num: 3
Linear Regression Model
petallength =
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0.6105
Number of Rules : 3
Time taken to build model: 1.31 seconds
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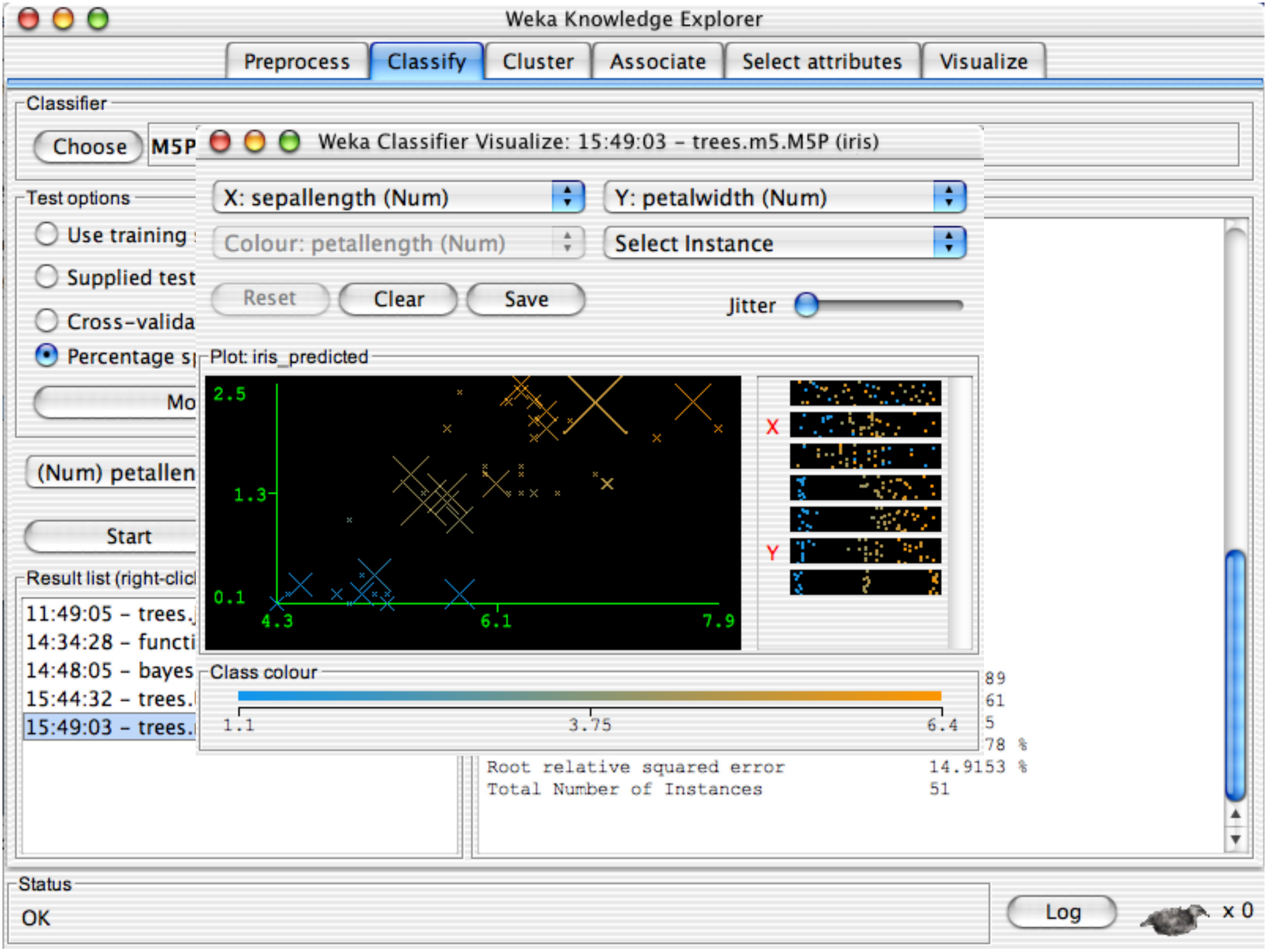
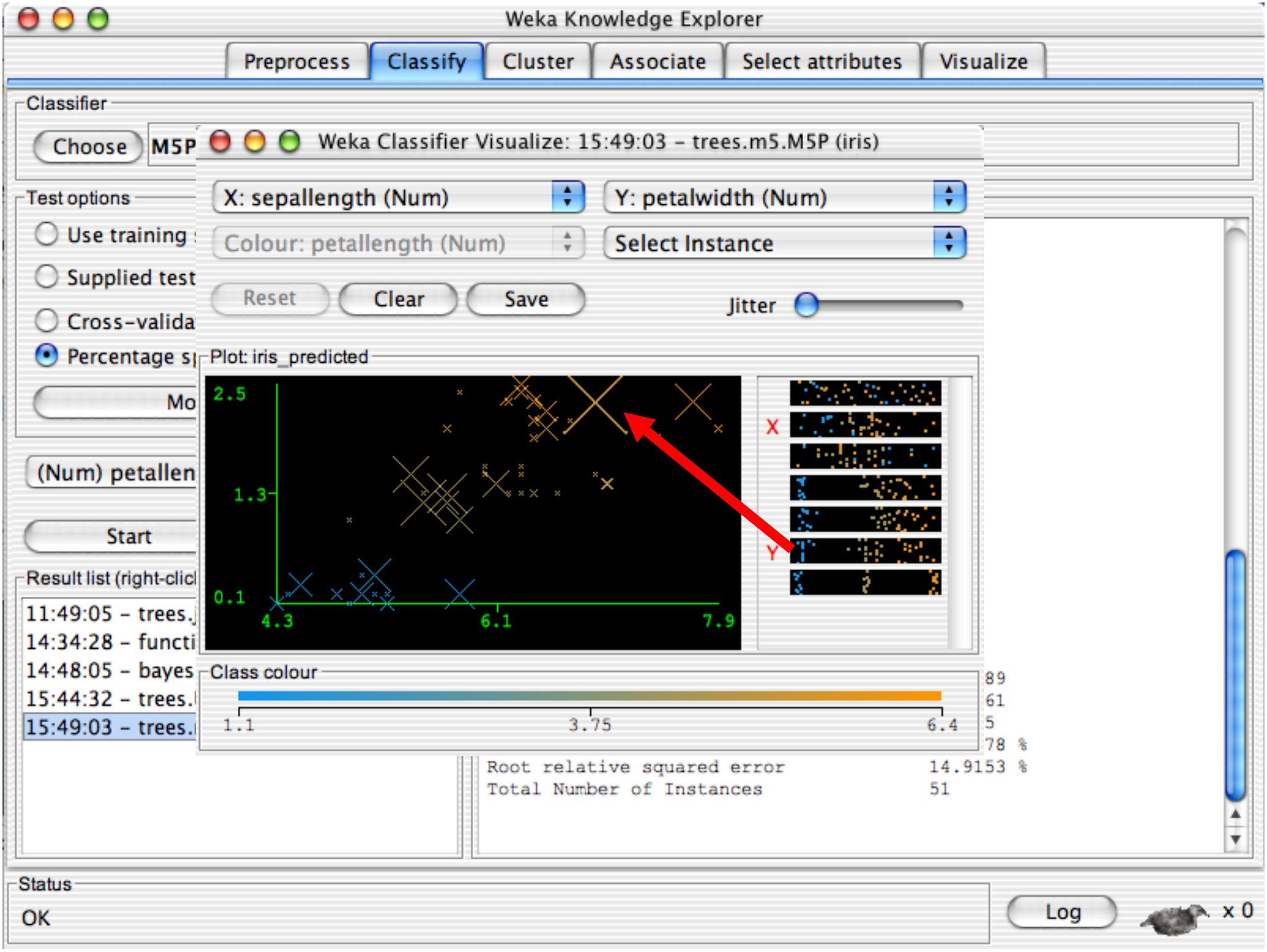
Total Number of Instances 51
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
M5P
Weka Classifier Visualize: 15:49:03 - trees.m5.M5P (iris)
X: sepallength (Num)
Y: petalwidth (Num)
Colour: petallength (Num)
Select Instance
Reset
Clear
Save
Jitter
Test options
Use training
Supplied test
Cross-valida
Percentage sp
Mo
(Num) petallen
Start
Result list (right-clic
11:49:05 - trees.
14:34:28 - functi
14:48:05 - bayes
15:44:32 - trees.
15:49:03 - trees.
Plot: iris_predicted
2.5
1.3
0.1
4.3
6.1
7.9
X
Y
Class colour
1.1
3.75
6.4
89
61
5
78 %
Root relative squared error 14.9153 %
Total Number of Instances 51
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
M5P
Weka Classifier Visualize: 15:49:03 - trees.m5.M5P (iris)
X: sepallength (Num)
Y: petalwidth (Num)
Colour: petallength (Num)
Select Instance
Reset
Clear
Save
Jitter
Test options
Use training
Supplied test
Cross-valida
Percentage sp
Plot: iris_predicted
2.5
1.3
0.1
4.3
6.1
7.9
X
Y
Class colour
1.1
3.75
6.4
(Num) petallen
Start
Result list (right-clic
11:49:05 - trees.
