Advanced Artificial Intelligence

Practical task

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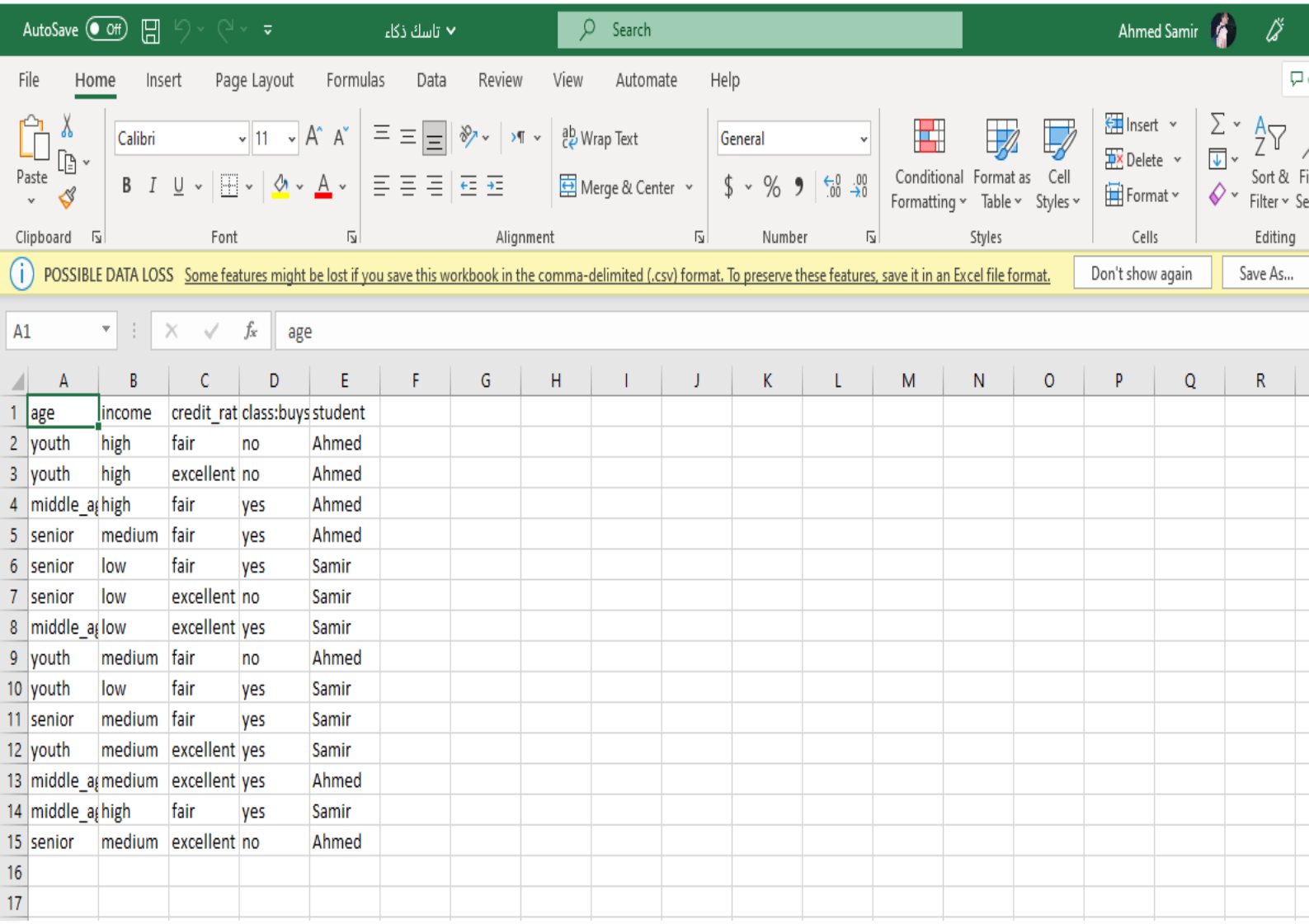
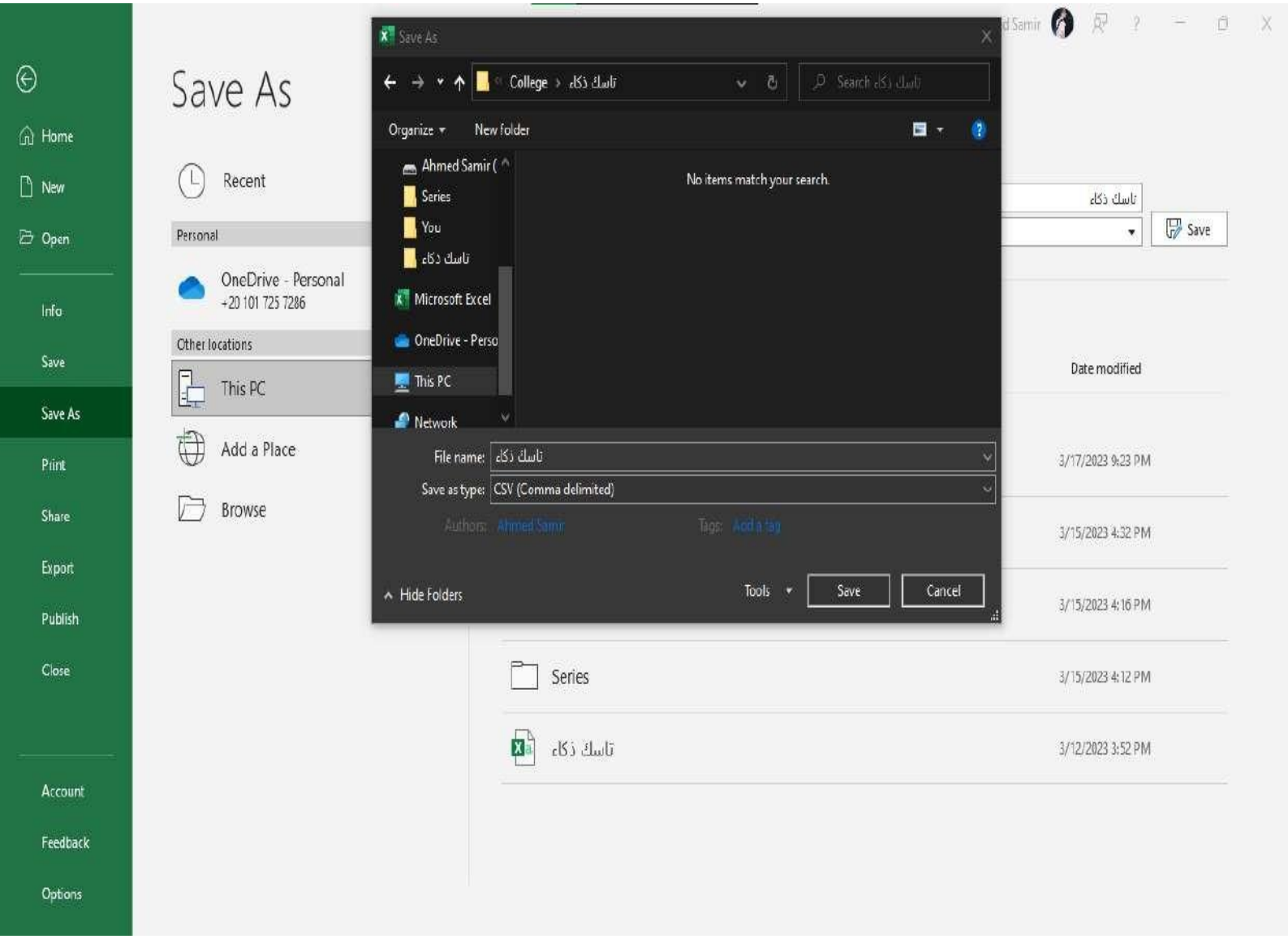
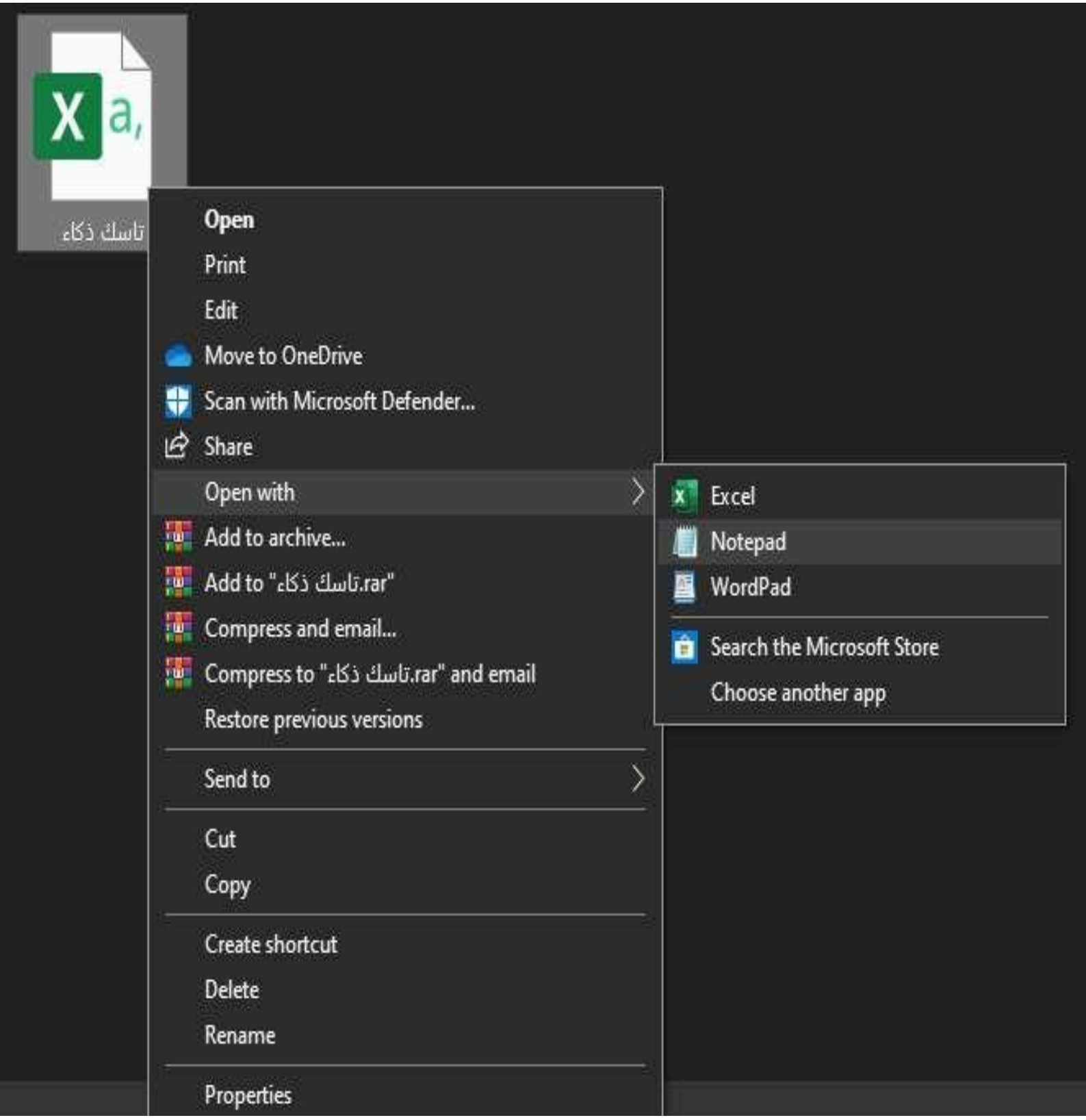
كيميا - حاسب

