

Perangkat Lunak - Weka*

Dr. rer. nat. Hendri Murfi

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Intelligent Data Analysis (IDA) Group

Departemen Matematika, Universitas Indonesia – Depok 16424

Telp. +62-21-7862719/7863439, Fax. +62-21-7863439, Email. hendri@ui.ac.id

Weka

- Weka adalah perangkat lunak machine learning yang ditulis dalam bahasa Java
- Didistribusikan berdasarkan the GNU Public License
- Fitur utama:
 - Memiliki fasilitas yang komprehensif untuk analisa data, yaitu perangkat pre-processing data, algoritma pembelajaran, serta metode-metode evaluasi
 - Memiliki interface grafis (GUI), termasuk untuk visualisasi data
 - Memiliki lingkungan untuk membandingkan algoritma-algoritma pembelajaran

Format Data

Flat File dalam Format ARFF

```
@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
```

```
...
```

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Format Data

Flat File dalam Format ARFF

```
@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
```

```
...
```

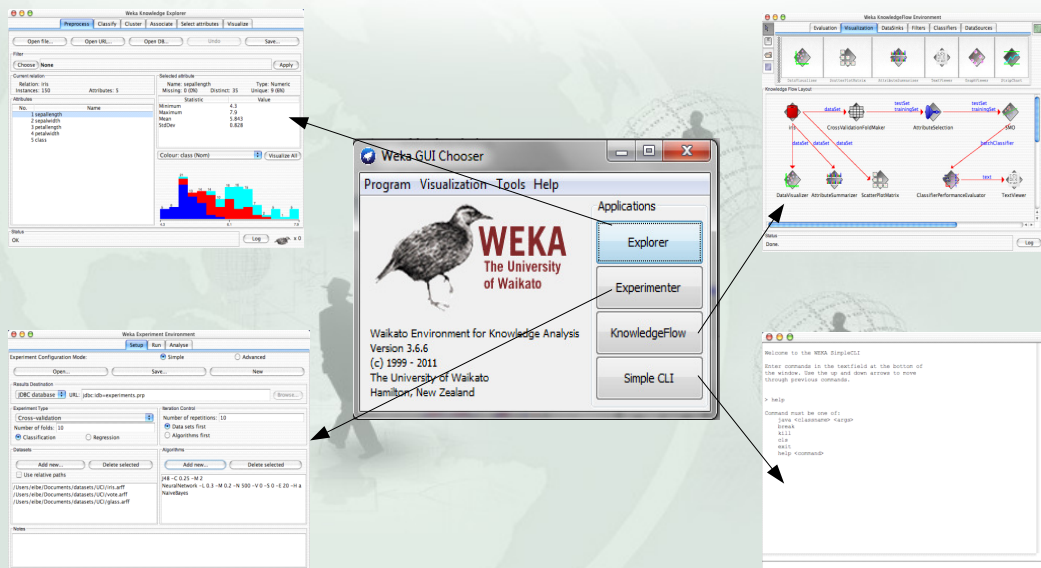
numeric attribute

nominal attribute

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Menu Utama

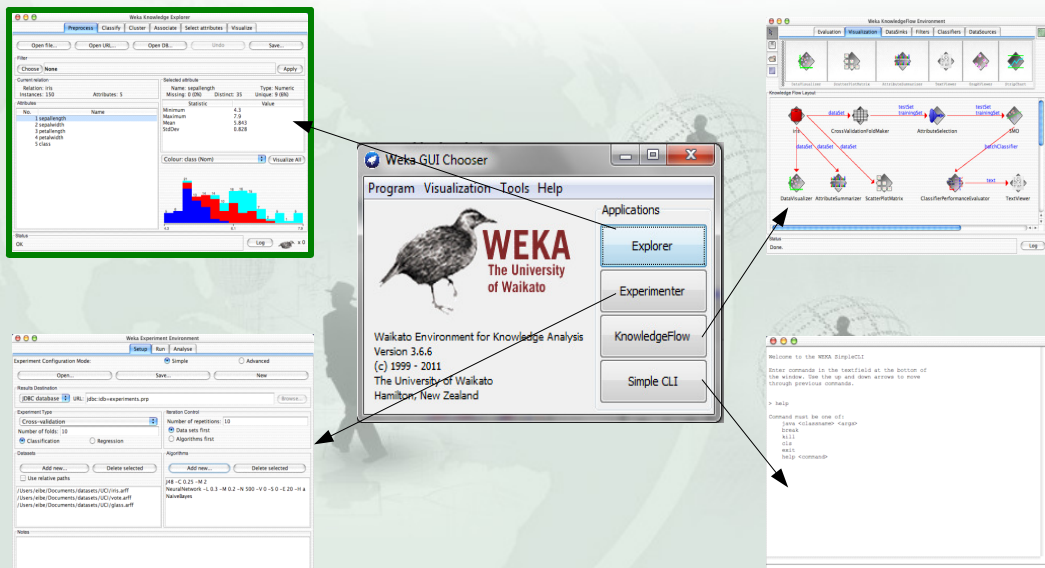
Explorer, Experimenter, KnowledgeFlow, Simple CLI



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GUI

Explorer, Experimenter, KnowledgeFlow, Simple CLI



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Explorer

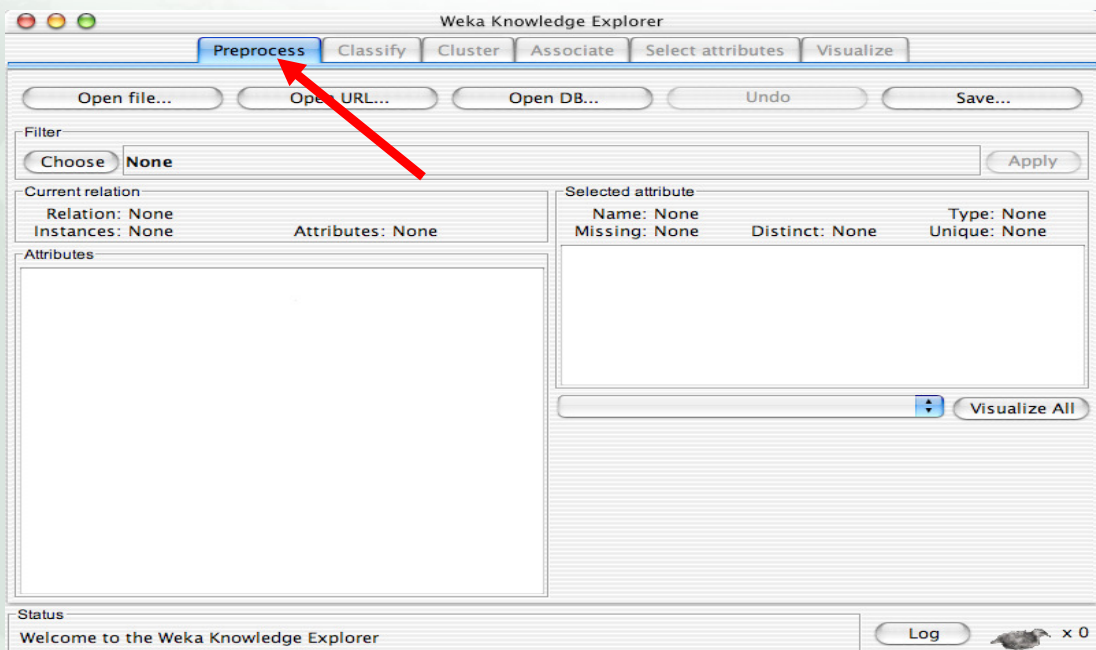
Menu Preprocess

- Data dapat diimpor dari file dengan beberapa format, yaitu: ARFF, CSV, C4.5, Binary. Data juga dapat dibaca dari alamat URL atau dari suatu database
- Perangkat pre-processing pada Weka disebut „filters“. Weka memiliki filter yang dapat digunakan untuk:
 - Diskritisasi, Normalisasi, Resampel, pemilihan atribut/fitur, DII
- Distribusi data dapat dilihat dengan cara melakukan visualisasi

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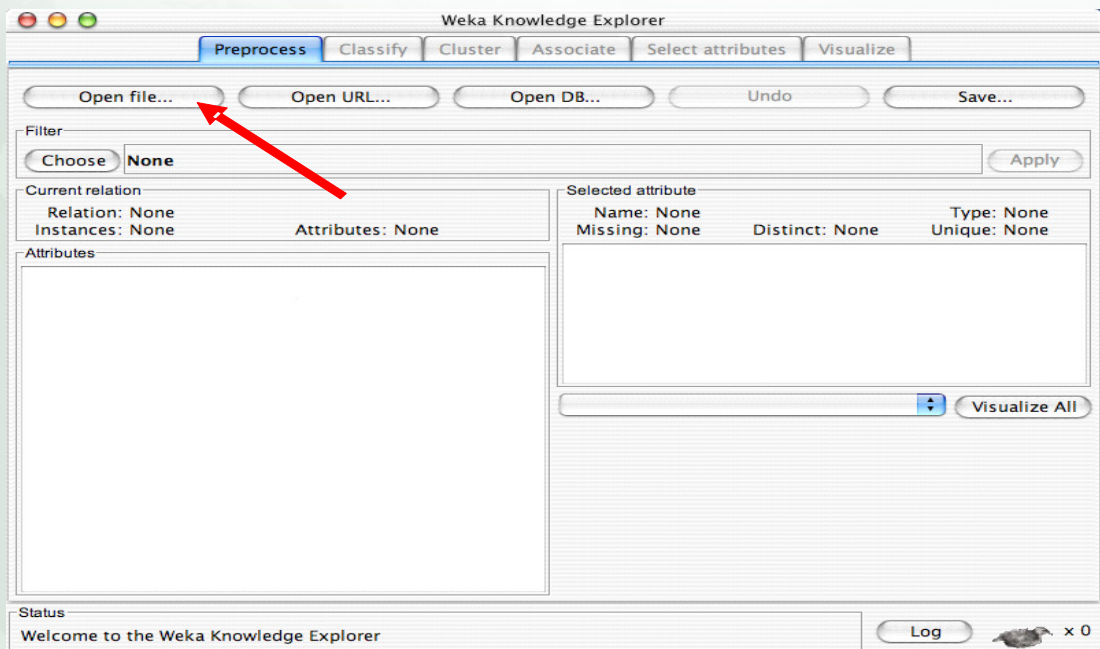
Explorer

