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USN:- 1SI24AD401

DATA MINING AND VISUALIZATION LABORATORY-4

4. Set up SQL database and insert sample data consisting of customer data. Integrate SQL database with Weka.

a). Perform data preprocessing, classification, clustering tasks on customer data.

b). Apply filters and interpret the results

c). Connect WEKA to a relational database using JDBC.

d). Retrieve customer data directly using SQL queries.

e). Load data into WEKA's Explorer interface.

f). Apply classification algorithms (e.g., J48, Naive Bayes) to predict customer spending behavior.

g). Use clustering (e.g., k-means) for market segmentation.

h). Generate evaluation metrics (accuracy, precision, recall)

i). Optionally automate data refresh using scripts or the WEKA KnowledgeFlow interface. Validate and analyse the result.

Additional: Derive Fact Table, Star schema, Snowflake schema and do the comparison

Step-1:- Download and Install Java 8 binaries from Eclipse Adoptium:

https://adoptium.net/temurin/releases/?version=8&utm_source

open CMD :-

- Java – version

Step 2:- Download MYSQL:

https://dev.mysql.com/downloads/file/?id=546163

Substeps

↳ Open MySQL Workbench

↳ Create database customerdb;

↳ Create table customers;

↳ Insert records to customers table.

Step 3:- Download MYSQL jar file (if don't have jar file):-

https://dev.mysql.com/downloads/connector/j/

Extract Folder

↳ Copy MySQL "jar" file

↳ Paste into inside WEKA folder

Step 4:-

File Explorer

↳ This PC

↳ Local Disk (C:) or (D:)

↳ Program Files

↳ weka-3-8-6

Open

↳ weka.java in "WinRAR"

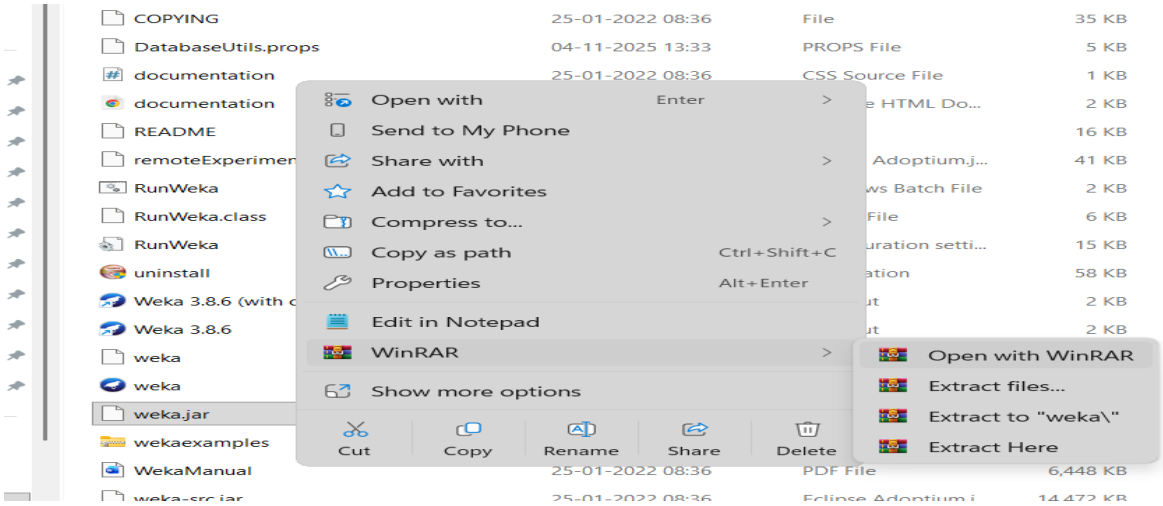
↳ weka

↳ experiments

↳ DatabaseUtils.props.mysql

↳ Copy file

↳ Paste file to weka-3-8-6 "folder"


