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Experiment No. 8

Title: Demonstrate Classification, Clustering, Association using WEKA.

Aim: Perform data Pre-processing task and demonstrate Classification, Clustering, Association algorithm on data sets using data mining tool WEKA.

Introduction :

Data mining is the process of extracting useful patterns from large datasets. WEKA is a powerful open-source tool that supports various data mining techniques through an easy-to-use interface. In this experiment, we use WEKA to demonstrate three key tasks:

- **Classification:** Predicting predefined class labels (e.g., spam detection).
- **Clustering:** Grouping similar data without prior labels.
- **Association:** Finding relationships between items (e.g., market basket analysis).

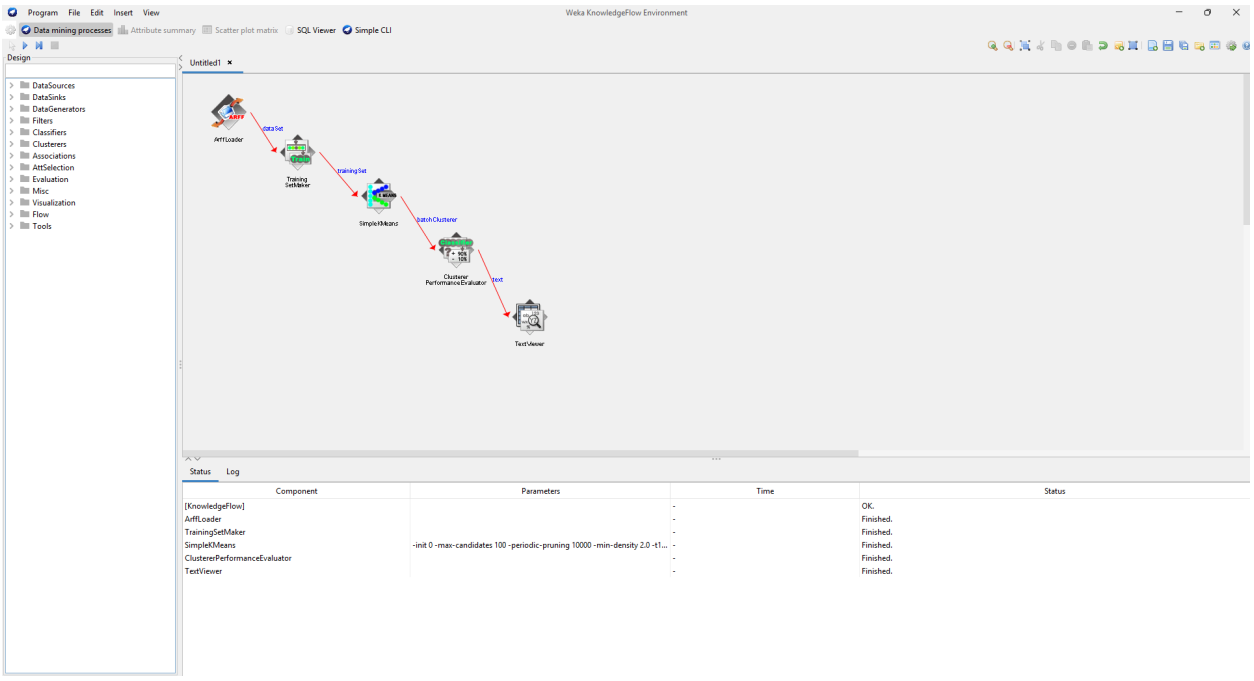
Before applying these algorithms, data preprocessing is done to clean and prepare the data for better accuracy.