Menu Preprocess



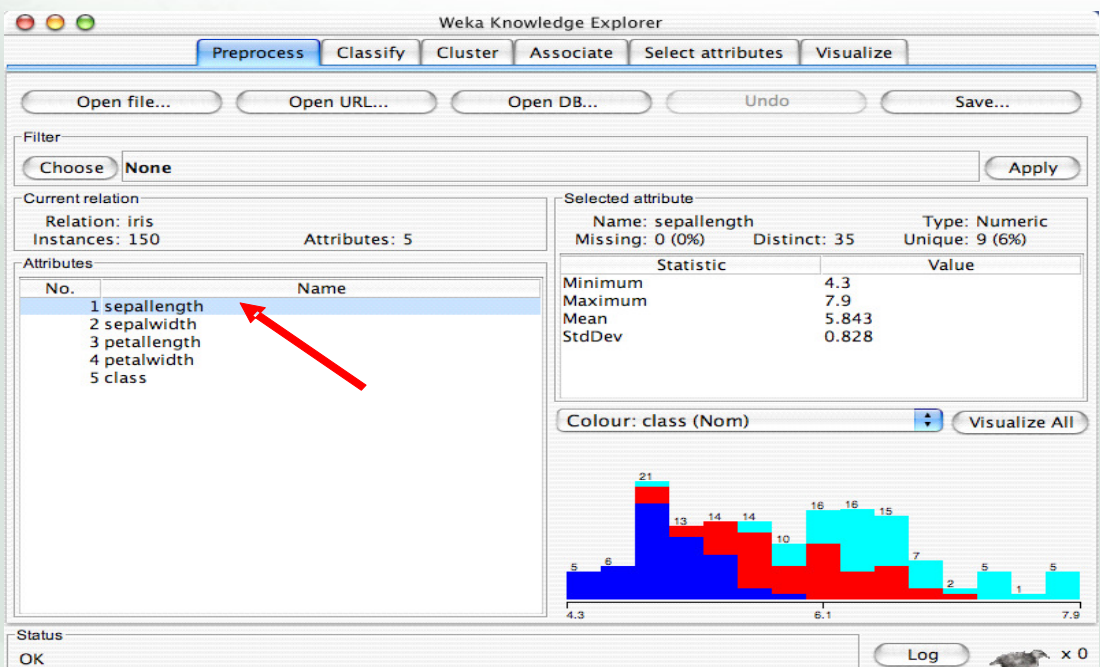
Explorer

Menu Preprocess: Membuka Data



Explorer

Menu Preprocess: Informasi Atribut/Fitur



Explorer

Menu Preprocess: Informasi Atribut/Fitur

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	sepalwidth
2	sepalwidth
3	petalwidth
4	petalwidth
5	class

Selected attribute:

Name: class Missing: 0 (0%) Distinct: 3 Type: Nominal 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

Explorer

Menu Preprocess: Visualisasi Semua Atribut/Fitur

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	sepalwidth
2	sepalwidth
3	petalwidth
4	petalwidth
5	class

Selected attribute:

Name: class Missing: 0 (0%) Distinct: 3 Type: Nominal Unique: 0 (0%)