COPYING 25-01-2022 08:36 File 35 KB
DatabaseUtils.props 04-11-2025 13:33 PROPS File 5 KB
documentation 25-01-2022 08:36 CSS Source File 1 KB
documentation 2 KB
README 16 KB
remoteExperimen 41 KB
RunWeka 2 KB
RunWeka.class 6 KB
RunWeka 15 KB
uninstall 58 KB
Weka 3.8.6 (with 2 KB
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weka
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weka.jar
wekaexamples
WekaManual 25-01-2022 08:36 PDF File 6,448 KB
Open with Enter
Send to My Phone
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Add to Favorites
Compress to...
Copy as path Ctrl+Shift+C
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Edit in Notepad
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Show more options
Cut
Copy
Rename
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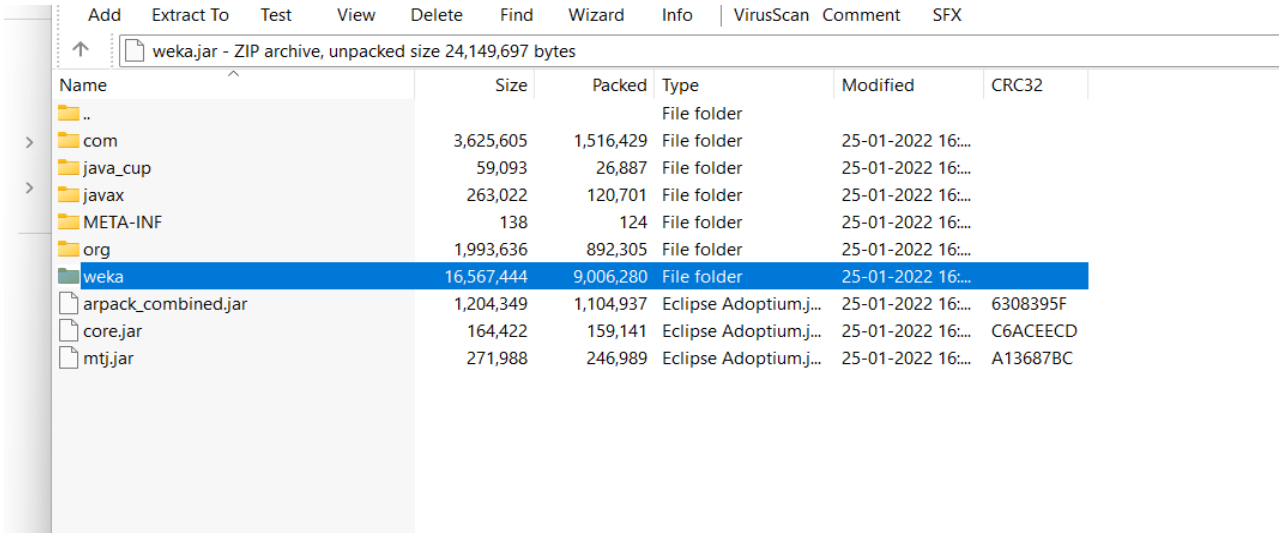
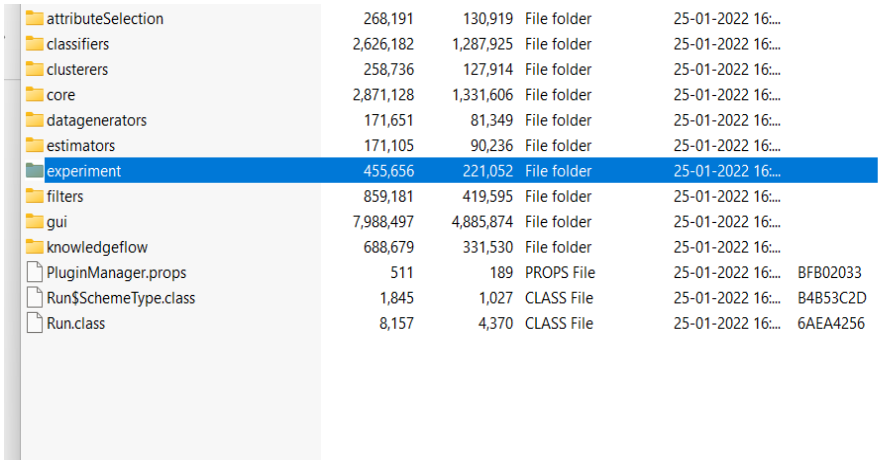
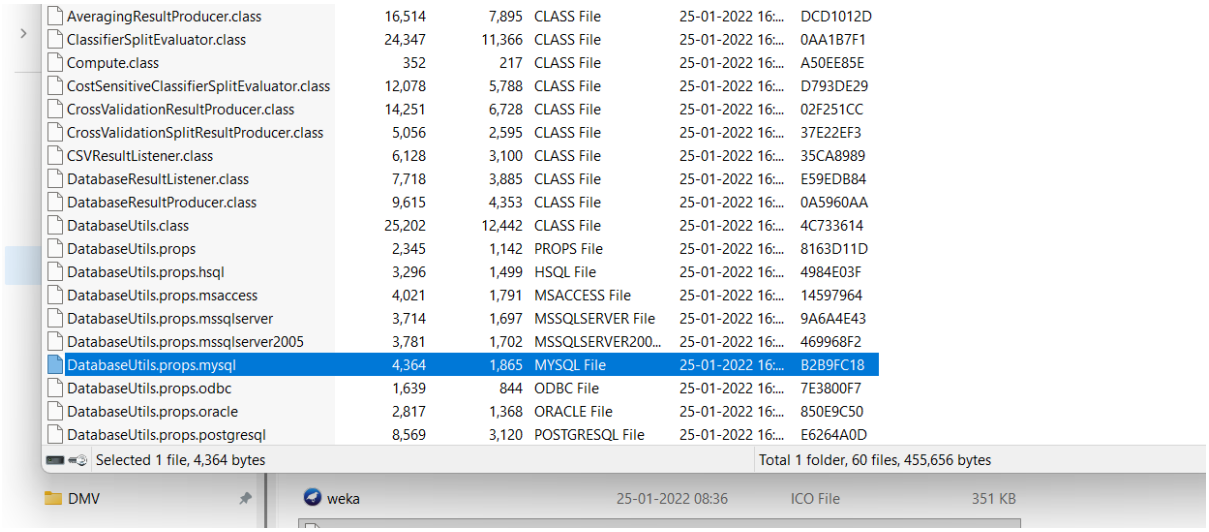
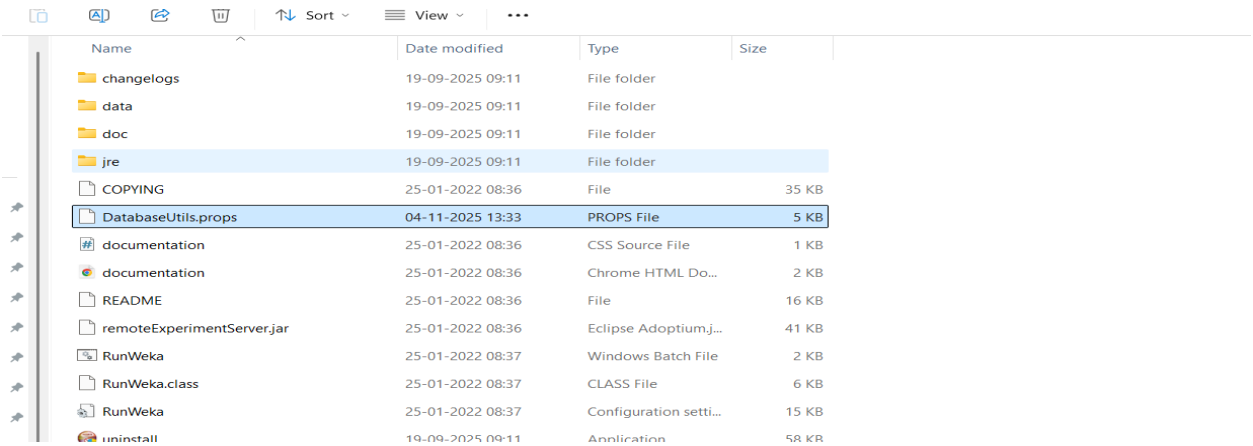
Delete
Open with WinRAR
Extract files...
Extract to "weka\"
Extract Here


Add Extract To Test View Delete Find Wizard Info VirusScan Comment SFX
weka.jar - ZIP archive, unpacked size 24,149,697 bytes
Name Size Packed Type Modified CRC32
.. File folder
com 3,625,605 1,516,429 File folder 25-01-2022 16:...
java_cup 59,093 26,887 File folder 25-01-2022 16:...
javax 263,022 120,701 File folder 25-01-2022 16:...
META-INF 138 124 File folder 25-01-2022 16:...
org 1,993,636 892,305 File folder 25-01-2022 16:...
weka 16,567,444 9,006,280 File folder 25-01-2022 16:...
arpack_combined.jar 1,204,349 1,104,937 Eclipse Adoptium.j... 25-01-2022 16:... 6308395F
core.jar 164,422 159,141 Eclipse Adoptium.j... 25-01-2022 16:... C6ACEECD
mtj.jar 271,988 246,989 Eclipse Adoptium.j... 25-01-2022 16:... A13687BC


attributeSelection 268,191 130,919 File folder 25-01-2022 16:...
classifiers 2,626,182 1,287,925 File folder 25-01-2022 16:...
clusterers 258,736 127,914 File folder 25-01-2022 16:...
core 2,871,128 1,331,606 File folder 25-01-2022 16:...
datagenerators 171,651 81,349 File folder 25-01-2022 16:...
estimators 171,105 90,236 File folder 25-01-2022 16:...
experiment 455,656 221,052 File folder 25-01-2022 16:...
filters 859,181 419,595 File folder 25-01-2022 16:...
gui 7,988,497 4,885,874 File folder 25-01-2022 16:...
knowledgeflow 688,679 331,530 File folder 25-01-2022 16:...
PluginManager.props 511 189 PROPS File 25-01-2022 16:... BFB02033
Run$SchemeType.class 1,845 1,027 CLASS File 25-01-2022 16:... B4B53C2D
Run.class 8,157 4,370 CLASS File 25-01-2022 16:... 6AEA4256





Rename the file –

Remove "mysql" from the end of the file name.

Example:

- Original: DatabaseUtils.props.mysql
- New name: DatabaseUtils.props

  Then **save** the file.

Open the DatabaseUtils.props file –

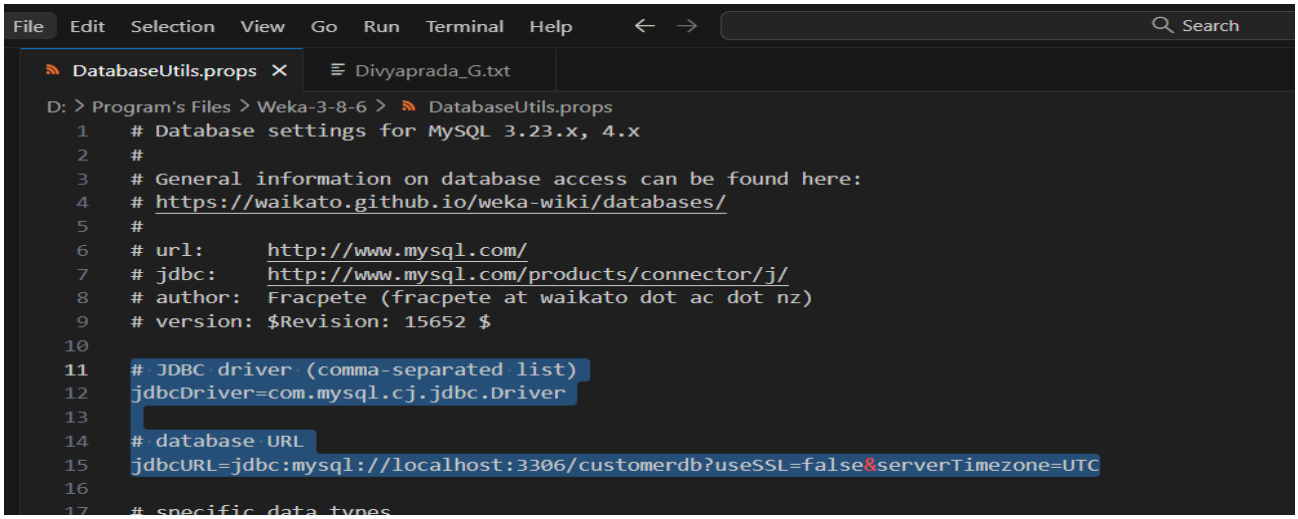
Edit the following entries:

- **Database URL:** Set your MySQL connection string.

