

Action rules extraction on Fragile State Index

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INSTRUCTOR - ZBIGNIEW W.RAS

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INTRODUCTION

The main goal of this project is to extract from the datasets for three consecutive years the rules of action and classification that describe the FSI. In order to evaluate the changes in the rules of action produced over the years, an additional six features must be applied to the data sets. Rules of action will specify what changes are needed to lower FSI in the values of classification apps. Data discretization and identification are also conducted for further data analysis.

FRAGILE STATE INDEX

The Fragile States Report is an annual report released by the United States, which since 2005 has been dreaming about tanking the Fund for Peace and the American Foreign Policy website. The index was intended to determine the susceptibility of states to confrontation or failure, listing all sovereign states with United Nations membership where adequate data are available for review. The ranking is based on the 12 criteria number of scores listed below. Every predictor is graded on a scale of 0 to 10, with 0 being the lowest, indicating the most stable, and 10 being the maximum, meaning the least stable.

The 12 indicators are as follows

- Security Apparatus
- Factionalized Elites
- Group Grievance
- Economic Decline and Property
- Uneven Economic Development
- Human Flight and Brain Drain
- State Legitimacy
- Public Services
- Human Rights and Rule of Law
- Demographic Pressures
- Refugees and Internally Displaced Persons
- External Intervention

ADDITIONAL FEATURES(INDICATORS)

We extend this analysis by adding six new features that can enable risk assessment and early dispute warning. The new features added are as follows.

Prison Population

When deciding whether a nation is vulnerable or not, the proportion of individuals who commit perjury of any kind to individuals who are not engaged in any crime is critical. The prison population is the number of adults and juvenile prisoners present per 1 million people.

Homeless people due to Natural Disaster

Each function reflects the number of people affected by natural disasters that lead to the loss of their shelter.

Life expectancy at birth

Life expectancy at birth is defined as how long if current death levels do not improve, an infant will expect to live on average.

Environmental Performance Index (EPI)

The Environmental Performance Index (EPI) is a means for quantifying and numerically identifying a state's policies ' environmental performance.

Infant Mortality Rate

Infant mortality rate (IMR) is the death rate of 1000 live births for children under the age of one year. The level for a given region is the number of children who die under the age of one year, divided by the number of live births throughout the year, multiplied by 1,000.

Education Index

The Education Index was measured by combining average adult years of schooling with expected years of children's schooling, each receiving weighting of 50%.

DATA EXTRACTION

The values for the additional features were collected from various websites and merged for further study with the initial three consecutive years FSI dataset (2014-16). The database sources from which the information derived are listed below.

1. <http://databank.worldbank.org/data/home.aspx>
2. <http://hdr.undp.org/en/data>

DATA PRE-PROCESSING

The data obtained from the FSI website was not clean and therefore some pre-processing was performed before identification was used. The following steps are

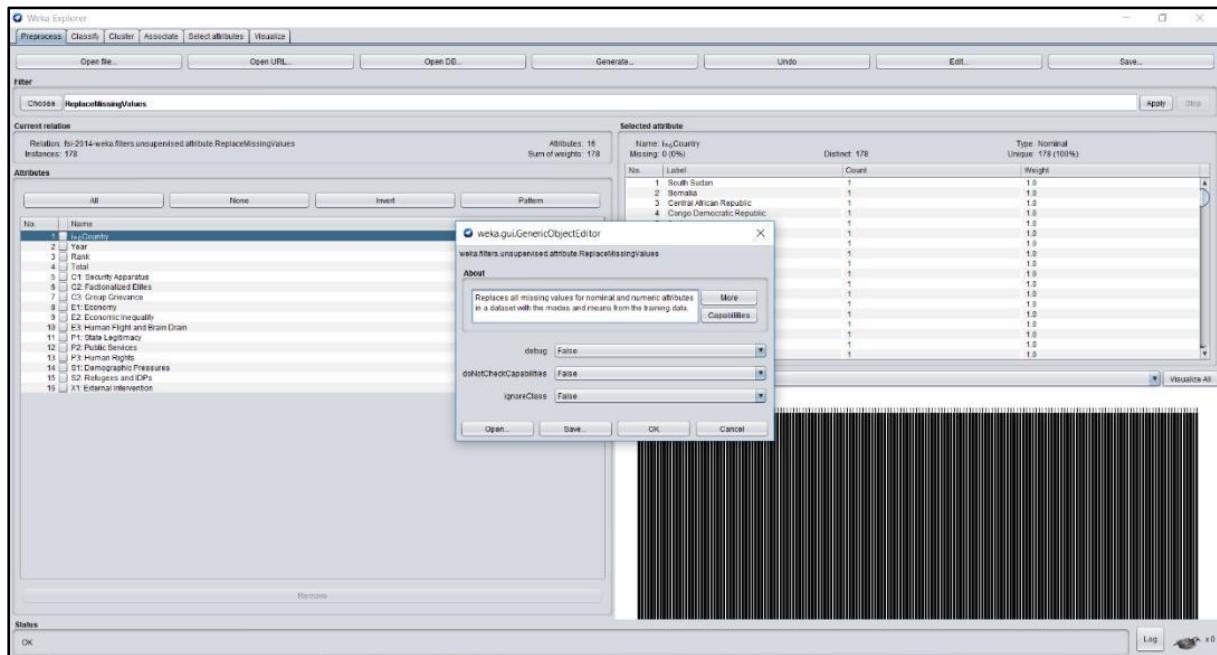
1. Special characters were removed so that the sheets can be parsed by the WEKA tool.
2. Outliers were removed and replaced by mean values.
3. Rows having a lot of empty values were removed from the analysis.
4. Missing numeric values were updated by their mean values.
5. Converting each numeric column value in the range of 0 to 10.
6. Numeric values of the Decision Variable Total were replaced by Nominal Values based on the following table values.

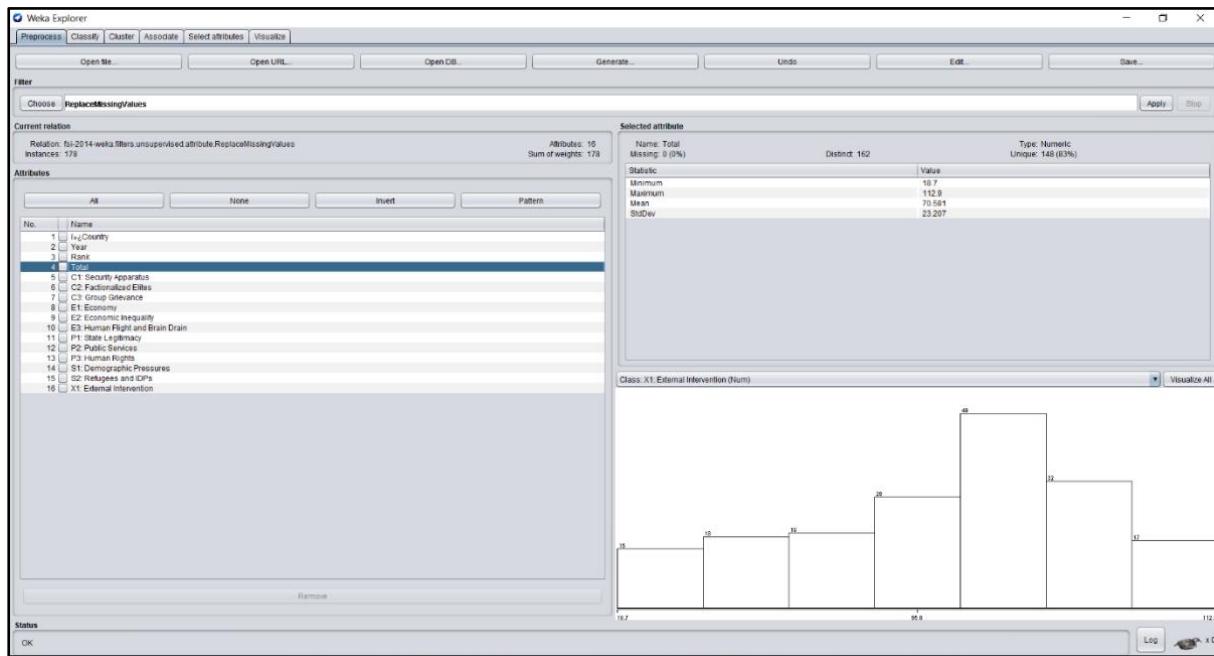
Category	Total Score
Alert	172.5–230.0
Warning	115–172.4
Stable	57.5–114.9
Sustainable	0.0–57.4

YEAR - 2014

REPLACING MISSING VALUES

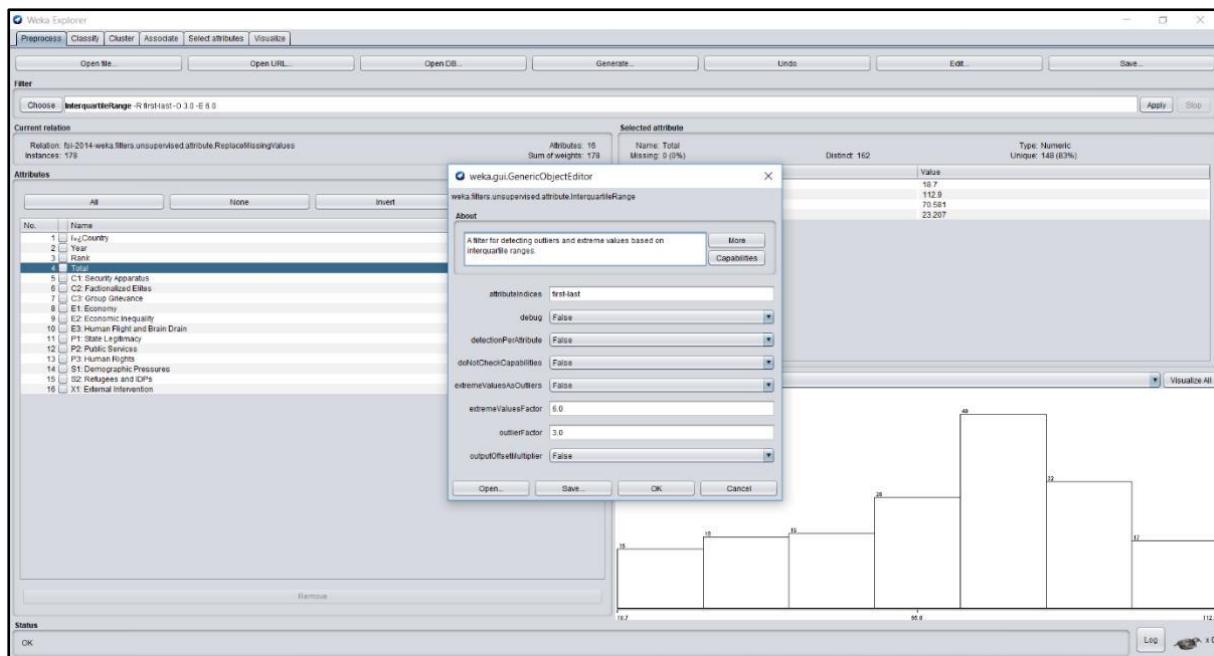
Filter - ReplaceMissingValues





OUTLIER REMOVAL

Filter - Interquartile Range



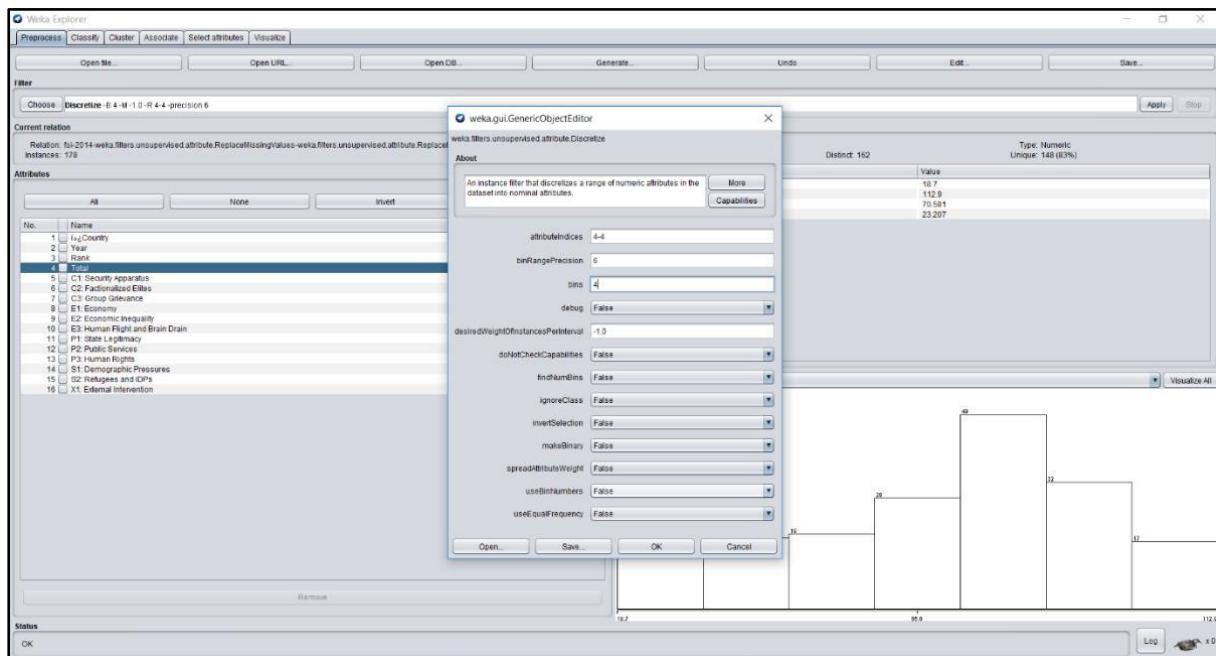
DATA DISCRETIZATION USING WEKA

The method of transforming an attribute of real value into an ordinal attribute or bins is called discretization. You can use the Discretize function to discretize the real-valued attributes in Weka.

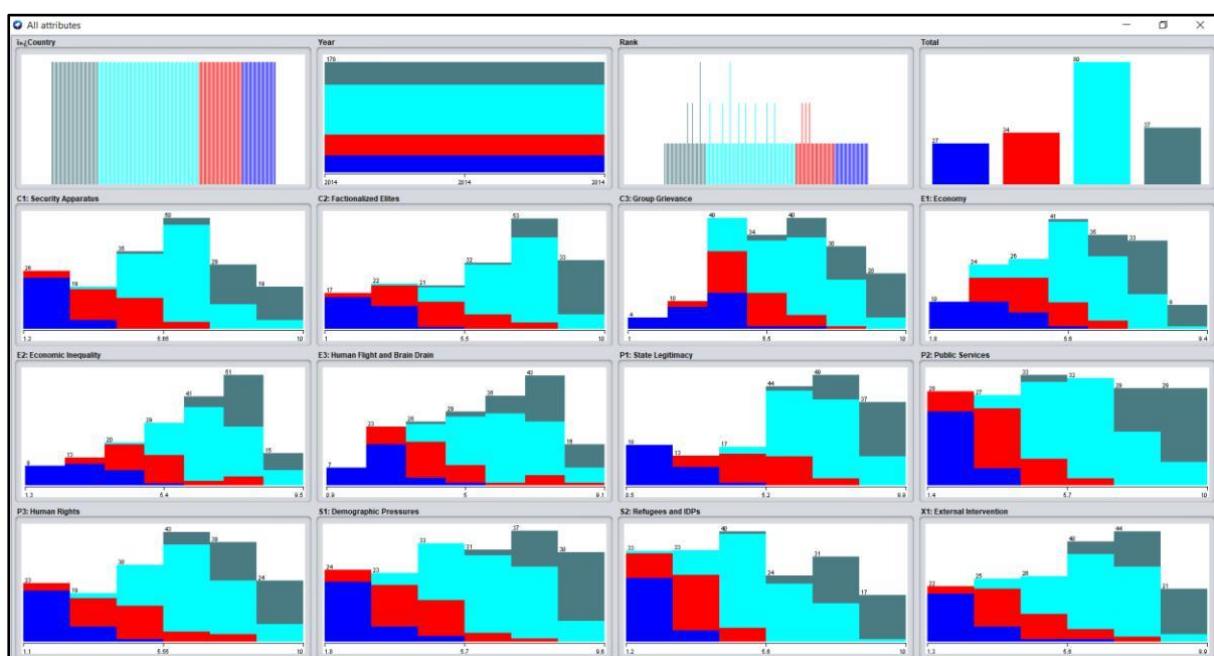
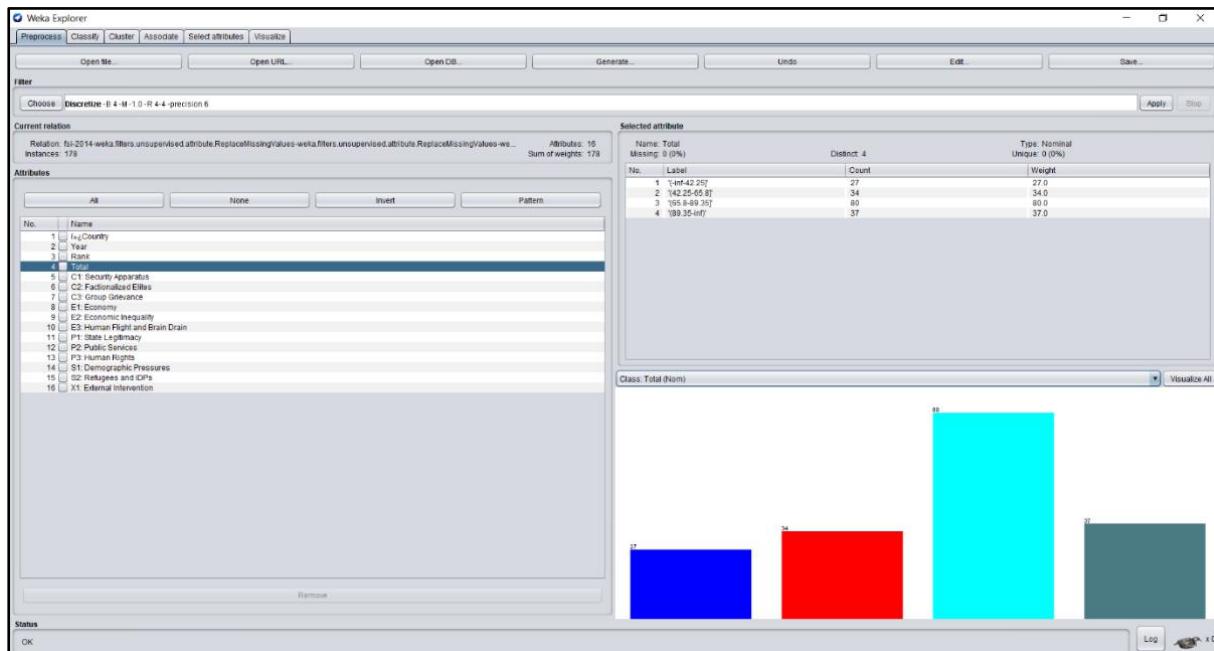
Throughout the dataset, the decision attribute TOTAL has different values, we used discretization to replace TOTAL numerical values with the following concepts.

1. Alert (union of Very High Alert, High Alert, Alert)
2. Warning (union of High Warning, Elevated Warning, Warning).
3. Stable (union of Stable, More Stable, Very Stable).
4. Sustainable (union of Sustainable, Very Sustainable).

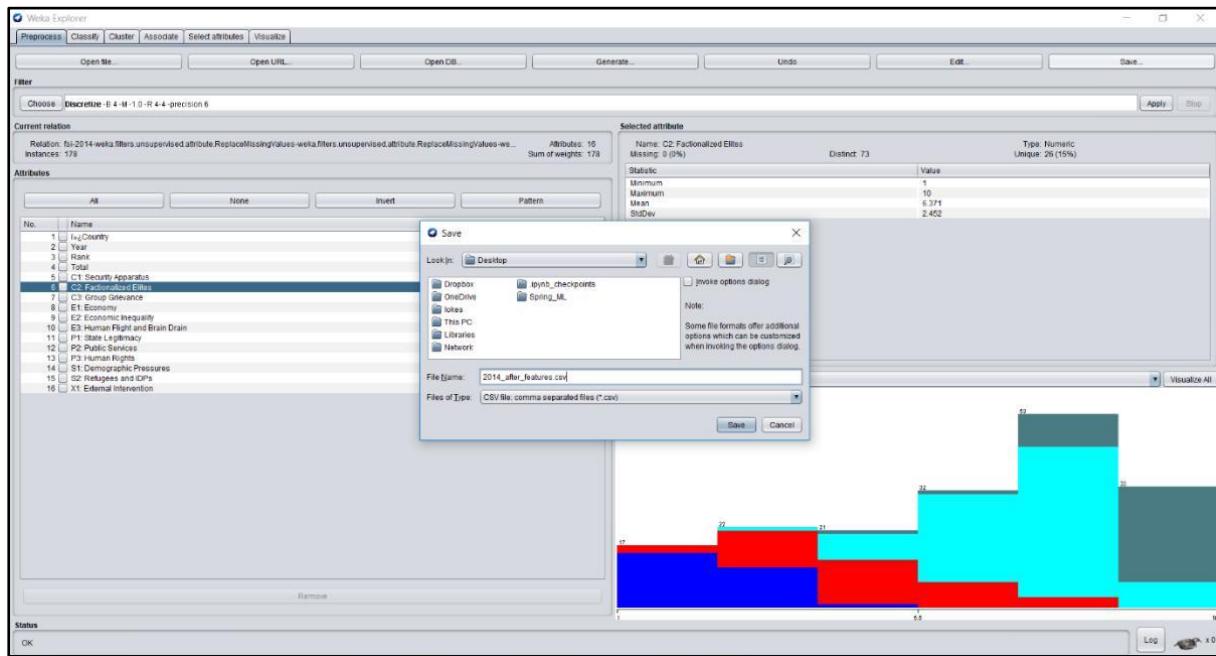
Filter used - Discretize



ITCS 6162 KNOWLEDGE DISCOVERY IN DATABASES (KDD)