Label	Count
Iris-setosa	50
Iris-versicolor	50
Iris-virginica	50

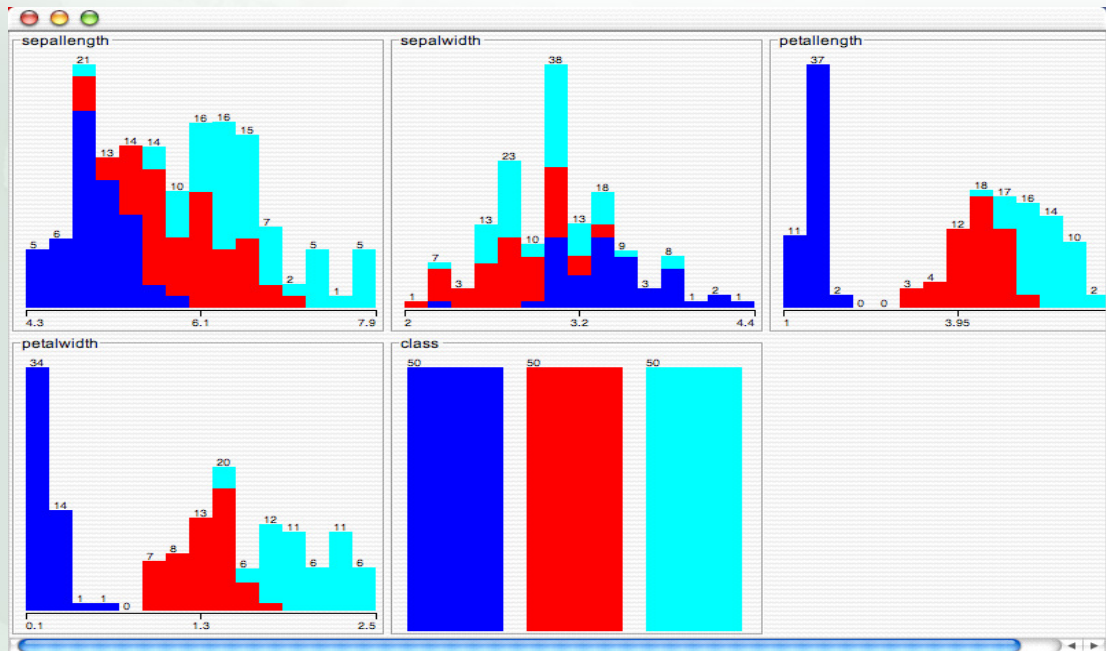
Colour: class (Nom) Visualize All

50 50 50

Status: OK Log x 0

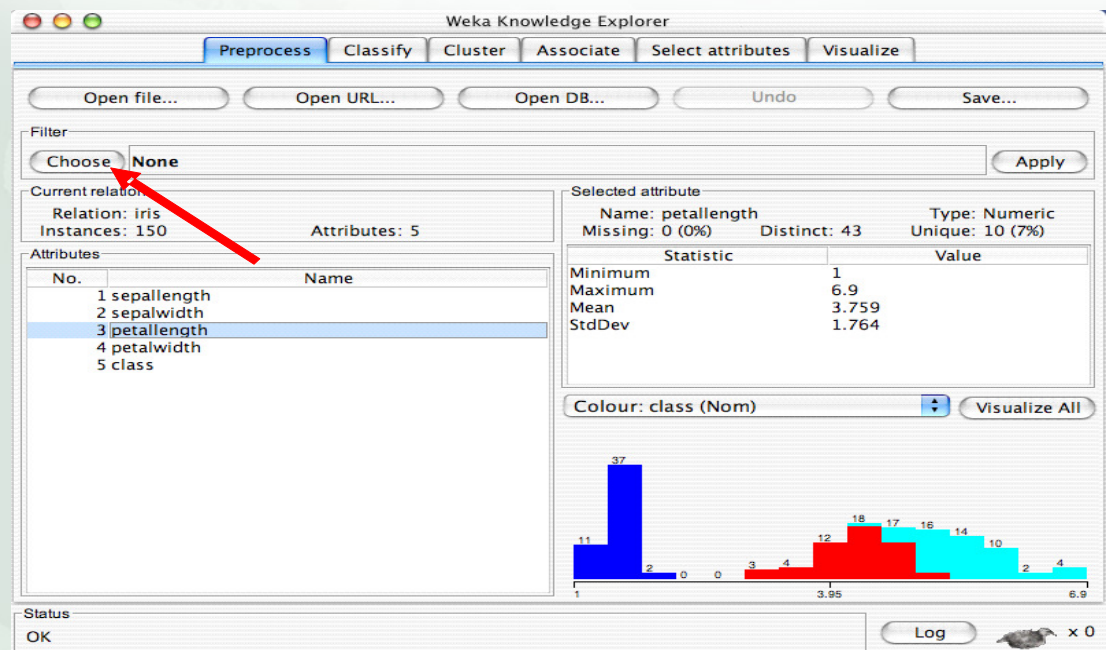
Explorer

Menu Preprocess: Visualisasi Semua Atribut/Fitur



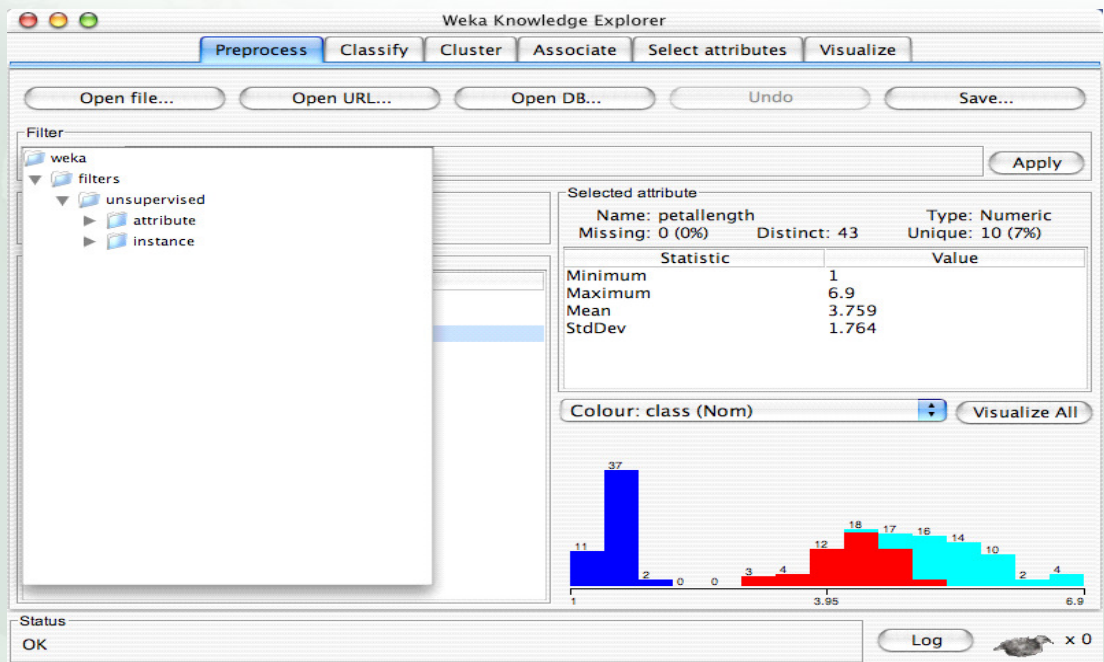
Explorer

Menu Preprocess: Filter



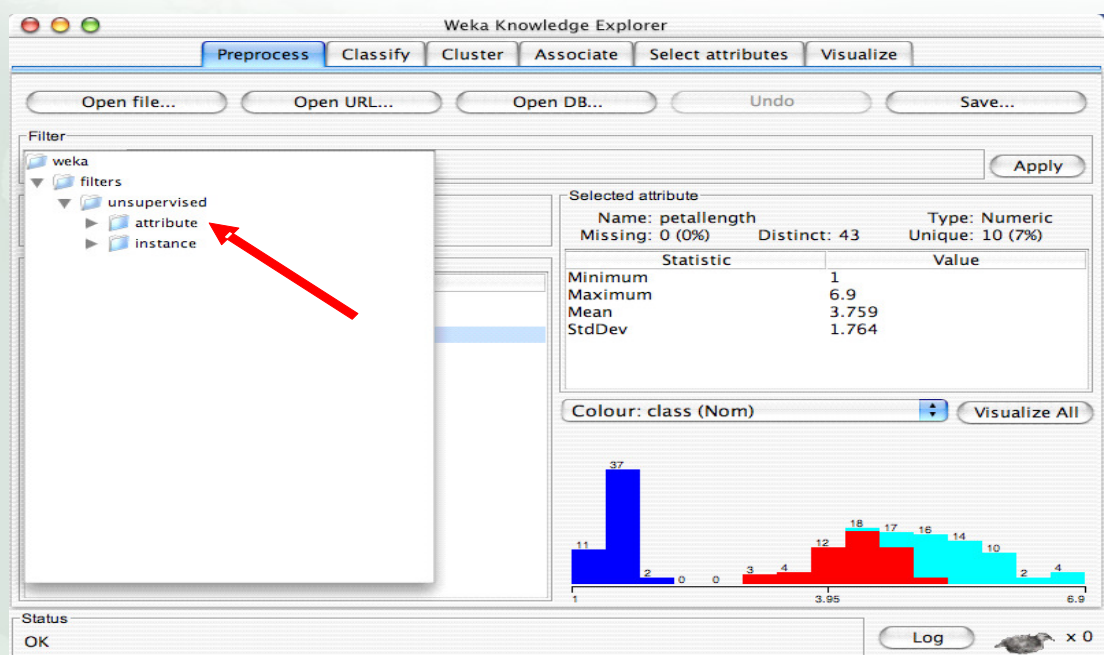
Explorer

Menu Preprocess: Filter



Explorer

Menu Preprocess: Filter



Explorer

Menu Preprocess: Filter

The screenshot shows the Weka Knowledge Explorer interface. The 'Preprocess' tab is selected. In the 'Filter' pane on the left, the 'attribute' sub-menu is expanded, and 'Discretize' is highlighted. The 'Selected attribute' pane on the right shows details for 'petallength': Name: petallength, Missing: 0 (0%), Distinct: 43, Type: Numeric, Unique: 10 (7%). Below this, a table lists statistics: Minimum (1), Maximum (6.9), Mean (3.759), and StdDev (1.764). A histogram at the bottom shows the distribution of 'petallength' values, colored by 'class (Nom)'. The status bar at the bottom indicates 'OK'.

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

Selected attribute

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

Explorer

Menu Preprocess: Filter

The screenshot shows the Weka Knowledge Explorer interface after applying the 'Discretize' filter. The 'Preprocess' tab is selected. In the 'Filter' pane, 'Discretize -B 10 -R first-last' is selected. The 'Current relation' pane shows 'Relation: Iris' and 'Instances: 150'. The 'Attributes' pane lists 5 attributes: 1 sepalwidth, 2 sepalwidth, 3 petallength, 4 petalwidth, and 5 class. The 'Selected attribute' pane shows details for 'petallength': Name: petallength, Missing: 0 (0%), Distinct: 43, Type: Numeric, Unique: 10 (7%). Below this, a table lists statistics: Minimum (1), Maximum (6.9), Mean (3.759), and StdDev (1.764). A histogram at the bottom shows the distribution of 'petallength' values, colored by 'class (Nom)'. The status bar at the bottom indicates 'OK'.

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

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

Selected attribute

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

Explorer

Menu Preprocess: Filter

The screenshot shows the Weka Knowledge Explorer interface. The 'Preprocess' tab is selected. The 'Filter' section shows the 'Discretize -B 10 -R first-last' filter applied. The 'Current relation' is 'iris' with 150 instances and 5 attributes. The 'Attributes' list shows 'petal length' selected. The 'Selected attribute' section shows 'petal length' with statistics: Minimum 1, Maximum 6.9, Mean 3.759, StdDev 1.764. A histogram of 'petal length' is displayed at the bottom right, with bars colored blue, red, and cyan. The status bar shows 'OK'.

Statistic	Value
Minimum	1
Maximum	6.9
Mean	3.759
StdDev	1.764

Colour: class (Nom) Visualize All

Log x 0

Explorer

Menu Preprocess: Filter

The screenshot shows the Weka Knowledge Explorer interface with the 'Discretize' filter configuration dialog box open. The dialog box is titled 'weka.gui.GenericObjectEditor' and contains the following settings:

- Attribute indices: first-last
- Bins: 10
- FindNumBins: False
- InvertSelection: False
- MakeBinary: False
- UseEqualFrequency: False

The dialog box also includes an 'About' section with the text: 'An instance filter that discretizes a range of numeric attributes in the dataset into nominal attributes.' and a 'More' button. The 'Visualize All' button is also visible. The status bar shows 'OK'.

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

Visualize All

Log x 0

Explorer

Menu Preprocess: Filter

The screenshot shows the Weka Knowledge Explorer interface. The 'Preprocess' tab is selected. The 'Filter' dropdown is set to 'Discretize -B 10 -R first-last'. The 'Current relation' is 'iris' with 150 instances. The 'Attributes' list on the left includes: 1 sepalwidth, 2 sepalwidth, 3 petalwidth, 4 petalwidth, and 5 class. The 'Discretize' configuration window is open, showing the following settings: attributeIndices: first-last, bins: 10, findNumBins: False, invertSelection: False, makeBinary: False, and useEqualFrequency: False. A red arrow points to the 'Save...' button. The 'Visualize All' button is also visible. The status bar at the bottom shows 'OK'.

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

Attribute Indices: first-last
Bins: 10
Find Num Bins: False
Invert Selection: False
Make Binary: False
Use Equal Frequency: False

Explorer

Menu Preprocess: Filter

This screenshot is identical to the one above, but with the 'useEqualFrequency' setting changed to 'True'. The 'Save...' button is still highlighted with a red arrow. The 'Visualize All' button and the status bar ('OK') are also visible.

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

Attribute Indices: first-last
Bins: 10
Find Num Bins: False
Invert Selection: False
Make Binary: False
Use Equal Frequency: True

Explorer

Menu Preprocess: Filter

The screenshot shows the Weka Knowledge Explorer interface. The 'Preprocess' tab is selected. The 'Filter' section shows 'Choose' and 'Discretize -B 10 -R first-last'. The 'Current relation' is 'iris' with 150 instances. The 'Attributes' list includes '1 sepalength', '2 sepalwidth', '3 petalength', '4 petalwidth', and '5 class'. The 'Discretize' dialog box is open, showing the 'Attribute indices' as 'first-last', 'bins' as '10', 'findNumBins' as 'False', 'invertSelection' as 'False', 'makeBinary' as 'False', and 'useEqualFrequency' as 'True'. A red arrow points to the 'OK' button. The 'Visualize All' button is also visible.

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:

No.	Name
1	sepalength
2	sepalwidth
3	petalength
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

Attribute indices: first-last

bins: 10

findNumBins: False

invertSelection: False

makeBinary: False

useEqualFrequency: True

Open... Save... OK Cancel

Visualize All

Status

OK

Log x 0

Explorer

Menu Preprocess: Filter

The screenshot shows the Weka Knowledge Explorer interface. The 'Preprocess' tab is selected. The 'Filter' section shows 'Choose' and 'Discretize -F -B 10 -R first-last'. The 'Current relation' is 'iris' with 150 instances. The 'Attributes' list includes '1 sepalength', '2 sepalwidth', '3 petalength', '4 petalwidth', and '5 class'. The 'Discretize' dialog box is open, showing the 'Attribute indices' as 'first-last', 'bins' as '10', 'findNumBins' as 'False', 'invertSelection' as 'False', 'makeBinary' as 'False', and 'useEqualFrequency' as 'True'. A red arrow points to the 'OK' button. The 'Visualize All' button is also visible.

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	sepalength
2	sepalwidth
3	petalength
4	petalwidth
5	class

Selected attribute

Name: petalength

Missing: 0 (0%)

Distinct: 43

Type: Numeric

Unique: 10 (7%)

Statistic	Value
Minimum	1
Maximum	6.9
Mean	3.759
StdDev	1.764

Colour: class (Nom)