فرقة رابعة



	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R
1	age	income	credit_rat	class:buys	student													
2	youth	high	fair	no	Ahmed													
3	youth	high	excellent	no	Ahmed													
4	middle_a	high	fair	yes	Ahmed													
5	senior	medium	fair	yes	Ahmed													
6	senior	low	fair	yes	Samir													
7	senior	low	excellent	no	Samir													
8	middle_a	low	excellent	yes	Samir													
9	youth	medium	fair	no	Ahmed													
10	youth	low	fair	yes	Samir													
11	senior	medium	fair	yes	Samir													
12	youth	medium	excellent	yes	Samir													
13	middle_a	medium	excellent	yes	Ahmed													
14	middle_a	high	fair	yes	Samir													
15	senior	medium	excellent	no	Ahmed													
16																		
17																		


Save As
Home
New
Open
Info
Save
Save As
Print
Share
Export
Publish
Close
Account
Feedback
Options
Recent
Personal
OneDrive - Personal
+20 101 725 7286
Other locations
This PC
Add a Place
Browse
Save
Date modified
3/17/2023 9:23 PM
3/15/2023 4:32 PM
3/15/2023 4:16 PM
Series
3/15/2023 4:12 PM
تاسك ذكاء
3/12/2023 3:52 PM
Save As
College › تاسك ذكاء
Search تاسك ذكاء
Organize
New folder
Ahmed Samir (
Series
You
تاسك ذكاء
Microsoft Excel
OneDrive - Perso
This PC
Network
No items match your search.
File name: تاسك ذكاء
Save as type: CSV (Comma delimited)
Authors: Ahmed Samir
Tags: Add a tag
Hide Folders
Tools
Save
Cancel