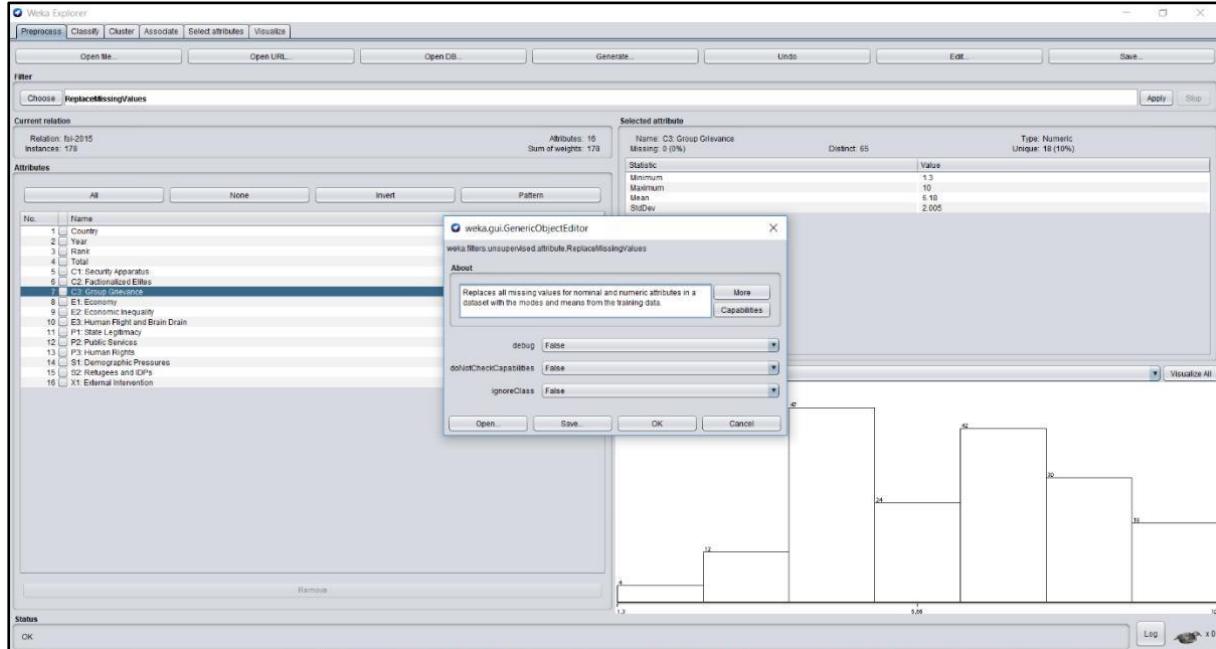
Saving this file in csv format

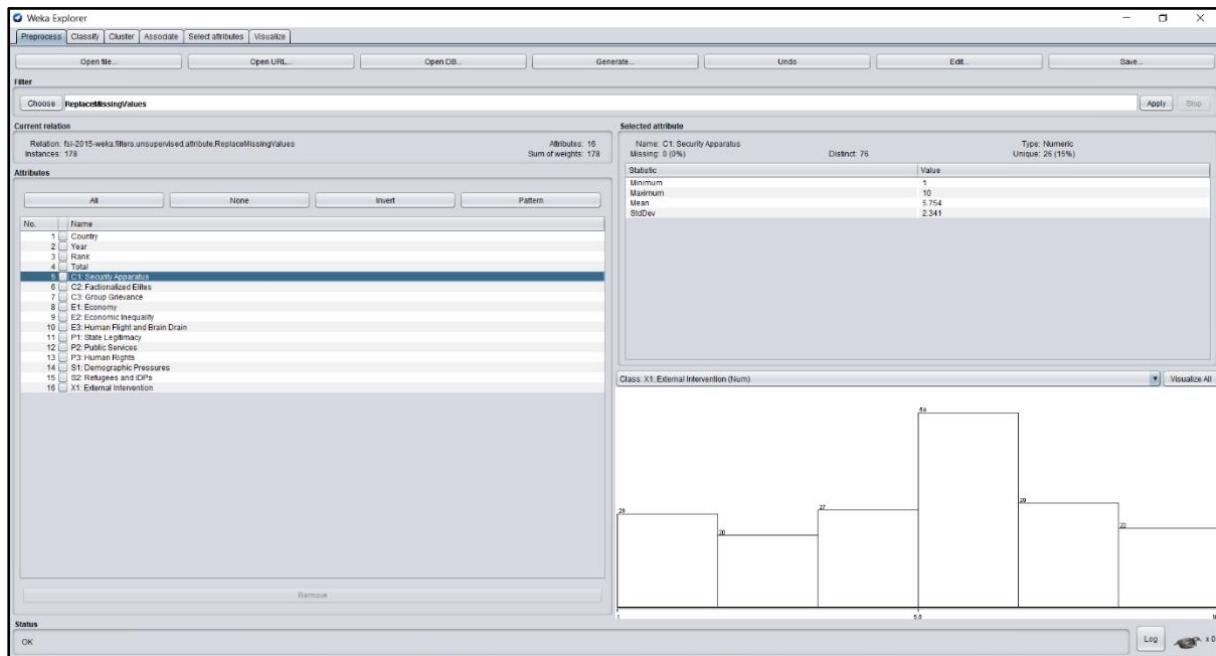


YEAR – 2015

REPLACE MISSING VALUES

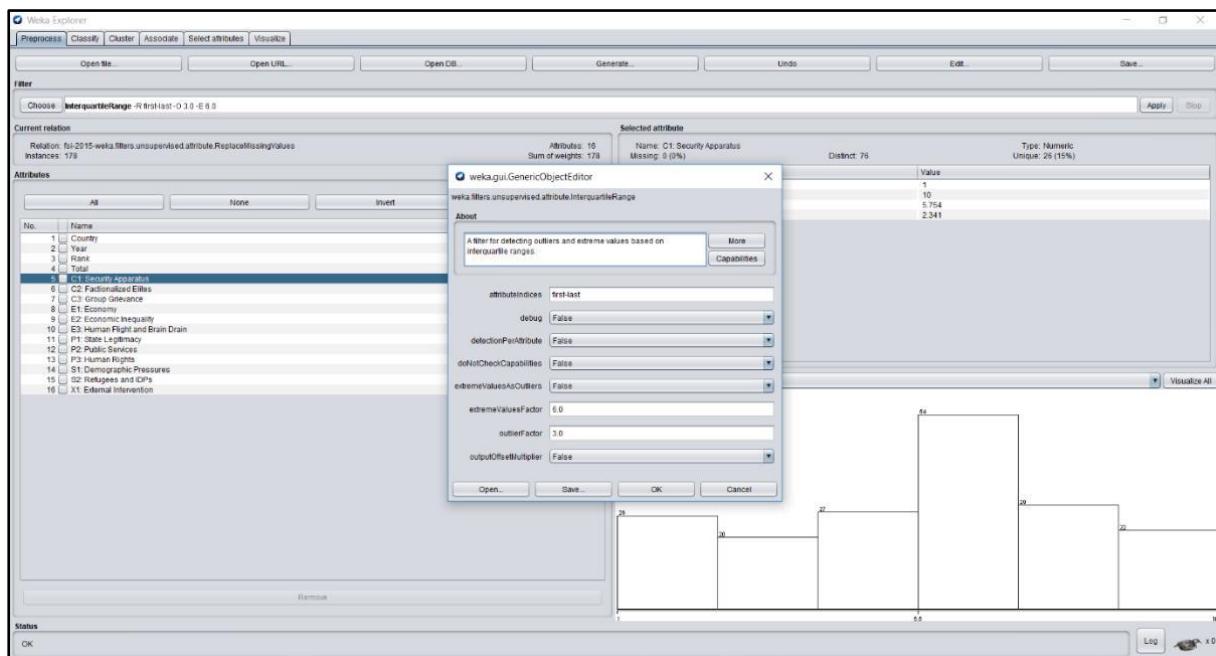
Filter - ReplaceMissingValues





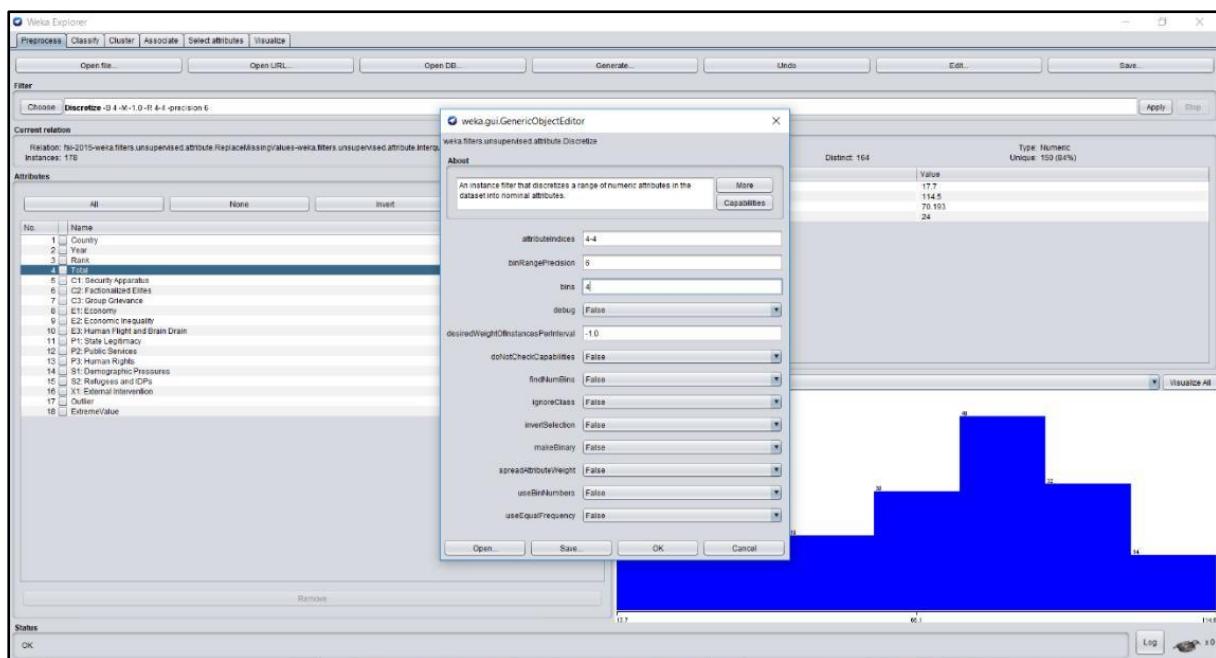
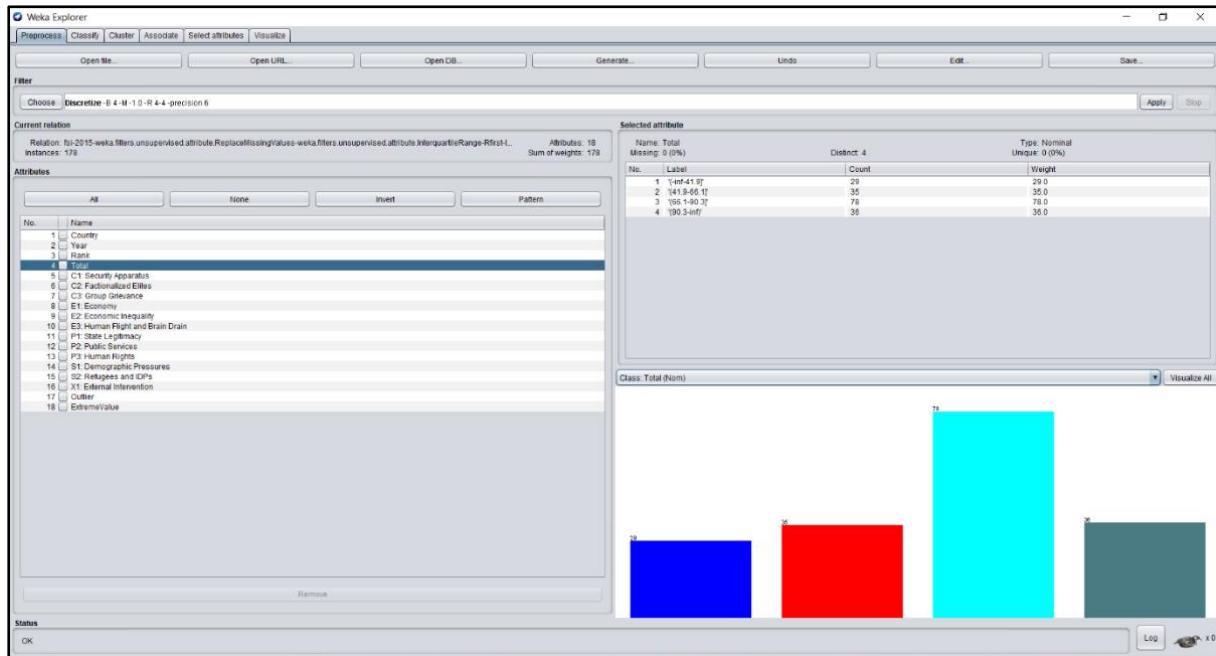
OUTLIER REMOVAL

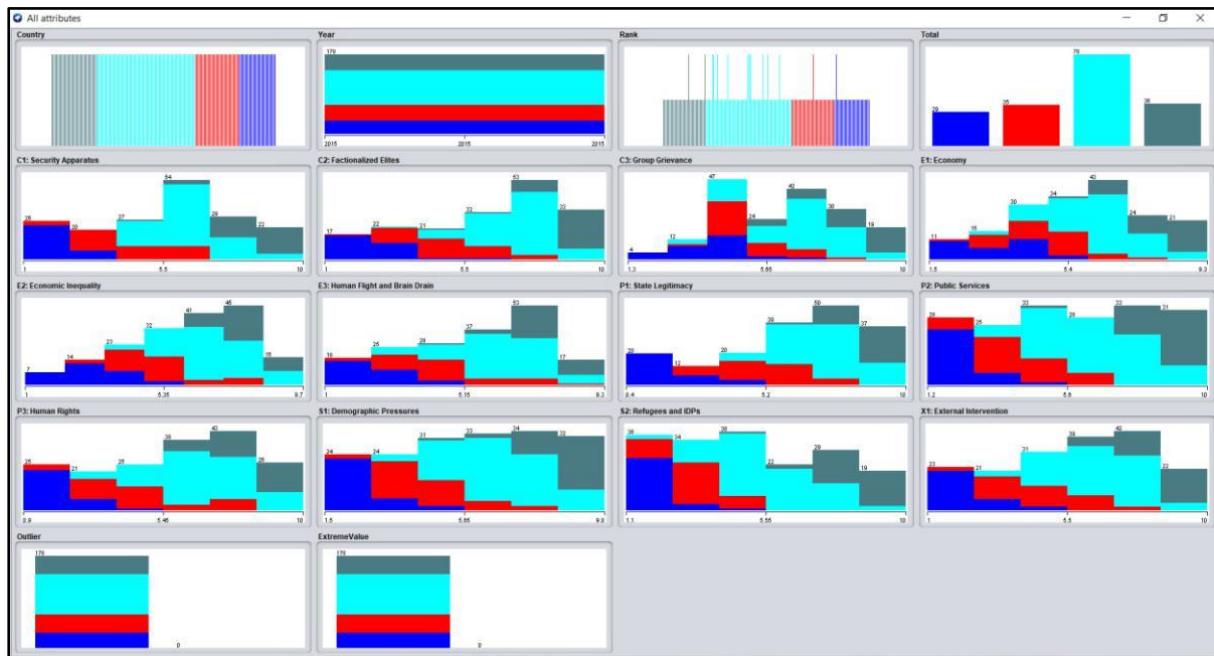
Filter - Interquartile Range



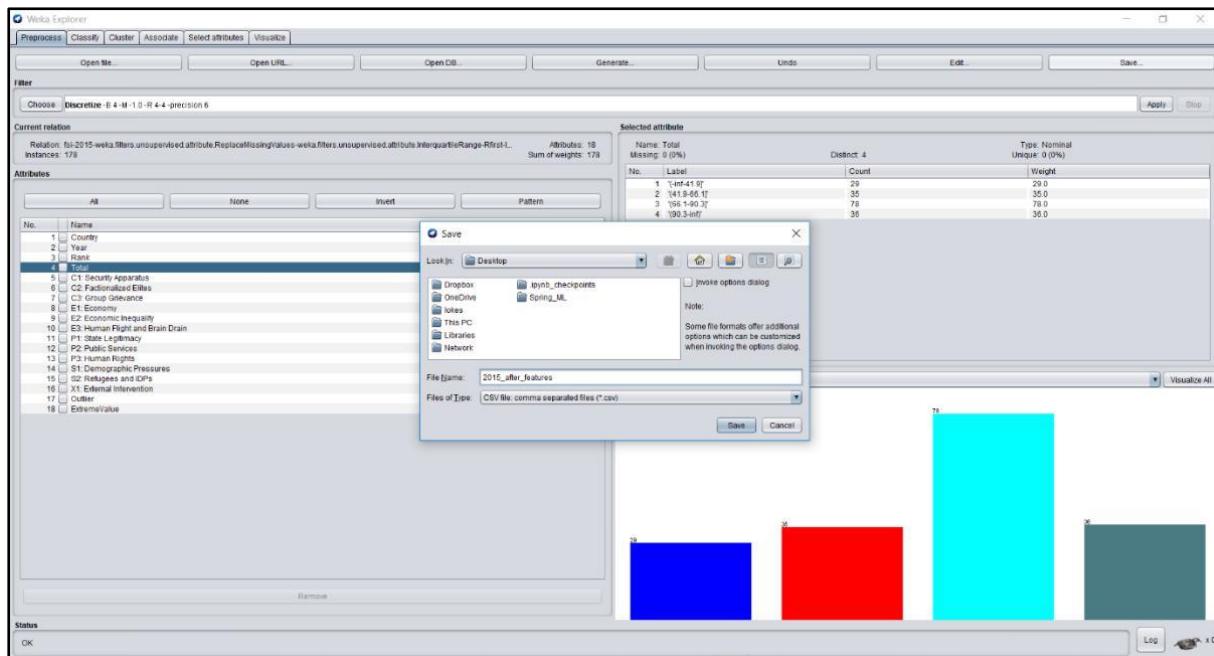
DISCRETIZATION

Filter used - Discretize





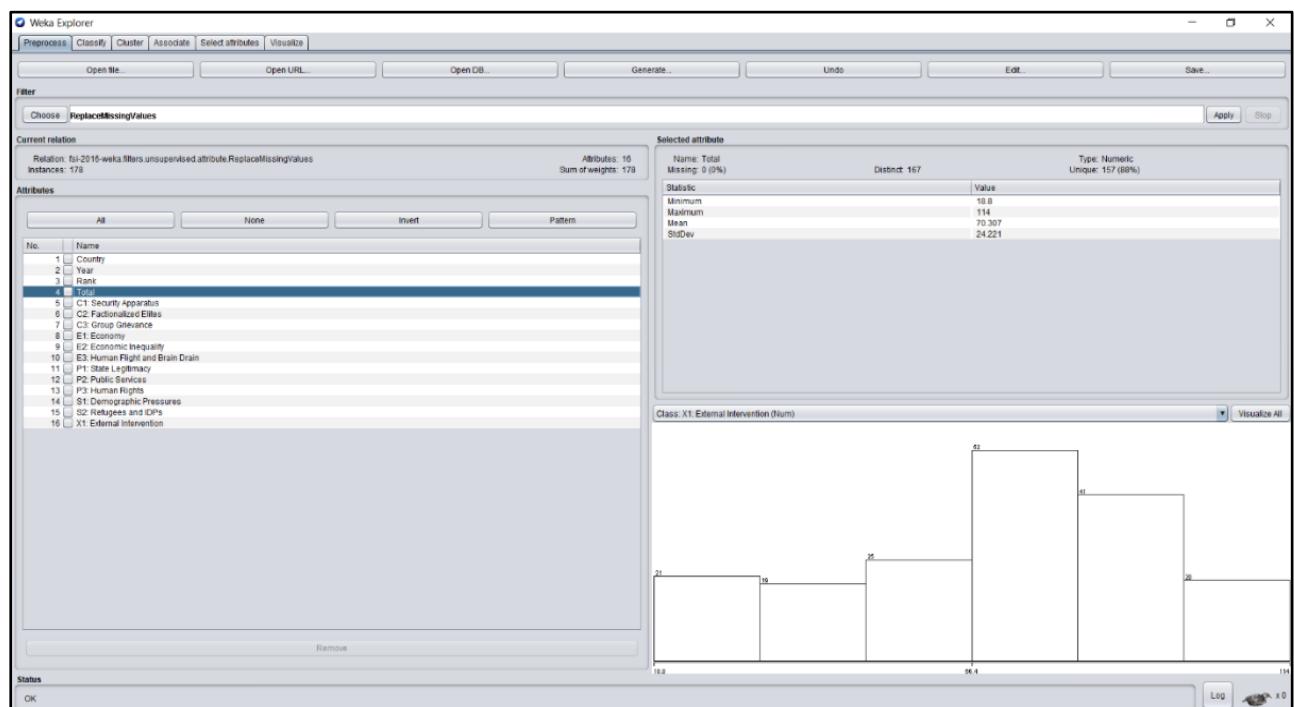
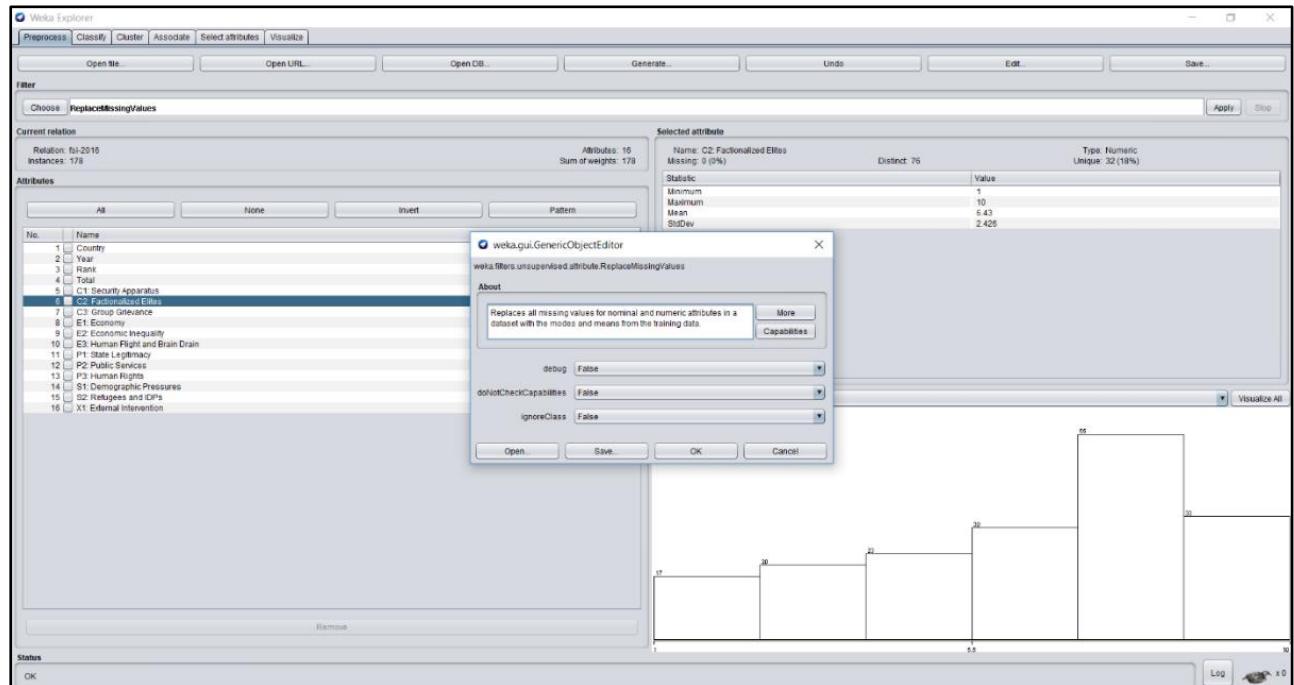
Saving this file in csv format



YEAR – 2016

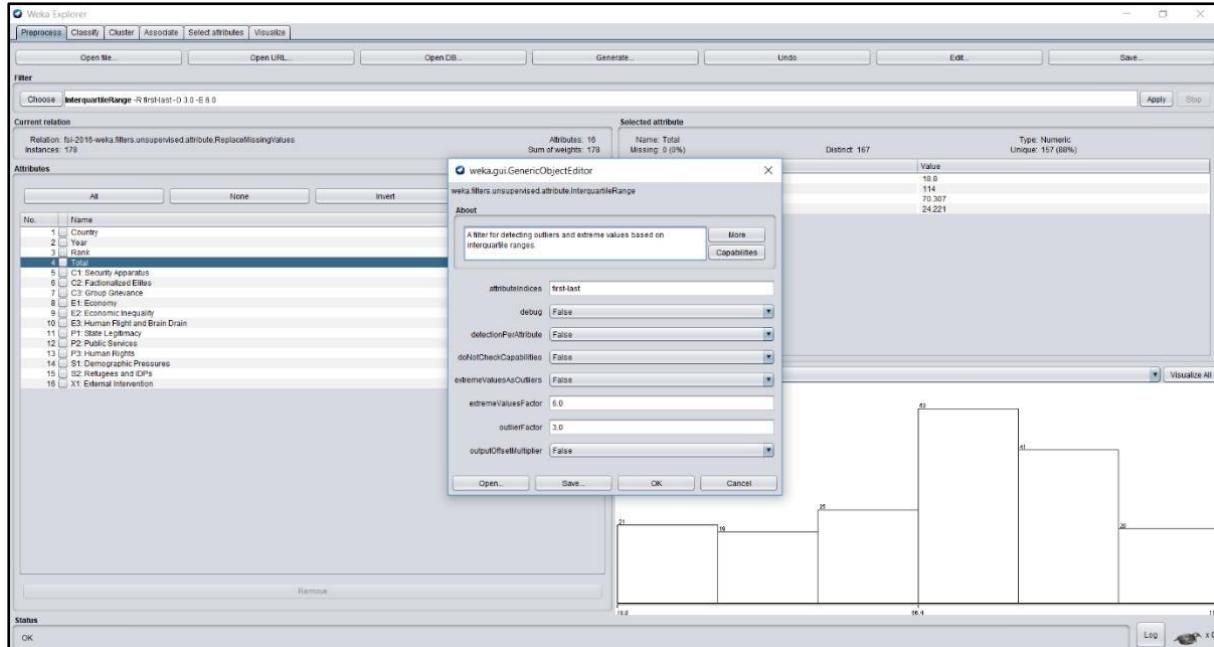
REPLACING MISSING VALUES

Filter - ReplaceMissingValues



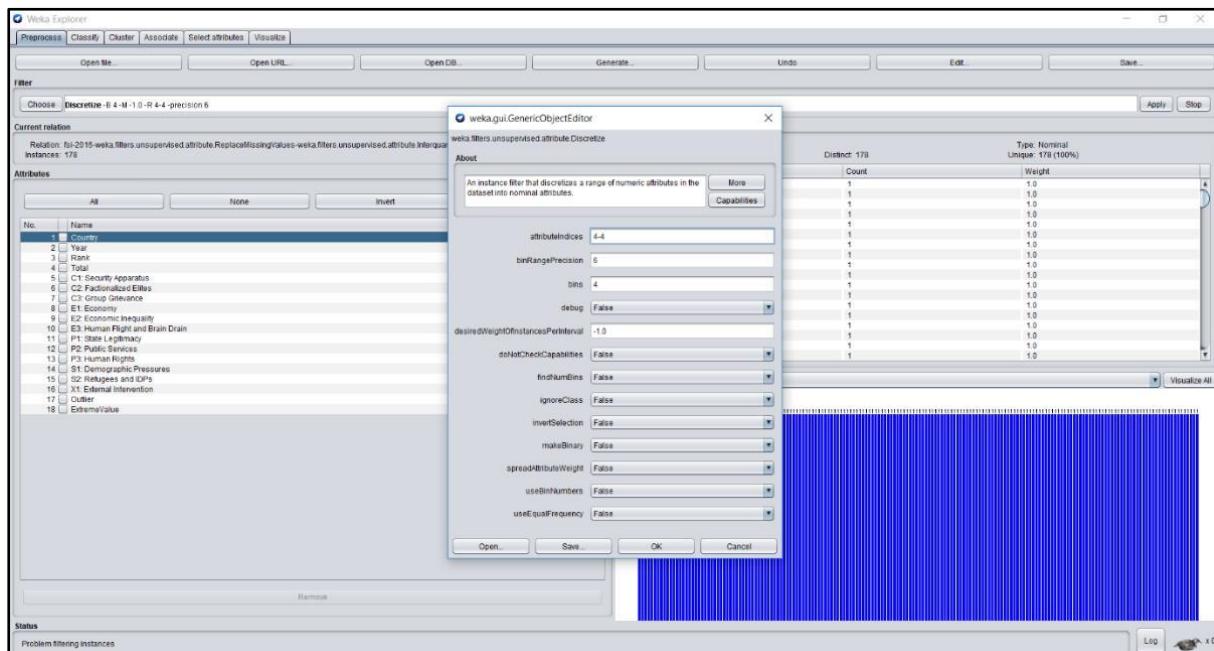
OUTLIER REMOVAL

Filter - Interquartile Range

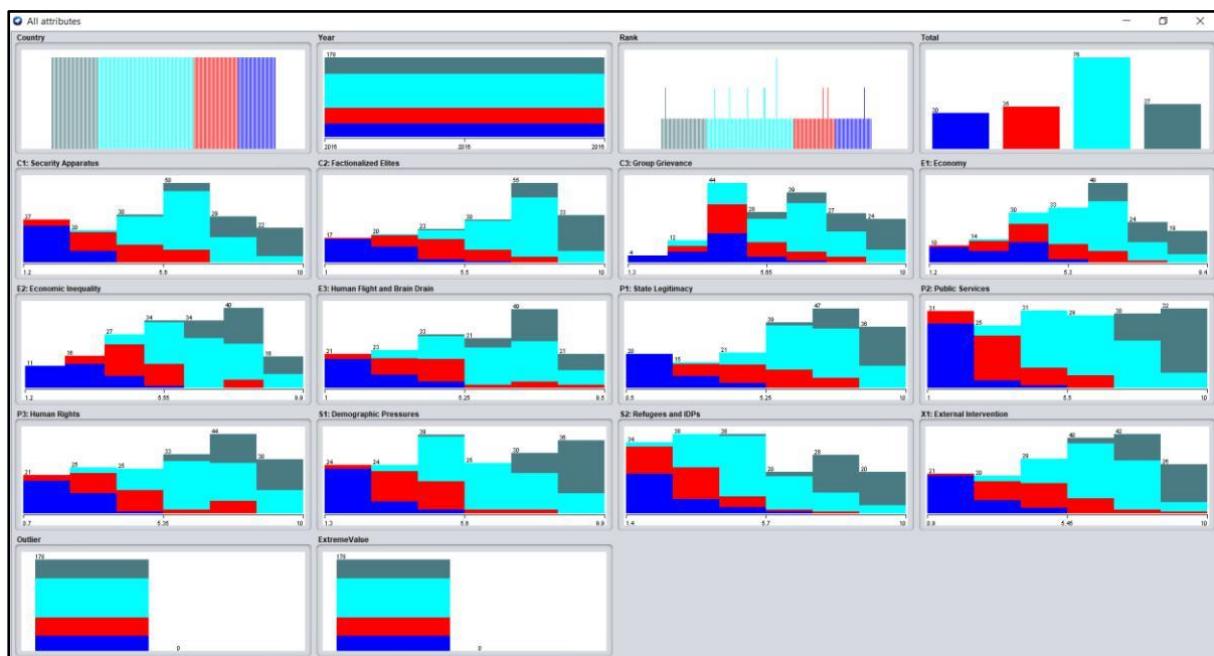
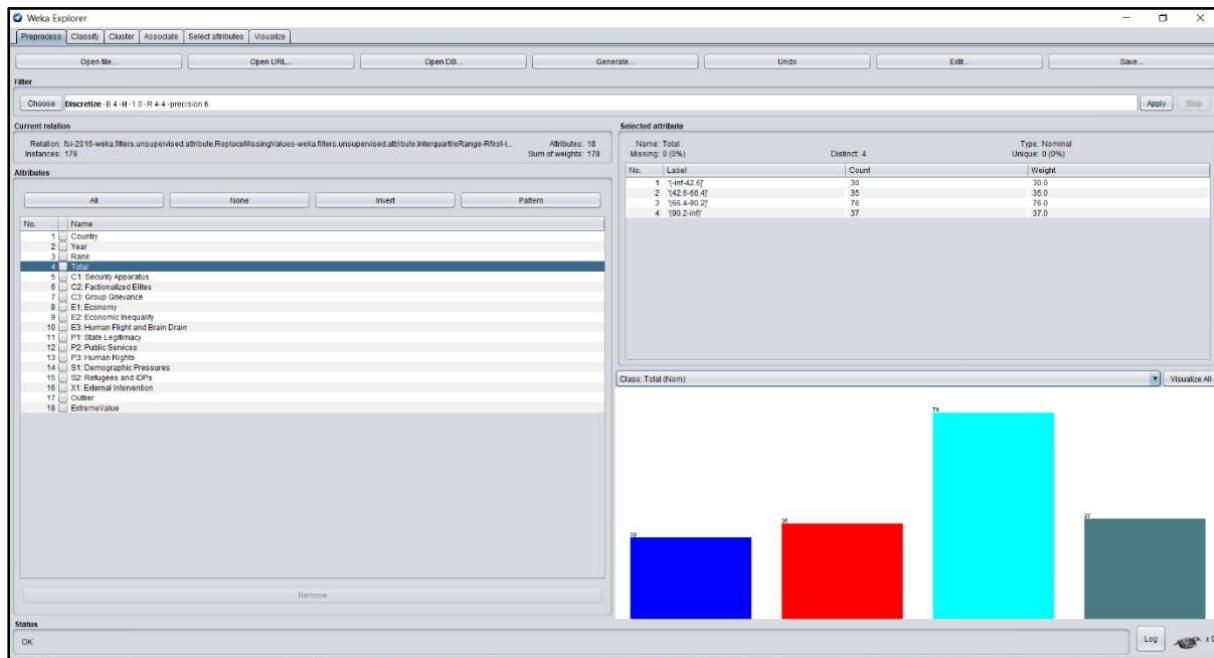


DISCRETIZATION

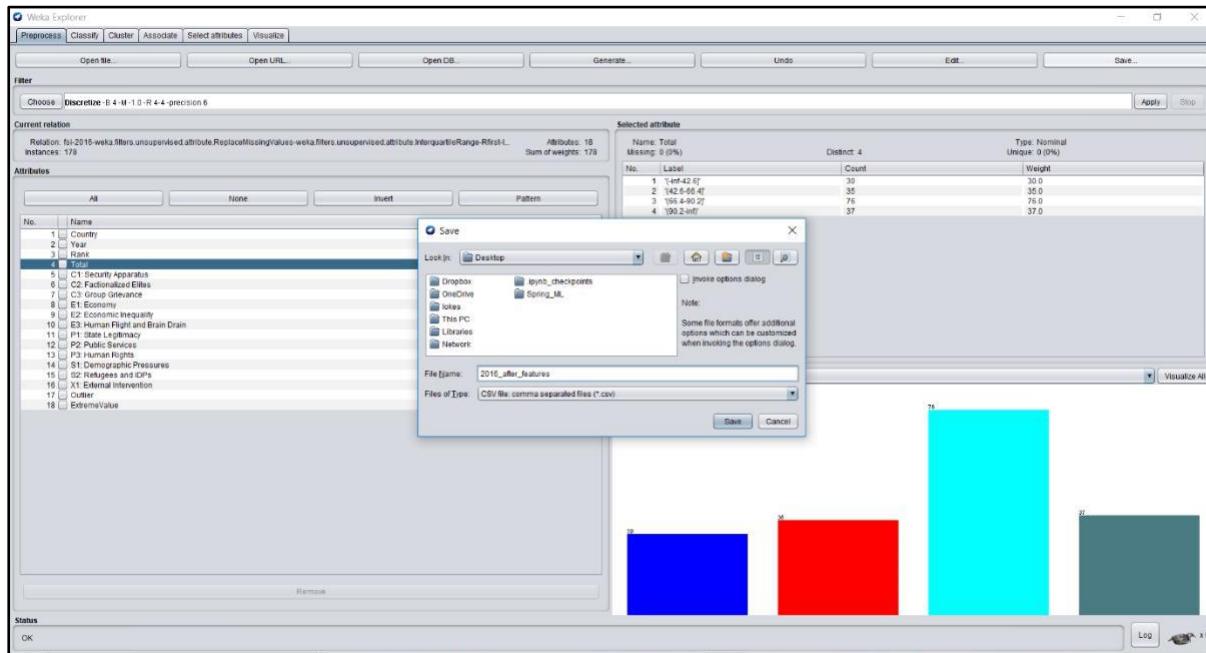
Filter used - Discretize



ITCS 6162 KNOWLEDGE DISCOVERY IN DATABASES (KDD)



Saving this file in csv format



DATA CLASSIFICATION

For Classification, we have used the following classifiers. Each classifier is made to run for the dataset from the year 2014 to 2016.