Visualize All

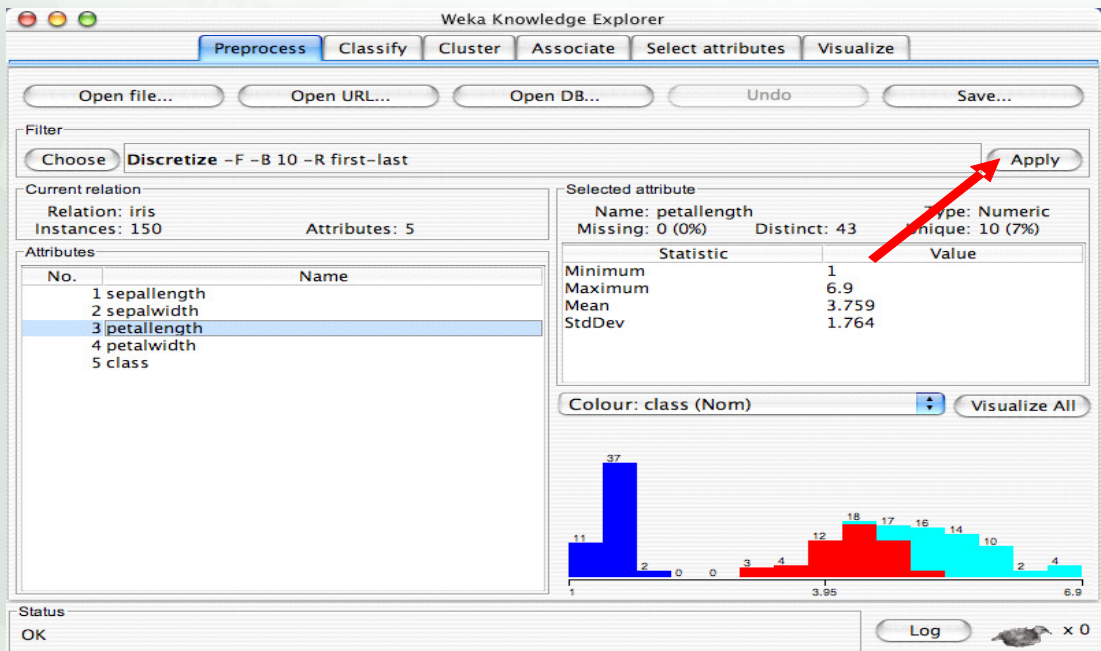
Status

OK

Log x 0

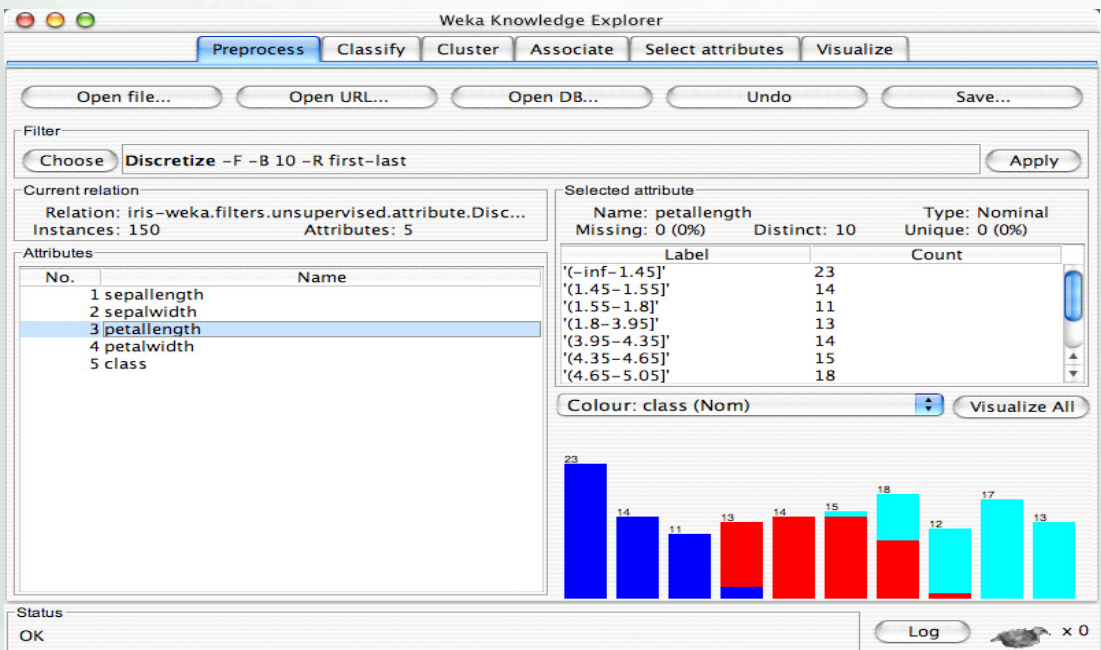
Explorer

Menu Preprocess: Filter



Explorer

Menu Preprocess: Filter



Explorer

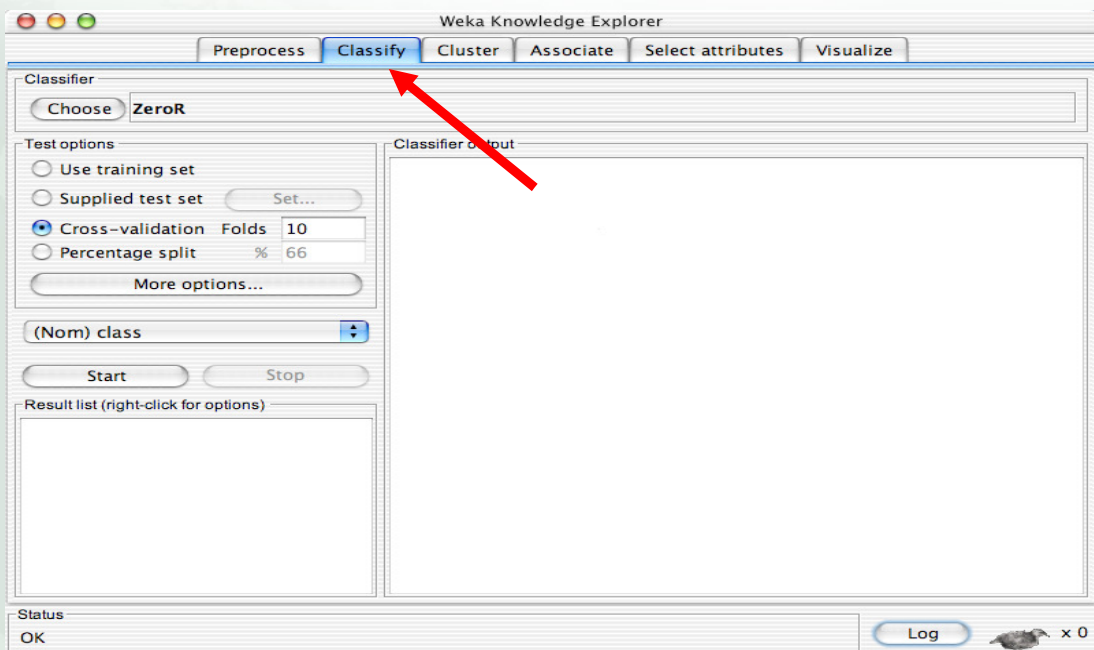
Menu Classify

- Classifiers pada Weka adalah model-model untuk memprediksi nilai-nilai nominal (klasifikasi) atau numerik (regresi)
- Machine learning yang diimplementasikan adalah:
 - Decision tree, instance-based classifiers, support vector machines, multi-layer perceptrons, Bayes' nets, rule, ...
- „Meta“-classifiers yang diimplementasikan adalah:
 - Filtered classifier, CVPParameterselection, Gridsearch, Boosting, ...

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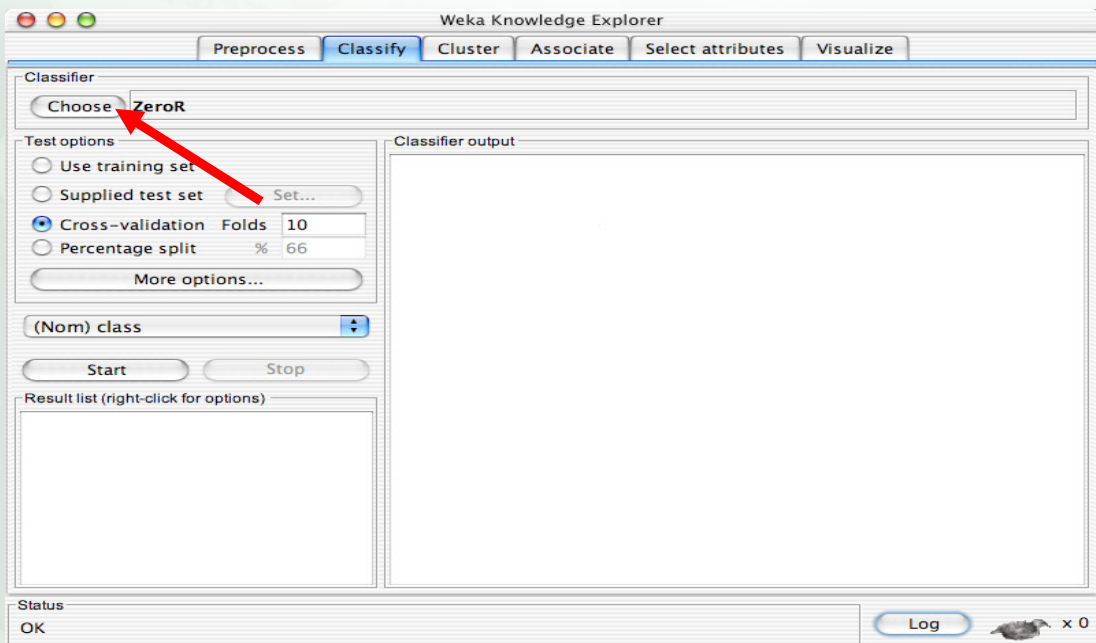
Explorer