تاسك ذكاء
Open
Print
Edit
Move to OneDrive
Scan with Microsoft Defender...
Share
Open with
Add to archive...
Add to "تاسك ذكاء.rar"
Compress and email...
Compress to "تاسك ذكاء.rar" and email
Restore previous versions
Send to
Cut
Copy
Create shortcut
Delete
Rename
Properties
Excel
Notepad
WordPad
Search the Microsoft Store
Choose another app

تاسك ذكاء - Notepad

File Edit Format View Help

```
age,income,credit_rating,class:buys_computer,student
youth,high,fair,no,Ahmed
youth,high,excellent,no,Ahmed
middle_aged,high,fair,yes,Ahmed
senior,medium,fair,yes,Ahmed
senior,low,fair,yes,Samir
senior,low,excellent,no,Samir
middle_aged,low,excellent,yes,Samir
youth,medium,fair,no,Ahmed
youth,low,fair,yes,Samir
senior,medium,fair,yes,Samir
youth,medium,excellent,yes,Samir
middle_aged,medium,excellent,yes,Ahmed
middle_aged,high,fair,yes,Samir
senior,medium,excellent,no,Ahmed
```

Ln 1, Col 1 | 100% | Windows (CRLF) | UTF-8

Program Visualization Tools Help

Weka GUI Chooser

Applications

Explorer

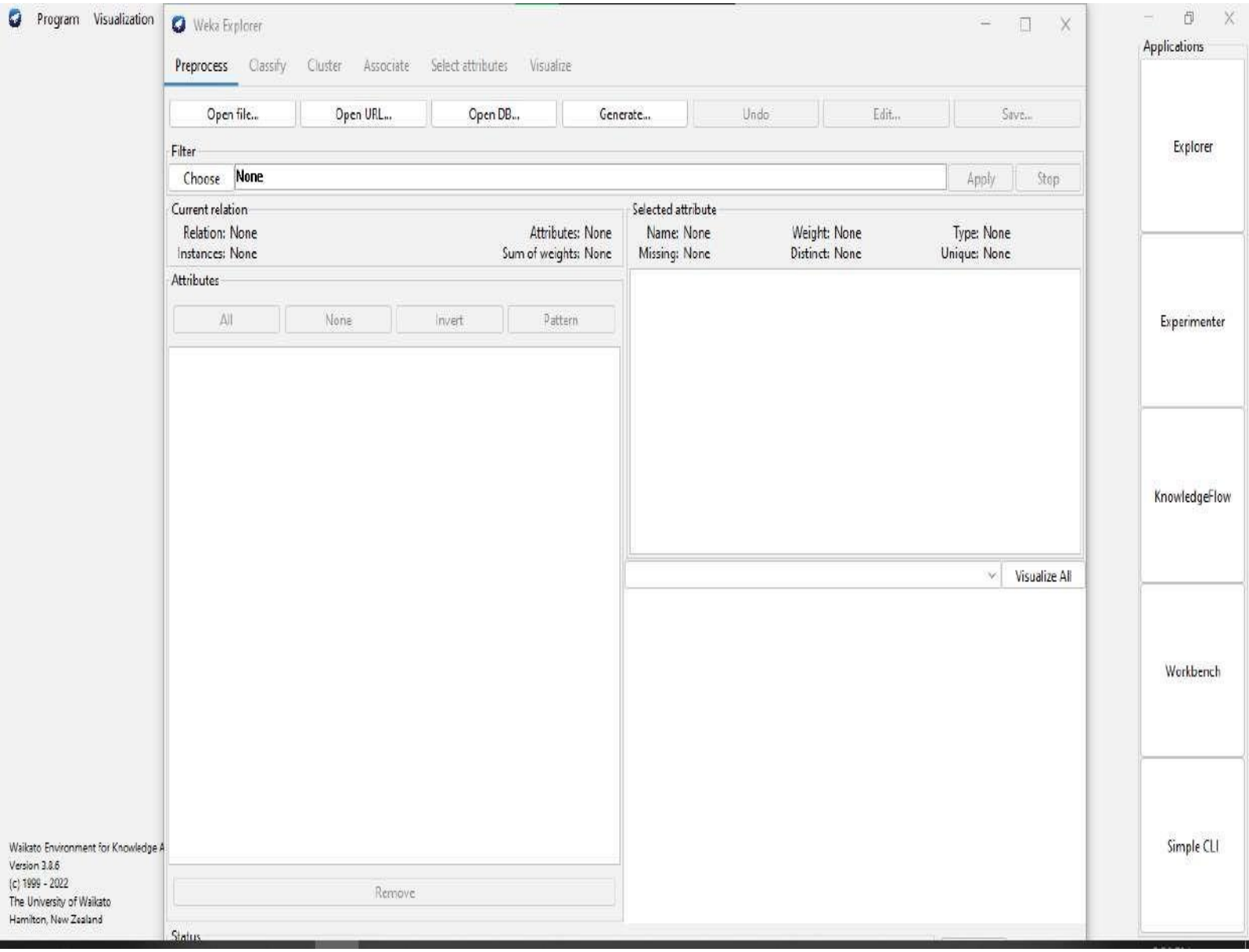
Experimenter

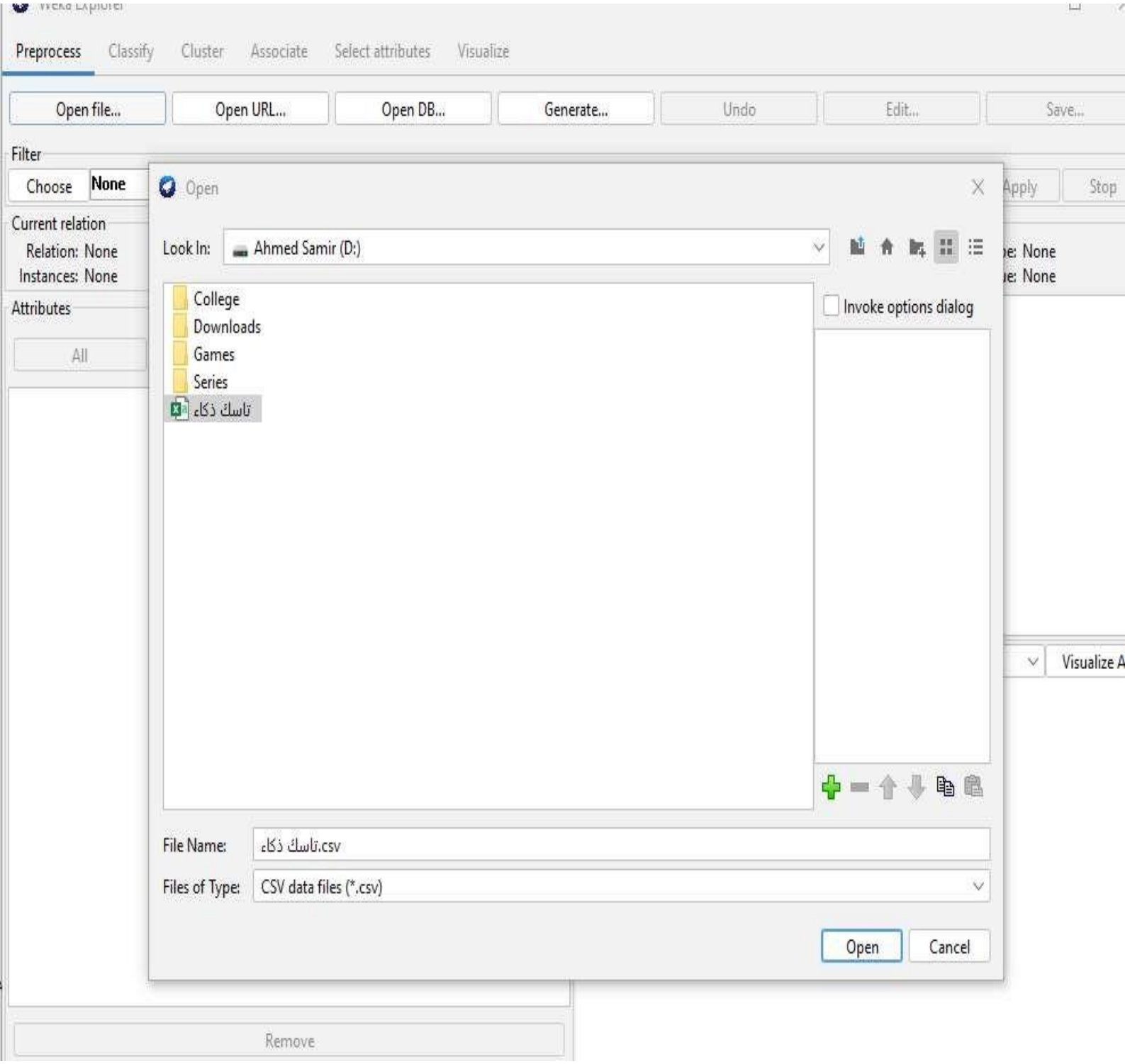
KnowledgeFlow

Workbench

Simple CLI

Waikato Environment for Knowledge Analysis
Version 3.8.6
(c) 1999 - 2022
The University of Waikato
Hamilton, New Zealand