Also, we have calculated the accuracy for each classifier for the datasets before adding the extra-features and after adding the extra-features to compare the efficiency of both types of datasets.

The different classifiers are as follows

- BayesNet
- Naïve Bayes
- J48

BayesNet

Bayes Network uses different search algorithms and metrics of performance. The Base Class for a Bayes Network Classifier includes popular Bayes Network algorithms such as K2 and B data structures and facilities.

Naïve Bayes

Class for a Naive Bayes classifier uses estimator classes. Numeric estimator precision values are chosen based on an analysis of the training data. The Naïve

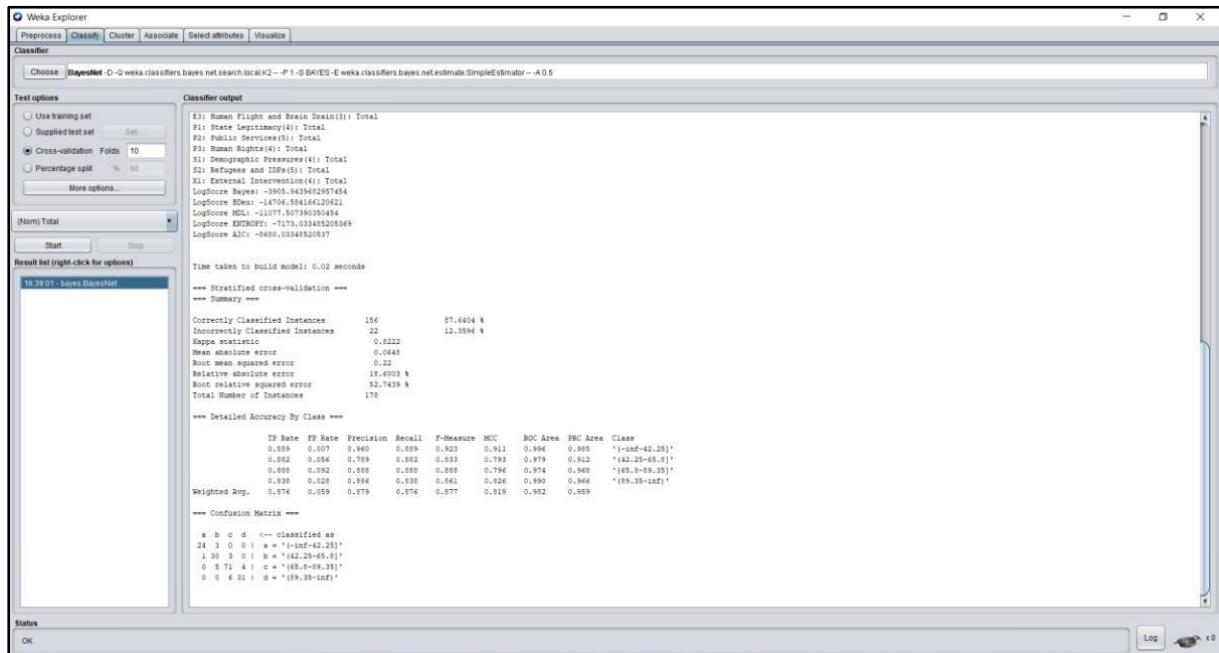
Bayes Updateable classifier will use a default precision of 0.1 for numeric attributes when built, Classifier is called with zero training instances.

J48

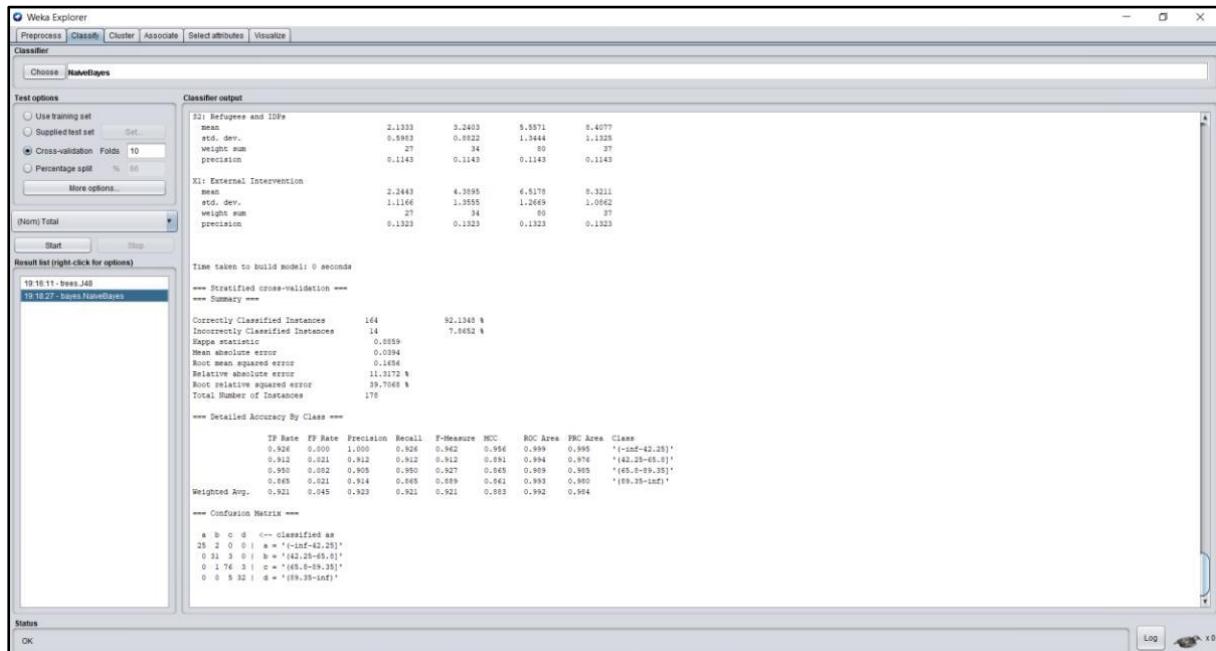
The C4.5 algorithm for building decision trees is implemented in Weka as a classifier called J48. Class for generating a pruned or unpruned C4.5 decision tree

