

Q1:

Using the default setting, list the 10 best rules generated with their corresponding support and confidence. List 5 itemsets of sizes 1 through 4, which satisfy the minimum support.

The screenshot shows the Weka Explorer interface with the 'Associate' tab selected. The 'Apriori' algorithm is chosen, and its command line is visible: `Apriori -I -N 10 -T 0 -C 0.9 -D 0.05 -U 1.0 -M 0.1 -S -1.0 -c -1`. The 'Result list' on the left shows two entries: '20:57:05 - Apriori' and '20:58:20 - Apriori'. The 'Associator output' pane displays the following information:

```
=== Run information ===  
Scheme:      weka.associa  
Relation:    vote  
Instances:   435  
Attributes:  17  
handicapped-  
water-projec  
adoption-of-  
physician-fe  
el-salvador-  
religious-gr  
anti-satelli  
aid-to-nicar  
mx-missile  
immigration  
synfuels-cor  
education-sp  
superfund-ri  
crime  
duty-free-ex  
export-admin
```

The 'weka.gui.GenericObjectEditor' window is open, showing the configuration for the 'weka.associations.Apriori' class. The 'outputItemSets' property is set to 'True' and is circled in red. Other settings include:

- car: False
- classIndex: -1
- delta: 0.05
- lowerBoundMinSupport: 0.1
- metricType: Confidence
- minMetric: 0.9
- numRules: 10
- removeAllMissingCols: False
- significanceLevel: -1.0
- upperBoundMinSupport: 1.0
- verbose: False

The 'Status' bar at the bottom of the Weka Explorer window shows 'OK'.

Best rules found:

1. adoption-of-the-budget-resolution=y physician-fee-freeze=n 219 ==> Class=democrat 219 conf:(1)
2. adoption-of-the-budget-resolution=y physician-fee-freeze=n aid-to-nicaraguan-contras=y 198 ==> Class=democrat 198 conf:(1)
3. physician-fee-freeze=n aid-to-nicaraguan-contras=y 211 ==> Class=democrat 210 conf:(1)
4. physician-fee-freeze=n education-spending=n 202 ==> Class=democrat 201 conf:(1)
5. physician-fee-freeze=n 247 ==> Class=democrat 245 conf:(0.99)
6. el-salvador-aid=n Class=democrat 200 ==> aid-to-nicaraguan-contras=y 197 conf:(0.99)
7. el-salvador-aid=n 208 ==> aid-to-nicaraguan-contras=y 204 conf:(0.98)
8. adoption-of-the-budget-resolution=y aid-to-nicaraguan-contras=y Class=democrat 203 ==> physician-fee-freeze=n 198 conf:(0.98)
9. el-salvador-aid=n aid-to-nicaraguan-contras=y 204 ==> Class=democrat 197 conf:(0.97)
10. aid-to-nicaraguan-contras=y Class=democrat 218 ==> physician-fee-freeze=n 210 conf:(0.96)

Minimum support: 0.45 (196 instances)

size 1

Size of set of large itemsets L(1): 20

Large Itemsets L(1):

handicapped-infants=n 236

adoption-of-the-budget-resolution=y 253

physician-fee-freeze=n 247

el-salvador-aid=n 208

el-salvador-aid=y 212

religious-groups-in-schools=y 272

anti-satellite-test-ban=y 239

aid-to-nicaraguan-contras=y 242

mx-missile=n 206

mx-missile=y 207

immigration=n 212

immigration=y 216

synfuels-corporation-cutback=n 264

education-spending=n 233

superfund-right-to-sue=n 201

superfund-right-to-sue=y 209

crime=y 248

duty-free-exports=n 233

export-administration-act-south-africa=y 269

Class=democrat 267

size 2

Size of set of large itemsets L(2): 17

Large Itemsets L(2):

adoption-of-the-budget-resolution=y physician-fee-freeze=n 219

adoption-of-the-budget-resolution=y anti-satellite-test-ban=y 201

adoption-of-the-budget-resolution=y aid-to-nicaraguan-contras=y 215

adoption-of-the-budget-resolution=y education-spending=n 201

adoption-of-the-budget-resolution=y Class=democrat 231

physician-fee-freeze=n anti-satellite-test-ban=y 197

physician-fee-freeze=n aid-to-nicaraguan-contras=y 211

physician-fee-freeze=n education-spending=n 202

physician-fee-freeze=n Class=democrat 245

el-salvador-aid=n aid-to-nicaraguan-contras=y 204

el-salvador-aid=n Class=democrat 200

el-salvador-aid=y religious-groups-in-schools=y 197

religious-groups-in-schools=y crime=y 214

anti-satellite-test-ban=y aid-to-nicaraguan-contras=y 210

anti-satellite-test-ban=y Class=democrat 200

aid-to-nicaraguan-contras=y Class=democrat 218

education-spending=n Class=democrat 213

size 3

Size of set of large itemsets L(3): 6

Large Itemsets L(3):