14:34:28 - functi
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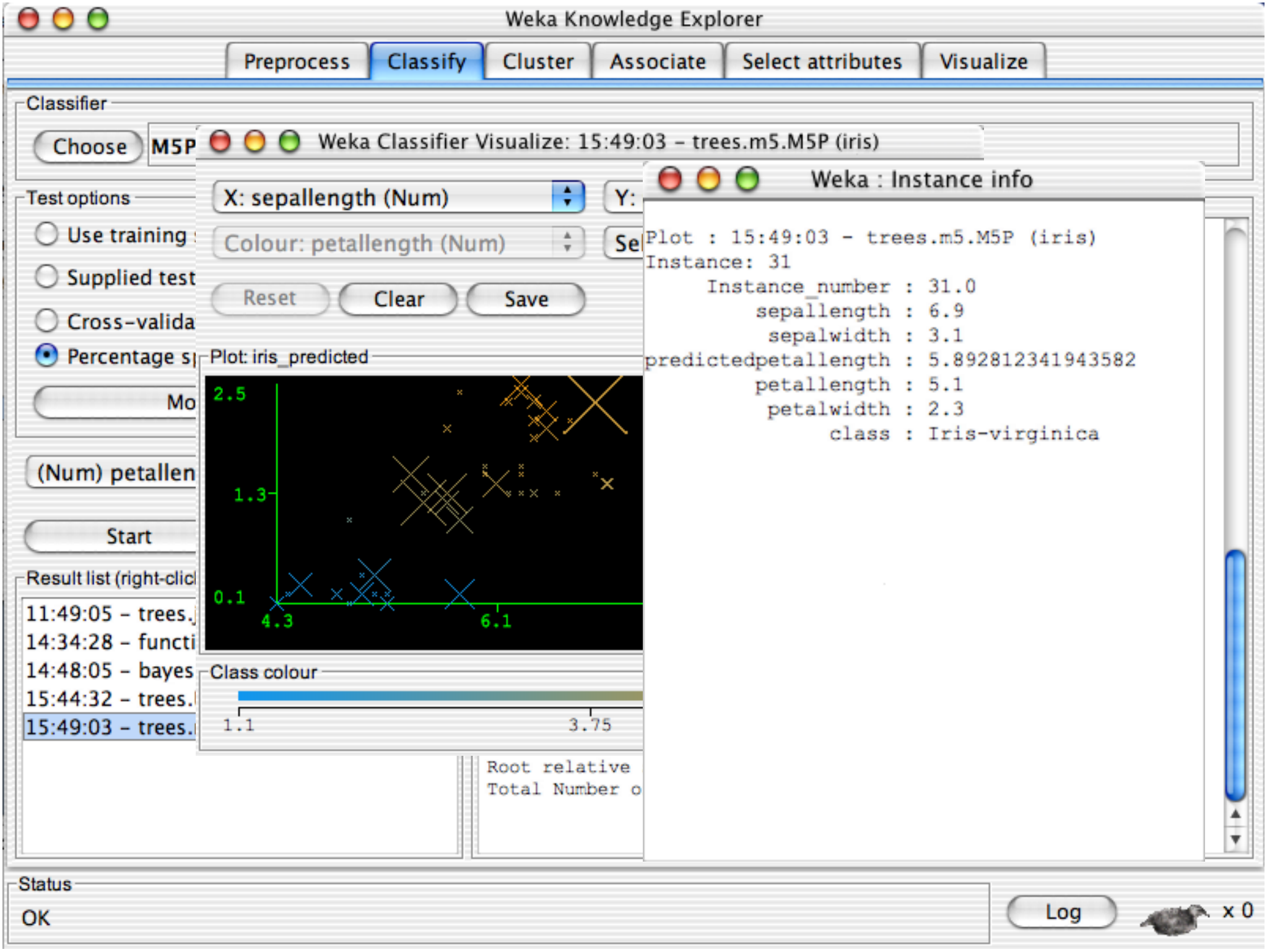
15:44:32 - trees.
15:49:03 - trees.
89
61
5
78 %
Root relative squared error 14.9153 %
Total Number of Instances 51
Status
OK
Log
x 0


Weka Knowledge Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
Choose
M5P
Weka Classifier Visualize: 15:49:03 - trees.m5.M5P (iris)
Weka : Instance info
Test options
Use training
Supplied test
Cross-valida
Percentage sp
Mo
X: sepallength (Num)
Y:
Colour: petallength (Num)
Se
Reset
Clear
Save
Plot: iris_predicted
2.5
1.3
0.1
4.3
6.1
Class colour
1.1
3.75
(Num) petallen
Start
Result list (right-clic
11:49:05 - trees.
14:34:28 - functi
14:48:05 - bayes
15:44:32 - trees.
15:49:03 - trees.
Root relative
Total Number o
Plot : 15:49:03 - trees.m5.M5P (iris)
Instance: 31
Instance_number : 31.0
sepallength : 6.9
sepalwidth : 3.1
predictedpetallength : 5.892812341943582
petallength : 5.1
petalwidth : 2.3
class : Iris-virginica
Status
OK
Log
x 0