CLASSIFICATION – 2014 BEFORE ADDING EXTRA FEATURES

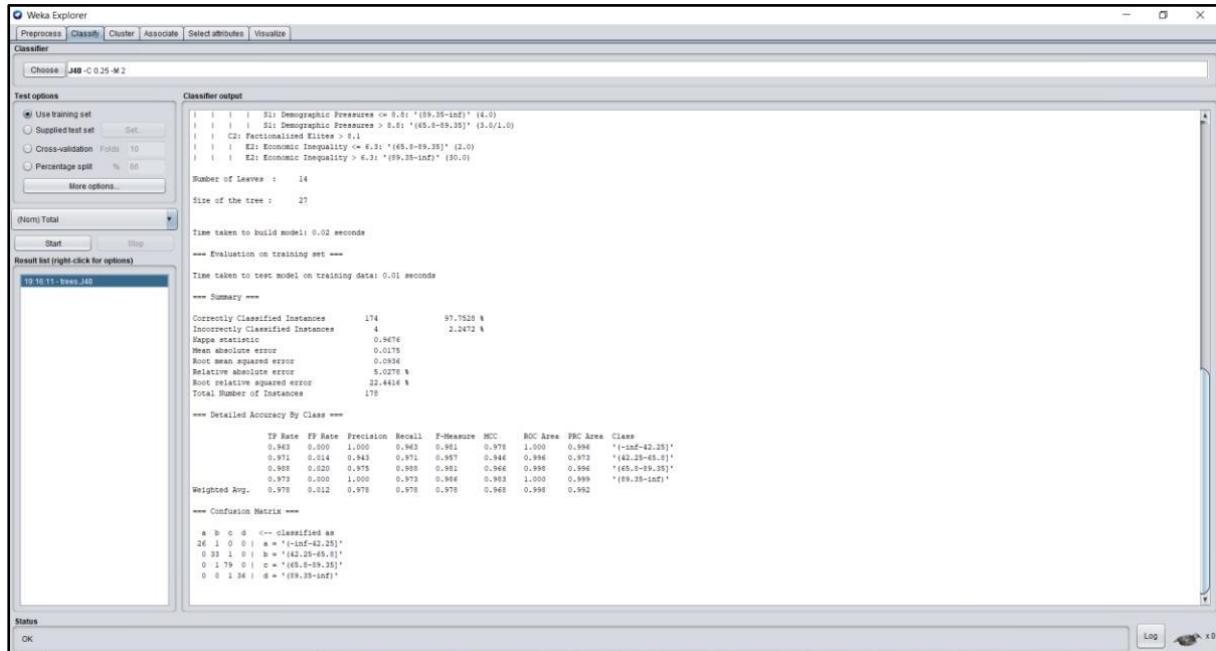
BAYESNET



NAÏVE BAYES

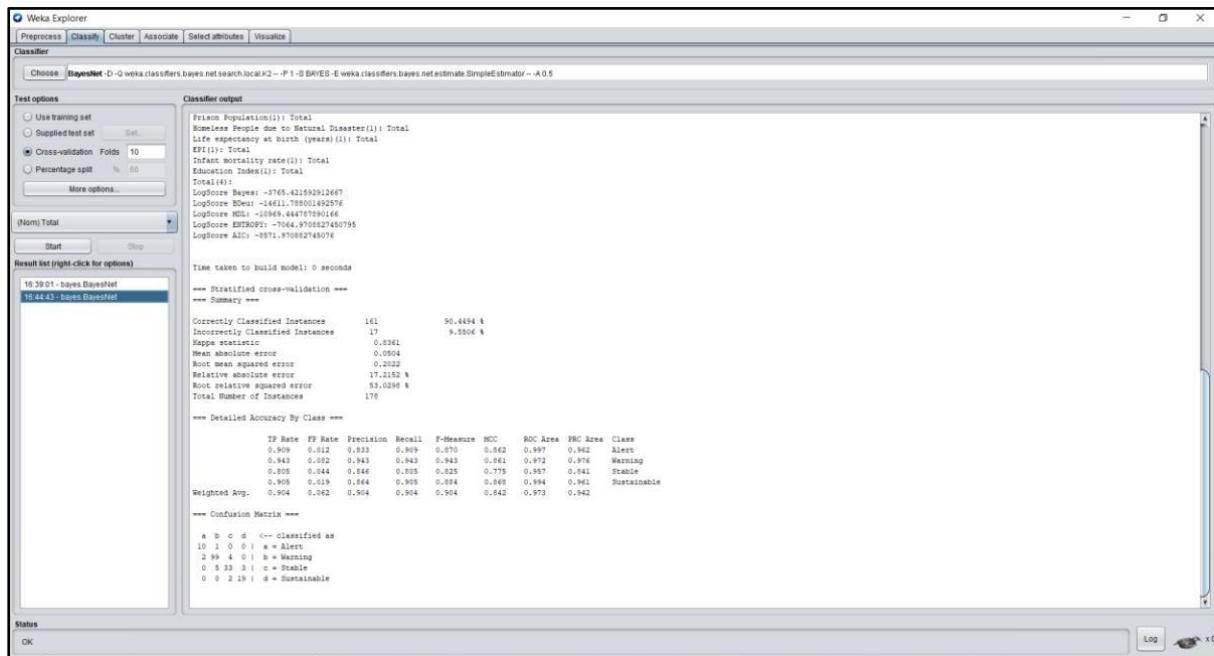


J48

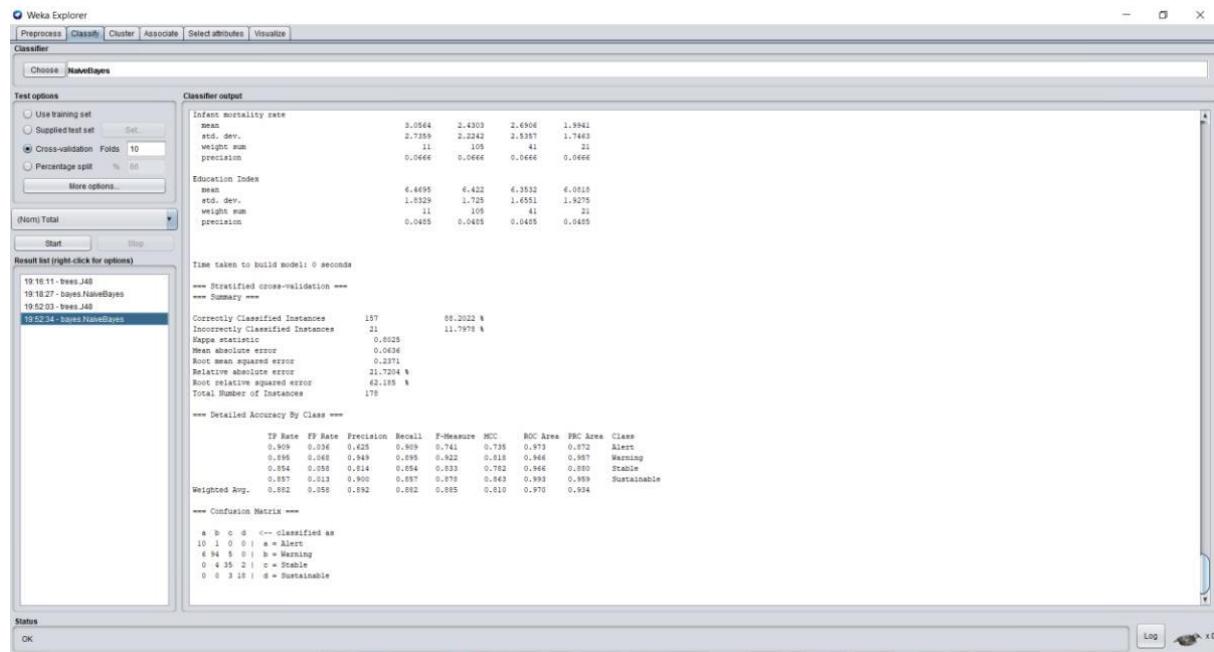


CLASSIFICATION 2014 – AFTER ADDING EXTRA FEATURES

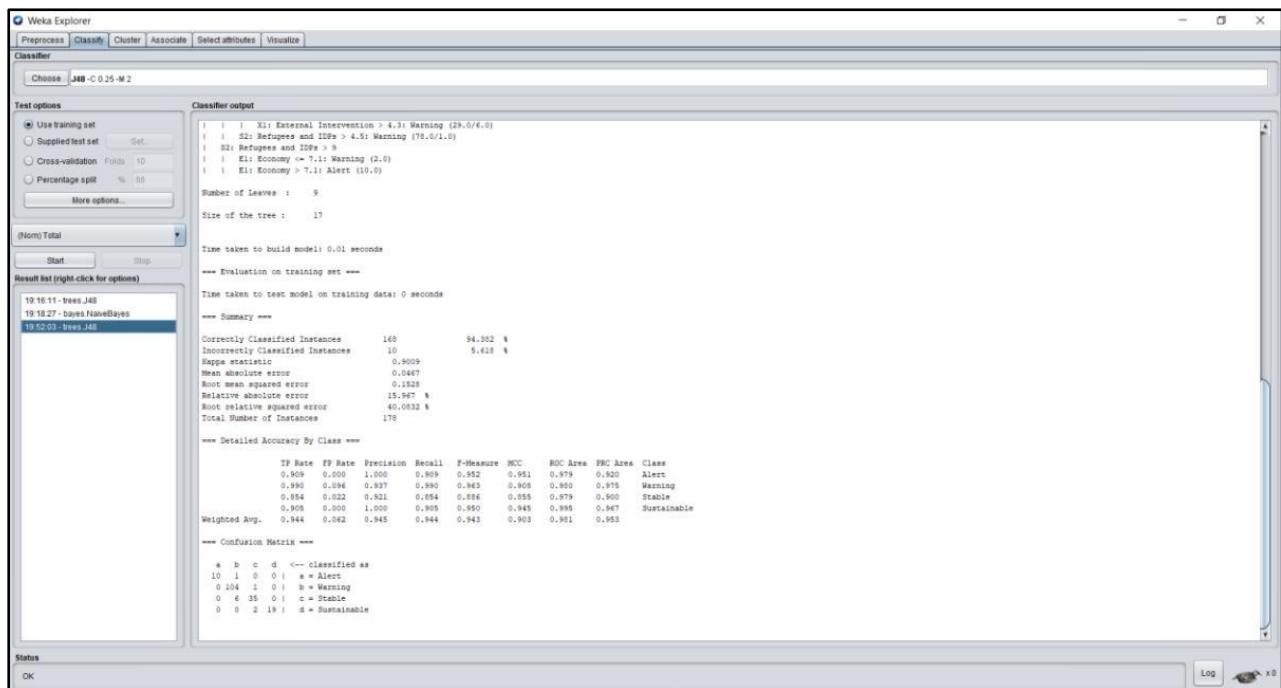
BAYESNET



NAÏVE BAYES

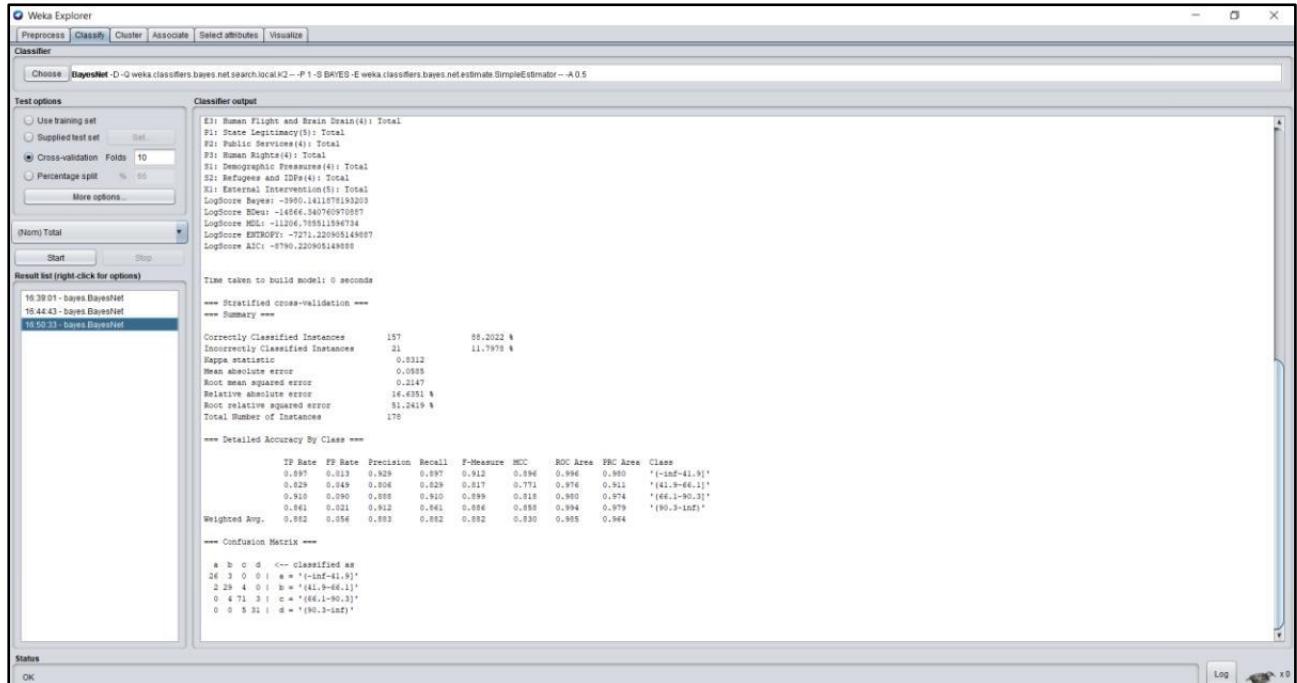


J48

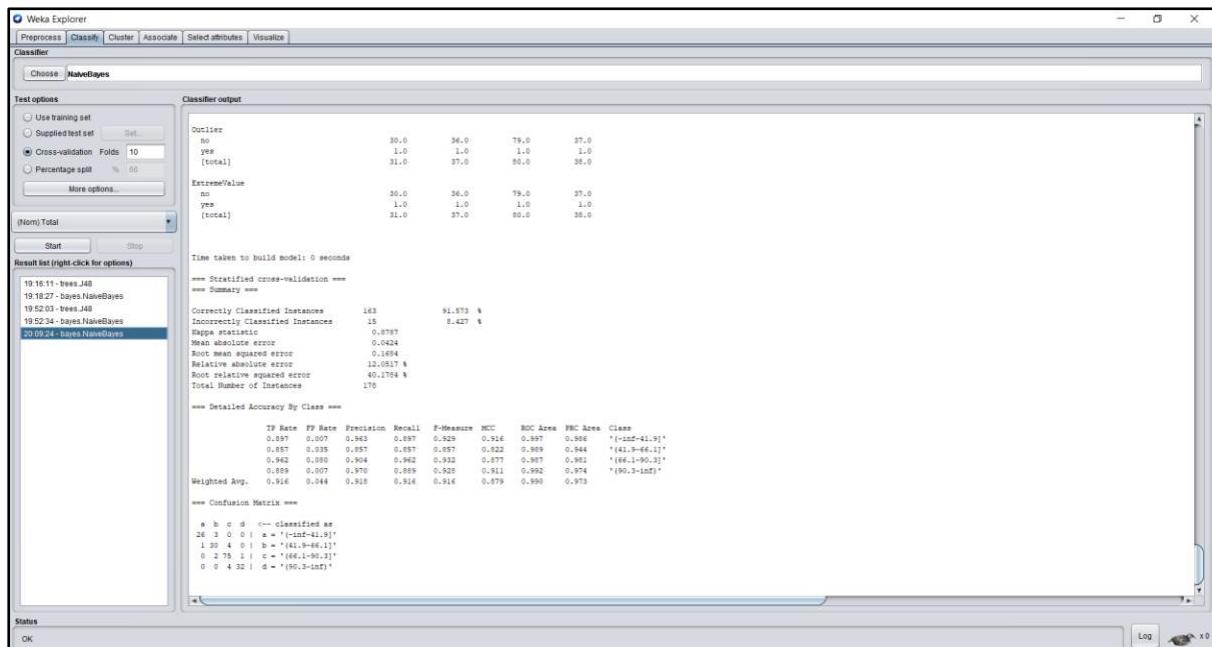


CLASSIFICATION 2015 – BEFORE ADDING EXTRA FEATURES

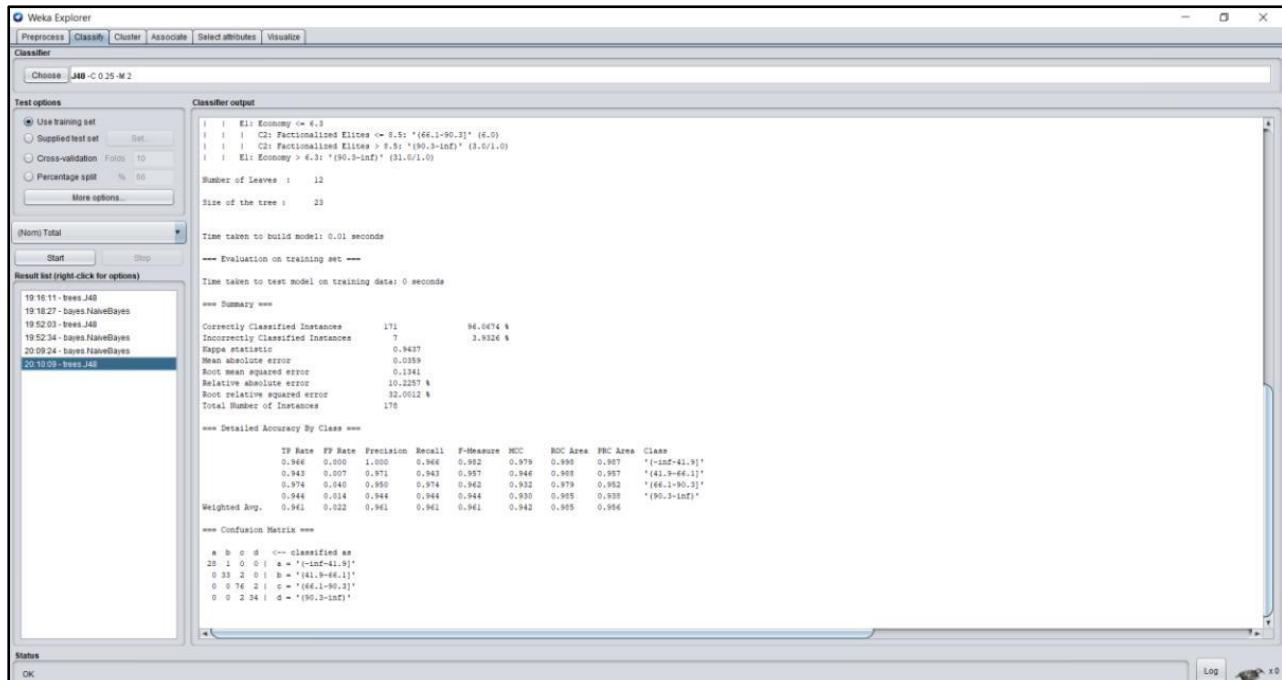
BAYESNET



NAÏVE BAYES

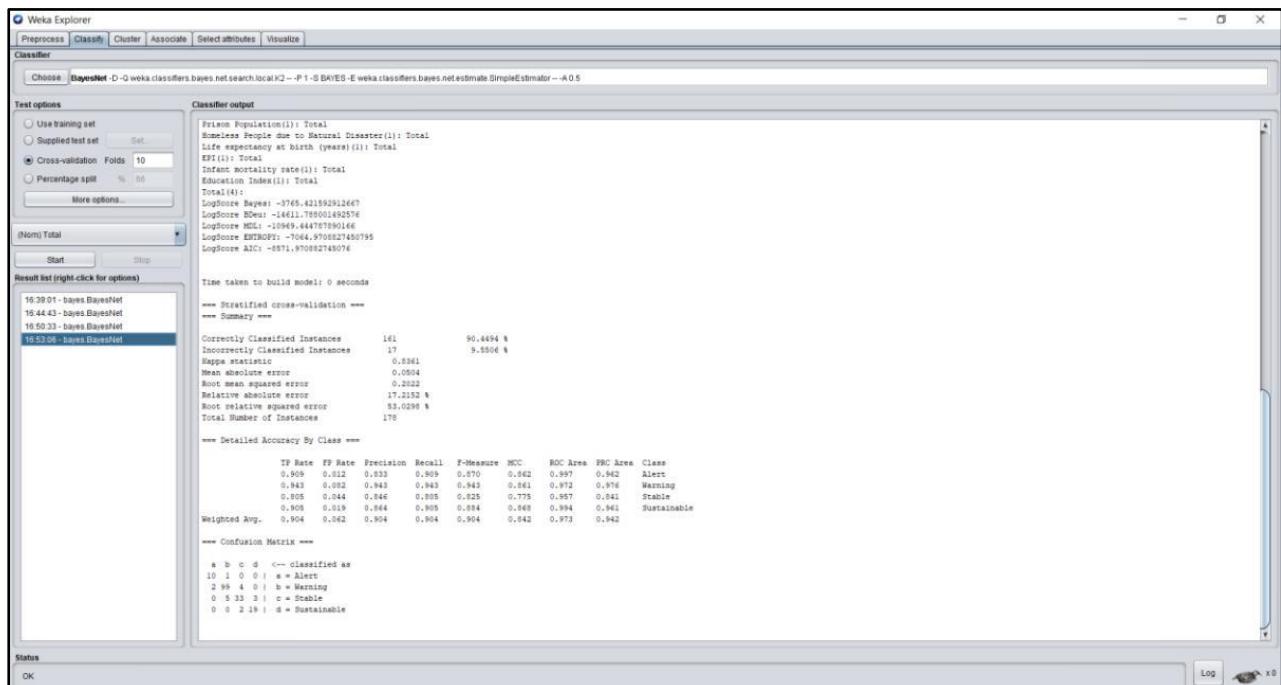


J48

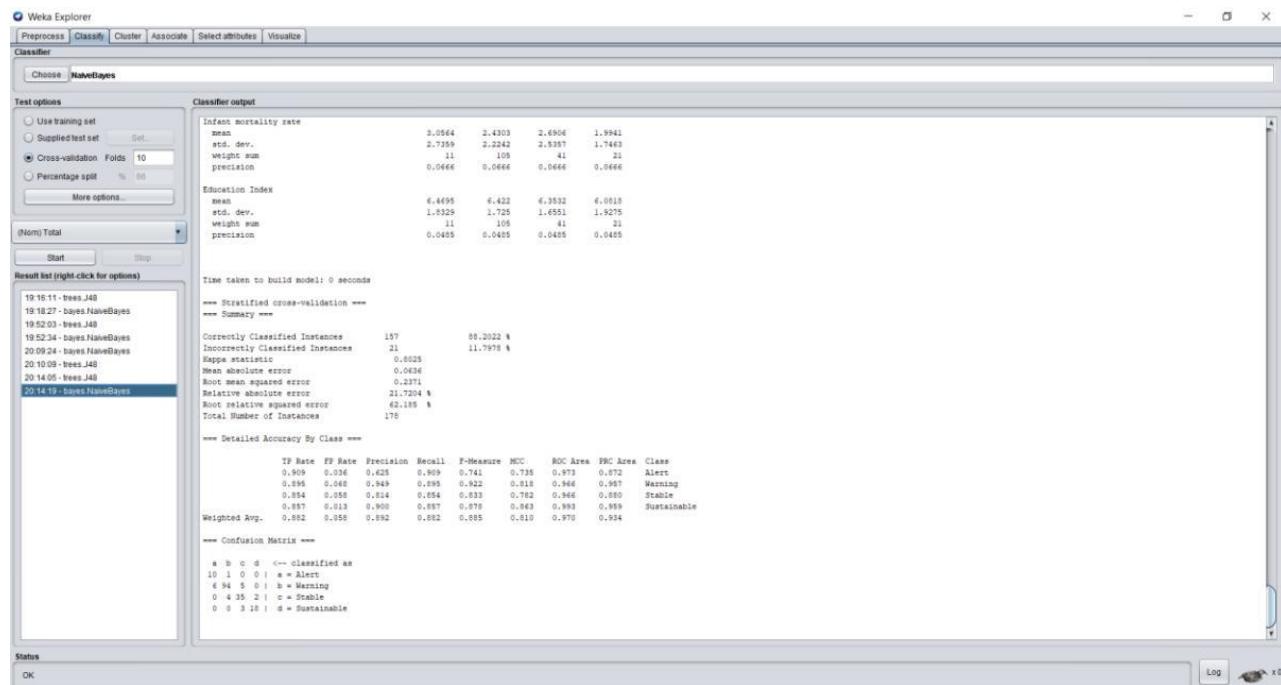


CLASSIFICATION 2015 – AFTER ADDING EXTRA FEATURES

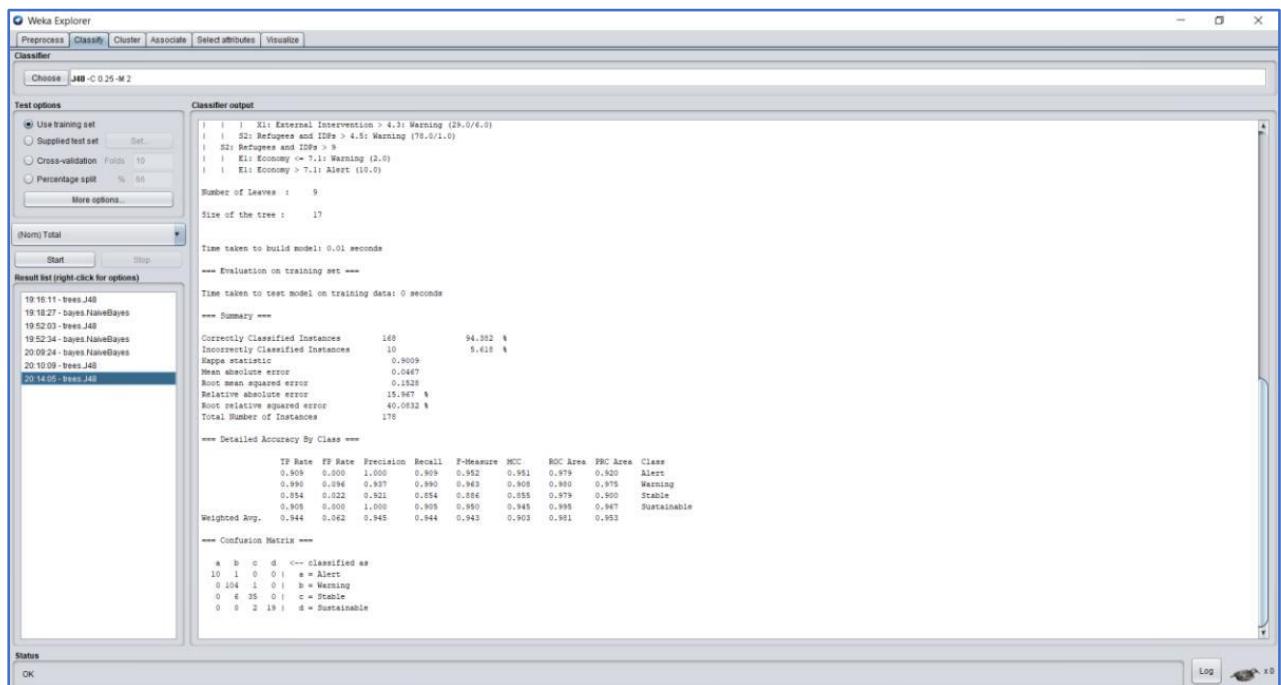
BAYESNET



NAÏVE BAYES

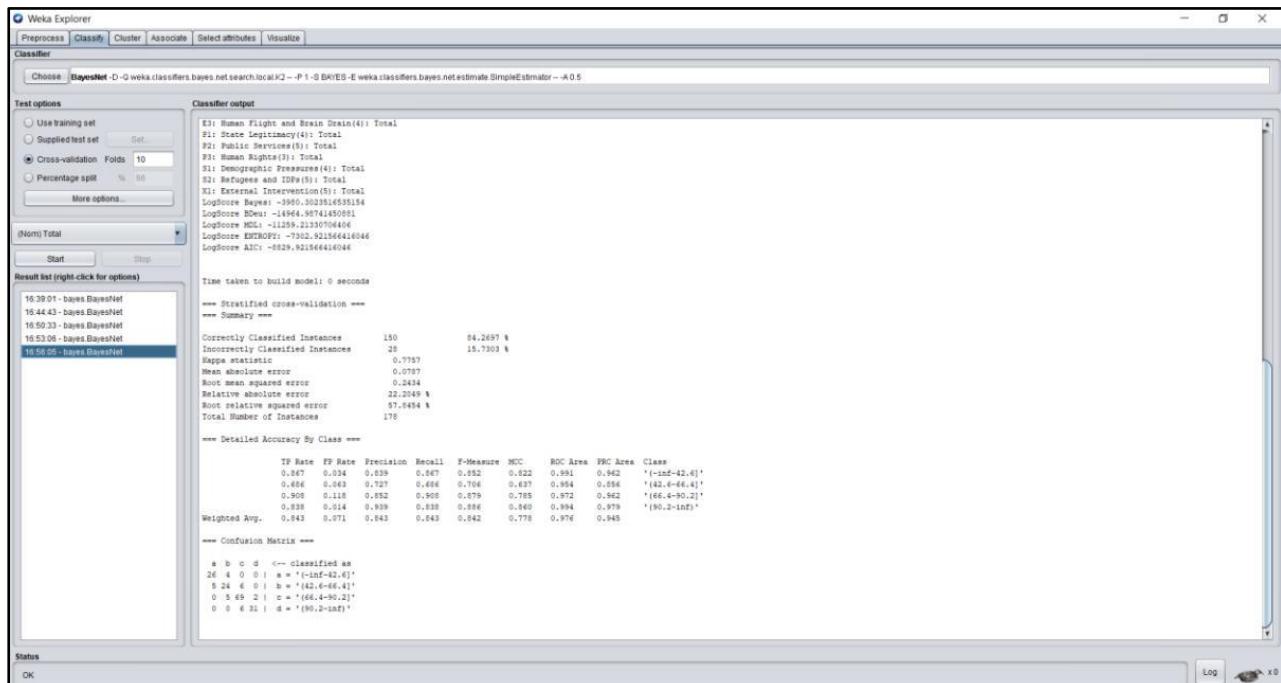


J48



CLASSIFICATION 2016 – BEFORE ADDING EXTRA FEATURES

BAYESNET



NAÏVE BAYES

The screenshot shows the Weka Explorer interface with the Naïve Bayes classifier selected. The 'Classifier output' pane displays the following results:

```

Test options:
  Cross-validation Folds 10
  Percentage split % 66

Result list (right-click for options)
  19.16.11 - trees_J48
  19.16.27 - bayes.NaiveBayes
  19.52.24 - bayes.NaiveBayes
  20.09.24 - bayes.NaiveBayes
  20.10.09 - trees_J48
  20.14.05 - trees_J48
  20.14.19 - bayes.NaiveBayes
  20.34.47 - bayes.NaiveBayes

Classifier output:
  Outlier
    no      31.0   36.0   77.0   38.0
    yes     1.0    1.0    1.0    1.0
    [Total] 32.0   37.0   78.0   39.0

  ExtremeValue
    no      31.0   36.0   77.0   38.0
    yes     1.0    1.0    1.0    1.0
    [Total] 32.0   37.0   78.0   39.0

  (Nom) Total

Time taken to build model: 0 seconds

  === Stratified cross-validation ===
  === Summary ===
  Correctly Classified Instances 143      91.872 %
  Incorrectly Classified Instances 15       8.127 %
  Kappa statistic               0.0798
  Mean absolute error           0.0505
  Root mean squared error      0.1284
  Relative absolute error       44.887 %
  Root relative squared error  43.5567 %
  Total Number of Instances    158

  === Detailed Accuracy By Class ===

    TP Rate FP Rate Precision Recall F-Measure MCC ROC Area FPR Area Class
    0.933 0.000 1.000 0.933 0.946 0.998 0.992 '(<=42.4)'
    0.896 0.028 0.986 0.896 0.896 0.958 0.997 0.936 '(42.4-64.4)'
    0.947 0.088 0.989 0.947 0.917 0.893 0.994 0.976 '(64.4-90.2)'
    0.868 0.014 0.941 0.865 0.901 0.979 0.993 0.976 '(90.2->Inf)'

  Weighted Avg.

  === Confusion Matrix ===

    a b c d  -- classified as
    20 2 0 0 | a = '<=42.4'
    0 31 4 0 | b = '(42.4-64.4)'
    0 2 72 2 | c = '(64.4-90.2)'
    0 0 5 32 | d = '(90.2->Inf)'

  Status: OK
  Log: x0

```

J48

The screenshot shows the Weka Explorer interface with the J48 classifier selected. The 'Classifier output' pane displays the following results:

```

Test options:
  Cross-validation Folds 10
  Percentage split % 66

Result list (right-click for options)
  19.16.11 - trees_J48
  19.16.27 - bayes.NaiveBayes
  19.52.24 - bayes.NaiveBayes
  20.09.24 - bayes.NaiveBayes
  20.10.09 - trees_J48
  20.14.05 - trees_J48
  20.14.19 - bayes.NaiveBayes
  20.34.47 - bayes.NaiveBayes
  20.35.00 - trees_J48

Classifier output:
  Number of Leaves : 15
  Size of the tree : 29

Time taken to build model: 0 seconds

  === Evaluation on training set ===

Time taken to test model on training data: 0 seconds

  === Summary ===
  Correctly Classified Instances 174      97.752 %
  Incorrectly Classified Instances 4       2.2472 %
  Kappa statistic               0.9462
  Mean absolute error           0.0194
  Root mean squared error      0.0991
  Relative absolute error       5.5476 %
  Root relative squared error  23.5686 %
  Total Number of Instances    178

  === Detailed Accuracy By Class ===

    TP Rate FP Rate Precision Recall F-Measure MCC ROC Area FPR Area Class
    1.000 0.000 1.000 1.000 1.000 1.000 1.000 1.000 1.000 '(<=42.4)'
    0.971 0.014 0.944 0.971 0.956 0.947 0.997 0.978 '(42.4-64.4)'
    0.974 0.020 0.974 0.974 0.974 0.954 0.994 0.985 '(64.4-90.2)'
    0.973 0.000 1.000 0.973 0.956 0.983 0.995 0.984 '(90.2->Inf)'

  Weighted Avg.

  === Confusion Matrix ===

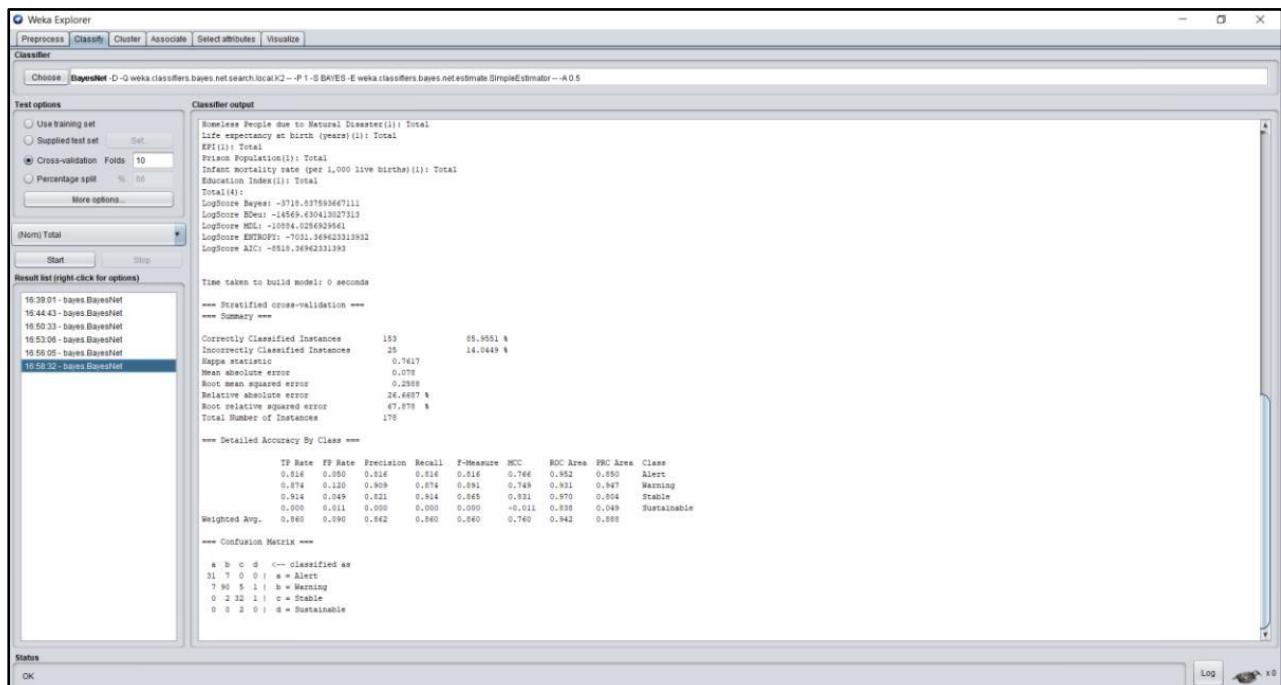
    a b c d  -- classified as
    20 2 0 0 | a = '<=42.4'