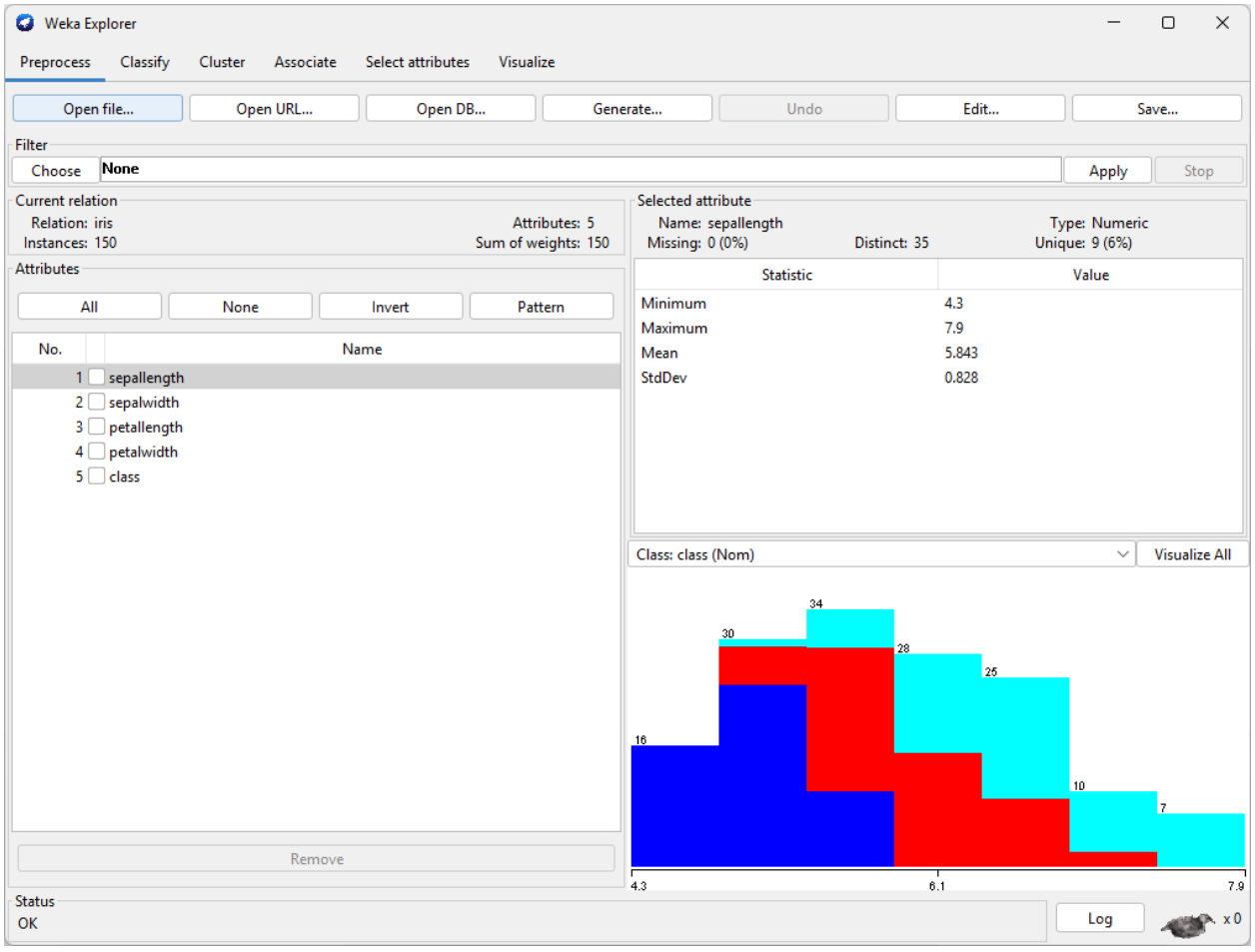
Procedure :