Menu Classify



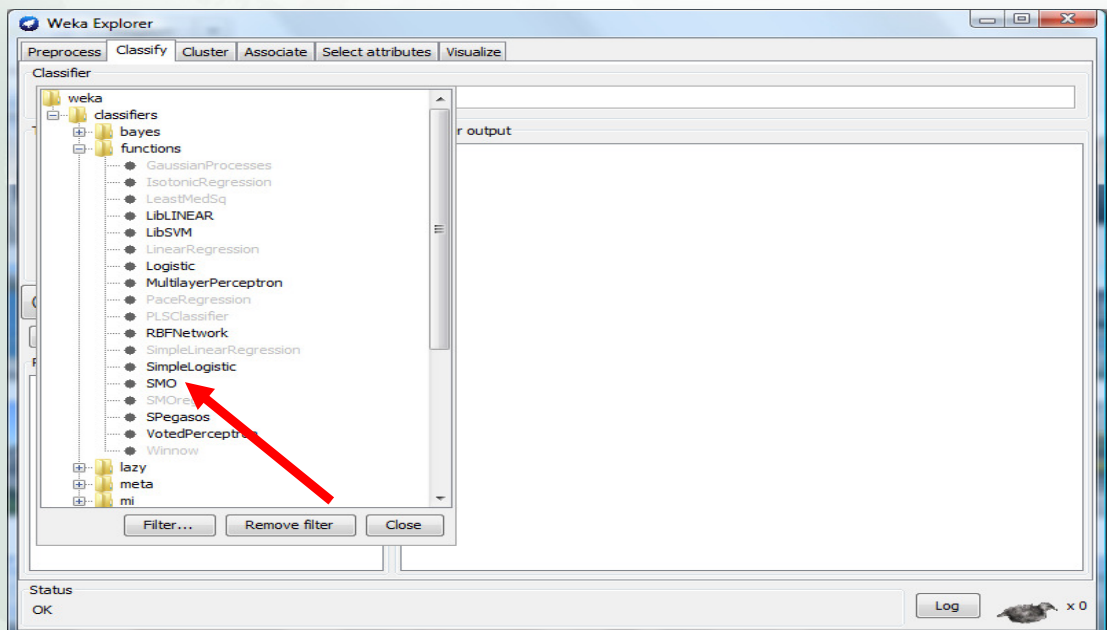
Explorer

Menu Classify: Pemilihan Classifier



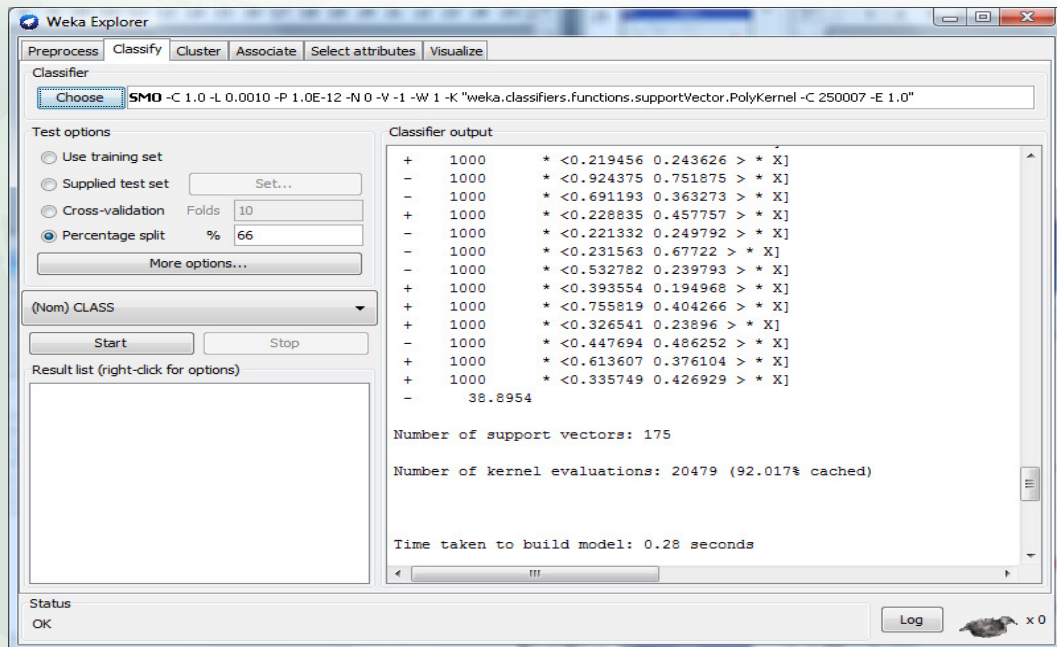
Explorer

Menu Classify: Pemilihan Classifier



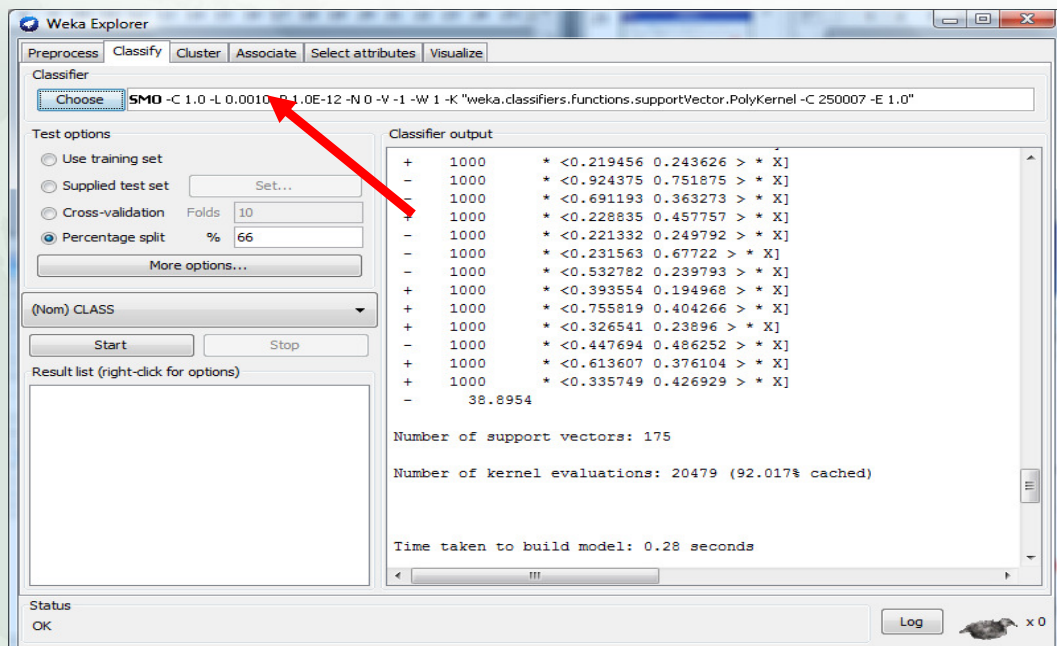
Explorer

Menu Classify: Pemilihan Classifier



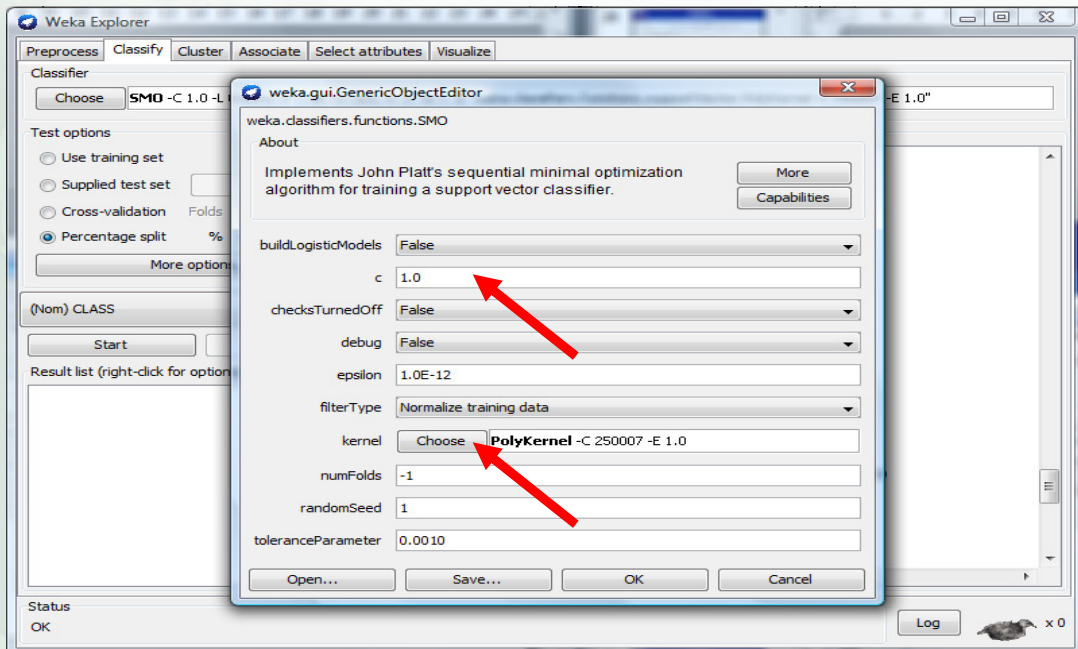
Explorer

Menu Classify: Pemilihan Model



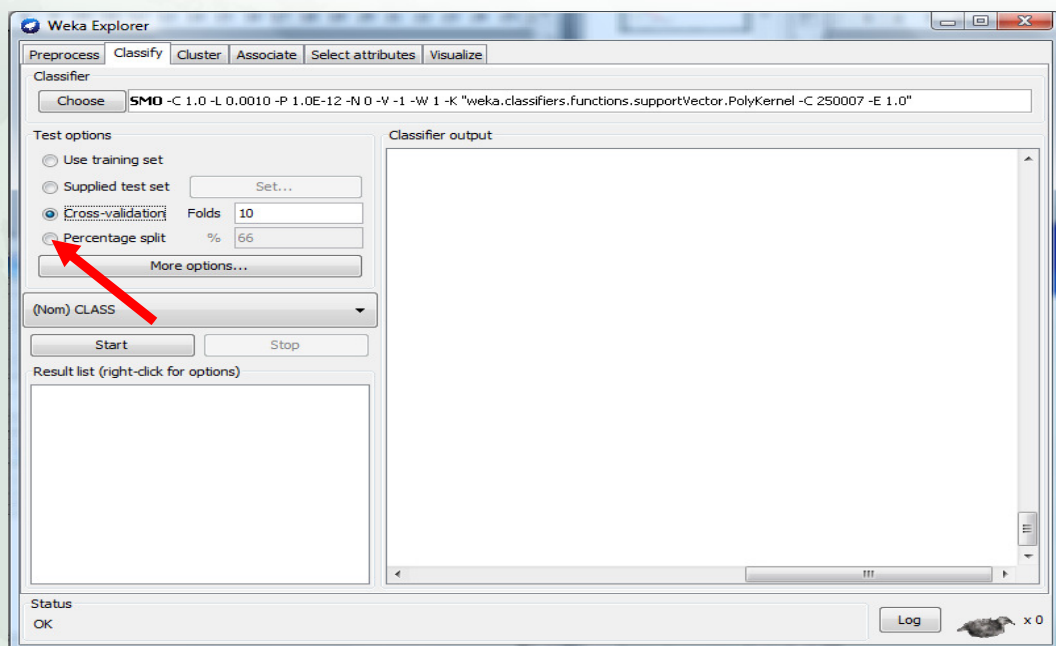
Explorer

Menu Classify: Pemilihan Model dan Kernel



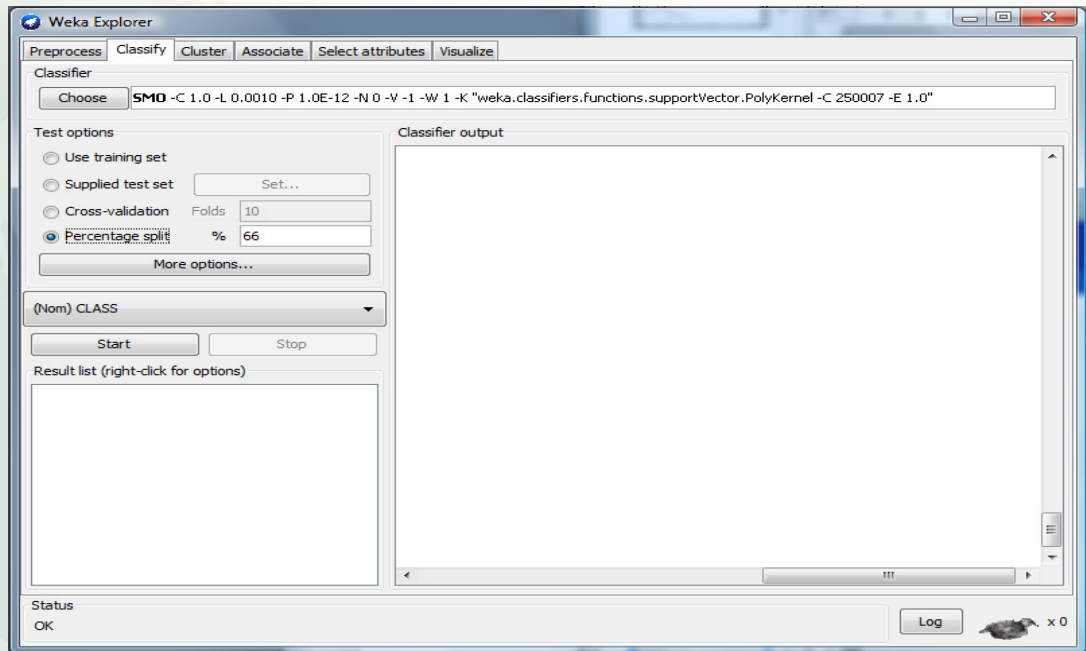
Explorer

Menu Classify: Pemilihan Skema Testing



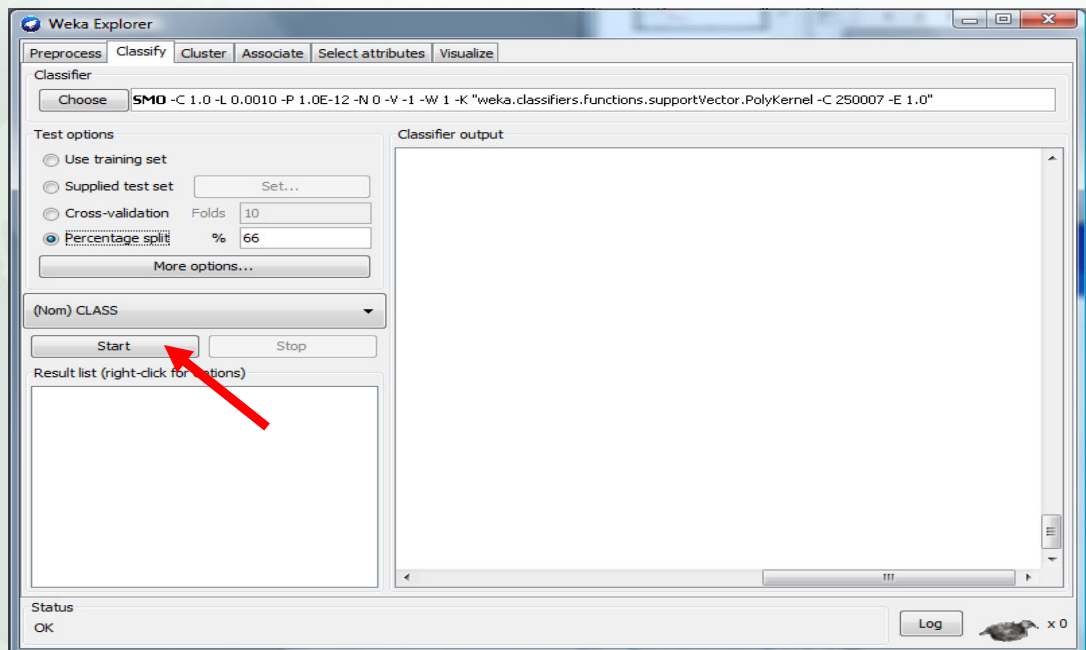
Explorer

Menu Classify: Pemilihan Skema Testing



Explorer

Menu Classify: Run/Start



Explorer

Menu Classify: Hasil

Weka Explorer

Preprocess **Classify** Cluster Associate Select attributes Visualize

Classifier: Choose **SMO** -C 1.0 -L 0.0010 -P 1.0E-12 -N 0 -V -1 -W 1 -K "weka.classifiers.functions.supportVector.PolyKernel -C 250007 -E 1.0"

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)
13:10:35 - functions.SMO

Classifier output:

```
=== Run information ===  
  
Scheme:weka.classifiers.functions.SMO -C 1.0 -L 0.0010 -P 1.0E-12 -N 0 -V -1 -W 1 -K "weka.classifiers.functions.supportVector.PolyKernel -C 250007 -E 1.0"  
Relation: hutaan-weka.filters.unsupervised.attribute.Remove-R1-2  
Instances: 202  
Attributes: 3  
          HH  
          HV  
          CLASS  
Test mode:split 66.0% train, remainder test  
  
=== Classifier model (full training set) ===  
  
SMO  
  
Kernel used:  
  Linear Kernel: K(x,y) = <x,y>  
  
Classifier for classes: 0, 1  
  
BinarySMO  
  
Machine learning: showing attribute weights, not support vectors
```

Status: OK Log x 0

Explorer

Menu Classify: Hasil

Weka Explorer

Preprocess **Classify** Cluster Associate Select attributes Visualize

Classifier: Choose **SMO** -C 1.0 -L 0.0010 -P 1.0E-12 -N 0 -V -1 -W 1 -K "weka.classifiers.functions.supportVector.PolyKernel -C 250007 -E 1.0"

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)
13:10:35 - functions.SMO

Classifier output:

```
=== Summary ===  
  
Correctly Classified Instances      40           57.971 %  
Incorrectly Classified Instances    29           42.029 %  
Kappa statistic                    0.1134  
Mean absolute error                 0.4203  
Root mean squared error             0.6483  
Relative absolute error             84.1754 %  
Root relative squared error         129.8373 %  
Total Number of Instances          69  
  
=== Detailed Accuracy By Class ===  
  
      TP Rate  FP Rate  Precision  Recall  F-Measure  ROC Area  Class  
0      0.429    0.317    0.48      0.429    0.453      0.556    0  
1      0.683    0.571    0.636    0.683    0.659      0.556    1  
Weighted Avg.   0.58    0.468    0.573    0.58      0.575      0.556  
  
=== Confusion Matrix ===  
  
  a  b  <-- classified as  
12 16 | a = 0  
13 28 | b = 1
```

Status: OK Log x 0

Explorer

Menu Classify: Visualisasi Hasil/Error

Weka Explorer

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

Classifier: Choose **SMO** -C 1.0 -L 0.0010 -P 1.0E-12 -N 0 -V -1 -W 1 -K "weka.classifiers.functions.supportVector.PolyKernel -C 250007 -E 1.0"

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):

- 13:10:35 - functions.SMO

Classifier output:

```
=== Summary ===
Correctly Classified Instances      40           57.971 %
Incorrectly Classified Instances    29           42.029 %
Kappa statistic                    0.1134
Mean absolute error                 0.4203
Root mean squared error             0.6483