Program
Visualization
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: None
Instances: None
Attributes: None
Sum of weights: None
Selected attribute
Name: None
Missing: None
Weight: None
Distinct: None
Type: None
Unique: None
Attributes
All
None
Invert
Pattern
Visualize All
Remove
Status
Applications
Explorer
Experimenter
KnowledgeFlow
Workbench
Simple CLI
Waikato Environment for Knowledge A
Version 3.8.6
(c) 1999 - 2022
The University of Waikato
Hamilton, New Zealand


Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Generate...
Undo
Edit...
Save...
Filter
Choose
None
Current relation
Relation: None
Instances: None
Attributes
All
Remove
Apply
Stop
Open
Look In:
Ahmed Samir (D:)
College
Downloads
Games
Series
تاسك ذكاء
Invoke options dialog
File Name:
تاسك ذكاء.csv
Files of Type:
CSV data files (*.csv)
Open
Cancel

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: تاسك ذكاء
Instances: 14
Attributes: 5
Sum of weights: 14

Attributes

All | None | Invert | Pattern

No.	Name
1	age
2	income
3	credit_rating
4	class:buys_computer
5	student

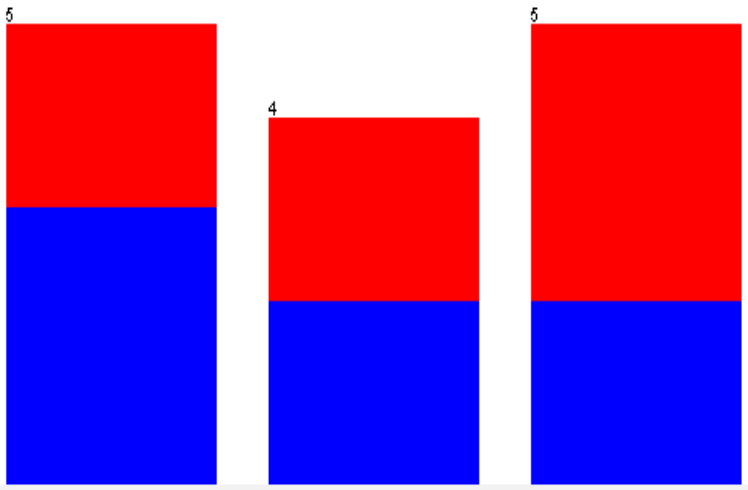
Remove

Selected attribute

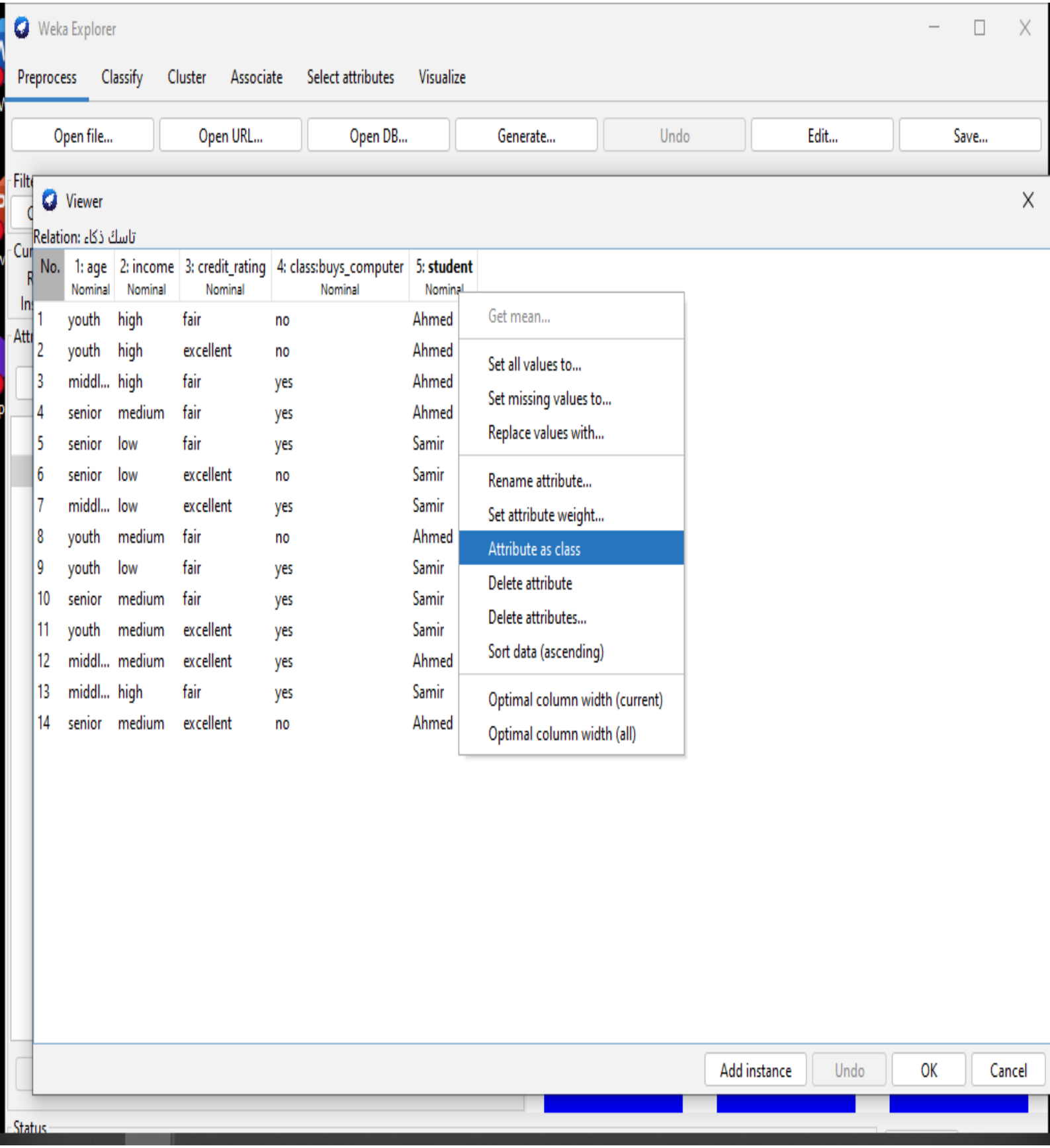
Name: age
Missing: 0 (0%)
Distinct: 3
Type: Nominal
Unique: 0 (0%)