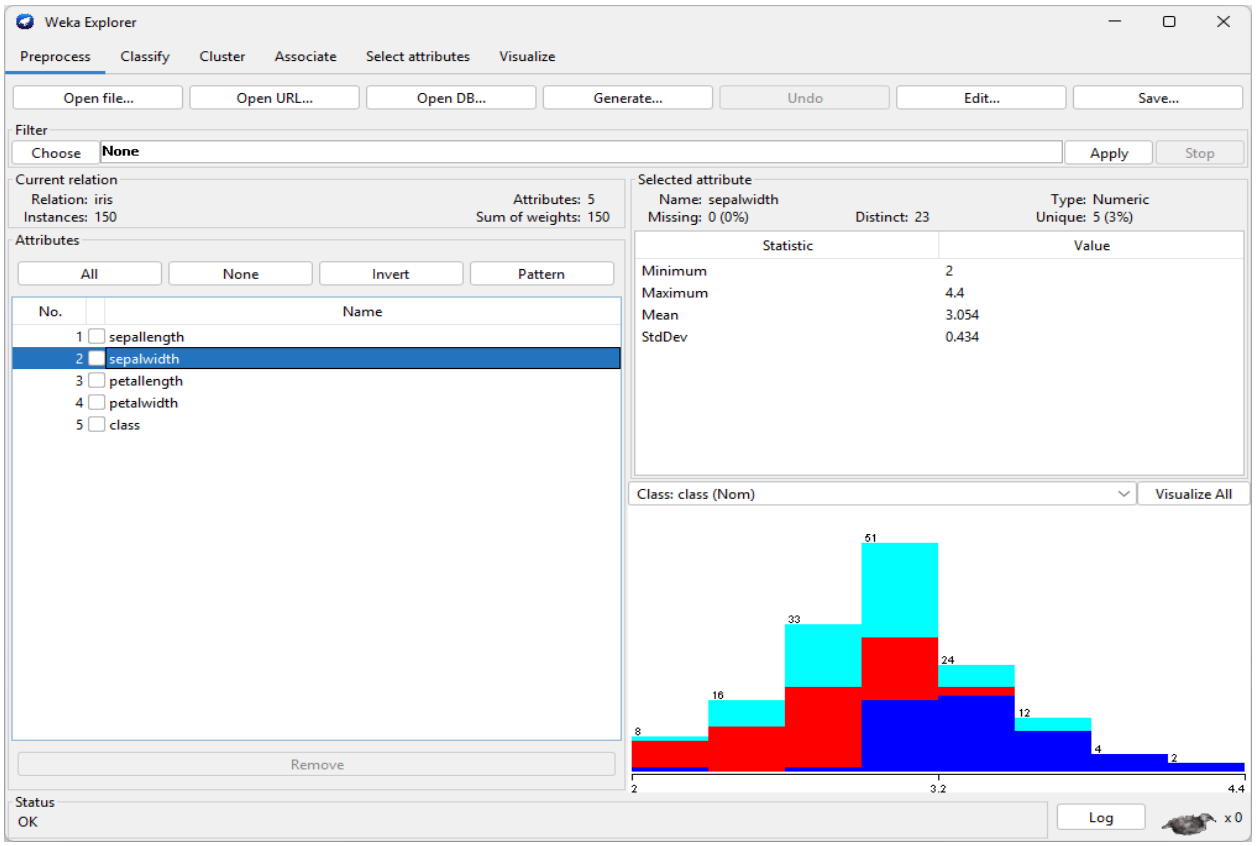
1. **Open Weka Knowledge Flow:**
    - Go to **Program Files** on your **PC** and launch **Weka 3.6**.

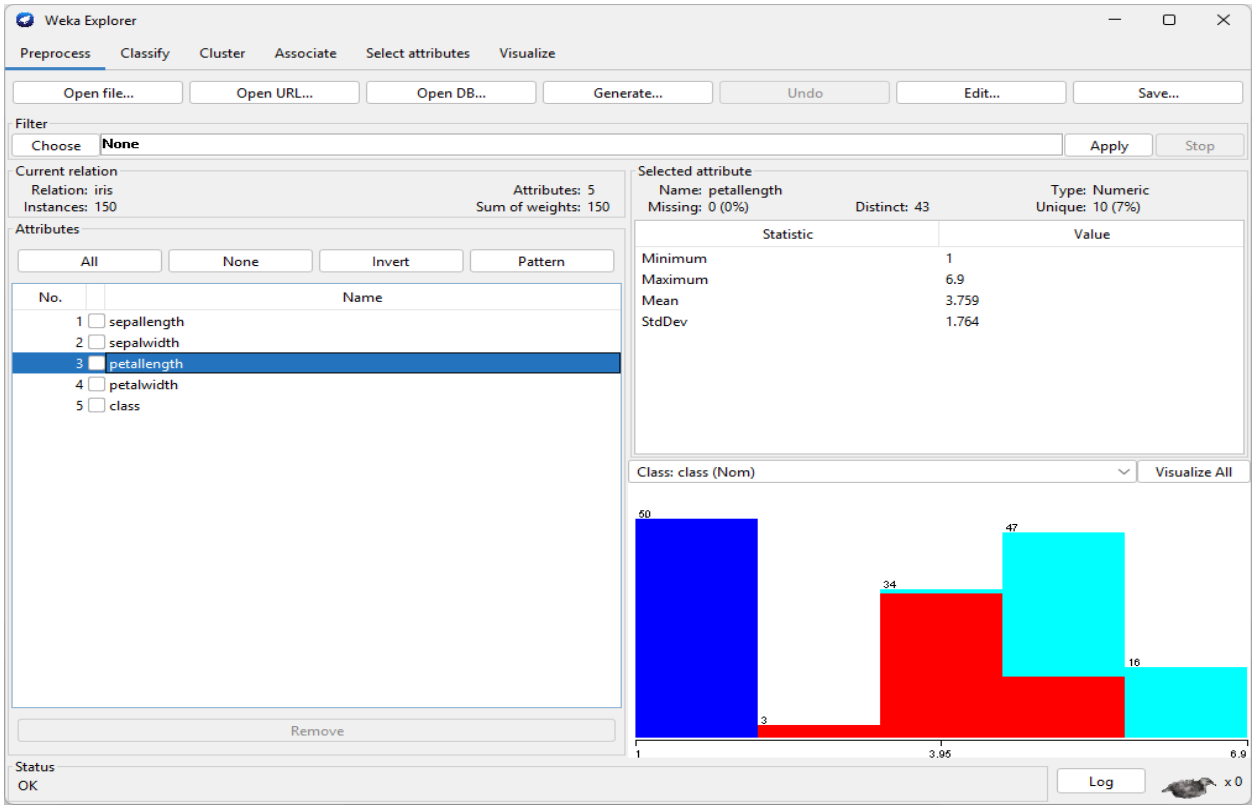
    - Choose the **Knowledge Flow** environment from the initial menu (Explorer, Experimenter, Knowledge Flow, etc.).
2. **Load Dataset Using Arff Loader:**
    - Drag the **ArffLoader** from the "Data Sources" section into the canvas.
    - Right-click → **Configure**, then click **Browse** and select a dataset (e.g., from the **Data** folder like iris.arff).
    - This loads your data into the flow.
3. **Configure Evaluation Component:**
    - Add the **Evaluation** component to evaluate the clustering model.
    - Set the evaluation type to **Static** for using the dataset as-is.
4. **Prepare the Training Format:**
    - Add a **TrainingSetMaker** component.
    - This prepares your data in a format suitable for training.
    - Connect it to the output of the ArffLoader.
5. **Add and Configure Clusterer:**
    - Drag the **Clusterer** component into the workspace.
    - Choose **SimpleKMeans** as the clustering algorithm.
    - Configure it (e.g., set number of clusters, distance function, etc.).
6. **Analyze Clustering Performance:**
    - Add the **ClustererPerformanceEvaluator** component.
    - Connect it to the output of the Clusterer to measure model effectiveness.
7. **Add Output Viewers:**
    - Drag in a **TextViewer** to view textual output (e.g., cluster assignments, summary).
    - Add a **Visualization** component for graphical display of cluster distribution.
8. **Connect Components and Run Flow:**
    - Right-click on each component to **Connect** them in order: ArffLoader → TrainingSetMaker → Clusterer → ClustererPerformanceEvaluator → TextViewer/Visualization
    - Finally, right-click the **last component** and choose **Start Execution** to run the workflow.