  Example:- jdbcURL=jdbc:mysql://localhost:3306/your_database_name

- **Database Driver:** Set your MySQL JDBC driver.

  Example: jdbcDriver=com.mysql.cj.jdbc.Driver



- Remove tags in front of the data type lines, then save the file.

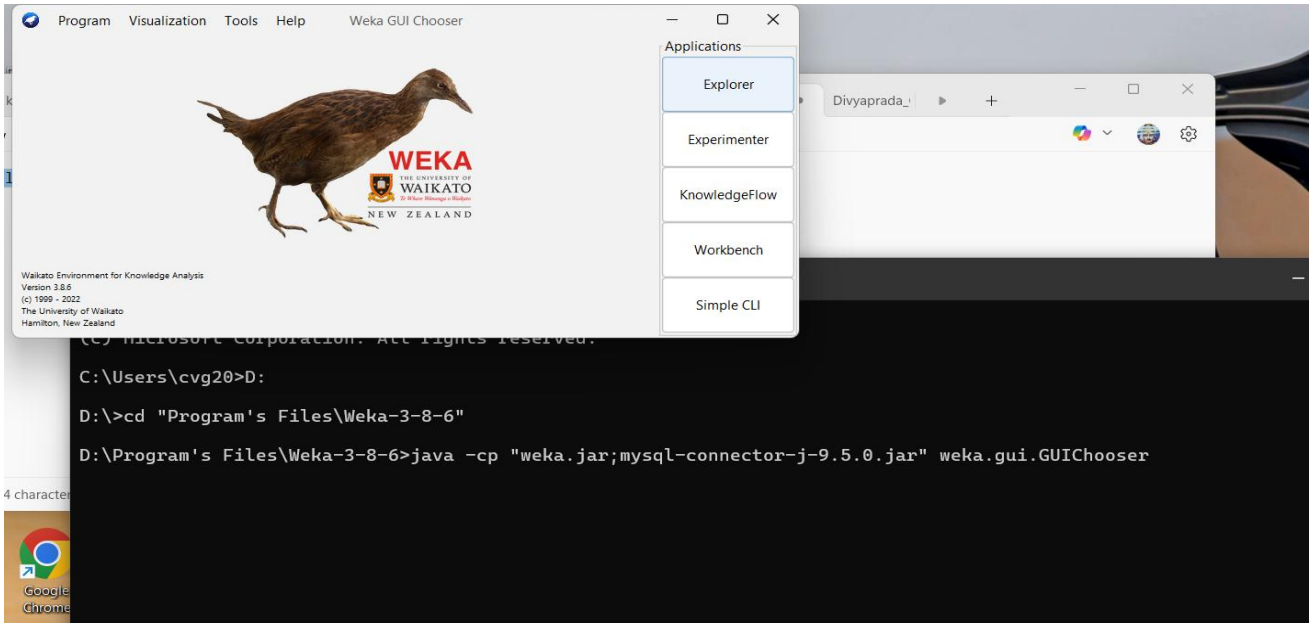
```
# database URL
jdbcURL=jdbc:mysql://localhost:3306/customerdb?useSSL=false&serverTimezone=UTC

# specific data types
STRING, getString() = 0;        --> nominal
BOOLEAN, getBoolean() = 1;      --> nominal
DOUBLE, getDouble() = 2;        --> numeric
BYTE, getByte() = 3;            --> numeric
SHORT, getShort() = 4;          --> numeric
INT, getInt() = 5;              --> numeric
INTEGER, getInt() = 5;          --> numeric
BIGINT, getLong() = 6;          --> numeric
FLOAT, getFloat() = 7;          --> numeric
DECIMAL, getDouble() = 2;       --> numeric
NUMERIC, getDouble() = 2;       --> numeric
DATE, getDate() = 8;            --> date
TEXT, getString() = 9;          --> string
TIME, getTime() = 10;           --> date
TIMESTAMP, getTimestamp() = 11;   --> date

# other options
```

c). Connect WEKA to a relational database using JDBC.

Step 5:- Run Weka in CMD.

> D: cd "Program's Files\Weka-3-8-6"

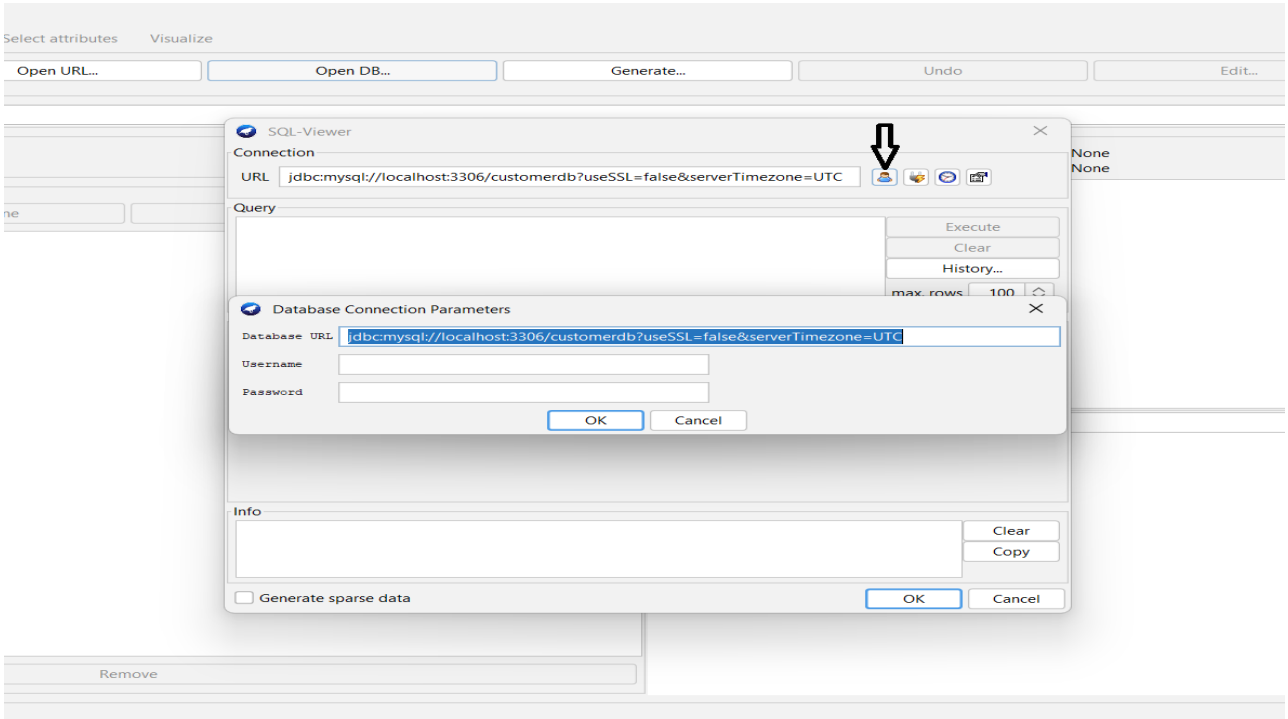
java -cp "weka.jar;mysql-connector-j-9.5.0.jar" weka.gui.GUIChooser