adoption-of-the-budget-resolution=y physician-fee-freeze=n aid-to-nicaraguan-contras=y 198
adoption-of-the-budget-resolution=y physician-fee-freeze=n Class=democrat 219
adoption-of-the-budget-resolution=y aid-to-nicaraguan-contras=y Class=democrat 203
physician-fee-freeze=n aid-to-nicaraguan-contras=y Class=democrat 210
physician-fee-freeze=n education-spending=n Class=democrat 201
el-salvador-aid=n aid-to-nicaraguan-contras=y Class=democrat 197

size 4

Size of set of large itemsets L(4): 1

Large Itemsets L(4):

adoption-of-the-budget-resolution=y physician-fee-freeze=n aid-to-nicaraguan-contras=y Class=democrat 198

Q2:

Determine the highest possible support to generate non-empty itemsets. List the corresponding 10 best rules generated with minimum confidence .80 and a sample of the generated itemsetsof sizes 1 through 4.

Assumption:

1. At least itemsets of size 1 and size 2

2. At most 10 best rules

The screenshot shows the Weka Explorer interface with the 'Associate' tab selected. The 'Apriori' algorithm is chosen, and the 'Start' button is visible. The 'Result list' on the left shows a list of Apriori results. The 'Associator output' pane displays the following text:

```
el-salvador-aid
religious-groups-in-sch
anti-satellite-test-bar
aid-to-nicaraguan-conti
mx-missile
immigration
synfuels-corporation-cv
education-spending
superfund-right-to-sue
crime
duty-free-exports
export-administration-s
Class
=== Associator model (full training s

Apriori
=====

Minimum support: 0.56 (244 instances)
Minimum metric <confidence>: 0.8
Number of cycles performed: 9
```

The 'GenericObjectEditor' window is open, showing the 'weka.associations.Apriori' class. The 'lowerBoundMinSupport' is set to 0.56, and the 'minMetric' is set to 0.8. A red arrow points from the 'lowerBoundMinSupport' field to the text 'trial and error'.

weka.gui.GenericObjectEditor

weka.associations.Apriori

About

Class implementing an Apriori-type algorithm.

More

Capabilities

car False

classIndex -1

delta 0.05

lowerBoundMinSupport 0.56

metricType Confidence

minMetric 0.8

numRules 10

outputItemSets True

removeAllMissingCols False

significanceLevel -1.0

upperBoundMinSupport 1.0

verbose False

Open... Save... OK Cancel

trial and error

```
Apriori
=====

Minimum support: 0.56 (244 instances)
Minimum metric <confidence>: 0.8
Number of cycles performed: 9
```

```
Generated sets of large itemsets:
```

```
Size of set of large itemsets L(1): 7
```

size 1

```
Large Itemsets L(1):
adoption-of-the-budget-resolution=y 253
physician-fee-freeze=n 247
religious-groups-in-schools=y 272
synfuels-corporation-cutback=n 264
crime=y 248
export-administration-act-south-africa=y 269
Class=democrat 267
```

size 2

```
Size of set of large itemsets L(2): 1

Large Itemsets L(2):
physician-fee-freeze=n Class=democrat 245
```

```
Best rules found:
```

1. physician-fee-freeze=n 247 ==> Class=democrat 245 conf:(0.99)
2. Class=democrat 267 ==> physician-fee-freeze=n 245 conf:(0.92)

Other possible answer

```
Minimum support: 0.52 (226 instances)
Minimum metric <confidence>: 0.8
Number of cycles performed: 10

Generated sets of large itemsets:

Size of set of large itemsets L(1): 12

Large Itemsets L(1):
handicapped-infants=n 236
adoption-of-the-budget-resolution=y 253
physician-fee-freeze=n 247
religious-groups-in-schools=y 272
anti-satellite-test-ban=y 239
aid-to-nicaraguan-contras=y 242
synfuels-corporation-cutback=n 264
education-spending=n 233
crime=y 248
duty-free-exports=n 233
export-administration-act-south-africa=y 269
Class=democrat 267

Size of set of large itemsets L(2): 2

Large Itemsets L(2):
adoption-of-the-budget-resolution=y Class=democrat 231
physician-fee-freeze=n Class=democrat 245

Best rules found:
1. physician-fee-freeze=n 247 ==> Class=democrat 245    conf: (0.99)
2. Class=democrat 267 ==> physician-fee-freeze=n 245    conf: (0.92)
3. adoption-of-the-budget-resolution=y 253 ==> Class=democrat 231    conf: (0.91)
4. Class=democrat 267 ==> adoption-of-the-budget-resolution=y 231    conf: (0.87)
```