Relative absolute error             84.1754 %
Root relative squared error        129.8373 %
Total Number of Instances          69

=== Detailed Accuracy By Class ===
               TP Rate  FP Rate  Precision  Recall  F-Measure  ROC Area  Class
Weighted Avg.   0.429   0.317    0.48      0.429   0.453     0.556    0
                  0.683   0.571    0.636    0.683   0.659     0.556    1

=== Confusion Matrix ===
  a b  <-- classified as
12 16 | a = 0
13 28 | b = 1
```

Status: OK Log x 0

Explorer

Menu Classify: Visualisasi Hasil/Error

Weka Explorer

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

Classifier: Choose **SMO** -C 1.0 -L 0.0010 -P 1.0E-12 -N 0 -V -1 -W 1 -K "weka.classifiers.functions.supportVector.PolyKernel -C 250007 -E 1.0"

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):

- 13:10:35 - functions.SMO

Classifier output:

```
Time taken to build model: 0.15 seconds

=== Evaluation on test split ===
=== Summary ===
Correctly Classified Instances      40           57.971 %
Incorrectly Classified Instances    29           42.029 %
Kappa statistic                    0.1134
Mean absolute error                 0.4203
Root mean squared error             0.6483
Relative absolute error             84.1754 %
Root relative squared error        129.8373 %
Total Number of Instances          69

=== Detailed Accuracy By Class ===
               TP Rate  FP Rate  Precision  Recall  F-Measure  ROC Area  Class
Weighted Avg.   0.317   0.468    0.48      0.429   0.453     0.556    0
                  0.571   0.636    0.636    0.683   0.659     0.556    1
```

Context menu options:

- View in main window
- View in separate window
- Save result buffer
- Delete result buffer
- Load model
- Save model
- Re-evaluate model on current test set
- Visualize classifier errors
- Visualize tree
- Visualize margin curve
- Visualize threshold curve
- Cost/Benefit analysis
- Visualize cost curve

Status: OK Log x 0

Explorer

Menu Select attributes

- Menu yang dapat digunakan untuk melakukan investigasi atribut/fitur mana yang paling berdaya guna
- Metode pemilihan atribut/fitur terdiri dari dua bagian:
 - Metode evaluasi: PrincipalComponents, LatentSemanticAnalysis, SVMAttributEval,
 - Metode pecarian: BestFirst, RandomSearch, GeneticSearch, RankSearch, ...

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Explorer

Menu Classify: Menyimpan atau Memanggil Kembali Model

The screenshot shows the Weka Explorer application window. The 'Classify' tab is selected. The classifier chosen is 'SMO -C 1.0 -L 0.0010 -P 1.0E-12 -N 0 -V -1 -W 1 -K "weka.classifiers.functions.supportVector.PolyKernel -C 250007 -E 1.0"'. The 'Test options' section shows 'Percentage split' at 66%. The 'Classifier output' section displays evaluation metrics for two classes (0 and 1).

Classifier output

Time taken to build model: 0.15 seconds

=== Evaluation on test split ===

=== Summary ===

Metric	Class 0	Class 1
Correctly Classified Instances	40	57.971 %
Incorrectly Classified Instances	29	42.029 %
Kappa statistic	0.1134	
Mean absolute error	0.4203	
Root mean squared error	0.6483	
Relative absolute error	84.1754 %	
Root relative squared error	129.8373 %	

By Class ===

FP Rate	Precision	Recall	F-Measure	ROC Area	Class
0.317	0.48	0.429	0.453	0.556	0
0.571	0.636	0.683	0.659	0.556	1
0.468	0.573	0.58	0.575	0.556	

A context menu is open over the 'Result list' area, showing options like 'Load model', 'Save model', 'Re-evaluate model on current test set', etc. The 'Load model' and 'Save model' options are highlighted with a red box.