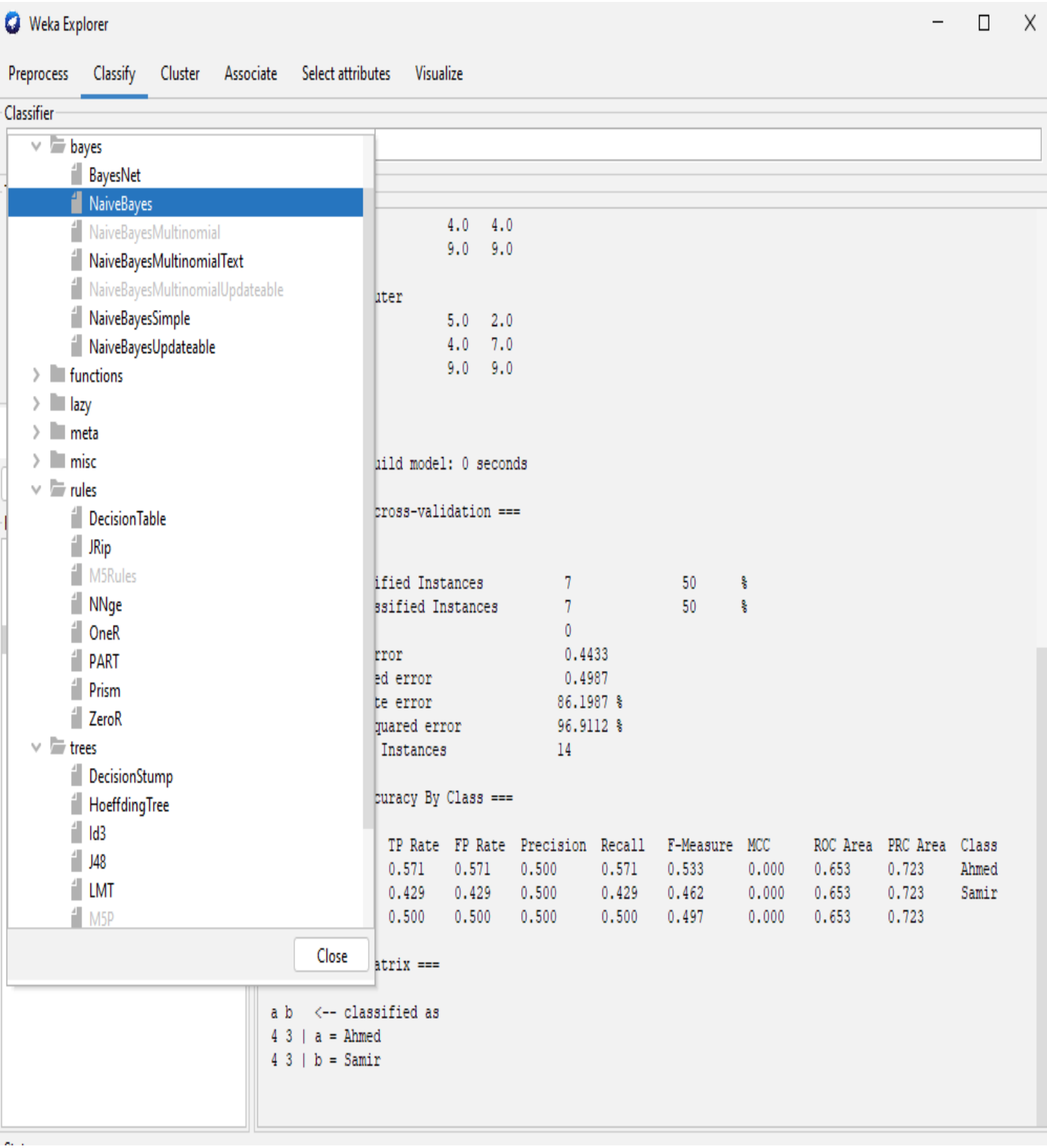
No.	Label	Count	Weight
1	youth	5	5
2	middle_aged	4	4
3	senior	5	5

Class: student (Nom) | Visualize All



Status


Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Open file...
Open URL...
Open DB...
Generate...
Undo
Edit...
Save...
Viewer
Relation: تاسك ذكاء
No.
1: age
Nominal
2: income
Nominal
3: credit_rating
Nominal
4: class:buys_computer
Nominal
5: student
Nominal
1 youth high fair no Ahmed
2 youth high excellent no Ahmed
3 middl... high fair yes Ahmed
4 senior medium fair yes Ahmed
5 senior low fair yes Samir
6 senior low excellent no Samir
7 middl... low excellent yes Samir
8 youth medium fair no Ahmed
9 youth low fair yes Samir
10 senior medium fair yes Samir
11 youth medium excellent yes Samir
12 middl... medium excellent yes Ahmed
13 middl... high fair yes Samir
14 senior medium excellent no Ahmed
Get mean...
Set all values to...
Set missing values to...
Replace values with...
Rename attribute...
Set attribute weight...
Attribute as class
Delete attribute
Delete attributes...
Sort data (ascending)
Optimal column width (current)
Optimal column width (all)
Add instance
Undo
OK
Cancel
Status