    0 34 4 0 | b = '(42.4-64.4)'
    0 2 74 2 | c = '(64.4-90.2)'
    0 0 1 36 | d = '(90.2->Inf)'

  Status: OK
  Log: x0

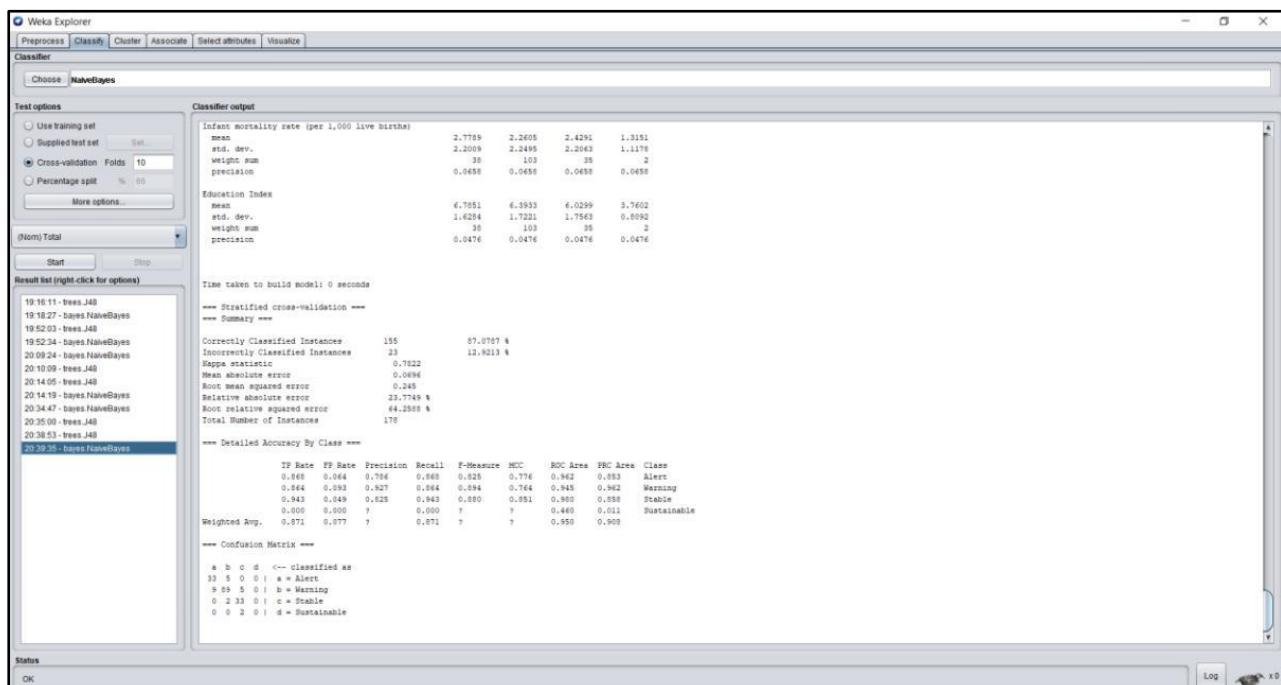
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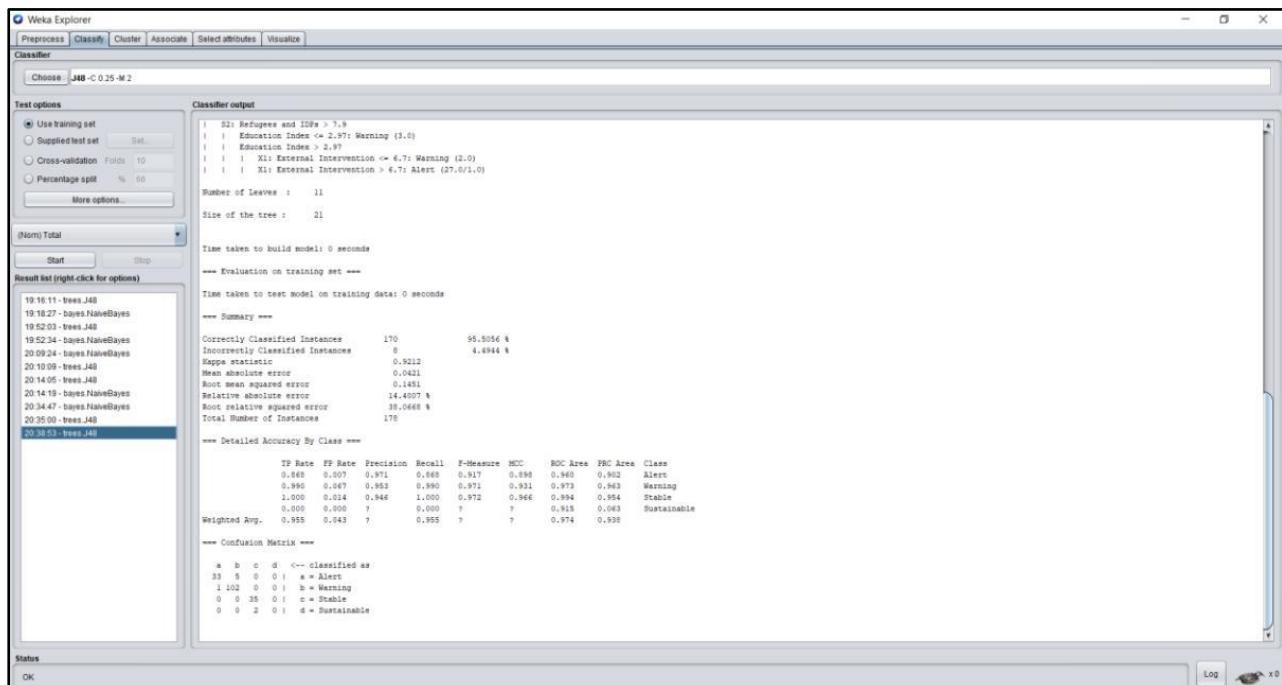
CLASSIFICATION 2016 – AFTER ADDING EXTRA FEATURES

BAYESNET



NAÏVE BAYES



J48

CREATING ACTION RULES USING LISP MINER

The attributes are classified into three categories. They are as follows.

- Stable
- Flexible
- Decision

The stable attributes are as follows.

- Country
- Rank

The flexible attributes are as follows.

- Homeless people due to natural disaster
- Public services
- Refugees and IDPs
- External intervention
- Prison Population

ITCS 6162 KNOWLEDGE DISCOVERY IN DATABASES (KDD)

The decision attributes are as follows.

- Alert
- Warning
- Stable
- Sustainable

Antecedent stable part - All the stable attributes are assigned to this set.

Antecedent variable part - All the flexible attributes are assigned to this set.

Succedent variable part – All the decision attributes are assigned to this set.

Attribute type - nominal

Coefficient type - one category

The Quantifiers are as follows

- a(BASE)Before - 5
- a(BASE)After - 5

Stable attributes

Attribute	Used DBColumn	Categories XCat	Sample categories
d_Country (01)	d_Country	178	Afghanistan, Albania, Algeria, Angola, Antigua and Barbuda, Argentina, Ar... 100th, 101st, 102nd, 103rd, 104th, 106th, 107th, 108th, 109th, 10th...
Rank_(01)	Rank_	164	

Flexible attributes

LM 2014_after_features MB - LISp-Miner Workspace module - 27.18.03

File Data Introduction Preprocessing Interactive Analysis Data-mining Tasks Domain Knowledge Window Help

Tab Tree Hide

A. Data Introduction
Tables
B. Data Preprocessing
Attributes
Total (01)
C. Interactive Analysis
D. Data-mining Tasks
Overview
E. Domain knowledge
W. Workspace

Tables Attributes Tasks Overview Total (01)

Matrix: x_2014_after_features

Groups of attributes tree	Attribute	Used	DBColumn	Categories	XCat	Sample categories
Root group of attributes						
decision	Homeless_People_due_to_Natural_Disaster	4	P1_Homeless_People	4	<3,47;5,47>, <5,47;7,47>, <7,47;9,47>, <9,47;11,47>	
flexible	P2_Public_Services	4	P2_Public_Services	4	<3,47;5,47>, <5,47;7,47>, <7,47;9,47>, <9,47;11,47>	
Stable	Prison_Population	4	P3_Prison_Population	4	<3,47;5,47>, <5,47;7,47>, <7,47;9,47>, <9,47;11,47>	
	S2_Refugees_and_IDPs	4	P4_Refugees_and_IDPs	4	<3,47;5,47>, <5,47;7,47>, <7,47;9,47>, <9,47;11,47>	
	X1_External_Intervention	4	X1_External_Intervene	4	<3,47;5,47>, <5,47;7,47>, <7,47;9,47>, <9,47;11,47>	

Show Attribute Show Matrix Add attribute Del Attribute Clone
Export Group detail Quick Assign Add group Del group

Decision attributes

LM 2014_after_features MB - LISp-Miner Workspace module - 27.18.03

File Data Introduction Preprocessing Interactive Analysis Data-mining Tasks Domain Knowledge Window Help

Tab Tree Hide

A. Data Introduction
Tables
B. Data Preprocessing
Attributes
Total (01)
C. Interactive Analysis
D. Data-mining Tasks
Overview
action rules
Task Results
Task Settings
Hypothesis (2)
E. Domain knowledge
W. Workspace

Tables Attributes Tasks Overview action rules action rules Hypothesis (2) Total (01)

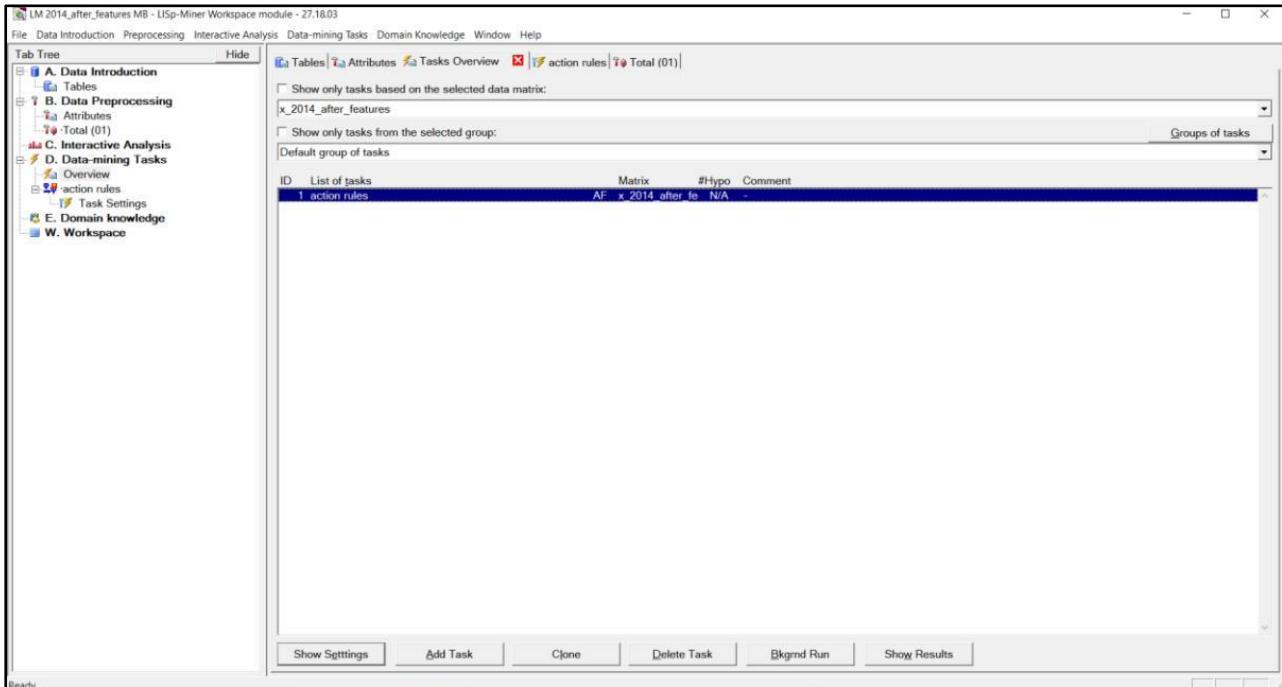
Matrix: x_2014_after_features

Groups of attributes tree	Attribute	Used	DBColumn	Categories	XCat	Sample categories
Root group of attributes	Total (01)	+	Total	4		Alert, Stable, Sustainable, Warning
decision						
flexible						
Stable						

Show Attribute Show Matrix Add attribute Del Attribute Clone
Export Group detail Quick Assign Add group Del group

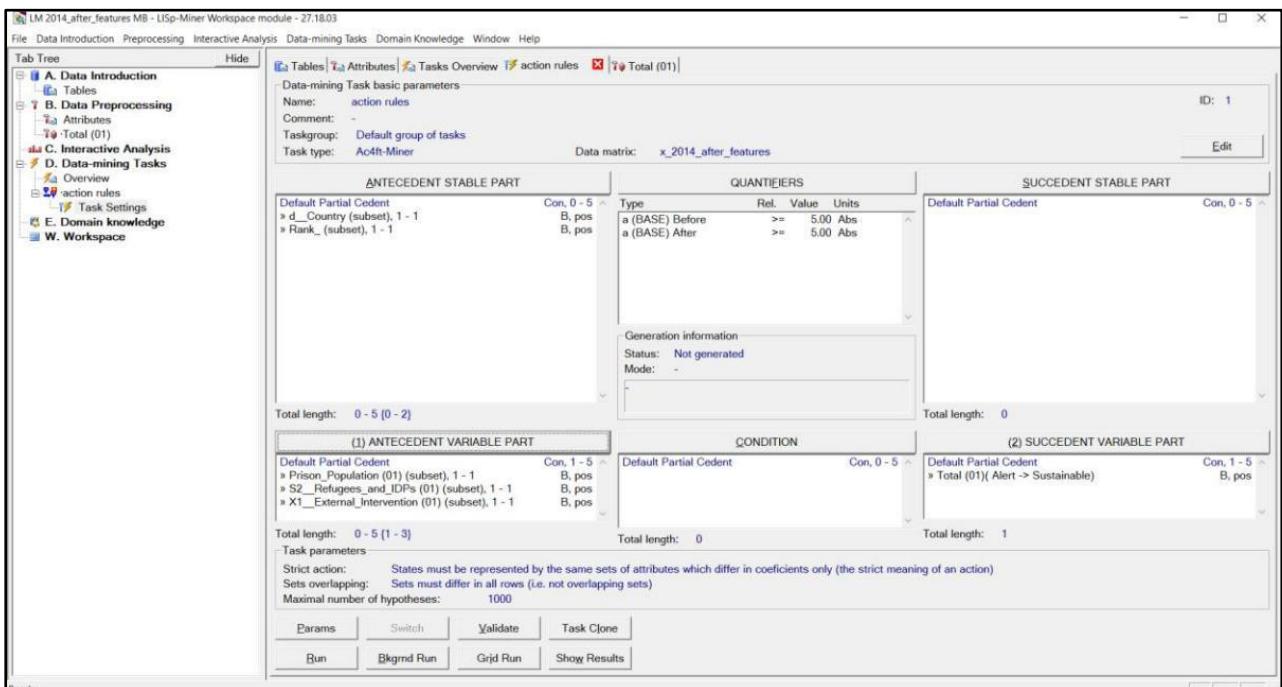
ITCS 6162 KNOWLEDGE DISCOVERY IN DATABASES (KDD)

Action Rule



ACTION RULES FOR 2014

Alert to Sustainable



The screenshot shows the LISp-Miner workspace interface. The top menu bar includes File, Data Introduction, Preprocessing, Interactive Analysis, Data-mining Tasks, Domain Knowledge, Window, and Help. The main window has a Tab Tree on the left with sections A. Data Introduction, B. Data Preprocessing, C. Interactive Analysis, D. Data-mining Tasks, E. Domain knowledge, and W. Workspace. The central area displays a list of hypotheses under the 'action rules' tab. The first hypothesis is highlighted:

```

Nr. Id Df-Conf B-Conf A-Conf Hypothesis
1 1 -0.051 0.078 0.129 (empty) : (Prison_Population (01)(<7.47;9.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Sustainable))
2 2 -0.080 0.078 0.158 (empty) : (Prison_Population (01)(<7.47;9.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Sustainable))

```

Below the list are buttons for Detail, Goto ID, Copy, Remove, Filter, Sorting, and Export.

Rule

Antecedent:	(Prison_Population (01)(<7.47;9.47)) \rightarrow Prison_Population (01)(<3.47;5.47))
Succedent:	(Total (01)(Alert) \rightarrow Total (01)(Sustainable))
State before:	Prison_Population (01)(<7.47;9.47)) $>\div<$ Total (01)(Alert)
State after:	Prison_Population (01)(<3.47;5.47)) $>\div<$ Total (01)(Sustainable)
Condition:	(empty)

Text

The screenshot shows the LISp-Miner workspace interface. The top menu bar includes File, Data Introduction, Preprocessing, Interactive Analysis, Data-mining Tasks, Domain Knowledge, Window, and Help. The main window has a Tab Tree on the left with sections A. Data Introduction, B. Data Preprocessing, C. Interactive Analysis, D. Data-mining Tasks, E. Domain knowledge, and W. Workspace. The central area displays a detailed view of a hypothesis under the 'Hypothesis (2)' tab. The hypothesis details are as follows:

Hypothesis ID: 2

Antecedent	(empty)	
Variable antecedent Before	Prison_Population (01)	<7.47;9.47)
Variable antecedent After	Prison_Population (01)	<3.47;5.47)
Succedent	(empty)	
Variable succedent Before	Total (01)	Alert
Variable succedent After	Total (01)	Sustainable

Quantifiers values:

a-frequency	6	6	a-frequency (BASE) from source contingency table
a-frequency	6	6	a-frequency (BASE) from source contingency table

Various interest measures from the four-fold tables:

D%_Sum	0.44	0.44	Sum of differences of relative frequencies between state before and after
DF-Conf	-0.08	-0.0799726589	Difference of values of Confidence
DF-AFUI	-0.04	-0.0400368155	Difference of values of D-Confidence
DF-FUE	-0.16	-0.1629213483	Difference of values of E-Confidence
DF-Avg	-0.08	-0.0774249874	Difference of values of Average Difference
R-Conf	0.49	0.4935064935	Ratio of values of Confidence
R-DFUI	0.65	0.6463414634	Ratio of values of D-Confidence
R-FUE	0.78	0.7786259542	Ratio of values of E-Confidence
R-Avg	0.77	0.7711662075	Ratio of values of Average Difference
H-Conf	2.03	2.0263157895	Higher of ratios of values of Confidence
H-DFUI	1.55	1.5471698113	Higher of ratios of values of D-Confidence
H-FUE	1.28	1.2843137255	Higher of ratios of values of E-Confidence

At the bottom are buttons for Export.

ITCS 6162 KNOWLEDGE DISCOVERY IN DATABASES (KDD)

ITCS 6162 KNOWLEDGE DISCOVERY IN DATABASES (KDD)

Data

LM 2014_after_features MB - LISp-Miner Workspace module - 27.18.03

File Data Introduction Preprocessing Interactive Analysis Data-mining Tasks Domain Knowledge Window Help

Tab Tree Hide

- A. Data Introduction
- B. Data Preprocessing
- C. Interactive Analysis
- D. Data-mining Tasks
- E. Domain knowledge
- W. Workspace

Antecedent: (Prison_Population (01)<47.947)) -> Prison_Population (01)<3.47;5.47))

Succedent: (Total (01)Alert) -> Total (01)Sustainable)

State before: Prison_Population (01)<47.947)) >< Total (01)Alert)

State after: Prison_Population (01)<3.47;5.47)) >< Total (01)Sustainable)

Condition: (empty)

#	A	b	a	S	b	a	Prison_Population (01)<47.947))	Prison_Population (01)<3.47;5.47))	Total (01)
1	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Alert
2	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Alert
3	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Alert
4	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Alert
5	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Alert
6	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Alert
7	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Alert
8	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Alert
9	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Alert
10	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Alert
11	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Alert
12	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
13	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
14	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
15	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
16	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
17	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
18	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
19	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
20	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
21	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
22	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
23	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
24	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
25	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
26	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
27	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
28	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
29	1	1	1	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning
nn	n	n	n	<47.947)	<47.947)	<47.947)	<47.947)	<47.947)	Warning

Export

Ready

State Before

LM 2014_after_features MB - LISp-Miner Workspace module - 27.18.03

File Data Introduction Preprocessing Interactive Analysis Data-mining Tasks Domain Knowledge Window Help

Tab Tree Hide

- A. Data Introduction
- B. Data Preprocessing
- C. Interactive Analysis
- D. Data-mining Tasks
- E. Domain knowledge
- W. Workspace

Antecedent: (Prison_Population (01)<47.947)) -> Prison_Population (01)<3.47;5.47))

Succedent: (Total (01)Alert) -> Total (01)Sustainable)

State before: Prison_Population (01)<47.947)) >< Total (01)Alert)

State after: Prison_Population (01)<3.47;5.47)) >< Total (01)Sustainable)

Condition: (empty)

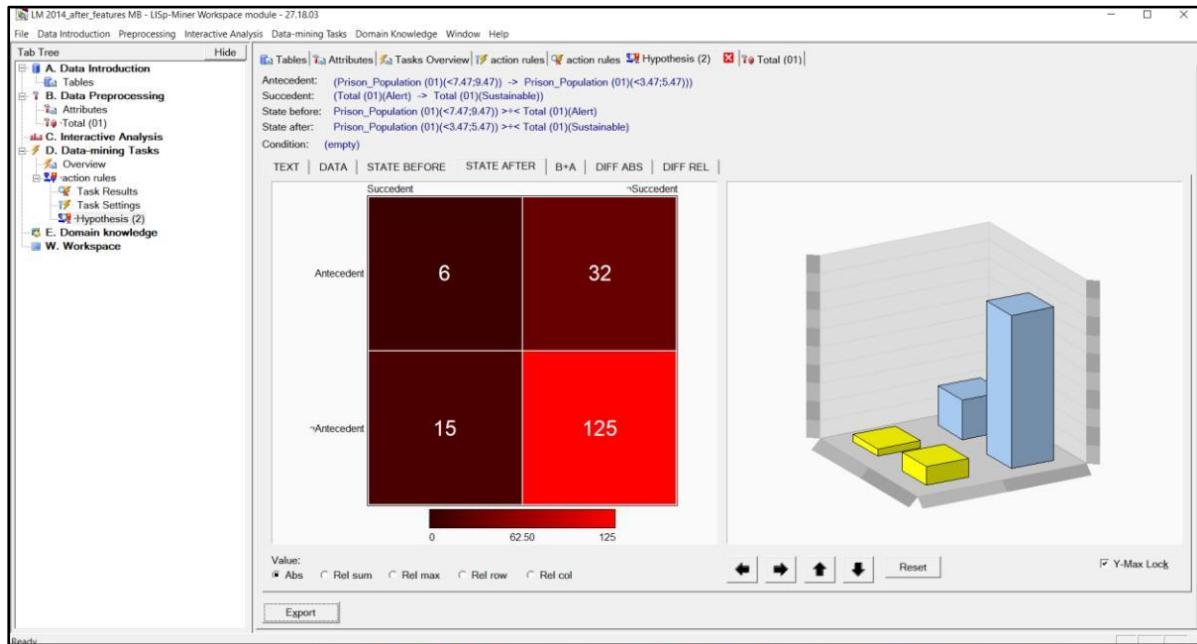
Antecedent		~Antecedent		Succedent		~Succedent	
6	71	5	96	0	62.50	125	

Value: Abs Rel sum Rel max Rel row Rel col

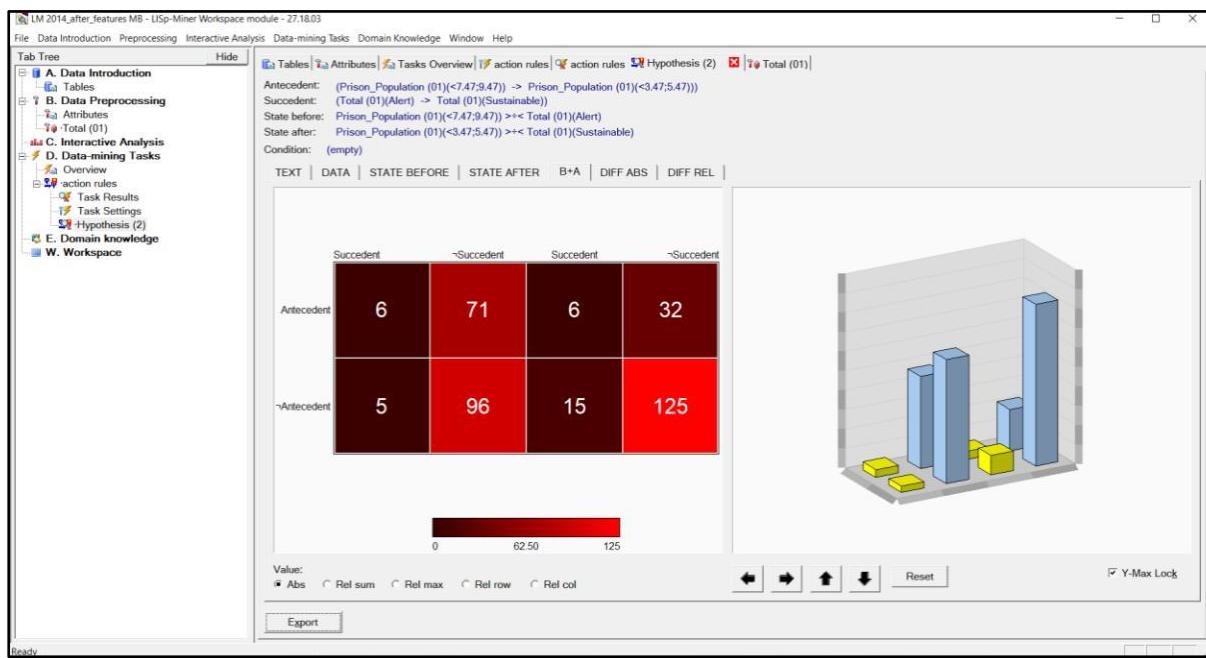
Export

Ready

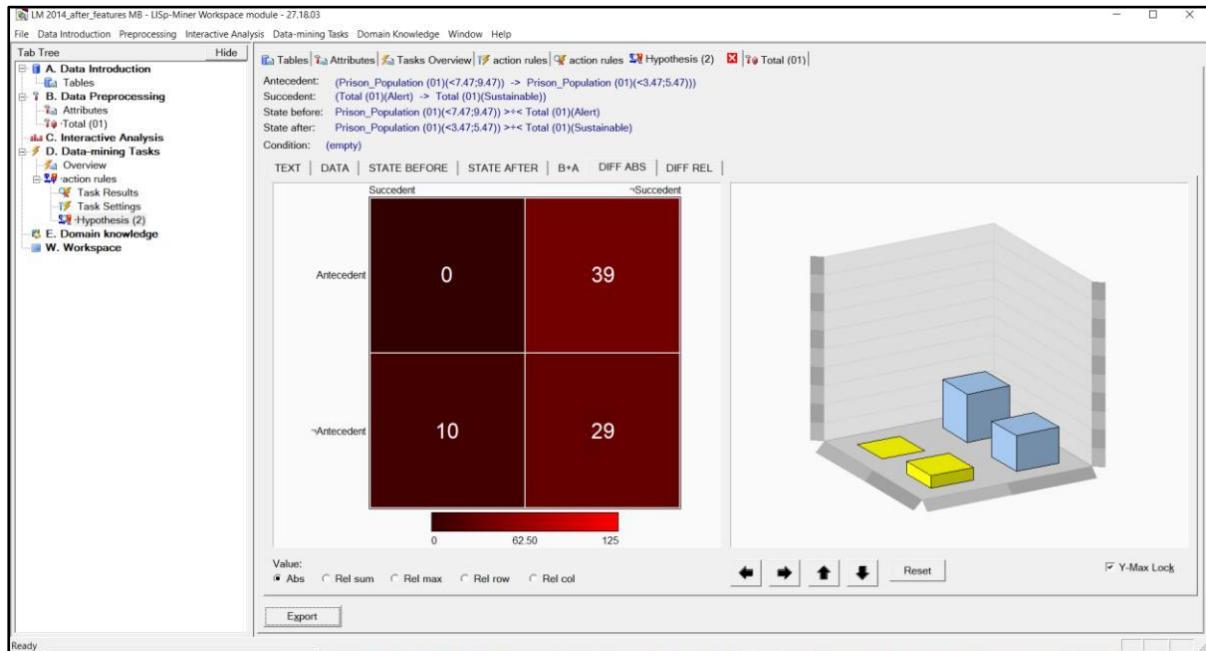
State After



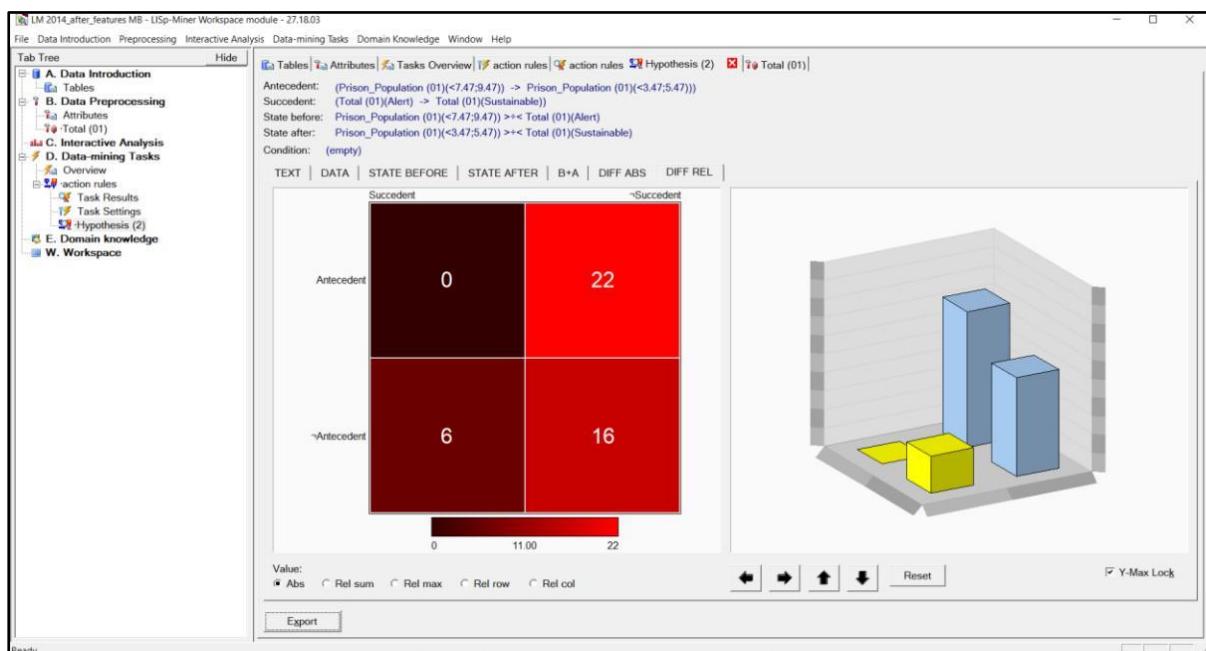
B + A



Diff ABS



Diff REL



Alert to Stable

LM 2014_after_features MB - UoP-Miner Workspace module - 27.18.03

File Data Introduction Preprocessing Interactive Analysis Data-mining Tasks Domain Knowledge Window Help

Tab Tree Hide

- A. Data Introduction
- B. Data Preprocessing
- C. Interactive Analysis
- D. Data-mining Tasks
- E. Domain knowledge
- W. Workspace

Tables Attributes Tasks Overview action rules Total (01)

Name: action rules
Comment: -
Taskgroup: Default group of tasks
Task type: Ac4f-Miner

Data matrix: x_2014_after_features

ANTECEDENT STABLE PART

Total length: 0 - 5 [0 - 2]

QUANTIÉIERS

Type	Rel.	Value	Units
a (BASE) Before	\geq	5.00	Abs
a (BASE) After	\geq	5.00	Abs

SUCCEDENT STABLE PART

Total length: 0

CONDITION

Total length: 0

(2) SUCCEDENT VARIABLE PART

Total length: 1

Generation information

Status: Not generated, 1 run(s)
Mode: -

Params **Switch** **Validate** **Task Clone**
Run **Bkgnd Run** **Grid Run** **Show Results**

LM 2014_after_features MB - UoP-Miner Workspace module - 27.18.03

File Data Introduction Preprocessing Interactive Analysis Data-mining Tasks Domain Knowledge Window Help

Tab Tree Hide

- A. Data Introduction
- B. Data Preprocessing
- C. Interactive Analysis
- D. Data-mining Tasks
- E. Domain knowledge
- W. Workspace

Tables Attributes Tasks Overview action rules Total (01)

Task: action rules
Comment: -
Taskgroup: Default group of tasks
Data matrix: x_2014_after_features
Task type: Ac4f-Miner

Task run:
Start: 15.2019 18:39:13 Total time: 0h 0m 0s
Number of verifications: 200
Number of hypotheses: 7 Mode: Standard

Actual group of hypotheses: All hypotheses
Hypotheses in group: 7 Shown hypotheses: 7 Highlighted: 0

Nr.	ID	Df-Conf	B-Conf	A-Conf	Hypothesis
1	6	0.745	1.000	0.255	(empty) : (S2_Refugees_and_IDPs (01)(≥ 9.47) -> S2_Refugees_and_IDPs (01)(< 5.47)) > \times < (empty) : (Total (01)(Alert) -> Total (01)(Stable))
2	4	0.620	0.750	0.130	(empty) : (X1_External_Intervention (01)(≥ 9.47) -> X1_External_Intervention (01)($< 4.7; 7.47$)) > \times < (empty) : (Total (01)(Alert) -> Total (01)(Stable))
3	7	0.584	1.000	0.412	(empty) : (S2_Refugees_and_IDPs (01)(≥ 9.47) & X1_External_Intervention (01)(> 9.47) -> S2_Refugees_and_IDPs (01)(< 5.47) & X1_External
4	5	0.291	0.750	0.459	(empty) : (X1_External_Intervention (01)(≥ 9.47) -> X1_External_Intervention (01)(< 5.47)) > \times < (empty) : (Total (01)(Alert) -> Total (01)(Stable))
5	3	-0.134	0.147	0.255	(empty) : (S2_Refugees_and_IDPs (01)($< 4.7; 9.47$) -> S2_Refugees_and_IDPs (01)(< 5.47)) > \times < (empty) : (Total (01)(Alert) -> Total (01)(Stable))
6	1	-0.134	0.078	0.210	(Prison_Population (01)($< 4.7; 9.47$)) -> Prison_Population (01)(< 5.47)) > \times < (empty) : (Total (01)(Alert) -> Total (01)(Stable))
7	2	-0.185	0.078	0.263	(empty) : (Prison_Population (01)($< 4.7; 9.47$)) -> Prison_Population (01)(< 5.47)) > \times < (empty) : (Total (01)(Alert) -> Total (01)(Stable))

Delete hypotheses

Detail **Goto ID** **Copy** **Remove** **Filter** **Sorting** **Export**

Rule

Antecedent: $(\text{Prison_Population (01)}(< 7.47; 9.47)) \rightarrow \text{Prison_Population (01)}(< 3.47; 5.47))$
 Succedent: $(\text{Total (01)}(\text{Alert}) \rightarrow \text{Total (01)}(\text{Stable}))$
 State before: $\text{Prison_Population (01)}(< 7.47; 9.47) >\div< \text{Total (01)}(\text{Alert})$
 State after: $\text{Prison_Population (01)}(< 3.47; 5.47) >\div< \text{Total (01)}(\text{Stable})$
 Condition: (empty)

Text

The screenshot shows the USp-Miner workspace interface with the title "LM 2014_after_features MB - USp-Miner Workspace module - 27.18.03". The main area displays a hypothesis table for the variable "Prison_Population (01)". The table includes columns for Antecedent, Succedent, Variable antecedent Before, Variable antecedent After, Variable succedent Before, Variable succedent After, and Total (01). It also lists various quantifiers and interest measures like D-Conf, D-HConf, D-Avg, R-Conf, R-HConf, R-Avg, and R-FUE, along with their descriptions.

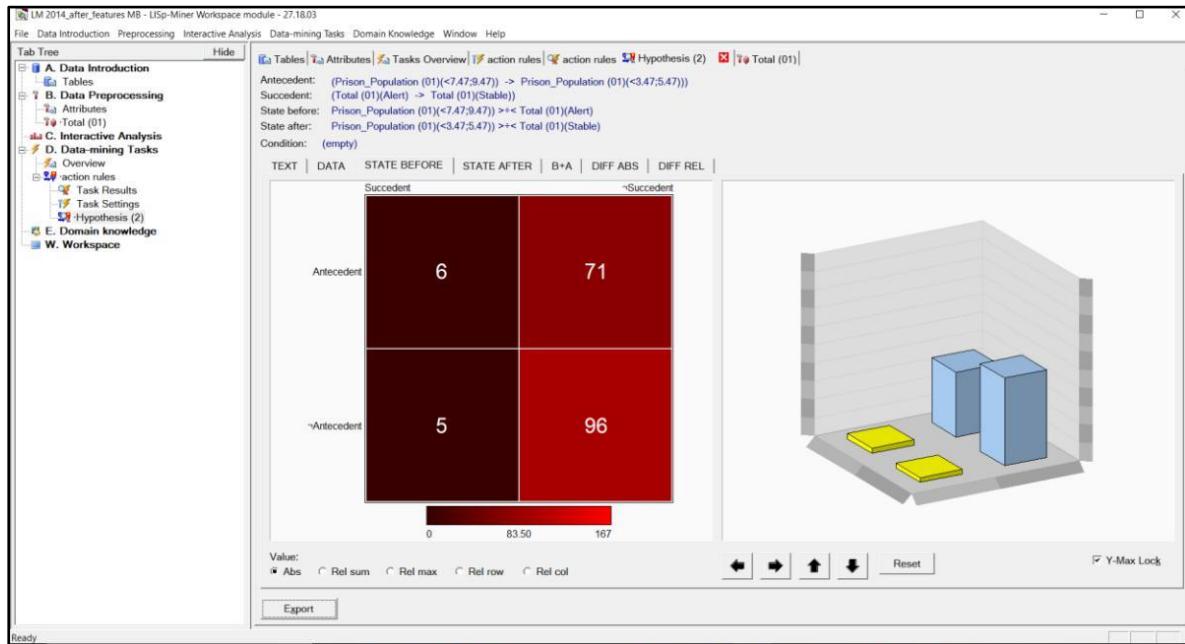
	Antecedent	Succedent	Variable antecedent Before	Variable antecedent After	Variable succedent Before	Variable succedent After	Total (01)
a-frequency	(empty)	(empty)	Prison_Population (01)	Prison_Population (01)	Total (01)	Alert	Stable
a-freqency	6	6	<7.47;9.47)	<3.47;5.47)	Total (01)	Alert	Stable
a-freqency	10	10	<7.47;9.47)	<3.47;5.47)	Total (01)	Alert	Stable

Data

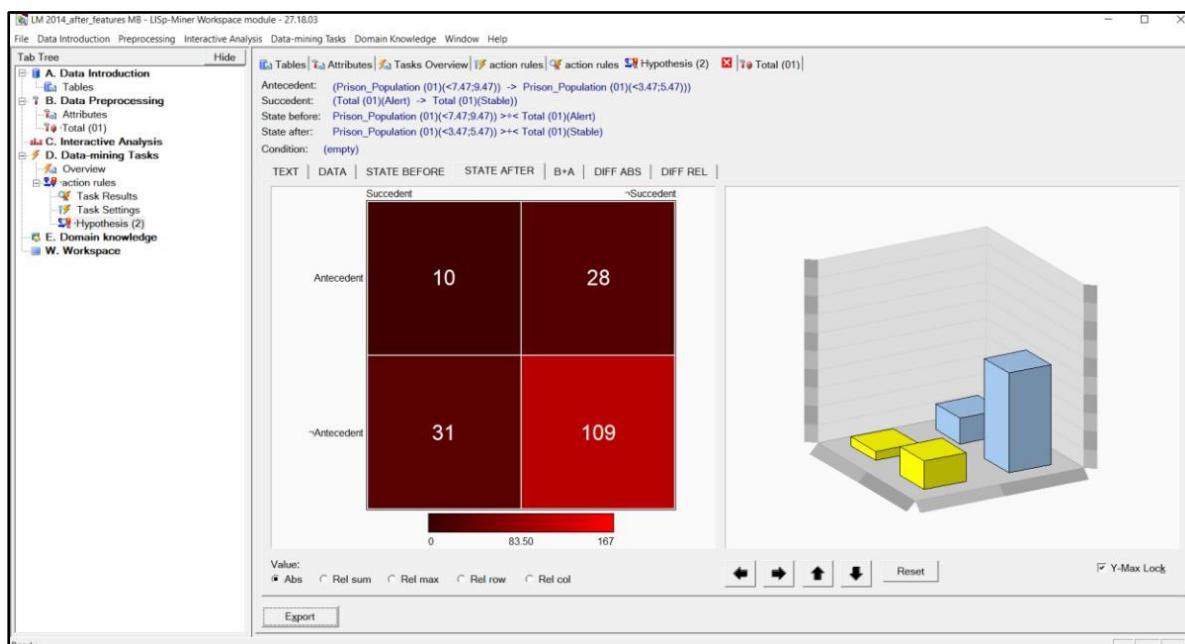
The screenshot shows the USp-Miner workspace interface with the title "LM 2014_after_features MB - USp-Miner Workspace module - 27.18.03". The main area displays a detailed data table for the variable "Prison_Population (01)". The table includes columns for #, A, b, |a|, S, |b|, |a|, Prison_Population (01), and Total (01). The table rows show various combinations of values for A, b, and S, with corresponding values for the population and total counts.

#	A	b	a	S	b	a	Prison_Population (01)	Total (01)
1	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Alert	Alert
2	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Alert	Alert
3	1	1	1	<7.47;9.47)	<3.47;5.47)	1	Alert	Alert
4	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Alert	Alert
5	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Alert	Alert
6	1	1	1	<3.47;5.47)	<3.47;5.47)	1	Alert	Alert
7	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Alert	Alert
8	1	1	1	<3.47;5.47)	<3.47;5.47)	1	Alert	Alert
9	1	1	1	<3.47;5.47)	<3.47;5.47)	1	Alert	Alert
10	1	1	1	<5.47;7.47)	<5.47;7.47)	1	Alert	Alert
11	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Alert	Alert
12	1	1	1	<3.47;5.47)	<3.47;5.47)	1	Warning	Warning
13	1	1	1	<5.47;7.47)	<5.47;7.47)	1	Warning	Warning
14	1	1	1	<5.47;7.47)	<5.47;7.47)	1	Warning	Warning
15	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Warning	Warning
16	1	1	1	<5.47;7.47)	<5.47;7.47)	1	Warning	Warning
17	1	1	1	<3.47;5.47)	<3.47;5.47)	1	Warning	Warning
18	1	1	1	<3.47;5.47)	<3.47;5.47)	1	Warning	Warning
19	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Warning	Warning
20	1	1	1	<5.47;7.47)	<5.47;7.47)	1	Warning	Warning
21	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Warning	Warning
22	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Warning	Warning
23	1	1	1	<5.47;7.47)	<5.47;7.47)	1	Warning	Warning
24	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Warning	Warning
25	1	1	1	<5.47;7.47)	<5.47;7.47)	1	Warning	Warning
26	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Warning	Warning
27	1	1	1	<7.47;9.47)	<7.47;9.47)	1	Warning	Warning
28	1	1	1	<5.47;7.47)	<5.47;7.47)	1	Warning	Warning
29	1	1	1	<5.47;7.47)	<5.47;7.47)	1	Warning	Warning
30	+	+	+	<7.47;9.47)	<7.47;9.47)	1	Warning	Warning

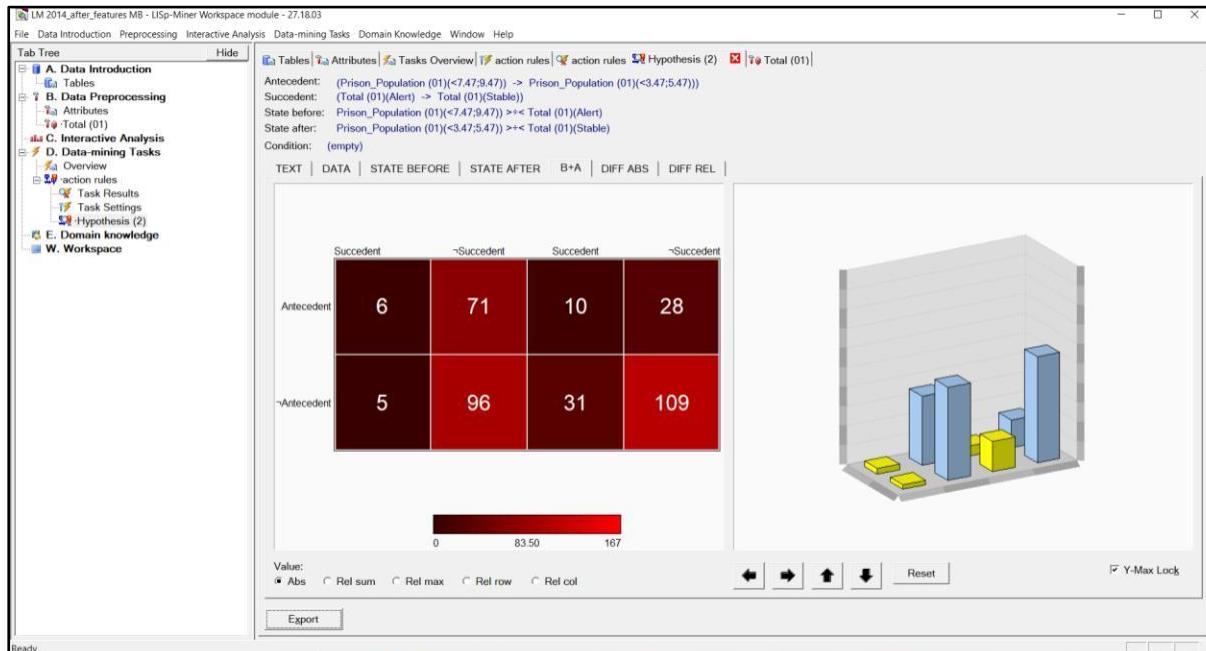
State Before



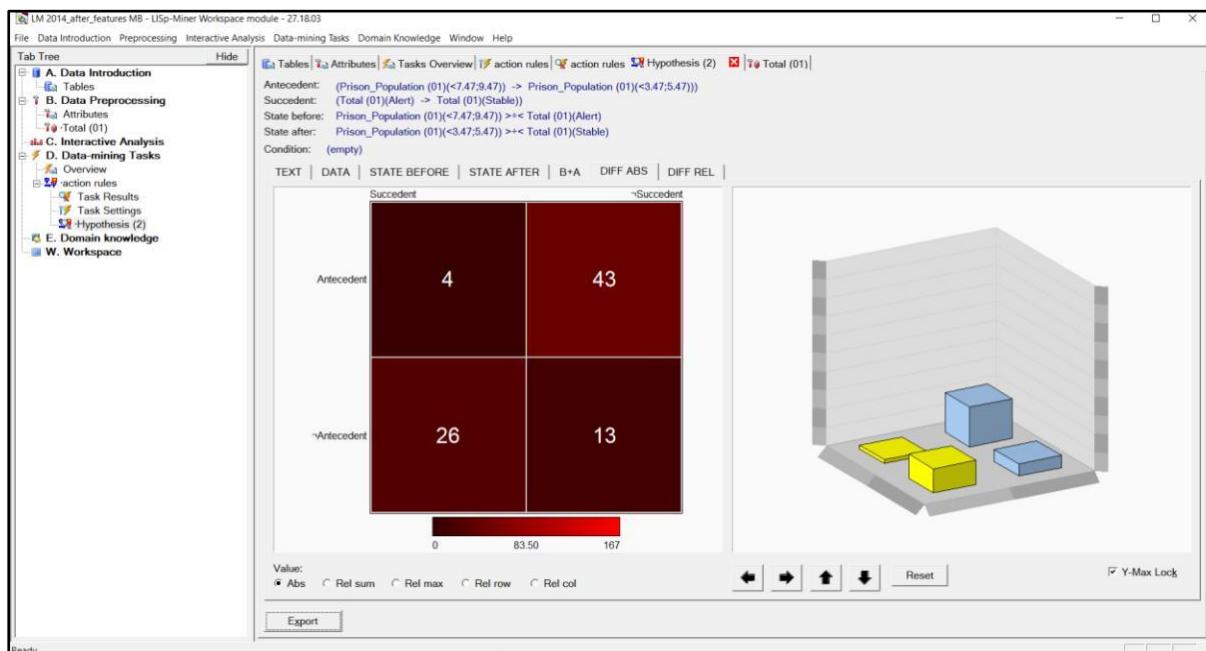
State After



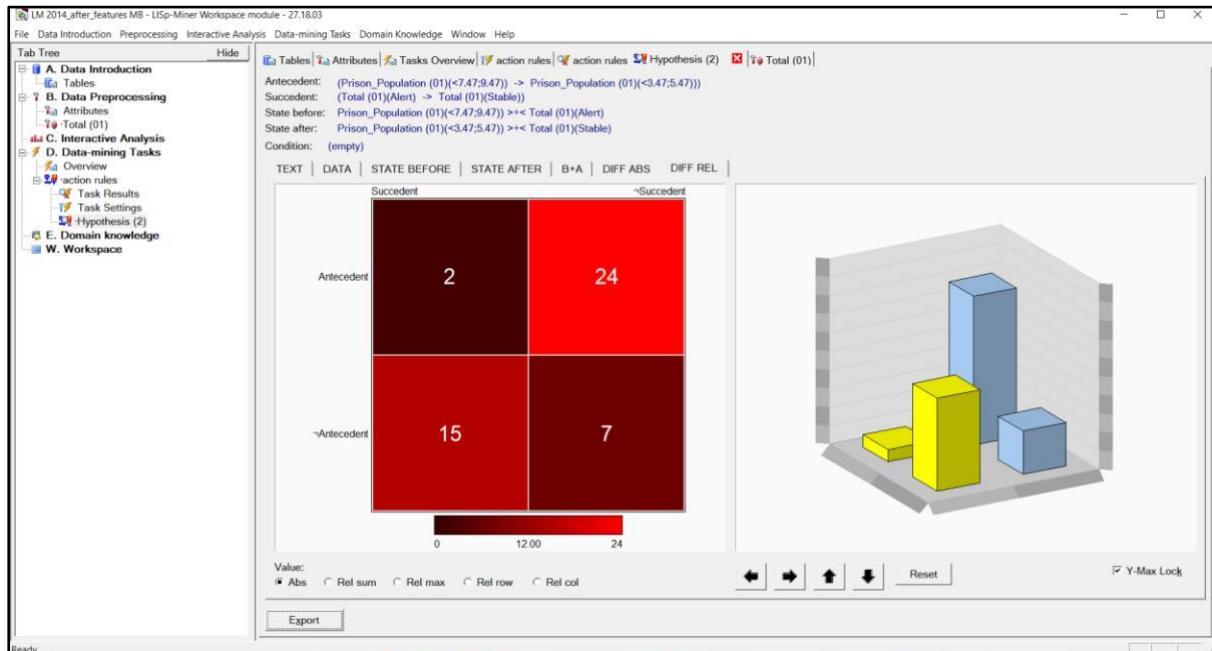
B + A



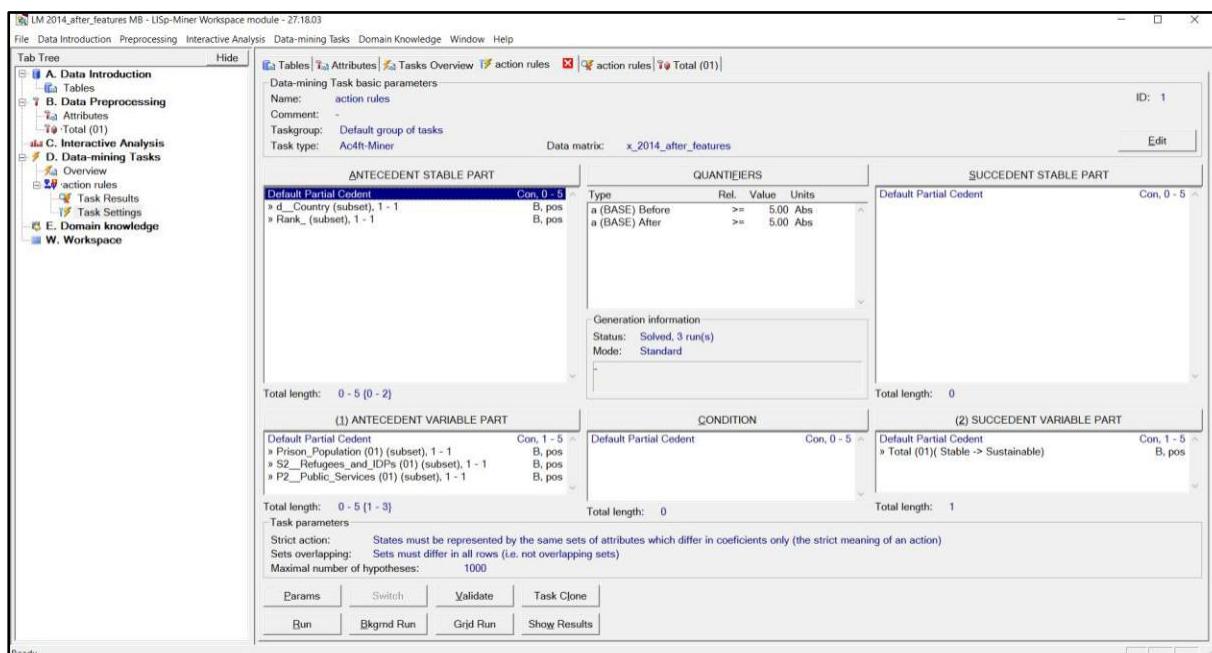
Diff ABS



Diff REL



Stable to Sustainable



Nr.	Id	Df-Conf	B-Conf	A-Conf	Hypothesis
1	5	0.172	0.263	0.091	(empty) : (Prison_Population (01)(<5.47) -> Prison_Population (01)(<7.47)) >+< (empty) : (Total (01) Stable) -> Total (01) Sustainable))
2	6	0.134	0.263	0.129	(empty) : (Prison_Population (01)(<5.47) -> Prison_Population (01)(<5.47;7.47)) >+< (empty) : (Total (01) Stable) -> Total (01) Sustainable))
3	3	0.119	0.210	0.091	(empty) : (Prison_Population (01)(<5.47;7.47) -> Prison_Population (01)(<7.47;9.47)) >+< (empty) : (Total (01) Stable) -> Total (01) Sustainable))
4	1	0.105	0.234	0.129	(empty) : (Prison_Population (01)(<7.47;9.47) -> Prison_Population (01)(<5.47;9.47)) >+< (empty) : (Total (01) Stable) -> Total (01) Sustainable))
5	2	0.076	0.234	0.158	(empty) : (Prison_Population (01)(<7.47;9.47) -> Prison_Population (01)(<5.47)) >+< (empty) : (Total (01) Stable) -> Total (01) Sustainable))
6	4	0.052	0.210	0.158	(empty) : (Prison_Population (01)(<5.47;7.47) -> Prison_Population (01)(<5.47)) >+< (empty) : (Total (01) Stable) -> Total (01) Sustainable))

Rule

Antecedent: $(\text{Prison_Population (01)}(<5.47;7.47)) \rightarrow \text{Prison_Population (01)}(<3.47;5.47))$