Explorer

↳ Preprocess

↳ Open DB



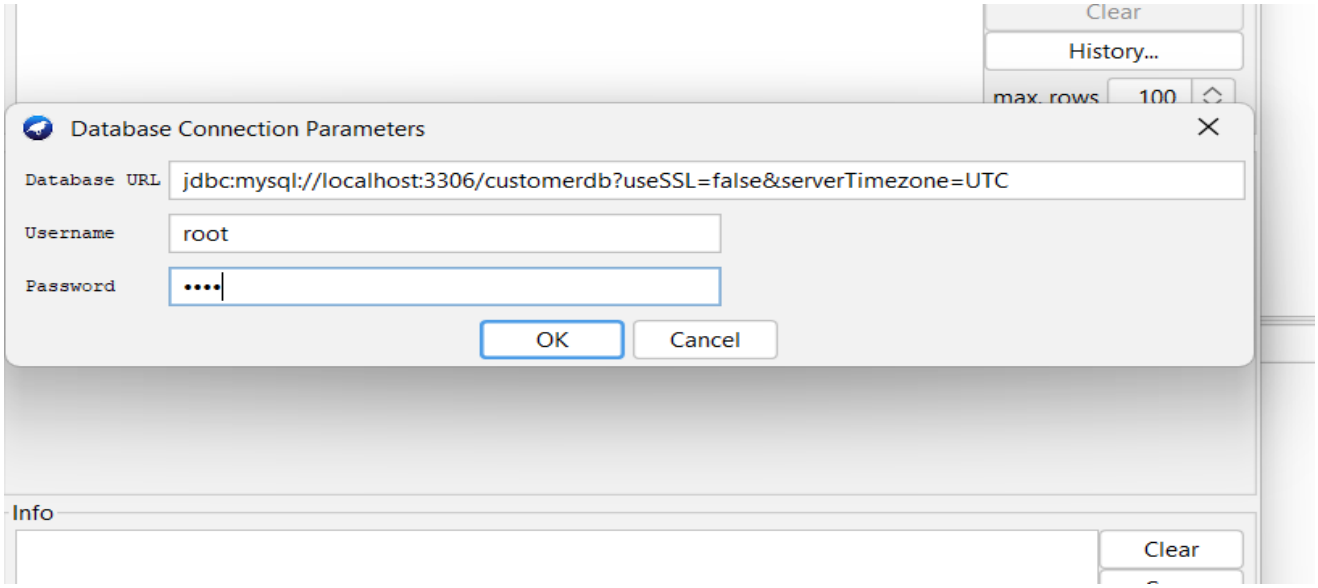
Enter the JDBC URL in props file

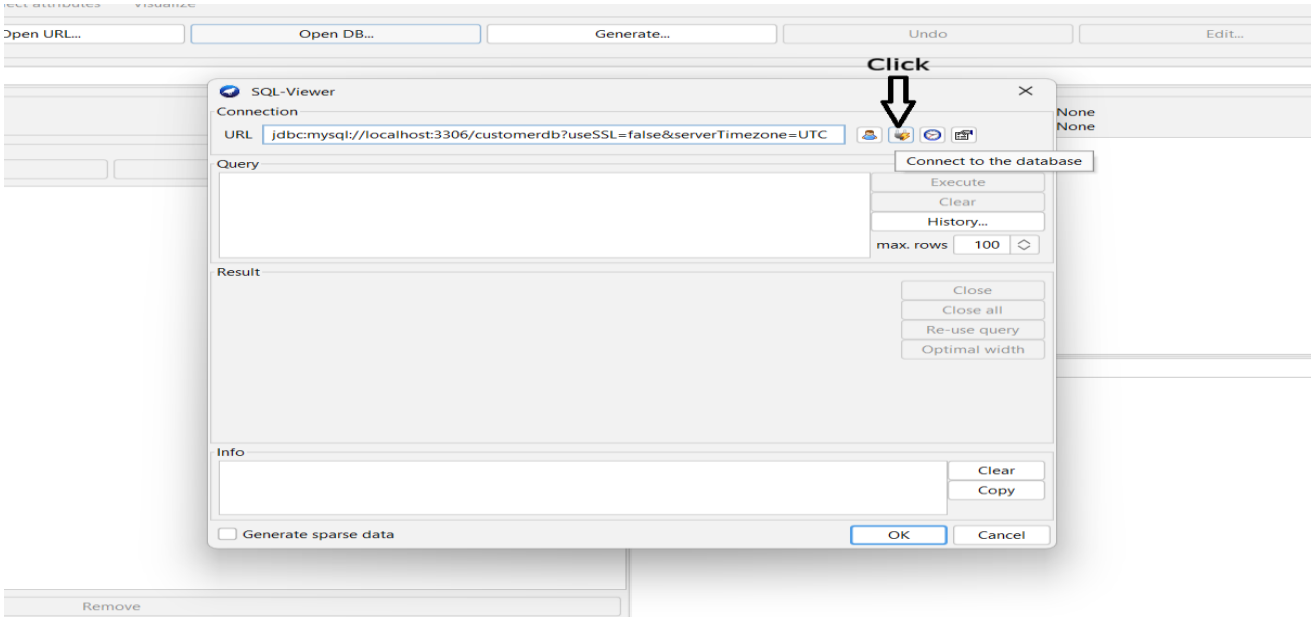
↳ **Type Username**

↳ **Type Password**

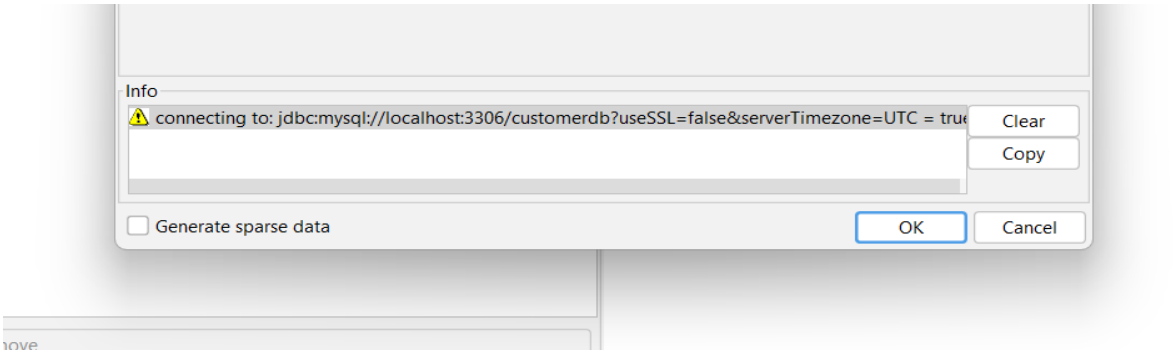
↳ **Click OK**

```
# JDBC driver (comma-separated list)
jdbcDriver=com.mysql.cj.jdbc.Driver

# database URL
jdbcURL=jdbc:mysql://localhost:3306/customerdb?useSSL=false&serverTimezone=UTC

# specific data types
STRING, getString() = 0;       --> nominal
```