Weka Explorer
Preprocess
Classify
Cluster
Associate
Select attributes
Visualize
Classifier
bayes
BayesNet
NaiveBayes
NaiveBayesMultinomial
NaiveBayesMultinomialText
NaiveBayesMultinomialUpdateable
NaiveBayesSimple
NaiveBayesUpdateable
functions
lazy
meta
misc
rules
DecisionTable
JRip
M5Rules
NNge
OneR
PART
Prism
ZeroR
trees
DecisionStump
HoeffdingTree
Id3
J48
LMT
M5P
Close
4.0 4.0
9.0 9.0
uter
5.0 2.0
4.0 7.0
9.0 9.0
uild model: 0 seconds
cross-validation ===
ified Instances 7 50 %
ssified Instances 7 50 %
0
rror 0.4433
ed error 0.4987
te error 86.1987 %
quared error 96.9112 %
Instances 14
curacy By Class ===
TP Rate FP Rate Precision Recall F-Measure MCC ROC Area PRC Area Class
0.571 0.571 0.500 0.571 0.533 0.000 0.653 0.723 Ahmed
0.429 0.429 0.500 0.429 0.462 0.000 0.653 0.723 Samir
0.500 0.500 0.500 0.500 0.497 0.000 0.653 0.723
atrix ===
a b <-- classified as
4 3 | a = Ahmed
4 3 | b = Samir

Weka Explorer

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

Classifier

Choose: Id3

Test options

- Use training set
- Supplied test set — Set...
- Cross-validation — Folds: 10
- Percentage split — %: 66

More options...

(Nom) student

Start | Stop

Result list (right-click for options)

21:30:33 - trees.Id3

Classifier output

```
|   age = middle_aged: Ahmed
|   age = senior: null
income = medium
|   class:buys_computer = no: Ahmed
|   class:buys_computer = yes
|   |   age = youth: Samir
|   |   age = middle_aged: Ahmed
|   |   age = senior: Ahmed
income = low: Samir

Time taken to build model: 0 seconds

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

Correctly Classified Instances           8               57.1429 %
Incorrectly Classified Instances         6               42.8571 %
Kappa statistic                          0.1429
Mean absolute error                      0.4643
Root mean squared error                  0.6409
Relative absolute error                 90.2778 %
Root relative squared error            124.5495 %
Total Number of Instances               14

=== Detailed Accuracy By Class ===

               TP Rate   FP Rate   Precision   Recall  F-Measure  MCC      ROC Area  PRC Area  Class
               0.571     0.429     0.571       0.571   0.571      0.143    0.551     0.520     Ahmed
               0.571     0.429     0.571       0.571   0.571      0.143    0.551     0.541     Samir
Weighted Avg.  0.571     0.429     0.571       0.571   0.571      0.143    0.551     0.531

=== Confusion Matrix ===

 a b   <-- classified as
 4 3 | a = Ahmed
 3 4 | b = Samir
```

Status

Weka 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) student

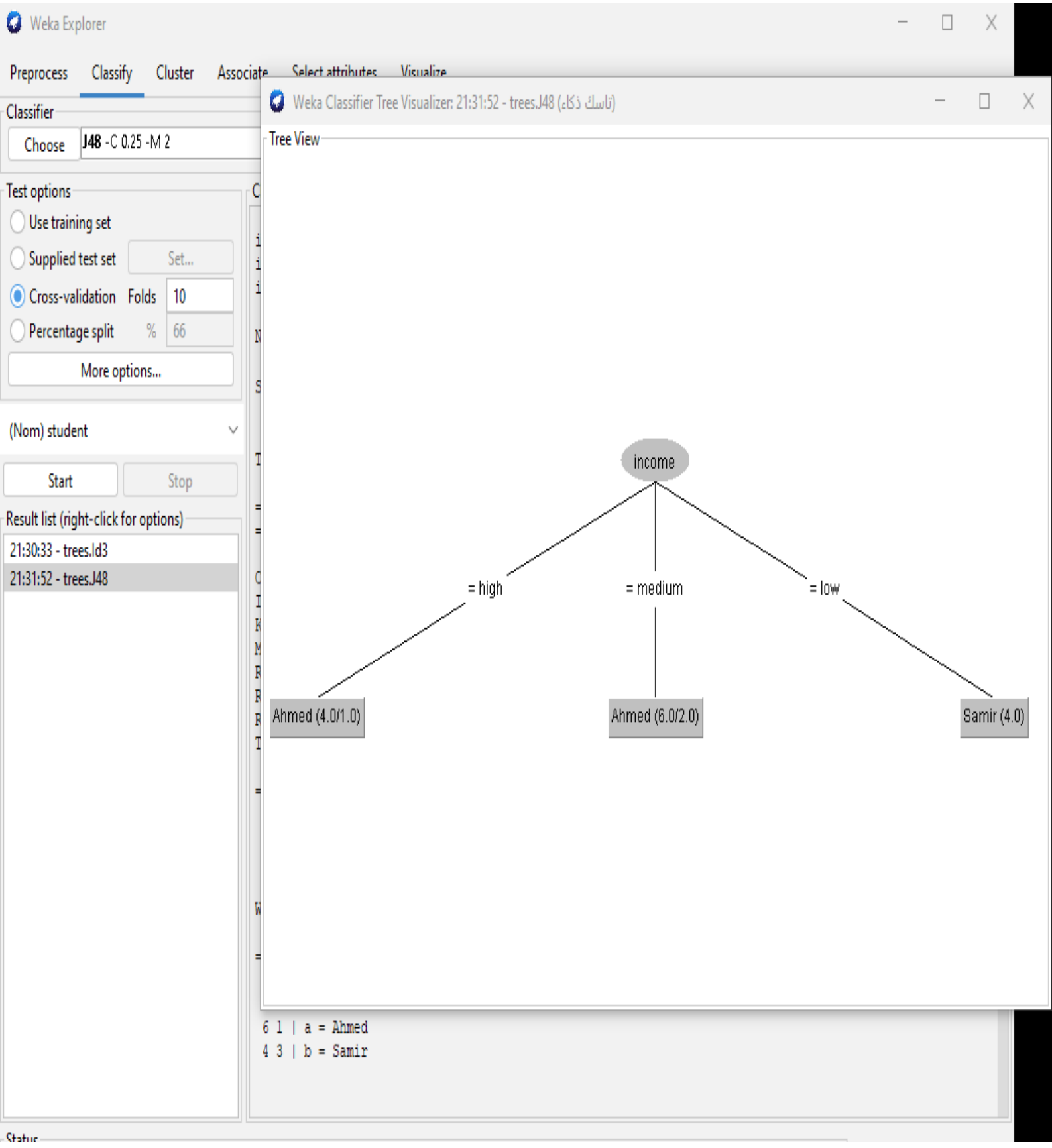
Start | Stop

Result list (right-click for options)