Succedent: $(\text{Total (01)}|\text{Stable}) \rightarrow \text{Total (01)}|\text{Sustainable})$
State before: $\text{Prison_Population (01)}(<5.47;7.47)) >+< \text{Total (01)}|\text{Stable}$
State after: $\text{Prison_Population (01)}(<3.47;5.47)) >+< \text{Total (01)}|\text{Sustainable}$
Condition: (empty)

Text

*** Hypothesis ID: 4			
Antecedent	(empty)	Variable antecedent Before	Prison_Population (01) <5.47;7.47)
Variable antecedent After	Prison_Population (01) <3.47;5.47)		
Succedent	(empty)	Variable succedent Before	Total (01) Stable
		Variable succedent After	Total (01) Sustainable
Quantifiers values:			
a-frequency	13	13	a-frequency (BASE) from source contingency table
a-frequency	6	6	a-frequency (BASE) from source contingency table
Various interest measures from the four-fold tables:			
D%-Sum	0.42	Sum of differences of relative frequencies between state before and after	
Df-Conf	0.05	Difference of values of Confidence	
DI-AFUI	0.03	Difference of values of D-Confidence	
DI-FUE	-0.17	Difference of values of E-Confidence	
DI-Avg	-0.43	Difference of values of Average Difference	
R-Conf	1.33	Ratio of values of Confidence	
R-DFUI	1.28	Ratio of values of D-Confidence	
R-FUE	0.77	Ratio of values of E-Confidence	
R-Avg	-0.27	Ratio of values of Average Difference	
H-Conf	1.33	Higher of ratios of values of Confidence	
H-DFUI	1.28	Higher of ratios of values of D-Confidence	
H-FUE	1.3	Higher of ratios of values of E-Confidence	

Data

LM 2014_after_features MB - LiSp-Miner Workspace module - 27.18.03

File Data Introduction Preprocessing Interactive Analysis Data-mining Tasks Domain Knowledge Window Help

Tab Tree Hide

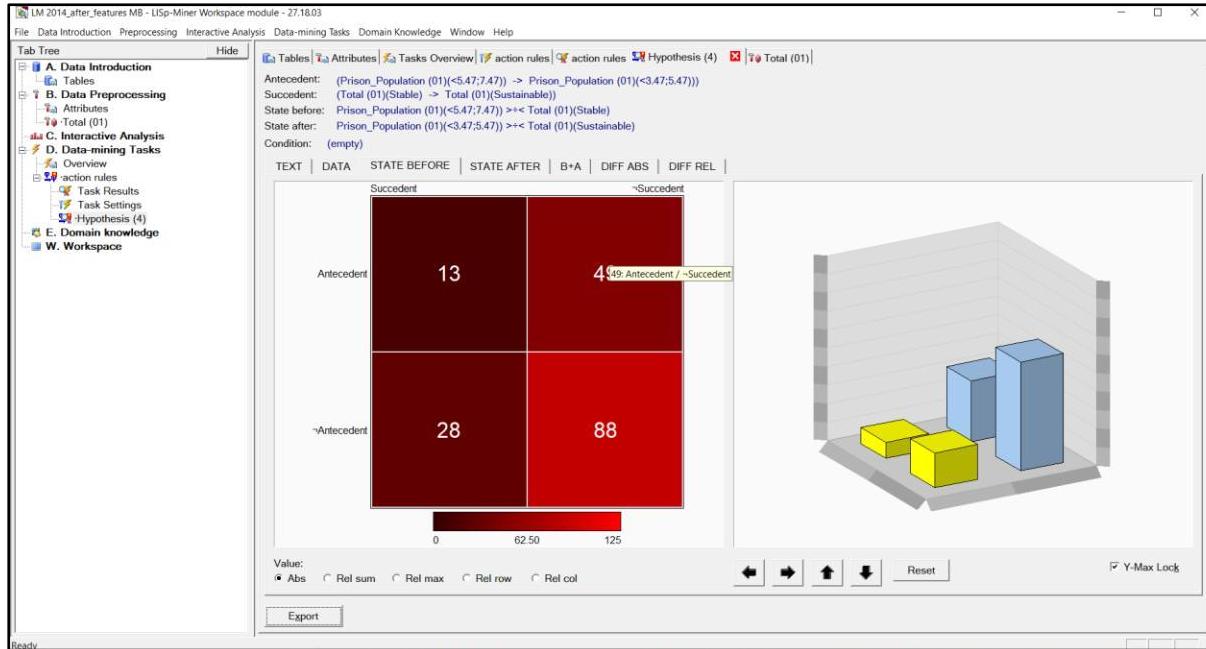
- A. Data Introduction
 - Tables
- B. Data Preprocessing
 - Total (01)
- C. Interactive Analysis
 - Hypothesis (4)
- D. Data-mining Tasks
 - Overview
 - Task Results
 - Task Settings
 - Hypothesis (4)
- E. Domain knowledge
- W. Workspace

Antecedent: (*Prison_Population (01)<5.47;7.47*) -> *Prison_Population (01)<3.47;5.47*)
 Succedent: (*Total (01)Stable*) -> *Total (01)(Sustainable)*
 State before: *Prison_Population (01)<5.47;7.47*) >< *Total (01)(Stable)*
 State after: *Prison_Population (01)<3.47;5.47*) >< *Total (01)(Sustainable)*
 Condition: (empty)

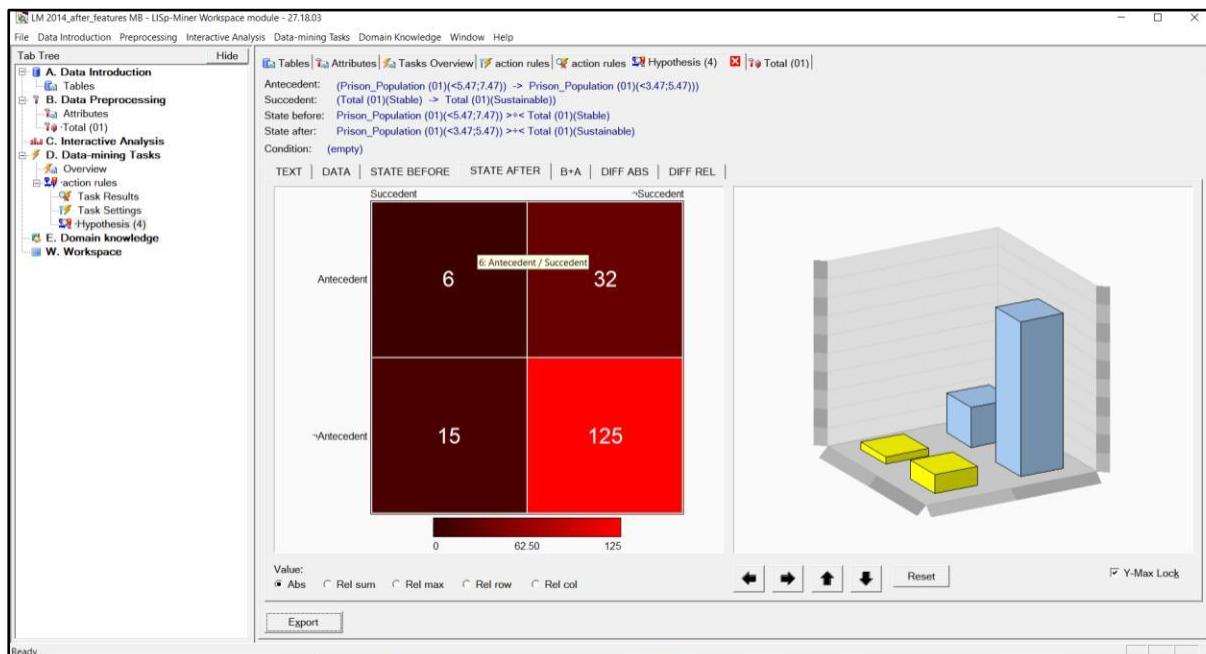
#	A	b	a	S	b	a	Prison_Population (01)<5.47;7.47	Prison_Population (01)<3.47;5.47	Total (01)	Total (01)
1	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Alert	Alert
2	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Alert	Alert
3	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Alert	Alert
4	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Alert	Alert
5	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Alert	Alert
6	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Alert	Alert
7	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Alert	Alert
8	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Alert	Alert
9	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Alert	Alert
10	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Alert	Alert
11	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Alert	Alert
12	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
13	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
14	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
15	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
16	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
17	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
18	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
19	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
20	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
21	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
22	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
23	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
24	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
25	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
26	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
27	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
28	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
29	1	1	1	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	Warning	Warning
30	*	*	*	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	<5.47;7.47	*	*

Export Ready

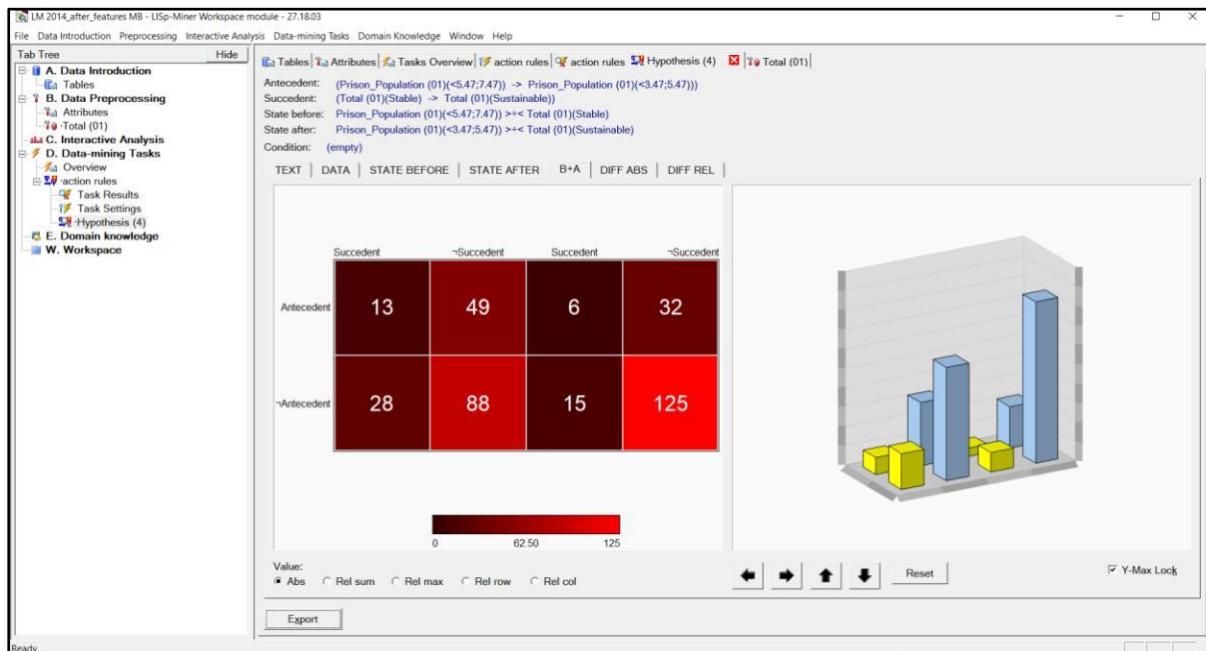
State Before



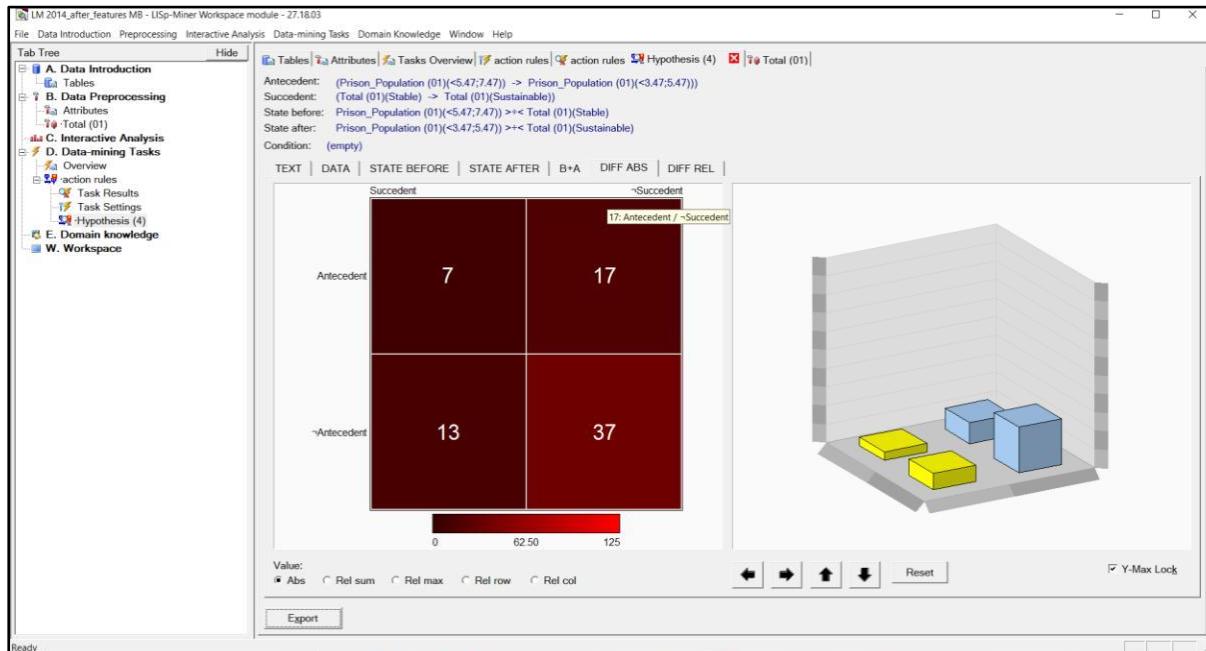
State After



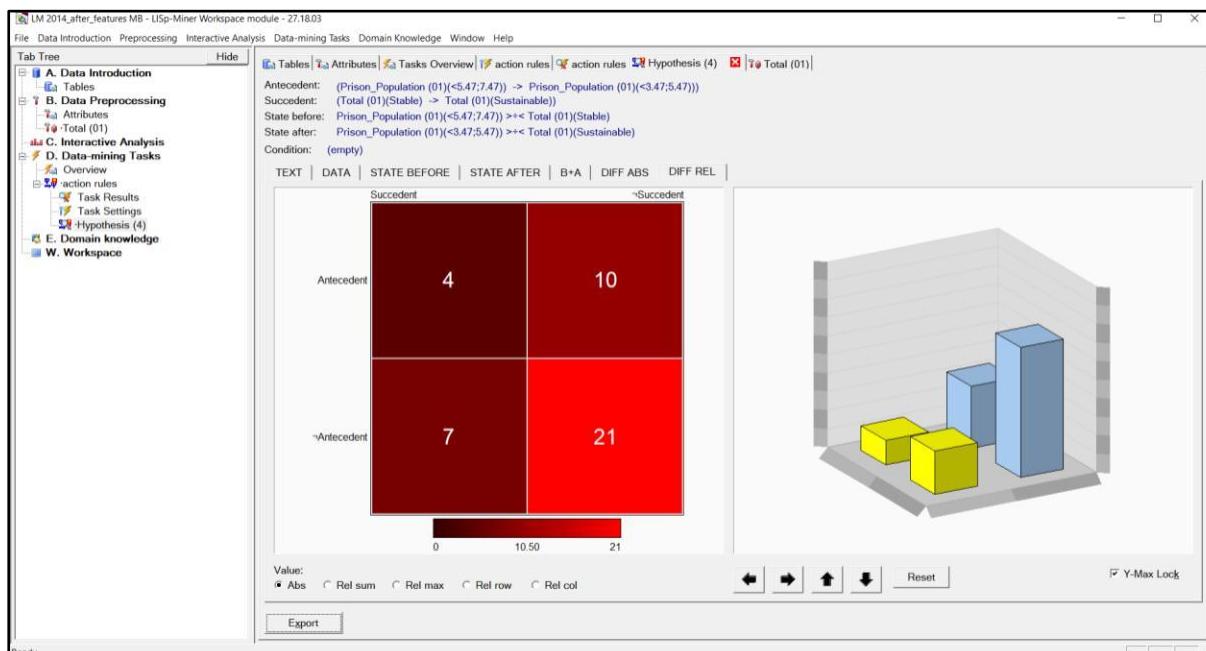
B + A



Diff ABS



Diff REL



ACTION RULES for 2015

Alert to Sustainable

The screenshot shows the LiSp-Miner workspace interface. The tab tree on the left includes sections for Data Introduction, Data Preprocessing, Interactive Analysis, Data-mining Tasks, Domain Knowledge, and Workspace. The main area displays the configuration of an action rule named 'action rules_1'. The rule is defined over a data matrix 'x_2015_after_features'. The rule consists of an Antecedent Stable Part, a Quantifier, and a Succedent Stable Part. The Antecedent Stable Part contains two partial cedents: one for 'd_Country' and another for 'Rank_'. The Quantifier section specifies a condition where a variable must be greater than or equal to 5.00. The Succedent Stable Part is also a partial cedent. Task parameters at the bottom include strict actions, set overlapping, and a maximal number of hypotheses (set to 1000). Buttons for Params, Switch, Validate, Task Clone, Run, Bkgnd Run, Grid Run, and Show Results are visible.

The screenshot shows the results of the task run for the 'action rules_1' task. The task was run on 1.5.2019 19:11:11 and completed in 0h 0m 0s. It involved 158 verifications and 2 hypotheses. The hypotheses table lists two entries:

Nr.	Id	Df-Conf	B-Conf	A-Conf	Hypothesis
1	1	-0.051	0.078	0.129	(empty) : (Prison_Population (01)(<7.47;9.47)) -> Prison_Population (01)(<3.47;5.47))
2	2	-0.080	0.078	0.158	(empty) : (Prison_Population (01)(<7.47;9.47)) -> Prison_Population (01)(<5.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Sustainable))

Rule

Antecedent: $(\text{Prison_Population (01)}(<7.47;9.47)) \rightarrow \text{Prison_Population (01)}(<3.47;5.47))$
 Succedent: $(\text{Total (01)}(\text{Alert}) \rightarrow \text{Total (01)}(\text{Sustainable}))$
 State before: $\text{Prison_Population (01)}(<7.47;9.47)) >+< \text{Total (01)}(\text{Alert})$
 State after: $\text{Prison_Population (01)}(<3.47;5.47)) >+< \text{Total (01)}(\text{Sustainable})$
 Condition: (empty)

Text

The screenshot shows the LiSp-Miner software interface with the following details:

- Tab Tree:**
 - A. Data Introduction
 - B. Data Preprocessing
 - C. Interactive Analysis
 - D. Data-mining Tasks
 - E. Domain knowledge
 - W. Workspace
- Central Panel:**
 - Hypothesis ID: 2**
 - Antecedent:** (Prison_Population (01)<7.47;9.47) -> Prison_Population (01)<3.47;5.47)
 - Succedent:** (Total (01)(Alert) -> Total (01)(Sustainable))
 - State before:** Prison_Population (01)<7.47;9.47) >+< Total (01)(Alert)
 - State after:** Prison_Population (01)<3.47;5.47) >+< Total (01)(Sustainable)
 - Condition:** (empty)
 - TEXT | DATA | STATE BEFORE | STATE AFTER | B+A | DIFF ABS | DIFF REL |**
 - Quantifiers values:**

a-frequency	6	6	a-frequency (BASE) from source contingency table
a-frequency	6	6	a-frequency (BASE) from source contingency table
 - Various interest measures from the four-fold tables:**

	D%_Sum	0.44	0.44	Sum of differences of relative frequencies between state before and after
DF-Conf	-0.08	-0.0799726589	-0.0799726589	Difference of values of Confidence
DF-DUI	0.04	0.1629213465	0.1629213465	Difference of values of D-Confidence
DF-EUI	-0.16	-0.1629213465	-0.1629213465	Difference of values of E-Confidence
DF-Avg	0.08	-0.0774249674	-0.0774249674	Difference of values of Average Difference
R-Conf	0.49	0.4935064935	0.4935064935	Ratio of values of Confidence
R-DUI	0.65	0.6463414634	0.6463414634	Ratio of values of D-Confidence
R-EUE	0.78	0.7786259542	0.7786259542	Ratio of values of E-Confidence
R-Avg	0.77	0.7711662075	0.7711662075	Ratio of values of Average Difference
H-Conf	2.03	2.0263157895	2.0263157895	Higher of ratios of values of Confidence
H-DUI	1.55	1.5471698113	1.5471698113	Higher of ratios of values of D-Confidence
H-EUE	1.26	1.2843137255	1.2843137255	Higher of ratios of values of E-Confidence
- Bottom Panel:** Export button

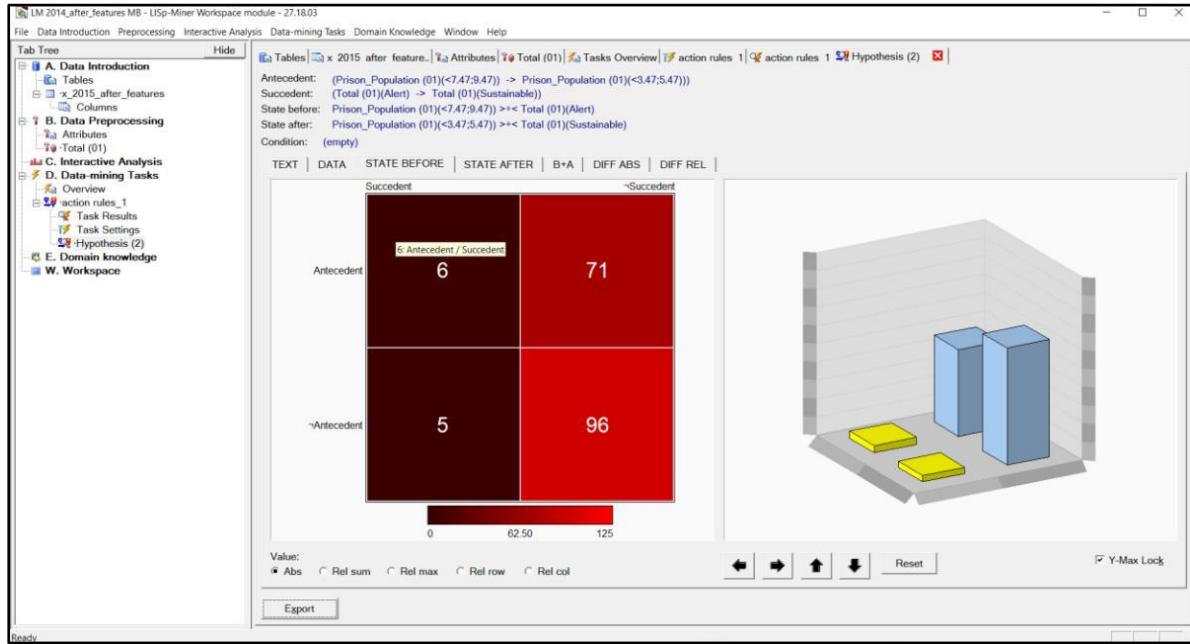
Data

The screenshot shows the LiSp-Miner software interface with the following details:

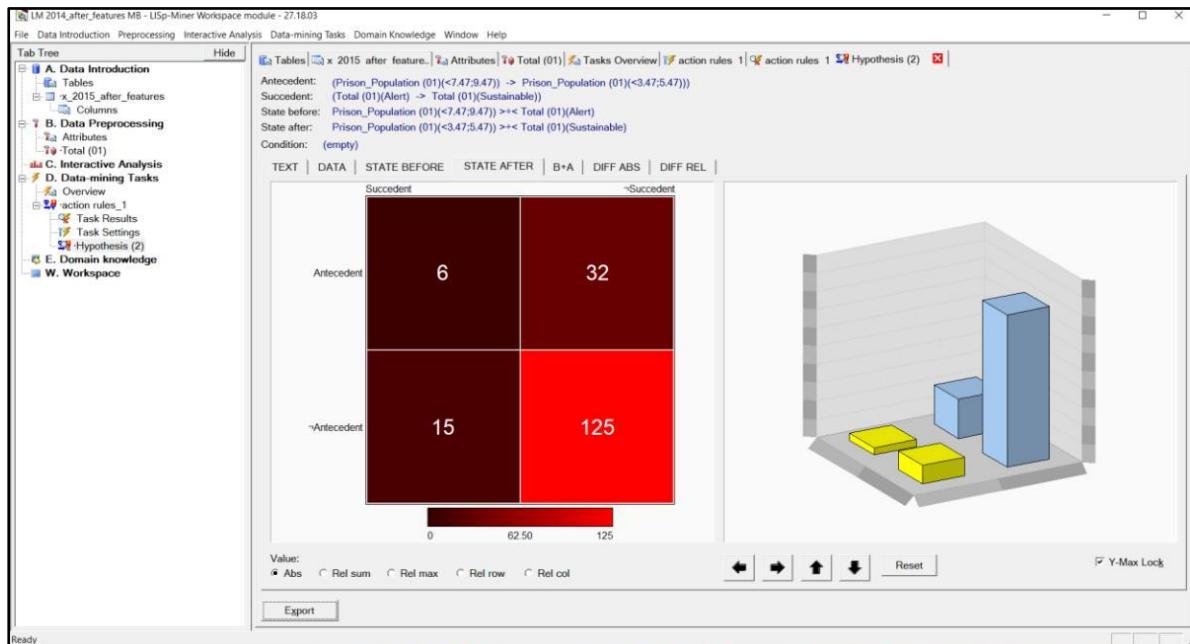
- Tab Tree:**
 - A. Data Introduction
 - B. Data Preprocessing
 - C. Interactive Analysis
 - D. Data-mining Tasks
 - E. Domain knowledge
 - W. Workspace
- Central Panel:**
 - Hypothesis ID: 2**
 - Antecedent:** (Prison_Population (01)<7.47;9.47) -> Prison_Population (01)<3.47;5.47))
 - Succedent:** (Total (01)(Alert) -> Total (01)(Sustainable))
 - State before:** Prison_Population (01)<7.47;9.47) >+< Total (01)(Alert)
 - State after:** Prison_Population (01)<3.47;5.47) >+< Total (01)(Sustainable)
 - Condition:** (empty)
 - TEXT | DATA | STATE BEFORE | STATE AFTER | B+A | DIFF ABS | DIFF REL |**
 - Data Table:**

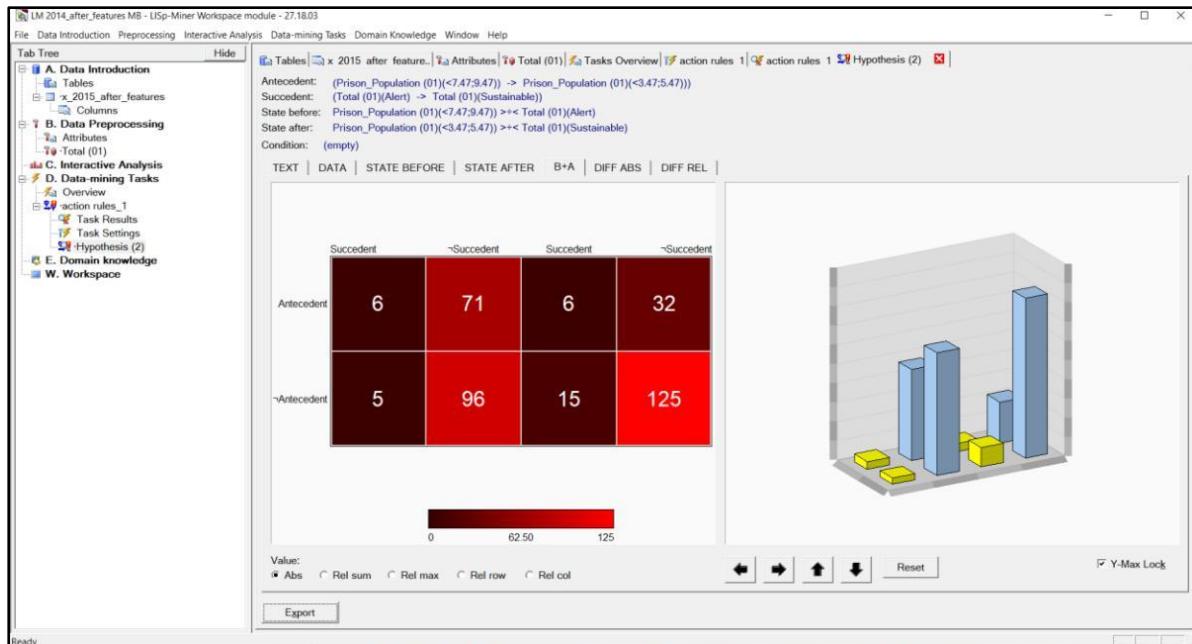
#	A	b	a	S	b	a	Prison_Population (0...)	Prison_Population (0...)	Total (01)	Total (01)	
1	1	1	1	<	7.47;9.47)	<	7.47;9.47)	<	7.47;9.47)	Alert	Alert
2	1	1	1	<	7.47;9.47)	<	7.47;9.47)	<	7.47;9.47)	Alert	Alert
3	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Alert	Alert
4	1	1	1	<	7.47;9.47)	<	7.47;9.47)	<	7.47;9.47)	Alert	Alert
5	1	1	1	<	7.47;9.47)	<	7.47;9.47)	<	7.47;9.47)	Alert	Alert
6	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Alert	Alert
7	1	1	1	<	7.47;9.47)	<	7.47;9.47)	<	7.47;9.47)	Alert	Alert
8	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Alert	Alert
9	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Alert	Alert
10	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Alert	Alert
11	1	1	1	<	7.47;9.47)	<	7.47;9.47)	<	7.47;9.47)	Alert	Alert
12	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
13	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
14	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
15	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
16	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
17	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
18	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
19	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
20	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
21	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
22	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
23	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
24	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
25	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
26	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
27	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
28	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
29	1	1	1	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
30	*	*	*	<	3.47;5.47)	<	3.47;5.47)	<	3.47;5.47)	Warning	Warning
 - Bottom Panel:** Export button

State Before

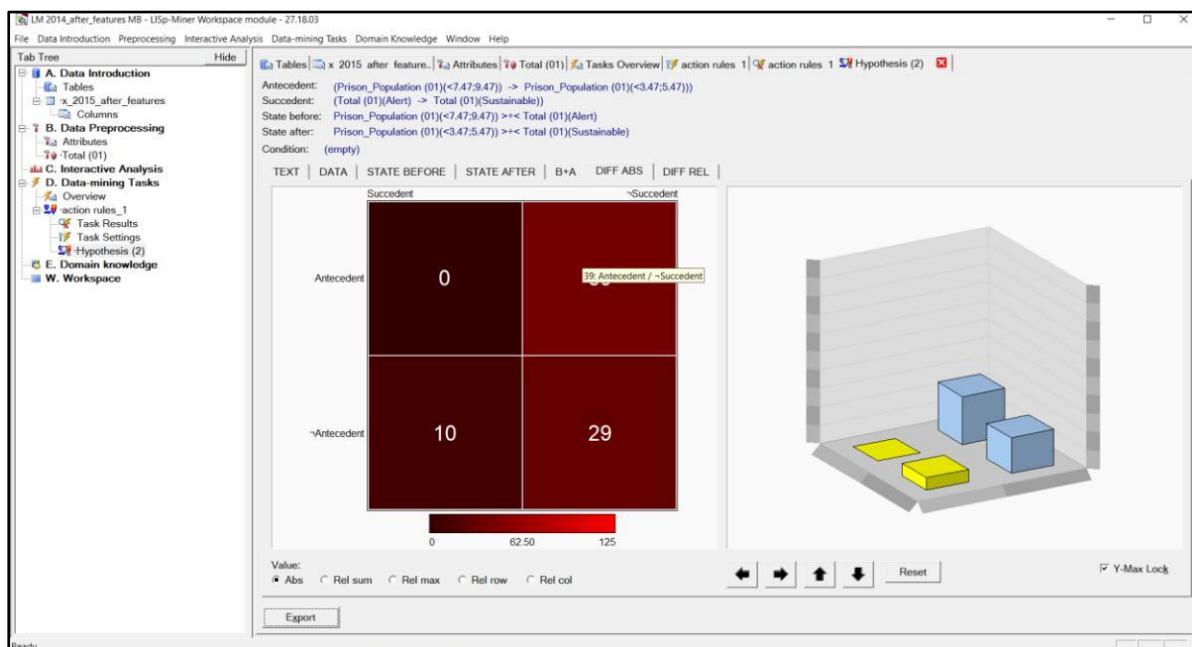


State After

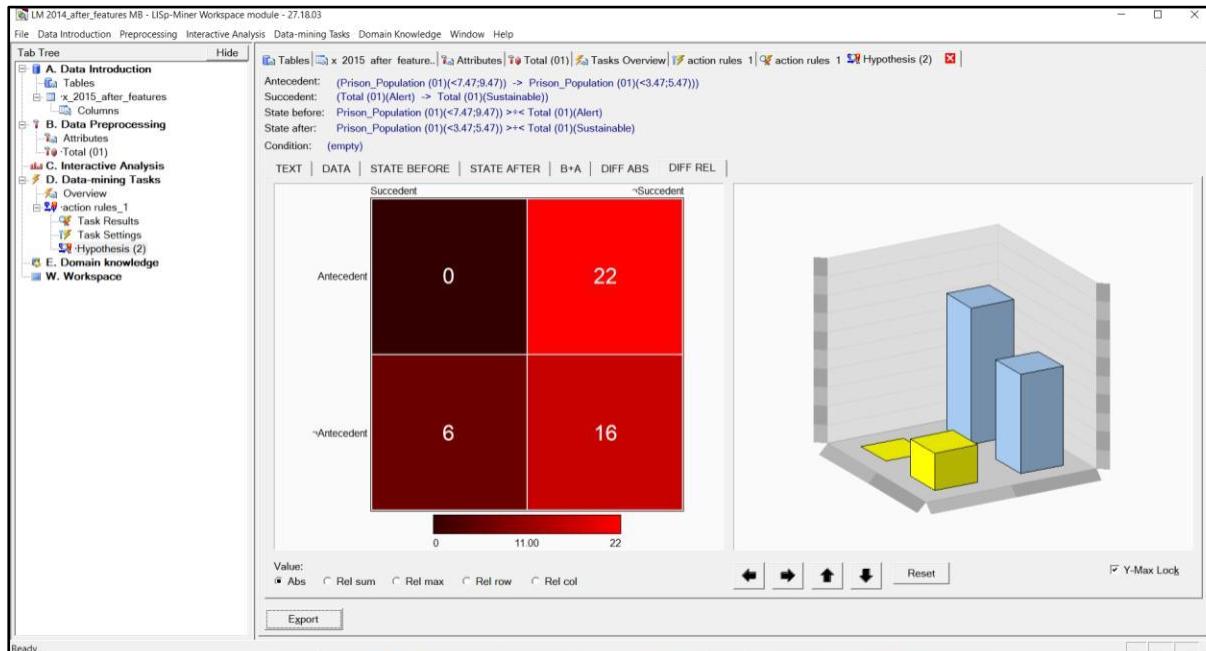


B + A


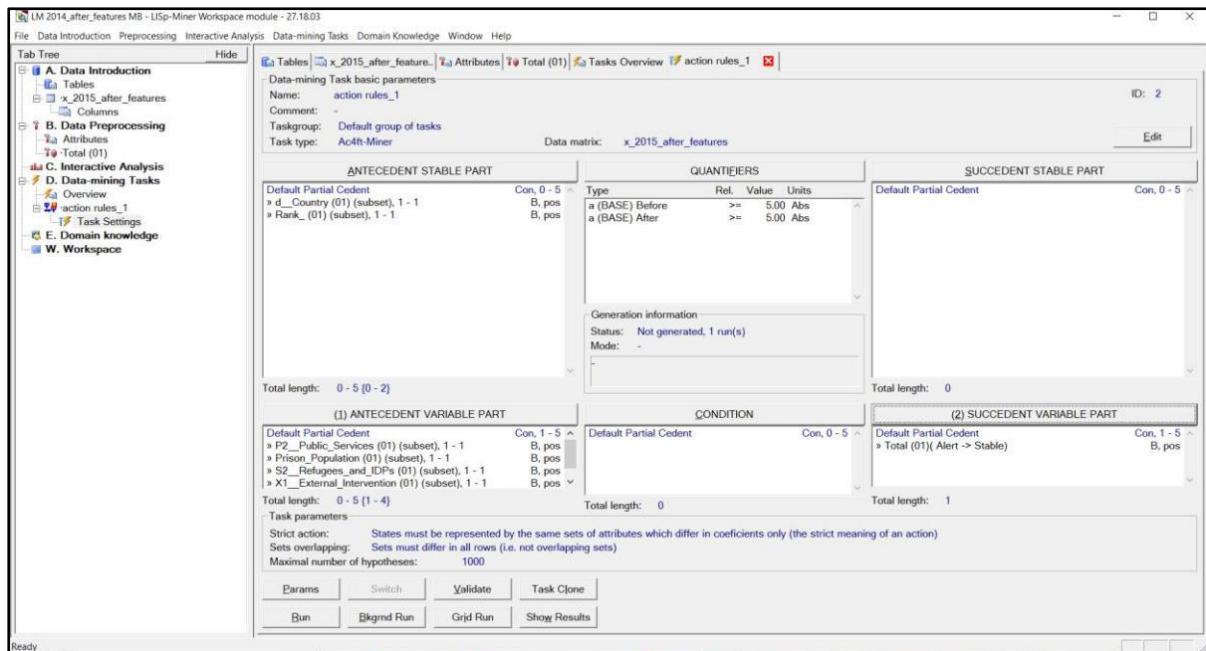
Diff ABS



Diff REL



Alert to Stable



ITCS 6162 KNOWLEDGE DISCOVERY IN DATABASES (KDD)

LM 2014_after_features MB - LISP-Miner Workspace module - 27.18.03

File Data Introduction Preprocessing Interactive Analysis Data-mining Tasks Domain Knowledge Window Help

Tab Tree Hide

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Tables
x_2015_after_features
Columns

B. Data Preprocessing
Attributes
Total (01)

C. Interactive Analysis
Overview
Task Results
Task Settings

D. Data-mining Tasks
Overview
action rules_1
Task Settings

E. Domain knowledge

W. Workspace

Tables x 2015_after_feature... Attributes Total (01) Tasks Overview action rules_1 action rules_1 Hypothesis (3)

Task: action rules_1
Comment: -
Taskgroup: Default group of tasks
Data matrix: x_2015_after_features
Task type: Ao4ff-Miner

Task run:
Start: 1.5.2019 19:20:01 Total time: 0h 0m 0s
Number of verifications: 398
Number of hypotheses: 13 Mode: Standard

Add group Del group Edit group

Actual group of hypotheses: All hypotheses
Hypotheses in group: 13 Shown hypotheses: 13 Highlighted: 0 Delete hypotheses

Nr. Id Dl-Conf B-Cofd A-Conf Hypothesis

1 12 0.876 1.000 0.125 (empty) : (P2_Public_Services (01)(>=9.47)) -> P2_Public_Services (01)(<5.47;7.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
2 10 0.745 1.000 0.255 (empty) : (S2_Refugees_and_IDPs (01)(>=9.47)) -> S2_Refugees_and_IDPs (01)(<5.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
3 6 0.620 0.750 0.130 (empty) : (X1_External_Intervention (01)(>=9.47)) -> X1_External_Intervention (01)(<5.47;7.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
4 13 0.580 1.000 0.412 (empty) : (S2_Refugees_and_IDPs (01)(>=9.47)) & X1_External_Intervention (01)(>=9.47) -> S2_Refugees_and_IDPs (01)(<5.47) & X1_External_Intervention (01)(>=9.47) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
5 11 0.561 1.000 0.439 (empty) : (P2_Public_Services (01)(>=9.47)) -> P2_Public_Services (01)(<5.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
6 8 0.331 0.625 0.294 (empty) : (X1_External_Intervention (01)(<5.47)) & X1_External_Intervention (01)(>=9.47) -> P2_Public_Services (01)(<5.47) & X1_External_Intervention (01)(<5.47) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
7 7 0.291 0.750 0.459 (empty) : (X1_External_Intervention (01)(>=9.47)) -> X1_External_Intervention (01)(<5.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
8 9 0.025 0.625 0.600 (empty) : (P2_Public_Services (01)(<5.47;7.47)) & X1_External_Intervention (01)(>=9.47) -> P2_Public_Services (01)(<5.47) & X1_External_Intervention (01)(>=9.47) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
9 4 -0.023 0.102 0.125 (empty) : (P2_Public_Services (01)(<5.47;7.47)) -> P2_Public_Services (01)(<5.47;7.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
10 5 -0.108 0.147 0.255 (empty) : (S2_Refugees_and_IDPs (01)(<5.47;7.47)) -> S2_Refugees_and_IDPs (01)(<5.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
11 1 -0.132 0.078 0.210 (empty) : (Prison_Population (01)(<5.47;9.47)) -> Prison_Population (01)(<5.47;7.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