- **Check Server Connection.**



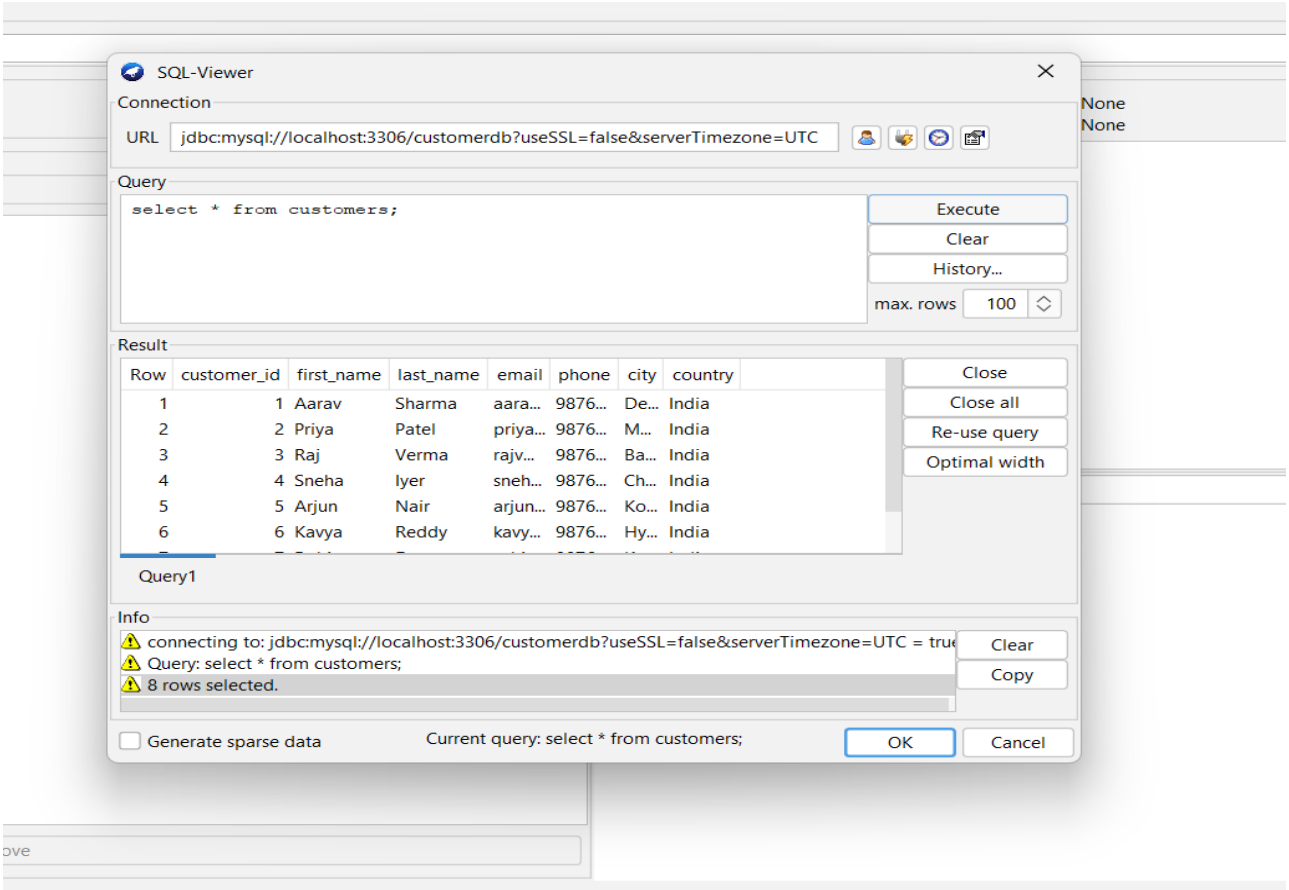
d). Retrieve customer data directly using SQL queries.

Write the SQL Query

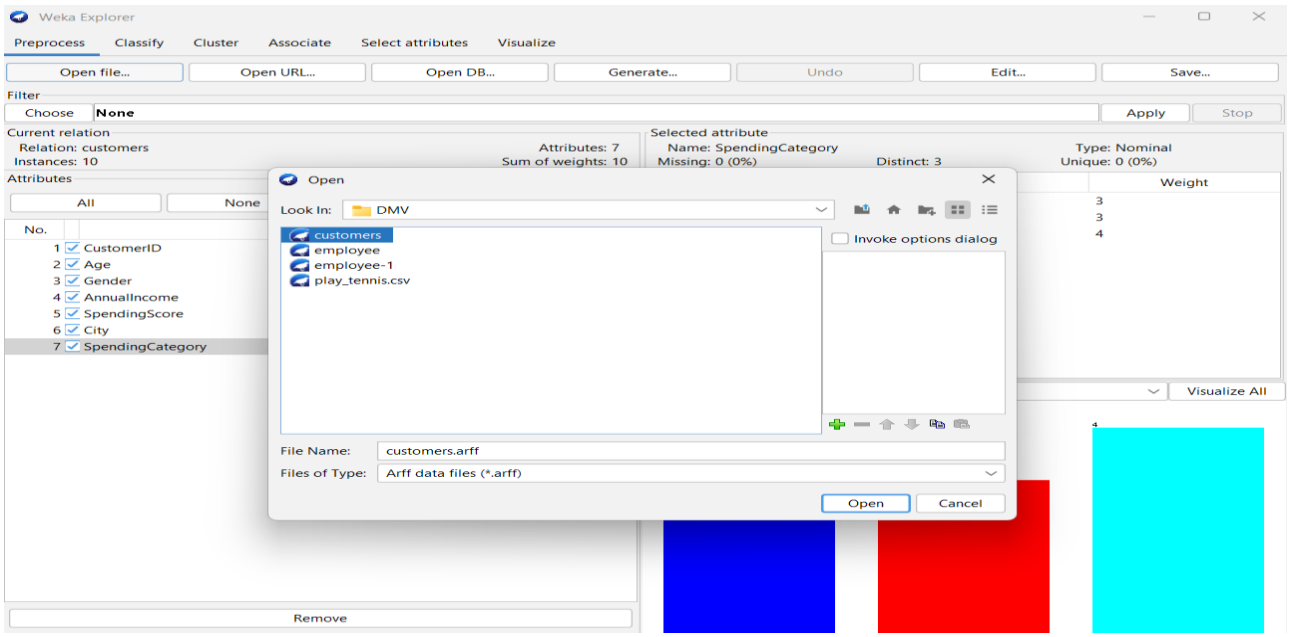
↳ Select * from <table_name>;

↳ Click Execute

↳ Click OK



e). Load data into WEKA's Explorer interface.