- 21:30:33 - trees.Id3
- 21:31:52 - trees.J48

Classifier output

```
income = high: Ahmed (4.0/1.0)
income = medium: Ahmed (6.0/2.0)
income = low: Samir (4.0)

Number of Leaves  : 3

Size of the tree :  4


Time taken to build model: 0.01 seconds

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

Correctly Classified Instances           9               64.2857 %
Incorrectly Classified Instances         5               35.7143 %
Kappa statistic                          0.2857
Mean absolute error                      0.406
Root mean squared error                  0.5515
Relative absolute error                 78.9352 %
Root relative squared error            107.187  %
Total Number of Instances               14

=== Detailed Accuracy By Class ===

               TP Rate  FP Rate  Precision  Recall   F-Measure  MCC      ROC Area  PRC Area  Class
               0.857    0.571    0.600      0.857    0.706      0.316    0.561     0.538     Ahmed
               0.429    0.143    0.750      0.429    0.545      0.316    0.561     0.706     Samir
Weighted Avg.  0.643    0.357    0.675      0.643    0.626      0.316    0.561     0.622

=== Confusion Matrix ===

 a b   <-- classified as
 6 1 | a = Ahmed
 4 3 | b = Samir
```


Weka 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) student
Start
Stop
Result list (right-click for options)
21:30:33 - trees.Id3
21:31:52 - trees.J48
Weka Classifier Tree Visualizer: 21:31:52 - trees.J48 (ناسك ذكاء)
Tree View
income
= high
= medium
= low
Ahmed (4.0/1.0)
Ahmed (6.0/2.0)
Samir (4.0)
6 1 | a = Ahmed
4 3 | b = Samir
Status

Weka Explorer

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

Classifier

Choose **NNge** -G 5 -I 5

Test options

- Use training set
- Supplied test set — Set...
- Cross-validation — Folds 10
- Percentage split — % 66

More options...

(Nom) student

Start | Stop

Result list (right-click for options)

- 21:30:33 - trees.Id3
- 21:31:52 - trees.J48
- 21:32:55 - rules.NNge

Classifier output

```
          class Ahmed : 3 exemplar(s) including 2 Hyperrectangle(s) and 1 Single(s).
          class Samir : 3 exemplar(s) including 2 Hyperrectangle(s) and 1 Single(s).

          Total : 6 exemplars(s) including 4 Hyperrectangle(s) and 2 Single(s).

          Feature weights : [0.020749575389522337 0.3746508927026093 0.0 0.15183550136234153]



Time taken to build model: 0 seconds

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

Correctly Classified Instances           9               64.2857 %
Incorrectly Classified Instances         5               35.7143 %
Kappa statistic                          0.2857
Mean absolute error                      0.3571
Root mean squared error                  0.5976
Relative absolute error                 69.4444 %
Root relative squared error            116.1431 %
Total Number of Instances               14

=== Detailed Accuracy By Class ===

               TP Rate   FP Rate   Precision   Recall  F-Measure  MCC      ROC Area  PRC Area  Class
               0.714     0.429     0.625      0.714     0.667      0.289     0.643     0.589     Ahmed
               0.571     0.286     0.667      0.571     0.615      0.289     0.643     0.595     Samir
Weighted Avg.  0.643     0.357     0.646      0.643     0.641      0.289     0.643     0.592

=== Confusion Matrix ===

 a b   <-- classified as
 5 2 | a = Ahmed
 3 4 | b = Samir
```

Status

Weka 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) student

Start | Stop

Result list (right-click for options)

- 21:30:33 - trees.Id3
- 21:31:52 - trees.J48
- 21:32:55 - rules.NNge
- 21:33:27 - bayes.NaiveBayes

Classifier output

```
  excellent              4.0   4.0
  [total]                9.0   9.0

class:buys_computer
  no                     5.0   2.0
  yes                    4.0   7.0
  [total]                9.0   9.0



Time taken to build model: 0 seconds

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

Correctly Classified Instances           7               50      %
Incorrectly Classified Instances         7               50      %
Kappa statistic                          0
Mean absolute error                      0.4433
Root mean squared error                  0.4987
Relative absolute error                 86.1987 %
Root relative squared error             96.9112 %
Total Number of Instances               14

=== Detailed Accuracy By Class ===

               TP Rate  FP Rate  Precision  Recall   F-Measure  MCC      ROC Area  PRC Area  Class
               0.571    0.571    0.500      0.571    0.533      0.000    0.653     0.723     Ahmed
               0.429    0.429    0.500      0.429    0.462      0.000    0.653     0.723     Samir
Weighted Avg.  0.500    0.500    0.500      0.500    0.497      0.000    0.653     0.723

=== Confusion Matrix ===

 a b   <-- classified as
 4 3 | a = Ahmed
 4 3 | b = Samir
```

Status

Weka Explorer

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

Classifier

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

Test options

- Use training set
- Supplied test set — Set...
- Cross-validation — Folds 10
- Percentage split — % 66

More options...

(Nom) student

Start | Stop

Result list (right-click for options)

15:10:40 - functions.MultilayerPerceptron

Classifier output

```
=== Run information ===

Scheme:       weka.classifiers.functions.MultilayerPerceptron -L 0.3 -M 0.2 -N 500 -V 0 -S 0 -E 20 -H a
Relation:     تاسلك ذكاء
Instances:    14
Attributes:   5
              age
              income
              credit_rating
              class:buys_computer
              student
Test mode:    10-fold cross-validation

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

Sigmoid Node 0
    Inputs    Weights
    Threshold    -0.01447249918827967
    Node 2    -0.8985053915967395
    Node 3    -3.7842478640963244
    Node 4    0.8276793898519504
    Node 5    1.2163894191222
    Node 6    3.0379011327875327
Sigmoid Node 1
    Inputs    Weights
    Threshold    0.016353732862376742
    Node 2    0.9025214793111487
    Node 3    3.7850804265075957
    Node 4    -0.8376012524231514
    Node 5    -1.2683191995228564
    Node 6    -2.9954722000083938
Sigmoid Node 2
    Inputs    Weights
    Threshold    -0.3145811745742426
    Attrib age=youth    0.827387015453985
    Attrib age=middle_aged    -0.4246564119662868
    Attrib age=senior    -0.22720643622384998
    Attrib income=high    -0.2817734130833501
```

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

Classifier

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

Test options

- Use training set
- Supplied test set — Set...
- Cross-validation — Folds 10
- Percentage split — % 66

More options...