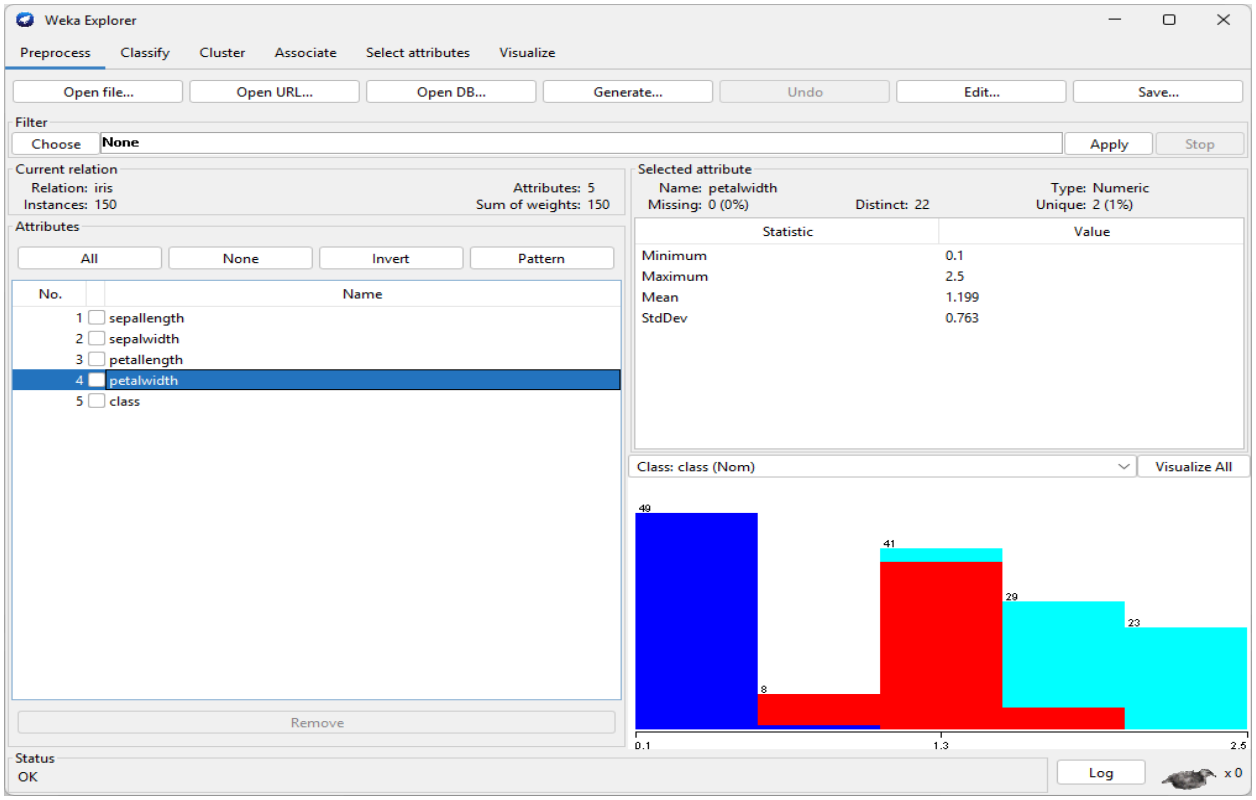
Output:

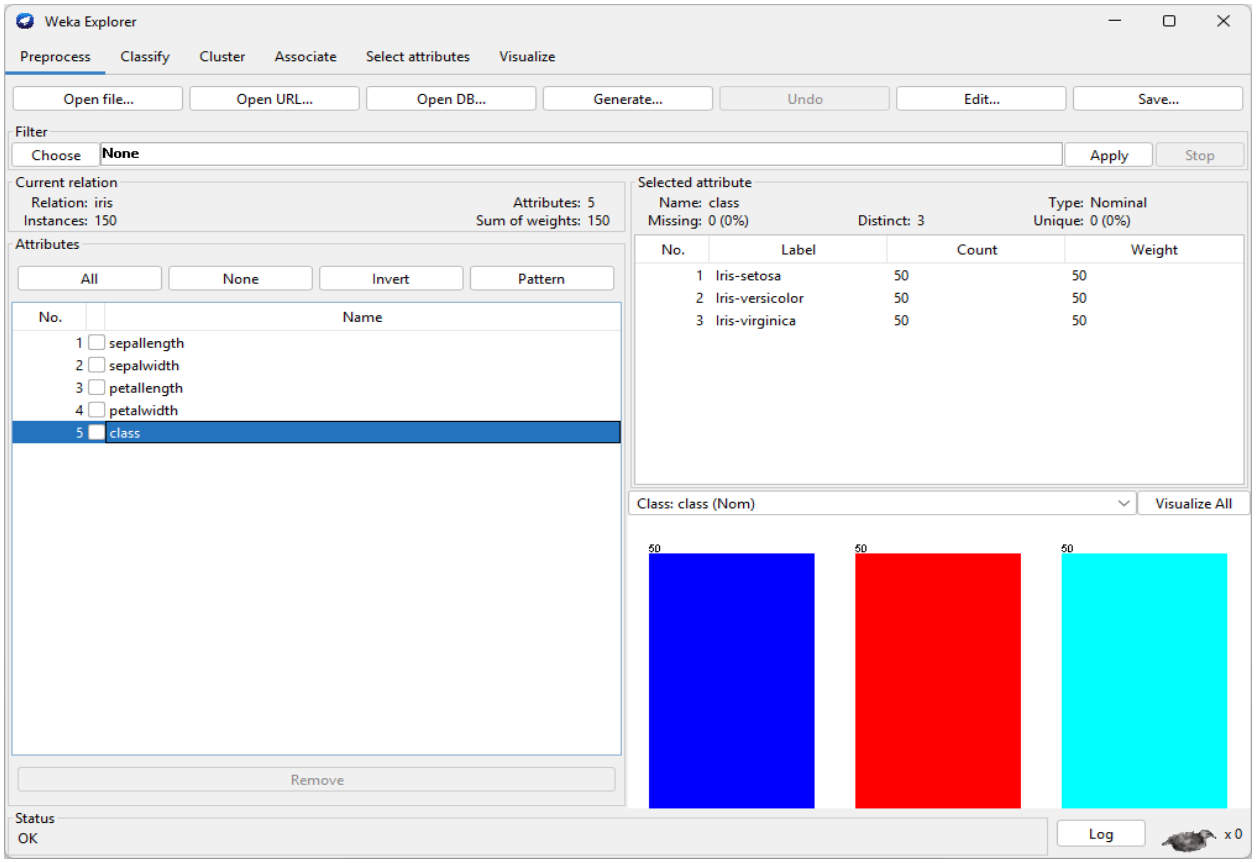

Program File Edit Insert View
Weka KnowledgeFlow Environment
Data mining processes
Attribute summary
Scatter plot matrix
SQL Viewer
Simple CLI
Design
DataSources
DataSinks
DataGenerators
Filters
Classifiers
Clusterers
Associations
AttSelection
Evaluation
Misc
Visualization
Flow
Tools
Untitled1
ArffLoader
Training SetMaker
SimpleKMeans
Clusterer PerformanceEvaluator
TextViewer
data Set
training Set
batch Clusterer
text
Status
Log
Component
Parameters
Time
Status
[KnowledgeFlow]
ArffLoader
TrainingSetMaker
SimpleKMeans
-init 0 -max-candidates 100 -periodic-pruning 10000 -min-density 2.0 -t1...
ClustererPerformanceEvaluator
TextViewer
OK.
Finished.

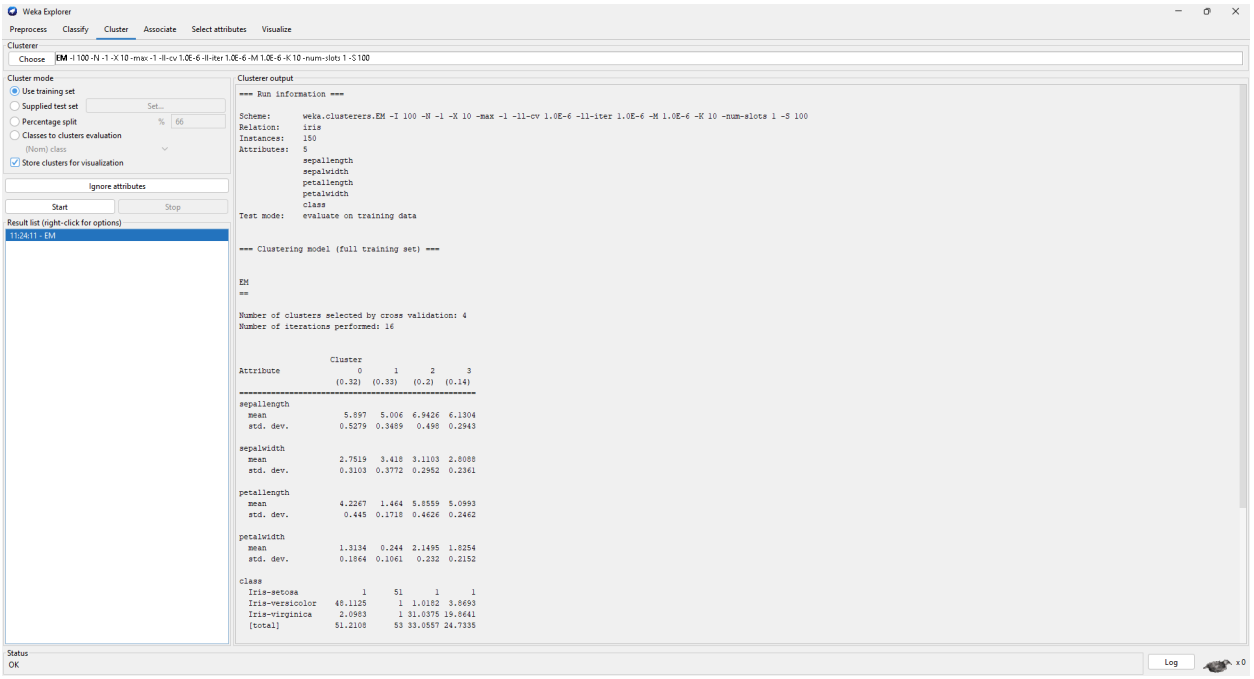

Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Generate...
Undo
Edit...
Save...
Filter
Choose
None
Apply
Stop
Current relation
Relation: iris
Instances: 150
Attributes: 5
Sum of weights: 150
Attributes
All
None
Invert
Pattern
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Remove
Selected attribute
Name: sepallength
Missing: 0 (0%)
Distinct: 35
Type: Numeric
Unique: 9 (6%)
Statistic
Value
Minimum 4.3
Maximum 7.9
Mean 5.843
StdDev 0.828
Class: class (Nom)
Visualize All
34
30
28
25
16
10
7
4.3
6.1
7.9
Status
OK
Log
x 0