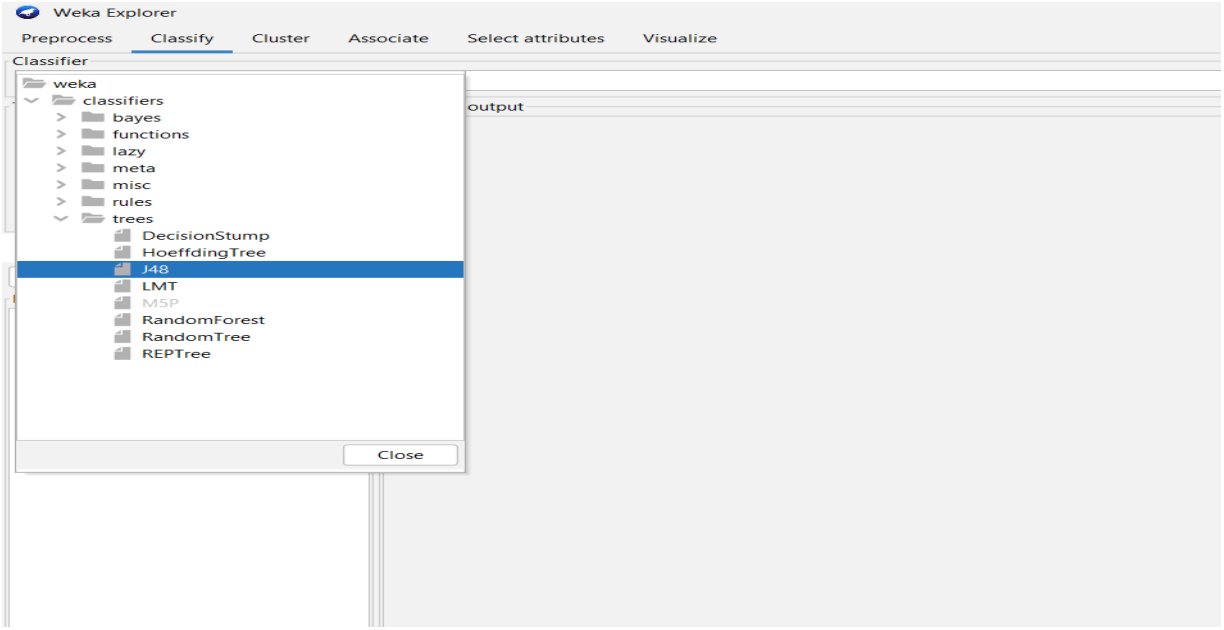


f). Apply classification algorithms (e.g., J48, Naive Bayes) to predict customer spending behavior.

Note:-

- **Training data** → loaded from your MySQL database (via query SELECT * FROM customers;)
- **Test data** → uploaded as an ARFF/CSV file (via "Supplied test set → Set…").

1. Go to "Classify" tab.
   - You'll see "Choose" button next to "Classifier".
2. Choose an algorithm:
   - Click Choose → trees → J48 (Decision Tree algorithm).
   - Or try Choose → bayes → NaiveBayes.

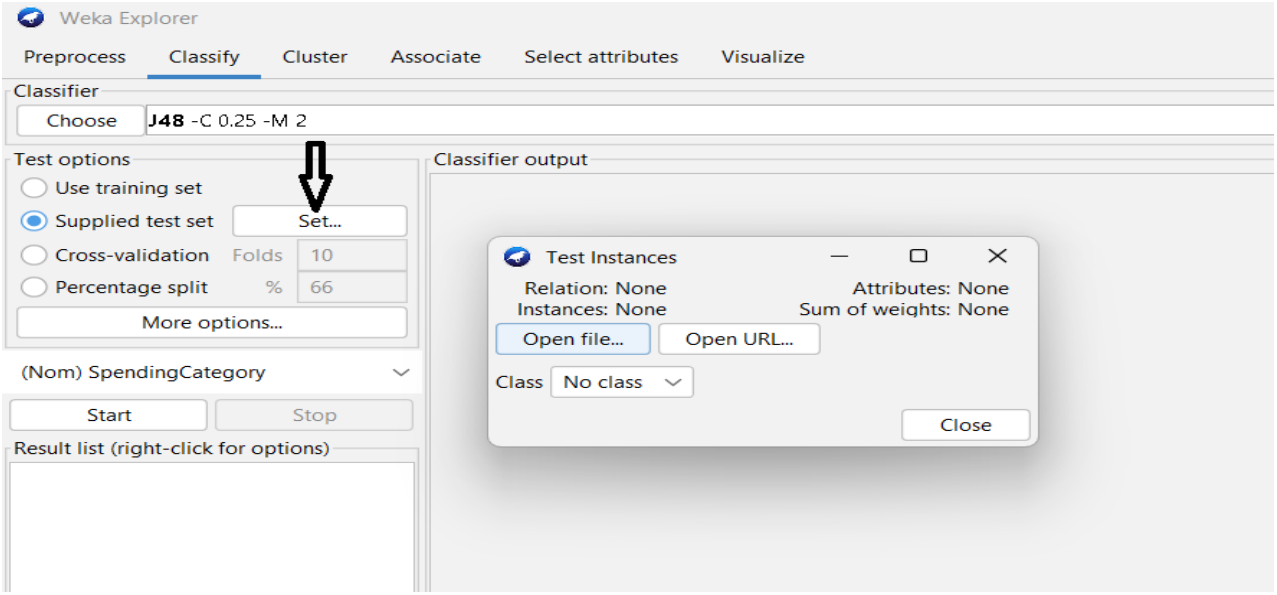


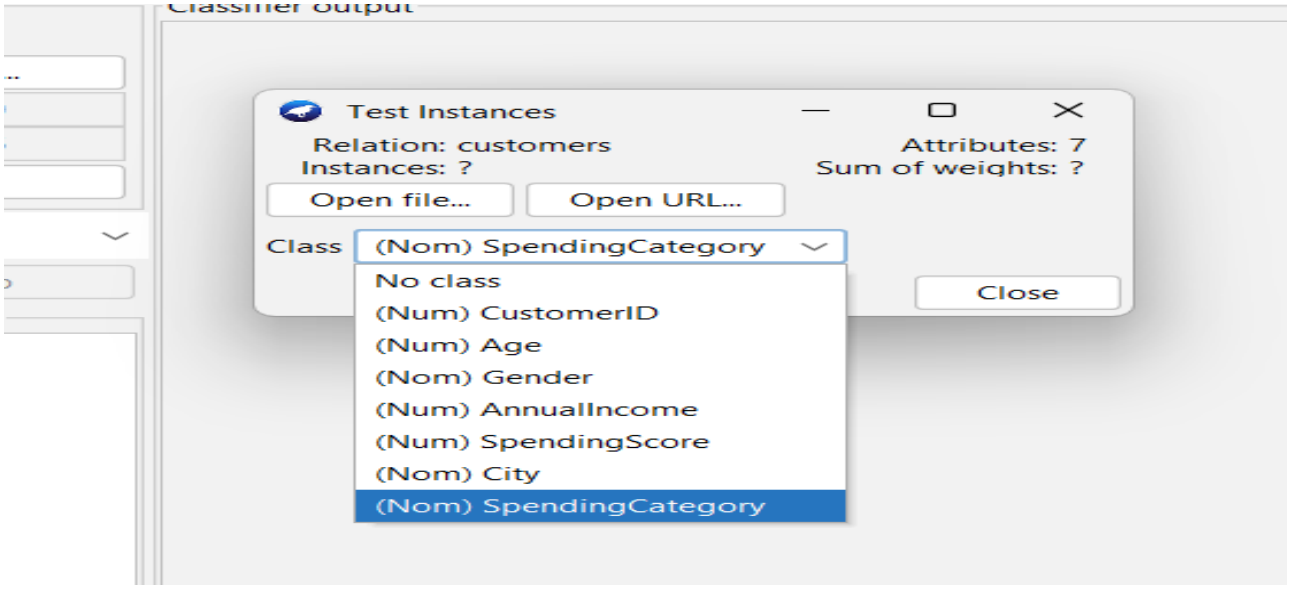
3. Select your class (target) attribute:

- At the bottom of the window, click “Set Class” and choose the column you want to predict (e.g., spend_category or purchase_behavior).

4. Evaluation method:

Choose Cross-validation (10 folds) — this is easiest.