(Nom) student

Start | Stop

Result list (right-click for options)

15:10:40 - functions.MultilayerPerceptron

Classifier output

```
    Attrib income=high    -1.2049724784639113
    Attrib income=medium    -0.9631625728412564
    Attrib income=low    2.9820547373179283
    Attrib credit_rating=excellent    1.3442452893377057
    Attrib class:buys_computer=yes    1.7660640672262748
Sigmoid Node 4
    Inputs    Weights
    Threshold    -0.6035919802092106
    Attrib age=youth    0.34926713647750934
    Attrib age=middle_aged    0.4732398919830516
    Attrib age=senior    -0.22128125840308002
    Attrib income=high    0.24097970800005472
    Attrib income=medium    0.7025698409749667
    Attrib income=low    -0.33684600992836755
    Attrib credit_rating=excellent    0.4693554209256771
    Attrib class:buys_computer=yes    -1.6171818501167898
Sigmoid Node 5
    Inputs    Weights
    Threshold    -0.6738197080436916
    Attrib age=youth    0.3084000156307304
    Attrib age=middle_aged    0.6799693338783674
    Attrib age=senior    -0.2931183989140097
    Attrib income=high    0.27510709211981926
    Attrib income=medium    0.961162567694585
    Attrib income=low    -0.5362099325347465
    Attrib credit_rating=excellent    0.6275034374886433
    Attrib class:buys_computer=yes    -2.0061812279886544
Sigmoid Node 6
    Inputs    Weights
    Threshold    -0.8473954677381286
    Attrib age=youth    0.10526548487062004
    Attrib age=middle_aged    1.430876755703548
    Attrib age=senior    -0.5930768888977214
    Attrib income=high    0.33790741405882097
    Attrib income=medium    1.7549877837018844
    Attrib income=low    -1.282466708506646
    Attrib credit_rating=excellent    0.9313770119816303
    Attrib class:buys_computer=yes    -3.516042683347936
```

Weka Explorer

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

Classifier

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

Test options

- Use training set
- Supplied test set — Set...
- Cross-validation — Folds 10
- Percentage split — % 66

More options...

(Nom) student

Start | Stop

Result list (right-click for options)

15:10:40 - functions.MultilayerPerceptron

Classifier output

```
    Attrib credit_rating=excellent    0.9313770119816303
    Attrib class:buys_computer=yes    -3.516042683347936
Class Ahmed
    Input
    Node 0
Class Samir
    Input
    Node 1


Time taken to build model: 0.06 seconds

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

Correctly Classified Instances           8               57.1429 %
Incorrectly Classified Instances         6               42.8571 %
Kappa statistic                          0.1429
Mean absolute error                      0.4227
Root mean squared error                  0.6091
Relative absolute error                 82.1838 %
Root relative squared error            118.3668 %
Total Number of Instances               14

=== Detailed Accuracy By Class ===

               TP Rate  FP Rate  Precision  Recall   F-Measure  MCC      ROC Area  PRC Area  Class
               0.714    0.571    0.556      0.714    0.625      0.149    0.592     0.602     Ahmed
               0.429    0.286    0.600      0.429    0.500      0.149    0.592     0.606     Samir
Weighted Avg.  0.571    0.429    0.578      0.571    0.563      0.149    0.592     0.604

=== Confusion Matrix ===

 a b   <-- classified as
 5 2 | a = Ahmed
 4 3 | b = Samir
```

Weka Explorer

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

Classifier

Choose **SMO** -C 1.0 -L 0.001 -P 1.0E-12 -N 0 -V -1 -W 1 -K "weka.classifiers.functions.supportVector.PolyKernel -E 1.0 -C 250007" -calibrator "weka.classifiers.functions.Logistic -R 1.0E

Test options

- Use training set
- Supplied test set — Set...
- Cross-validation — Folds 10
- Percentage split — % 66

More options...

(Nom) student

Start | Stop

Result list (right-click for options)

20:13:58 - functions.SMO

Classifier output

```
=== Run information ===

Scheme:       weka.classifiers.functions.SMO -C 1.0 -L 0.001 -P 1.0E-12 -N 0 -V -1 -W 1 -K "weka.classifi
Relation:     تماسك ذكاء
Instances:    14
Attributes:   5
              age
              income
              credit_rating
              class:buys_computer
              student
Test mode:    10-fold cross-validation

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

SMO

Kernel used:
  Linear Kernel: K(x,y) = <x,y>

Classifier for classes: Ahmed, Samir

BinarySMO

Machine linear: showing attribute weights, not support vectors.

        0.2001 * (normalized) age=youth
 +     -0.3997 * (normalized) age=middle_aged
 +      0.1996 * (normalized) age=senior
 +     -0.667  * (normalized) income=high
 +     -0.6665 * (normalized) income=medium
 +      1.3335 * (normalized) income=low
 +      0.0007 * (normalized) credit_rating=excellent
 +      0.6003 * (normalized) class:buys_computer=yes
 -      0.534

Number of kernel evaluations: 70 (87.544% cached)
```

Weka Explorer

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

Classifier

Choose: SMO -C 1.0 -L 0.001 -P 1.0E-12 -N 0 -V -1 -W 1 -K "weka.classifiers.functions.supportVector.PolyKernel -E 1.0 -C 250007" -calibrator "weka.classifiers.functions.Logistic -R 1.0E

Test options

- Use training set
- Supplied test set — Set...
- Cross-validation — Folds: 10
- Percentage split — %: 66

More options...

(Nom) student

Start | Stop

Result list (right-click for options)

20:13:58 - functions.SMO

Classifier output

```
 +       -0.6005 * (normalized) income=medium
 +       1.3335 * (normalized) income=low
 +       0.0007 * (normalized) credit_rating=excellent
 +       0.6003 * (normalized) class:buys_computer=yes
 -       0.534

Number of kernel evaluations: 70 (87.544% cached)



Time taken to build model: 0.01 seconds

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

Correctly Classified Instances           9               64.2857 %
Incorrectly Classified Instances         5               35.7143 %
Kappa statistic                          0.2857
Mean absolute error                      0.3571
Root mean squared error                  0.5976
Relative absolute error                 69.4444 %
Root relative squared error            116.1431 %
Total Number of Instances               14

=== Detailed Accuracy By Class ===

               TP Rate   FP Rate   Precision   Recall  F-Measure  MCC      ROC Area  PRC Area  Class
               0.714     0.429     0.625      0.714     0.667     0.289     0.643     0.589     Ahmed
               0.571     0.286     0.667      0.571     0.615     0.289     0.643     0.595     Samir
Weighted Avg.  0.643     0.357     0.646      0.643     0.641     0.289     0.643     0.592

=== Confusion Matrix ===

 a b   <-- classified as
 5 2 | a = Ahmed
 3 4 | b = Samir
```