Explorer

Menu Select attributes

- Menu yang dapat digunakan untuk melakukan investigasi atribut/fitur mana yang paling berdaya guna
- Metode pemilihan atribut/fitur terdiri dari dua bagian:
 - Metode evaluasi: PrincipalComponents, LatentSemanticAnalysis, SVMAttributEval,
 - Metode pencarian: BestFirst, RandomSearch, GeneticSearch, RankSearch, ...

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Explorer

Menu Select attributes: Pemilihan Metode Evaluasi dan Pencarian

Weka Knowledge Explorer

Preprocess Classify Cluster Associate **Select attributes** Visualize

Attribute Evaluator
Choose **CfsSubsetEval**

Search Method
Choose **BestFirst -D 1 -N 5**

Attribute Selection Mode
☒ Use full training set
☐ Cross-validation Folds 10 Seed 1

(Nom) Class

Start Stop

Result list (right-click for options)

Attribute selection output

Status
OK Log x 0

Explorer

Menu Select attributes: Run/Start

The screenshot shows the 'Weka Knowledge Explorer' window with the 'Select attributes' tab selected. The 'Attribute Evaluator' is set to 'CfsSubsetEval' and the 'Search Method' is 'BestFirst -D 1 -N 5'. Under 'Attribute Selection Mode', 'Use full training set' is selected with 'Folds' set to 10 and 'Seed' to 1. The '(Nom) Class' dropdown is set to '(Nom) Class'. The 'Start' button is highlighted with a red arrow. The 'Result list' and 'Attribute selection output' areas are empty. The status bar at the bottom shows 'OK' and a 'Log' button.

Explorer

Menu Select attributes: Hasil

The screenshot shows the 'Weka Knowledge Explorer' window with the 'Select attributes' tab selected, displaying the results of the attribute selection process. The 'Attribute Evaluator' is 'CfsSubsetEval' and the 'Search Method' is 'BestFirst -D 1 -N 5'. The 'Attribute Selection Mode' is 'Use full training set' with 'Folds' set to 10 and 'Seed' to 1. The '(Nom) Class' dropdown is set to '(Nom) Class'. The 'Start' button is highlighted. The 'Result list' shows '16:39:40 - BestFirst + CfsSubsetEval'. The 'Attribute selection output' area displays the following text:

```
duty-free-exports
export-administration-act-south-africa
Class
Evaluation mode: evaluate on all training data

=== Attribute Selection on all input data ===

Search Method:
Best first.
Start set: no attributes
Search direction: forward
Stale search after 5 node expansions
Total number of subsets evaluated: 83
Merit of best subset found: 0.729

Attribute Subset Evaluator (supervised, Class (nominal): 17 Class):
CFS Subset Evaluator

Selected attributes: 4 : 1
physician-fee-freeze
```

The status bar at the bottom shows 'OK' and a 'Log' button.

Explorer

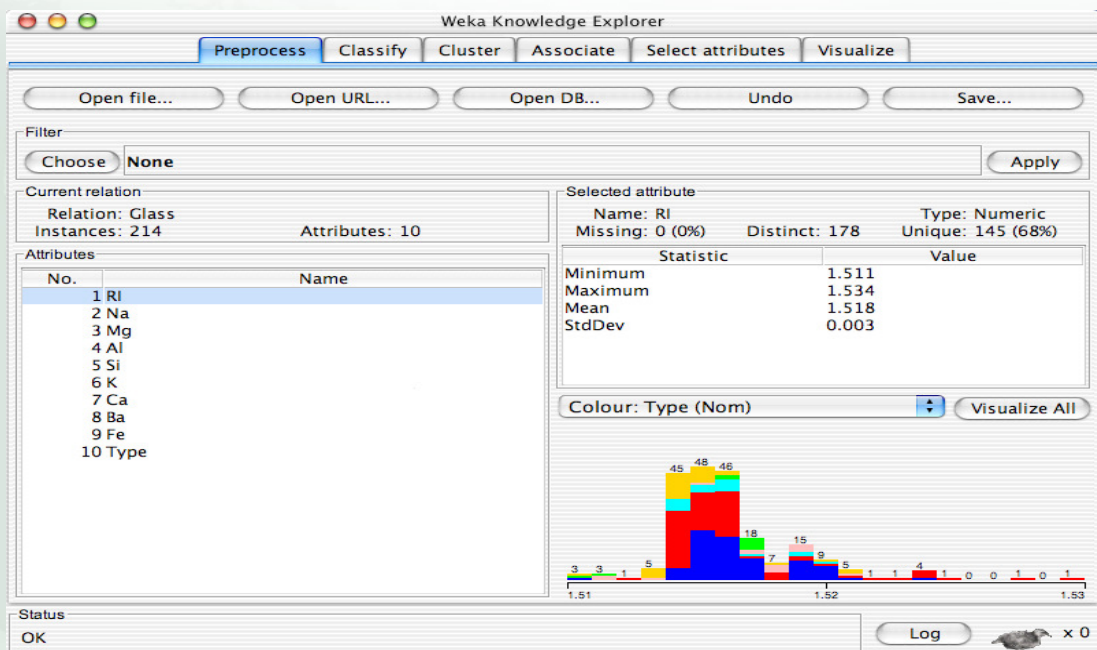
Menu Visualize

- Visualisasi dengan berguna pada machine learning pada tataran praktis, misal: membantu menentukan tingkat kesulitan dari masalah yang akan di olah
- Weka dapat melakukan visualisasi dalam bentuk satu atribut/fitur (1-d) atau pasangan atribut/fitur (2-d)
- Fasilitas lain:
 - Nilai-nilai kelas yang berbeda warna
 - Fungsi „zoom-in“

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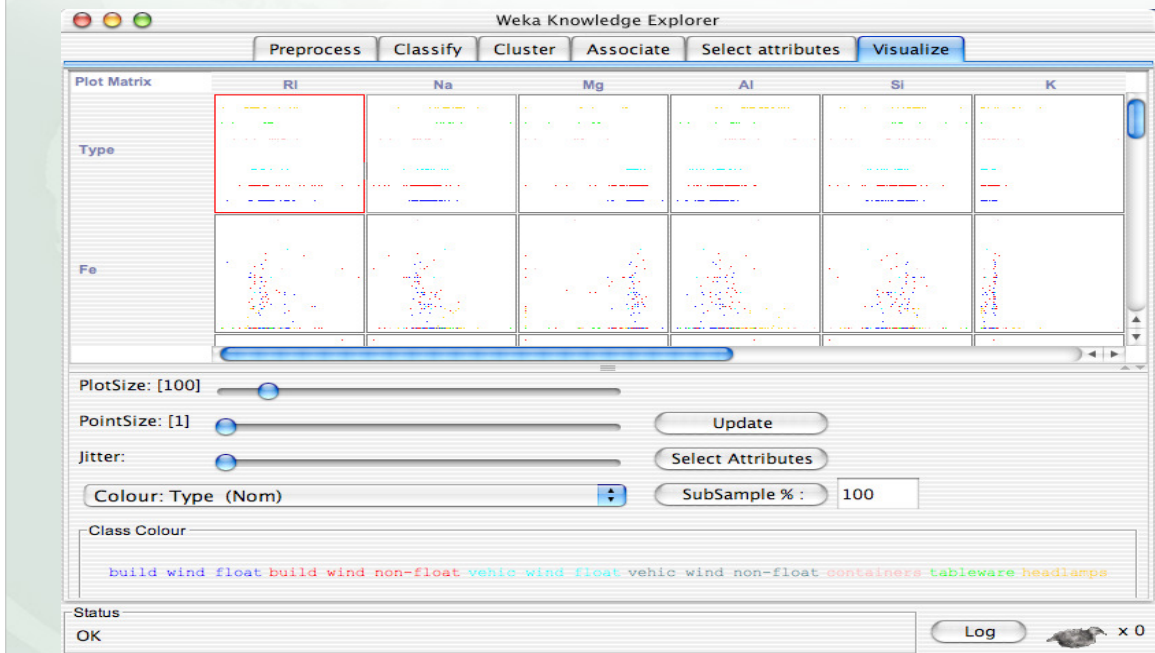
Explorer