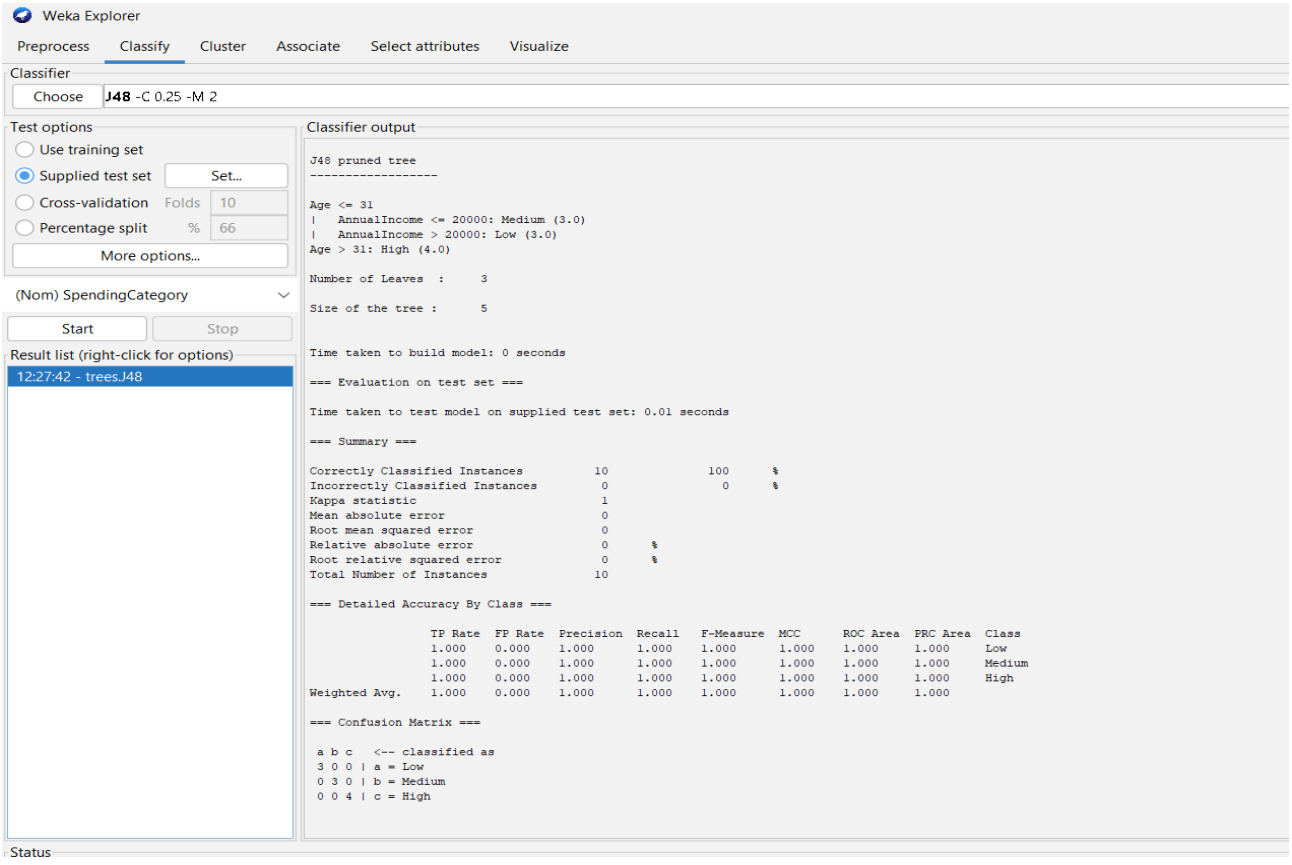


5. Click Start.

- Wait a few seconds → results will appear on the right side.

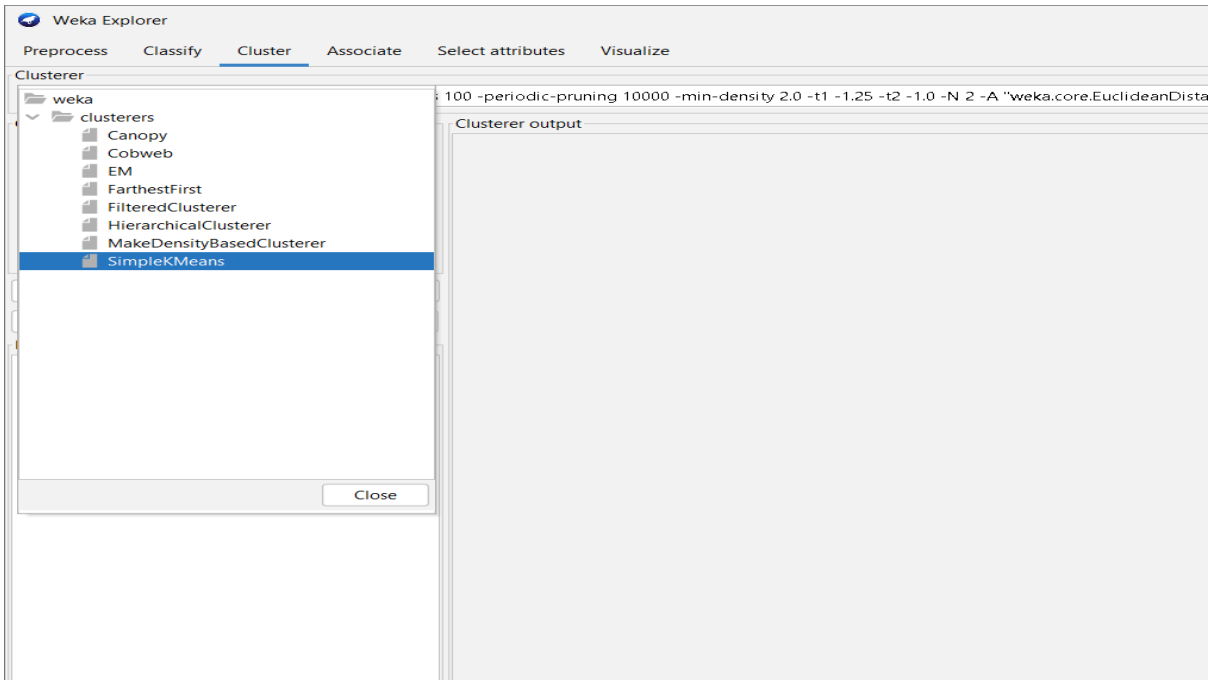
6. Read your results:

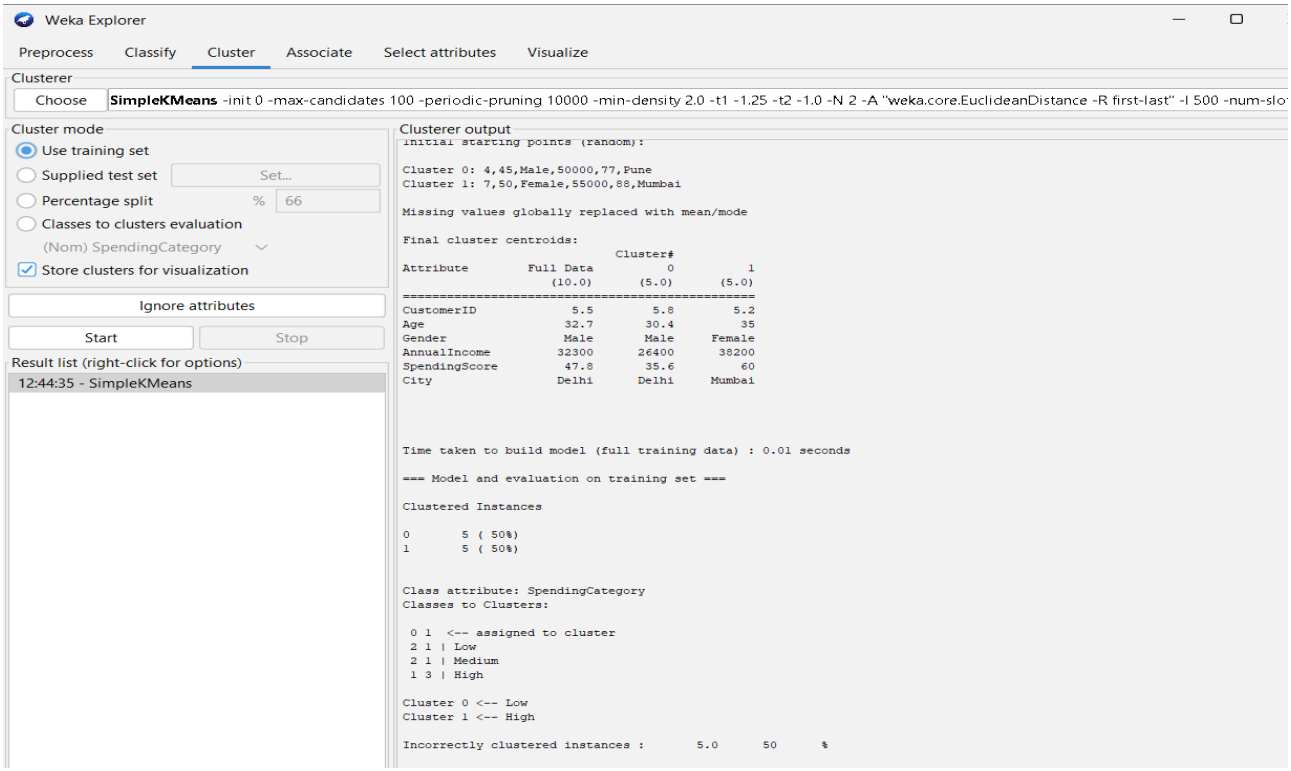
- You'll see Accuracy (%), Precision, Recall, F-Measure.
- You'll also see a Confusion Matrix (shows correct vs wrong predictions).