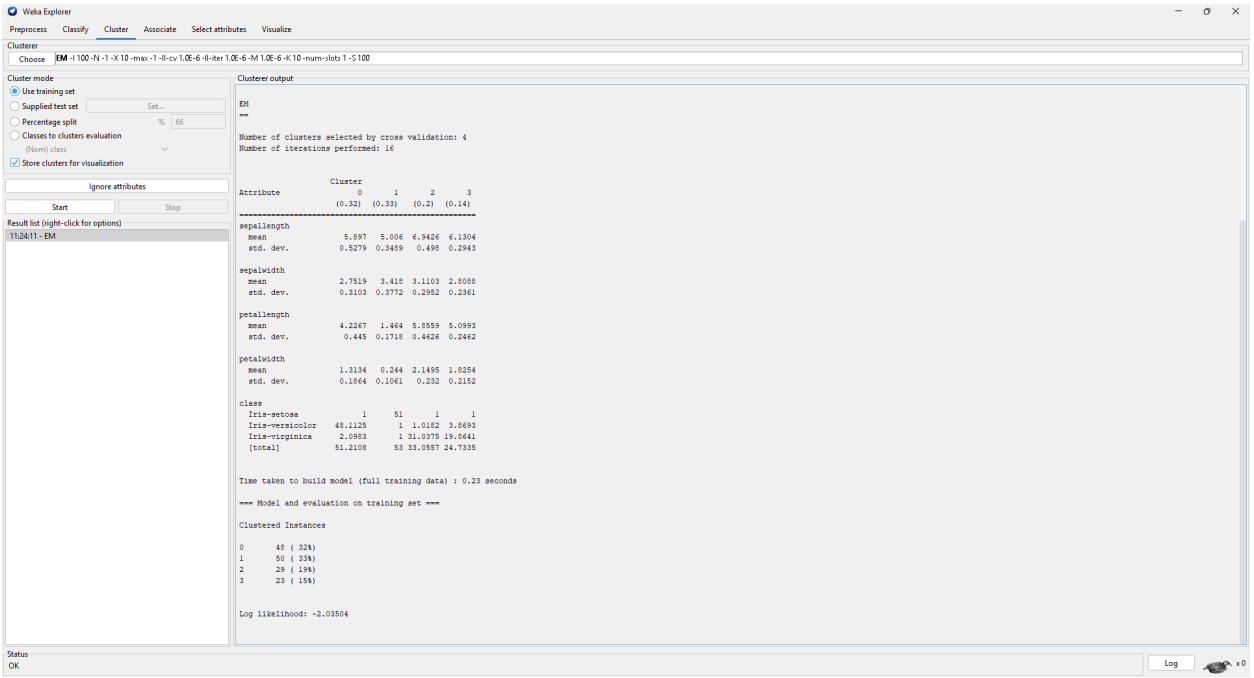

Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Generate...
Undo
Edit...
Save...
Filter
Choose
None
Apply
Stop
Current relation
Relation: iris
Instances: 150
Attributes: 5
Sum of weights: 150
Attributes
All
None
Invert
Pattern
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Remove
Selected attribute
Name: sepalwidth
Missing: 0 (0%)
Distinct: 23
Type: Numeric
Unique: 5 (3%)
Statistic
Value
Minimum 2
Maximum 4.4
Mean 3.054
StdDev 0.434
Class: class (Nom)
Visualize All
51
33
24
16
12
8
4
2
2
3.2
4.4
Status
OK
Log
x 0


Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Generate...
Undo
Edit...
Save...
Filter
Choose
None
Apply
Stop
Current relation
Relation: iris
Instances: 150
Attributes: 5
Sum of weights: 150
Attributes
All
None
Invert
Pattern
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Remove
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
Class: class (Nom)
Visualize All
50
47
34
16
3
1
3.95
6.9
Status
OK
Log
x 0


Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Generate...
Undo
Edit...
Save...
Filter
Choose
None
Apply
Stop
Current relation
Relation: iris
Instances: 150
Attributes: 5
Sum of weights: 150
Attributes
All
None
Invert
Pattern
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Remove
Selected attribute
Name: petalwidth
Missing: 0 (0%)
Distinct: 22
Type: Numeric
Unique: 2 (1%)
Statistic
Value
Minimum 0.1
Maximum 2.5
Mean 1.199
StdDev 0.763
Class: class (Nom)
Visualize All
49
8
41
29
23
0.1
1.3
2.5
Status
OK
Log
x 0


Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Generate...
Undo
Edit...
Save...
Filter
Choose
None
Apply
Stop
Current relation
Relation: iris
Instances: 150
Attributes: 5
Sum of weights: 150
Attributes
All
None
Invert
Pattern
No.
Name
1 sepallength
2 sepalwidth
3 petallength
4 petalwidth
5 class
Remove
Selected attribute
Name: class
Missing: 0 (0%)
Distinct: 3
Type: Nominal
Unique: 0 (0%)
No.
Label
Count
Weight
1 Iris-setosa 50 50
2 Iris-versicolor 50 50
3 Iris-virginica 50 50
Class: class (Nom)
Visualize All
50
50
50
Status
OK
Log
x 0


Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Clusterer
Choose
EM -I 100 -N -1 -X 10 -max -1 -ll-cv 1.0E-6 -ll-iter 1.0E-6 -M 1.0E-6 -K 10 -num-slots 1 -S 100
Cluster mode
Use training set
Supplied test set
Set...
Percentage split
%
66
Classes to clusters evaluation
(Nom) class
Store clusters for visualization
Ignore attributes
Start
Stop
Result list (right-click for options)
11:24:11 - EM
Clusterer output
=== Run information ===
Scheme: weka.clusterers.EM -I 100 -N -1 -X 10 -max -1 -ll-cv 1.0E-6 -ll-iter 1.0E-6 -M 1.0E-6 -K 10 -num-slots 1 -S 100
Relation: iris
Instances: 150
Attributes: 5
sepallength
sepalwidth
petallength
petalwidth
class
Test mode: evaluate on training data
=== Clustering model (full training set) ===
EM
==
Number of clusters selected by cross validation: 4
Number of iterations performed: 16
Cluster
Attribute 0 1 2 3
(0.32) (0.33) (0.2) (0.14)
sepallength
mean 5.897 5.006 6.9426 6.1304
std. dev. 0.5279 0.3489 0.498 0.2943
sepalwidth
mean 2.7519 3.418 3.1103 2.8088
std. dev. 0.3103 0.3772 0.2952 0.2361
petallength
mean 4.2267 1.464 5.8559 5.0993
std. dev. 0.445 0.1718 0.4626 0.2462
petalwidth
mean 1.3134 0.244 2.1495 1.8254
std. dev. 0.1864 0.1061 0.232 0.2152
class
Iris-setosa 1 51 1 1
Iris-versicolor 48.1125 1 1.0182 3.8693
Iris-virginica 2.0903 1 31.0375 19.8641
[total] 51.2108 53 33.0557 24.7335
Status
OK
Log
x 0


Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Clusterer
Choose
EM -I 100 -N -1 -X 10 -max -1 -ll-cv 1.0E-6 -ll-iter 1.0E-6 -M 1.0E-6 -K 10 -num-slots 1 -S 100
Cluster mode
Use training set
Supplied test set
Set...
Percentage split
%
66
Classes to clusters evaluation
(Nom) class
Store clusters for visualization
Ignore attributes
Start
Stop
Result list (right-click for options)
11:24:11 - EM
Clusterer output
EM
==
Number of clusters selected by cross validation: 4
Number of iterations performed: 16
Cluster
Attribute 0 1 2 3
(0.32) (0.33) (0.2) (0.14)
sepallength
mean 5.897 5.006 6.9426 6.1304
std. dev. 0.5279 0.3489 0.498 0.2943
sepalwidth
mean 2.7519 3.418 3.1103 2.8088
std. dev. 0.3103 0.3772 0.2952 0.2361
petallength
mean 4.2267 1.464 5.8559 5.0993
std. dev. 0.445 0.1718 0.4626 0.2462
petalwidth
mean 1.3134 0.244 2.1495 1.8254
std. dev. 0.1864 0.1061 0.232 0.2152
class
Iris-setosa 1 51 1 1
Iris-versicolor 48.1125 1 1.0182 3.8693
Iris-virginica 2.0903 1 31.0375 19.8641
[total] 51.2108 53 33.0557 24.7335
Time taken to build model (full training data) : 0.23 seconds
=== Model and evaluation on training set ===
Clustered Instances
0 48 (32%)
1 50 (33%)
2 29 (19%)
3 23 (15%)
Log likelihood: -2.03504
Status
OK
Log
x 0

Conclusion :

In this experiment, we effectively demonstrated the process of data preprocessing and implemented core data mining techniques—Classification, Clustering, and Association—using the WEKA tool. WEKA's user-friendly interface and comprehensive algorithm support enabled us to efficiently load datasets, apply models, and interpret the outcomes through visualizations. This hands-on experience enhanced our understanding of how to categorize data, identify meaningful groupings, and uncover hidden patterns—skills that are fundamental in practical data analysis and informed decision-making.

Github Link: https://github.com/SrishtiPandey15/DWM-Batch-B-Exps