Menu Visualize: Single Atribut/Fitur



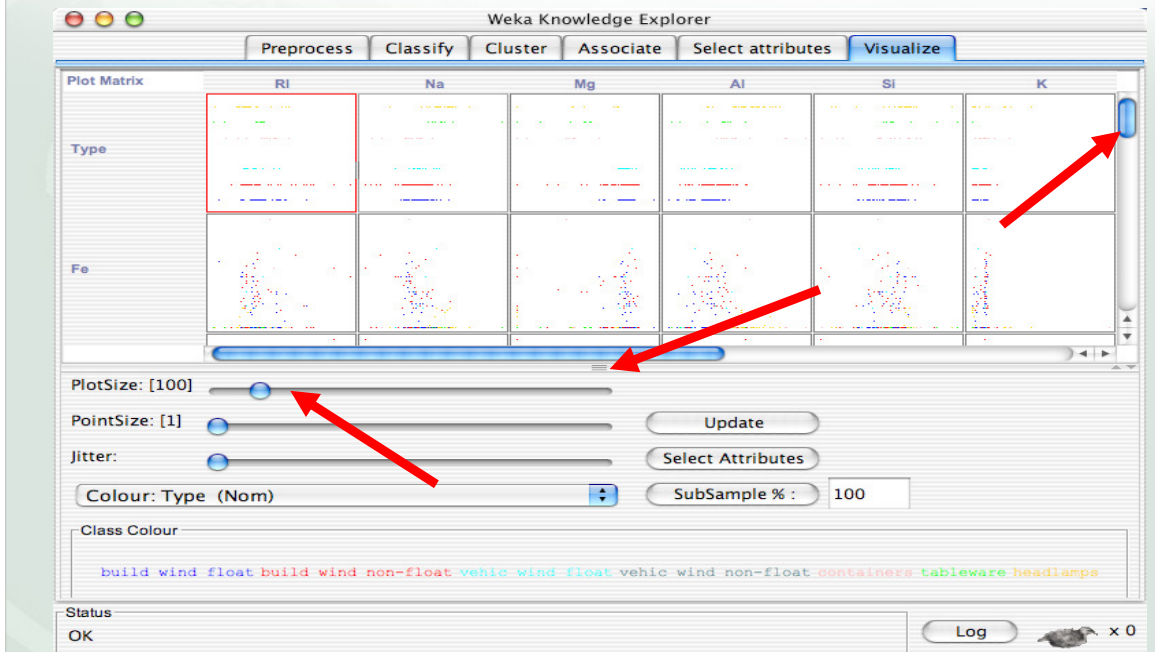
Explorer

Menu Visualize: Pasangan Atribut/Fitur



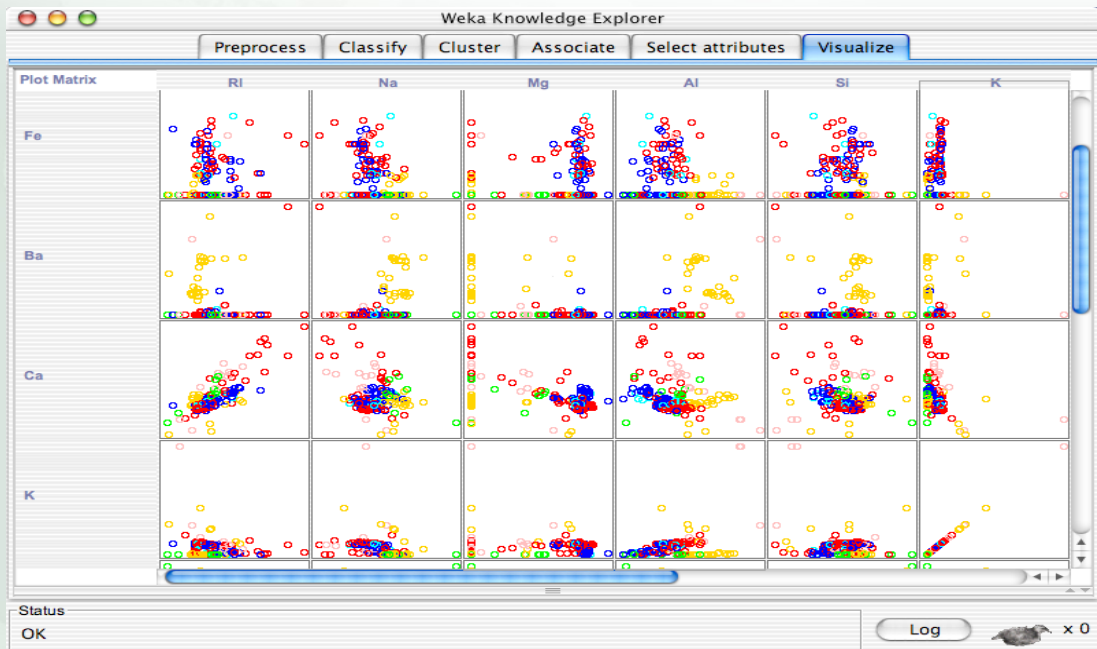
Explorer

Menu Visualize: Pasangan Atribut/Fitur



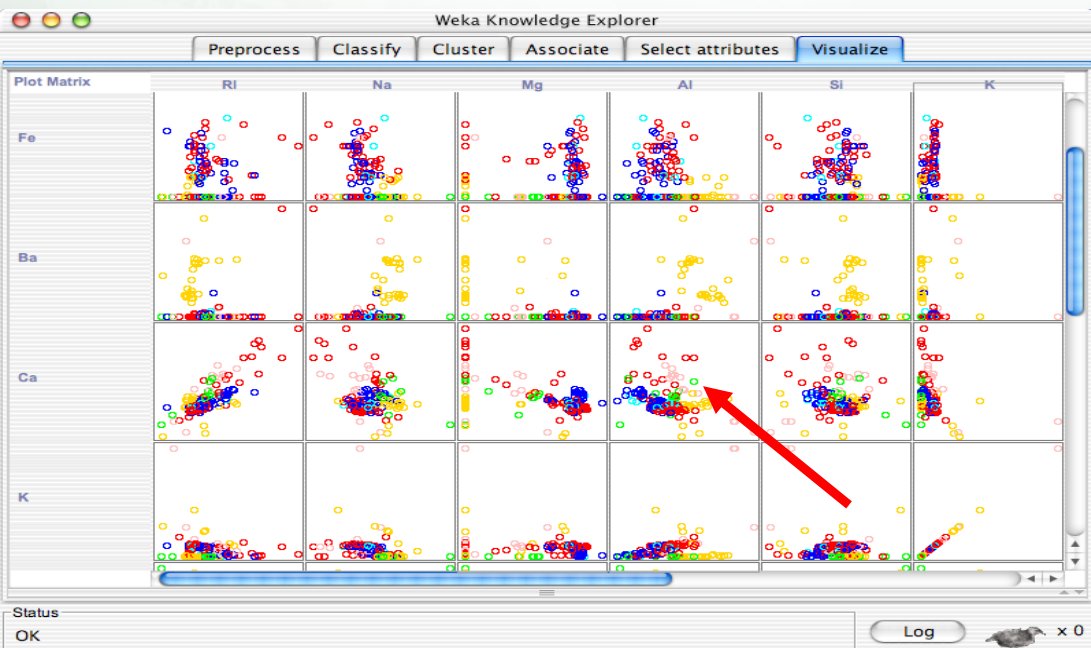
Explorer

Menu Visualize: Pasangan Atribut/Fitur



Explorer

Menu Visualize: Pasangan Atribut/Fitur - „Zoom-in“



Explorer

Menu Visualize: Pasangan Atribut/Fitur - „Zoom-in“



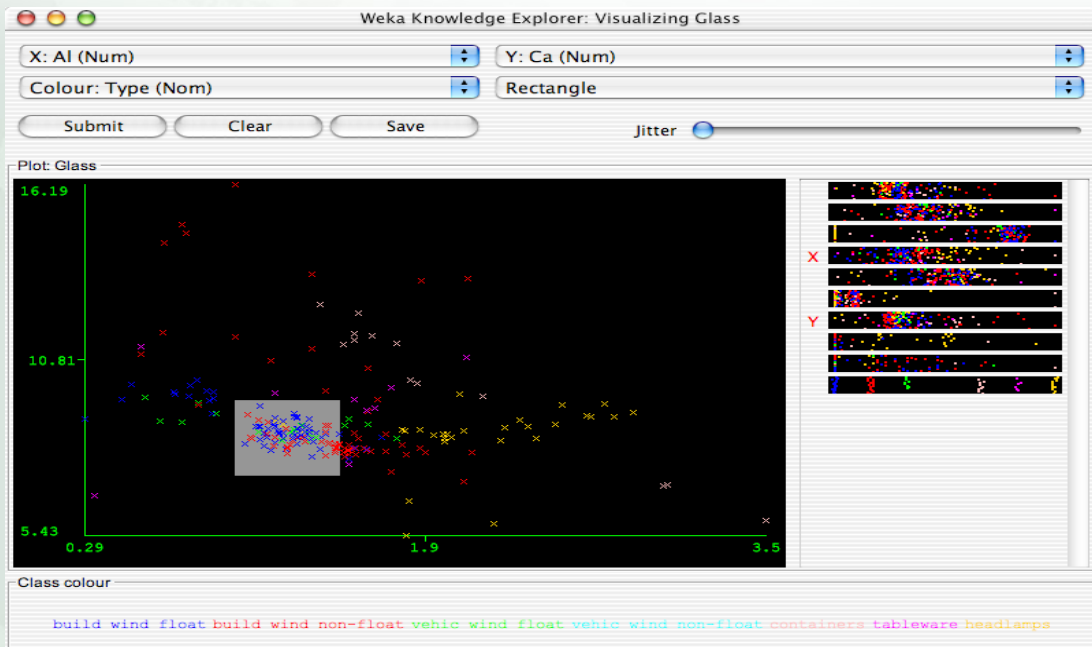
Explorer

Menu Visualize: Pasangan Atribut/Fitur - „Zoom-in“



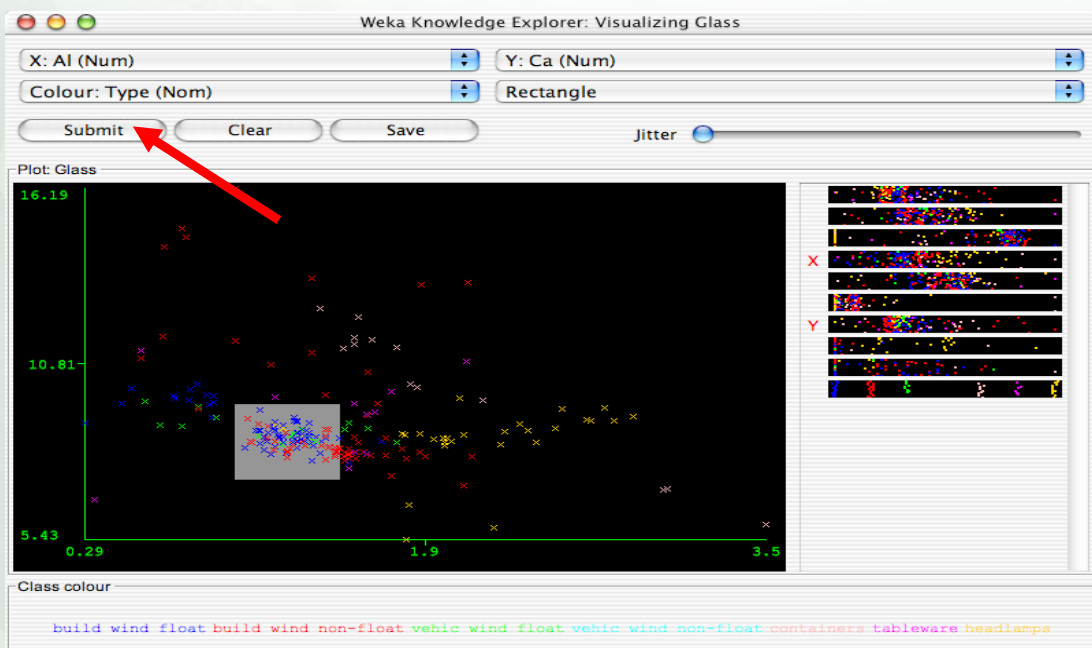
Explorer

Menu Visualize: Pasangan Atribut/Fitur - „Zoom-in“



Explorer

Menu Visualize: Pasangan Atribut/Fitur - „Zoom-in“



Explorer

Menu Visualize: Pasangan Atribut/Fitur - „Zoom-in“