g). Use clustering (e.g., k-means) for market segmentation.

1. Click on “Cluster” tab (next to Classify).
2. Choose algorithm:
    - Click Choose → SimpleKMeans.
3. Configure:
    - Click on the name SimpleKMeans → change number of clusters (like 3 or 4) → Click OK.
4. Click Start.
    - WEKA will group your customers into clusters.
    - Output will show:
        - How many clusters (e.g., 3)
        - What each cluster’s average values are (like average income, age, etc.)
        - Which cluster each customer belongs to.





h). Generate evaluation metrics (accuracy, precision, recall).

You already get metrics when you run classification (Step o):

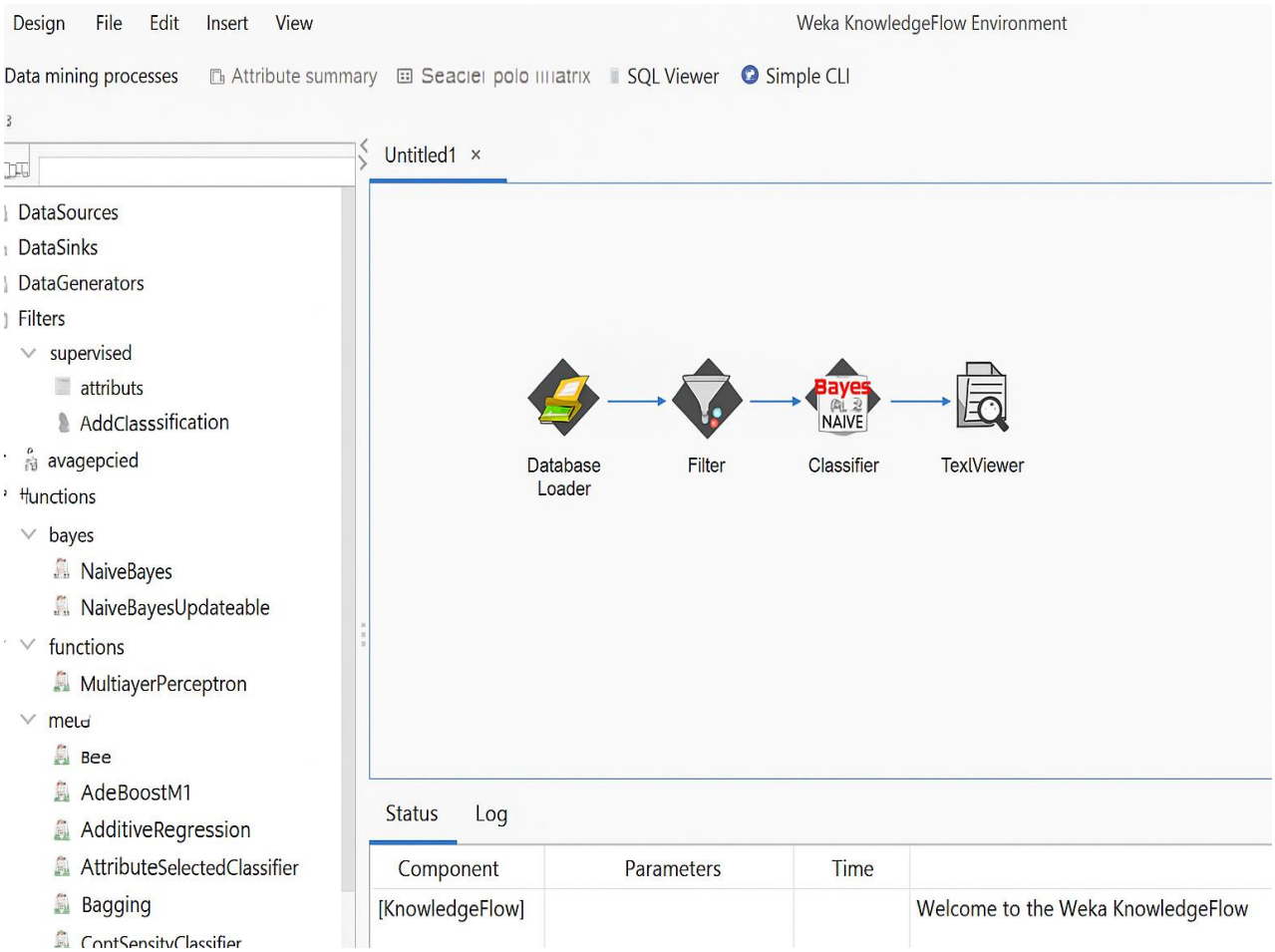
- Accuracy
- Precision
- Recall
- F-Measure
- Confusion Matrix

To save them:

- Right-click the result in the “Result list”.
- Click “Save result buffer” → save as .txt file.

i). Optionally automate data refresh using scripts or the WEKA KnowledgeFlow interface. Validate and analyse the result.

- Open WEKA → KnowledgeFlow (instead of Explorer).
- Drag these blocks:
- DatabaseLoader → Filter → Classifier → TextViewer.
- Connect them with arrows.
- Right-click → Configure each block (like set SQL query, choose J48).
- Click Run → It will do everything automatically (load → train → show result).
- Save the flow file (.kfml) to reuse.



Classifier output

```
Scheme:       weka.classifiers.rules.ZeroR
Relation:     customers
Instances:    10
Attributes:   7
              CustomerID
              Age
              Gender
              AnnualIncome
              SpendingScore
              City
              SpendingCategory
Test mode:    10-fold cross-validation

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

ZeroR predicts class value: High

Time taken to build model: 0 seconds

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

Correctly Classified Instances           0               0       %
Incorrectly Classified Instances        10             100       %
Kappa statistic                         -0.5625
Mean absolute error                      0.4778
Root mean squared error                  0.5083
Relative absolute error                100       %
Root relative squared error            100       %
Total Number of Instances               10

=== Detailed Accuracy By Class ===

                 TP Rate  FP Rate  Precision  Recall   F-Measure  MCC      ROC Area  PRC Area  Class
                 0.000    0.571    0.000      0.000    0.000      -0.535   0.000     0.300     Low
                 0.000    0.000    ?          0.000    ?          ?        0.000     0.300     Medium
                 0.000    1.000    0.000      0.000    0.000      -1.000   0.000     0.400     High
Weighted Avg.    0.000    0.571    ?          0.000    ?          ?        0.000     0.340

=== Confusion Matrix ===

 a b c   <-- classified as
 0 0 3 | a = Low
 0 0 3 | b = Medium
 4 0 0 | c = High
```