12 2 -0.185 0.078 0.263 (empty) : (Prison_Population (01)(<5.47;9.47)) -> Prison_Population (01)(<5.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))
13 3 -0.337 0.102 0.439 (empty) : (P2_Public_Services (01)(<5.47;7.47)) -> P2_Public_Services (01)(<5.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Stable))

Detail Goto ID Copy Remove Filter Sorting Export

Rule

Antecedent:	(P2_Public_Services (01)(<7.47;9.47)) -> P2_Public_Services (01)(<3.47;5.47)))
Succedent:	(Total (01)(Alert) -> Total (01)(Stable))
State before:	P2_Public_Services (01)(<7.47;9.47)) >+< Total (01)(Alert)
State after:	P2_Public_Services (01)(<3.47;5.47)) >+< Total (01)(Stable)
Condition:	(empty)

Text

LM 2014_after_features MB - LISP-Miner Workspace module - 27.18.03

File Data Introduction Preprocessing Interactive Analysis Data-mining Tasks Domain Knowledge Window Help

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A. Data Introduction
Tables
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Columns

B. Data Preprocessing
Attributes
Total (01)

C. Interactive Analysis
Overview
action rules_1
Task Results
Task Settings
Hypothesis (3)

D. Data-mining Tasks
Overview
action rules_1
Task Settings

E. Domain knowledge

W. Workspace

Tables x 2015_after_feature... Attributes Total (01) Tasks Overview action rules_1 action rules_1 Hypothesis (3)

Antecedent: (P2_Public_Services (01)(<7.47;9.47)) -> P2_Public_Services (01)(<3.47;5.47))
Succedent: (Total (01)(Alert) -> Total (01)(Stable))
State before: P2_Public_Services (01)(<7.47;9.47)) >+< Total (01)(Alert)
State after: P2_Public_Services (01)(<3.47;5.47)) >+< Total (01)(Stable)
Condition: (empty)

TEXT | DATA | STATE BEFORE | STATE AFTER | B+A | DIFF ABS | DIFF REL |

*** Hypothesis ID: 3

Antecedent (empty)
Variable antecedent Before P2_Public_Services (01) <7.47;9.47)
Variable antecedent After P2_Public_Services (01) <3.47;5.47)

Succedent (empty)
Variable succedent Before Total (01) Alert
Variable succedent After Total (01) Stable

Quantifiers values:
a-frequency 5 5 a-frequency (BASE) from source contingency table
a-frequency 18 18 a-frequency (BASE) from source contingency table

Various interest measures from the four-fold tables:

D% Sum	0.34	0.34	Sum of differences of relative frequencies between state before and after
Df-Conf	-0.34	-0.2369835730	Difference of values of Confidence
Df-AFUI	-0.19	-0.1903409091	Difference of values of D-Confidence
Df-FUE	-0.02	-0.0224719101	Difference of values of E-Confidence
Df-Avg	-0.25	-0.2548023915	Difference of values of Average Difference
R-Conf	0.23	0.2324263039	Ratio of values of Confidence
R-DfUI	0.32	0.3232323232	Ratio of values of D-Confidence
R-FUE	0.97	0.9696969697	Ratio of values of E-Confidence
R-Avg	0.72	0.7186374326	Ratio of values of Average Difference
H-Conf	4.3	4.3004300244	Higher of ratios of values of Confidence
H-DfUI	3.09	3.009375	Higher of ratios of values of D-Confidence
H-FUE	1.03	1.03125	Higher of ratios of values of E-Confidence

Export

Data

LM 2014_after_features MB - LiSp-Miner Workspace module - 27.18.03

File Data Introduction Preprocessing Interactive Analysis Data-mining Tasks Domain Knowledge Window Help

Tab Tree Hide

- A. Data Introduction
 - Tables
 - $x_{2015_after_features}$
 - Columns
- B. Data Preprocessing
 - Attributes
 - Total (01)
- C. Interactive Analysis
- D. Data-mining Tasks
 - Overview
 - action rules_1
 - Task Results
 - Task Settings
 - Hypothesis (3)
- E. Domain knowledge
- W. Workspace

Antecedent: ($P2_{_Public_Services}(01) < 47.947$) $\rightarrow P2_{_Public_Services}(01) < 47.947$)

Succedent: ($Total(01) \text{Alert} \rightarrow Total(01) \text{Stable}$)

State before: $P2_{_Public_Services}(01) < 47.947 \gg < Total(01) \text{Alert}$

State after: $P2_{_Public_Services}(01) < 47.947 \gg < Total(01) \text{Stable}$

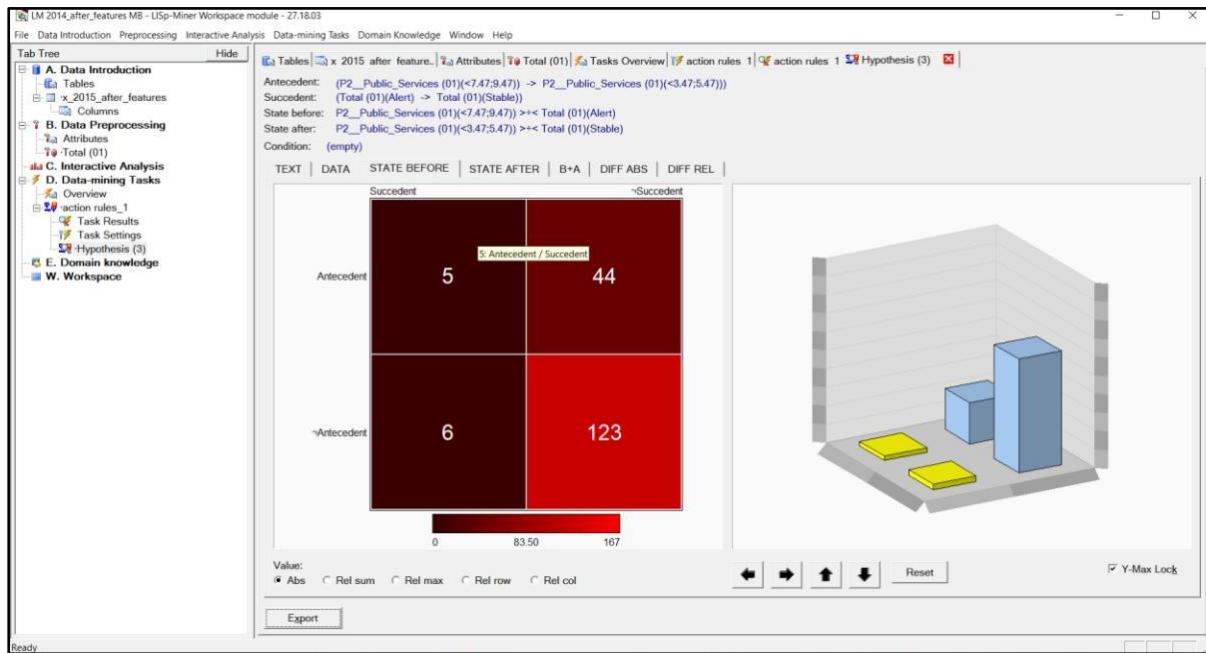
Condition: (empty)

#	A	b	a	S	b	a	$P2_{_Public_Service}_{-}$	$P2_{_Public_Service}_{-}$	Total (01)	Total (01)
1	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Alert	Alert
2	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Alert	Alert
3	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Alert	Alert
4	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Alert	Alert
5	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Alert	Alert
6	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Alert	Alert
7	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Alert	Alert
8	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Alert	Alert
9	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Alert	Alert
10	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Alert	Alert
11	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Alert	Alert
12	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
13	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
14	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
15	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
16	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
17	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
18	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
19	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
20	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
21	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
22	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
23	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
24	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
25	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
26	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
27	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
28	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
29	1	1	1	1	<47.947	<47.947	<47.947	<47.947	Warning	Warning
30	*	*	*	*	<47.947	<47.947	<47.947	<47.947	Warning	Warning

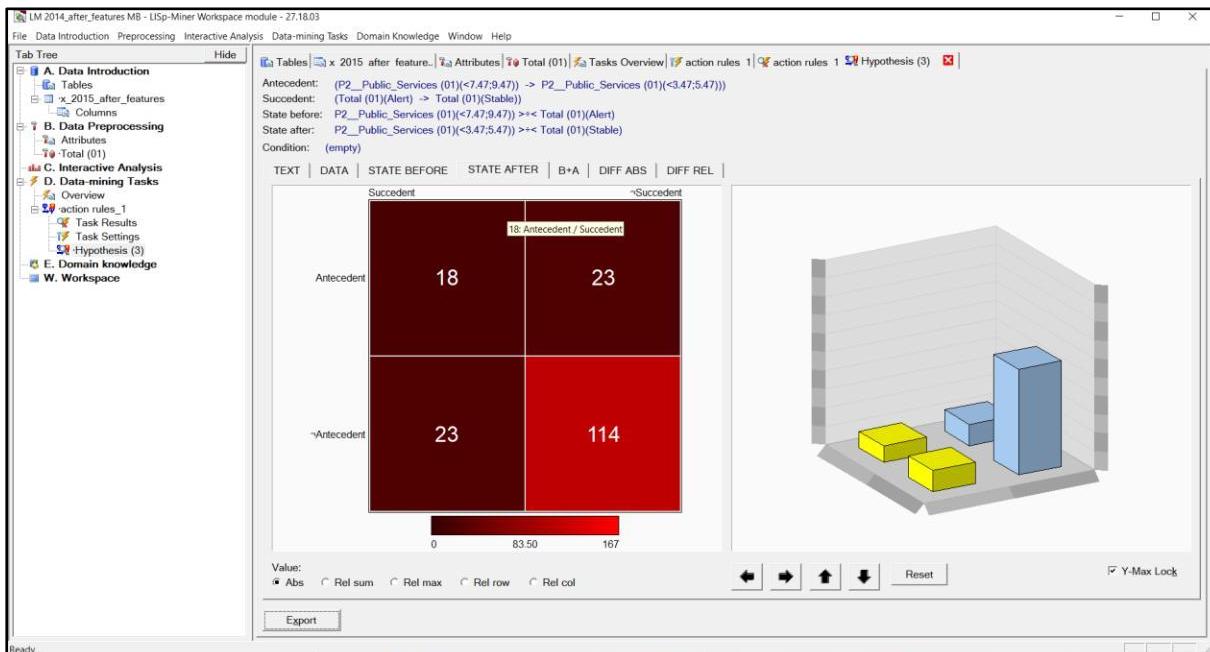
Export

Ready

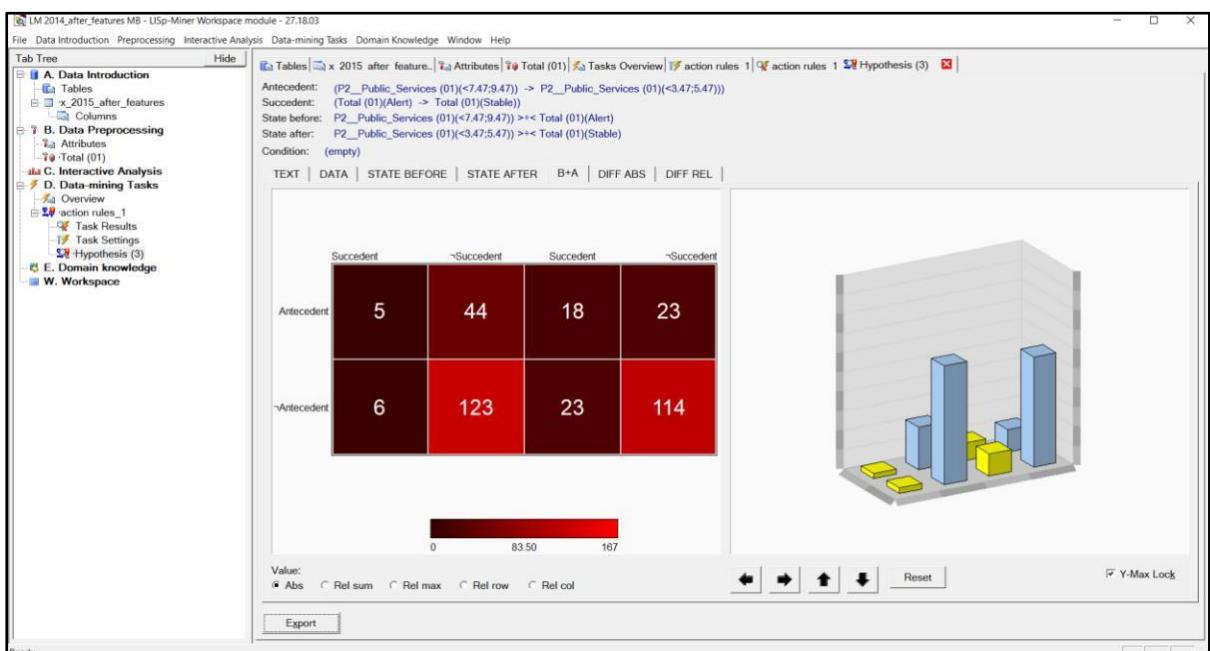
State Before



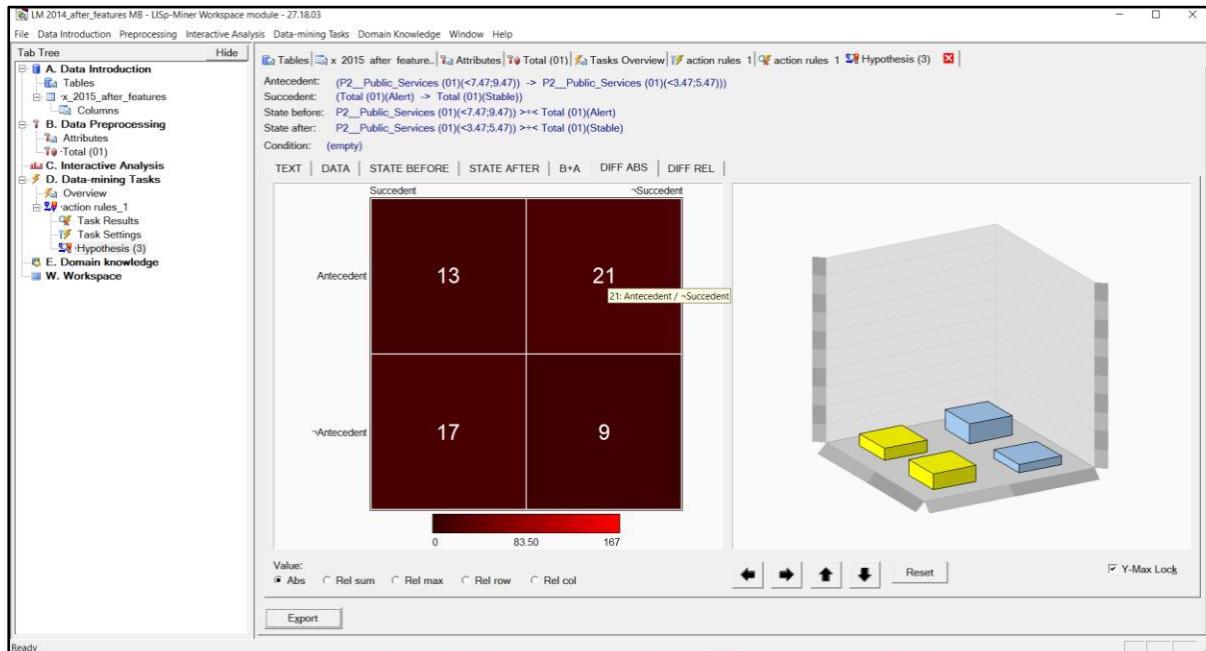
State After



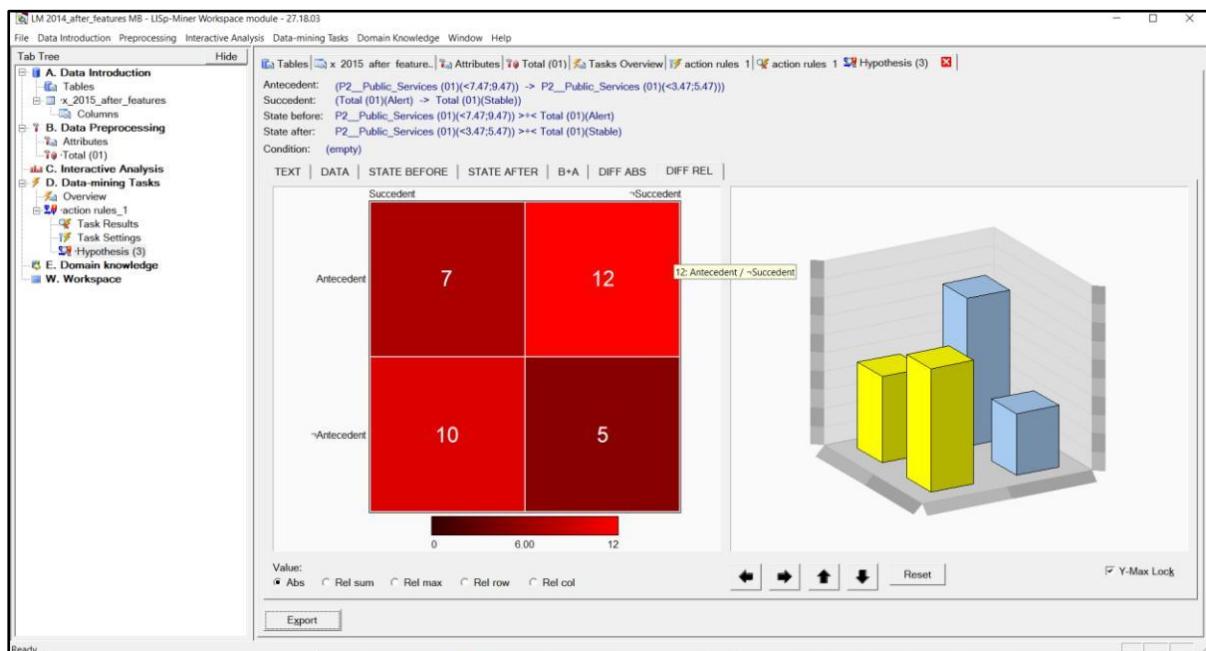
B + A



Diff ABS



Diff REL



Stable to Sustainable

LM 2014_after_features MB - LISp-Miner Workspace module - 27.18.03

A. Data Introduction

- Tables
- x_2015_after_features
- Columns

B. Data Preprocessing

- Attributes
- Total (01)

C. Interactive Analysis

- Overview
- action rules_1
- Task Results
- Task Settings

D. Data-mining Tasks

- action rules_1
- Task Overview
- Task Results
- Task Settings

E. Domain knowledge

W. Workspace

Data-mining Task basic parameters

Name: action rules_1
Comment: -
Taskgroup: Default group of tasks
Task type: Ac4f-Miner

Data matrix: x_2015_after_features

ANTECEDENT STABLE PART

Default Partial Cedent

	Con. 0 - 5
» d_Country (01) (subset), 1 - 1	B, pos
» Rank_ (01) (subset), 1 - 1	B, pos

QUANTIFIERS

Type	Ref.	Value	Units
a (BASE) Before	>=	5.00	Abs
a (BASE) After	>=	5.00	Abs

SUCCEDENT STABLE PART

Default Partial Cedent

	Con. 0 - 5
--	------------

Generation information

Status: Solved, 3 run(s)
Mode: Standard

Total length: 0 - 5 [0 - 2]

(1) ANTECEDENT VARIABLE PART

Default Partial Cedent

	Con. 1 - 5
P2_Public_Population (01) (subset), 1 - 1	B, pos
» Prison_Population (01) (subset), 1 - 1	B, pos
» S2_Refugees_and_IDPs (01) (subset), 1 - 1	B, pos
» X1_External_Intervention (01) (subset), 1 - 1	B, pos

CONDITION

Default Partial Cedent

	Con. 0 - 5
--	------------

(2) SUCCEDENT VARIABLE PART

Default Partial Cedent

	Con. 1 - 5
» Total (01)(Stable -> Sustainable)	B, pos

Total length: 0 - 1

Task parameters

Strict action: States must be represented by the same sets of attributes which differ in coefficients only (the strict meaning of an action)
Sets overlapping: Sets must differ in all rows (i.e. not overlapping sets)
Maximal number of hypotheses: 1000

Buttons: Params, Switch, Validate, Task Clone, Run, Bkgnd Run, Grid Run, Show Results

LM 2014_after_features MB - LISp-Miner Workspace module - 27.18.03

A. Data Introduction

- Tables
- x_2015_after_features
- Columns

B. Data Preprocessing

- Attributes
- Total (01)

C. Interactive Analysis

- Overview
- action rules_1
- Task Results
- Task Settings

D. Data-mining Tasks

- action rules_1
- Task Overview
- Task Results
- Task Settings

E. Domain knowledge

W. Workspace

Task: action rules_1
Comment: -
Taskgroup: Default group of tasks
Data matrix: x_2015_after_features
Task type: Ac4f-Miner

Task run:
Start: 1.5.2019 19:26:21 Total time: 0h 0m 0s
Number of verifications: 838
Number of hypotheses: 18 Mode: Standard

Actual group of hypotheses: All hypotheses
Hypotheses in group: 18 Shown hypotheses: 18 Highlighted: 0 Delete hypotheses

Nr. id	DF-Cont	B:Cont	A:Cont	Hypothesis
1	0.172	0.263	0.091	(empty) : (Prison_Population (01)<5.47) -> Prison_Population (01)<7.47;9.47)) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))
2	0.172	0.263	0.091	(empty) : (Prison_Population (01)<5.47) & Homeless_People_due_to_Natural_Disaster (01)<5.47) -> Prison_Population (01)<7.47;9.47) & Homeless_People_due_to_Natural_Disaster (01)<5.47) & Homeless_People_due_to_Natural_Disaster (01)<7.47;9.47)) >+< (empty) : (
3	0.172	0.263	0.091	(empty) : (Homeless_People_due_to_Natural_Disaster (01)<5.47) -> Homeless_People_due_to_Natural_Disaster (01)<7.47;9.47)) >+< (empty) : (
4	0.134	0.263	0.129	(empty) : (Prison_Population (01)<5.47) -> Prison_Population (01)<5.47;7.47)) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))
5	0.134	0.263	0.129	(empty) : (Prison_Population (01)<5.47) & Homeless_People_due_to_Natural_Disaster (01)<5.47) -> Prison_Population (01)<5.47;7.47) & Homeless_People_due_to_Natural_Disaster (01)<5.47) & Homeless_People_due_to_Natural_Disaster (01)<7.47;9.47)) >+< (empty) : (
6	0.134	0.263	0.129	(empty) : (Homeless_People_due_to_Natural_Disaster (01)<5.47) -> Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47)) >+< (empty) : (
7	0.119	0.210	0.091	(empty) : (Prison_Population (01)<5.47;7.47) -> Prison_Population (01)<7.47;9.47)) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))
8	0.119	0.210	0.091	(empty) : (Prison_Population (01)<5.47;7.47) & Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47) -> Prison_Population (01)<7.47;9.47);
9	0.119	0.210	0.091	(empty) : (Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47) -> Homeless_People_due_to_Natural_Disaster (01)<7.47;9.47)) >+< (empty) : (
10	0.105	0.234	0.129	(empty) : (Prison_Population (01)<7.47;9.47) -> Prison_Population (01)<5.47;7.47)) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))
11	0.105	0.234	0.129	(empty) : (Prison_Population (01)<7.47;9.47) & Homeless_People_due_to_Natural_Disaster (01)<7.47;9.47) -> Prison_Population (01)<5.47;7.47);
12	0.105	0.234	0.129	(empty) : (Homeless_People_due_to_Natural_Disaster (01)<7.47;9.47) -> Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47)) >+< (empty) : (
13	0.076	0.234	0.158	(empty) : (Prison_Population (01)<7.47;9.47) -> Prison_Population (01)<5.47)) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))
14	0.076	0.234	0.158	(empty) : (Prison_Population (01)<7.47;9.47) & Homeless_People_due_to_Natural_Disaster (01)<7.47;9.47) -> Prison_Population (01)<5.47;7.47) & Homeless_People_due_to_Natural_Disaster (01)<7.47;9.47);
15	0.076	0.234	0.158	(empty) : (Homeless_People_due_to_Natural_Disaster (01)<7.47;9.47) -> Homeless_People_due_to_Natural_Disaster (01)<5.47)) >+< (empty) : (
16	0.052	0.210	0.158	(empty) : (Prison_Population (01)<5.47;7.47) -> Prison_Population (01)<5.47)) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))
17	0.052	0.210	0.158	(empty) : (Prison_Population (01)<5.47;7.47) & Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47) -> Prison_Population (01)<5.47;7.47) & Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47)) >+< (empty) : (
18	0.052	0.210	0.158	(empty) : (Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47) -> Homeless_People_due_to_Natural_Disaster (01)<5.47)) >+< (empty) : (

Buttons: Detail, Goto ID, Copy, Remove, Filter, Sorting, Export

Rule

Antecedent:	(Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47)) -> Homeless_People_due_to_Natural_Disaster (01)<3.47;5.47))
Succedent:	(Total (01)(Stable) -> Total (01)(Sustainable))
State before:	Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47)) >+< Total (01)(Stable)
State after:	Homeless_People_due_to_Natural_Disaster (01)<3.47;5.47)) >+< Total (01)(Sustainable)
Condition:	(empty)

Text

The screenshot shows the LiSp-Miner software interface with the following details:

- Tab Tree:** Shows sections A. Data Introduction, B. Data Preprocessing, C. Interactive Analysis, D. Data-mining Tasks, E. Domain knowledge, and W. Workspace.
- Toolbar:** Includes File, Data Introduction, Preprocessing, Interactive Analysis, Data-mining Tasks, Domain Knowledge, Window, and Help.
- Central Panel:**
 - Hypothesis ID:** 8
 - Antecedent:** (Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47)) -> Homeless_People_due_to_Natural_Disaster (01)<3.47;5.47))
 - Succedent:** (Total (01)Stable) -> Total (01)(Sustainable)
 - State before:** Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47)) >< Total (01)(Stable)
 - State after:** Homeless_People_due_to_Natural_Disaster (01)<3.47;5.47)) >< Total (01)(Sustainable)
 - Condition:** (empty)
 - Quantifiers values:**

	Total (01)	Total (01)
a-frequency	13	13
a-frequency	6	6

a-frequency (BASE) from source contingency table
a-frequency (BASE) from source contingency table
 - Various interest measures from the four-fold tables:**

	D% Sum	D% Conf	DI-AFUI	DI-FUE	DI-Avg	R-Conf	R-DFUI	R-FUE	R-Avg	H-Conf	H-DFUI	H-FUE
	0.42	0.05	0.0517826825	-0.17	-0.43	1.33	1.2759259259	0.77	-0.27	1.33	1.2759259259	1.3
	0.42	0.05	0.0312368973	-0.1685393258	-0.4280390197	1.2759259259	1.2759259259	0.77	-0.2650000025	1.33	1.2759259259	1.297029703
	0.42	0.05	0.0312368973	-0.1685393258	-0.4280390197	1.2759259259	1.2759259259	0.77	-0.2650000025	1.33	1.2759259259	1.297029703

Sum of differences of relative frequencies between state before and after
Difference of values of Confidence
Difference of values of D-Confidence
Difference of values of E-Confidence
Difference of values of Average Difference
Ratio of values of Confidence
Ratio of values of D-Confidence
Ratio of values of E-Confidence
Ratio of values of Average Difference
Higher of ratios of values of Confidence
Higher of ratios of values of D-Confidence
Higher of ratios of values of E-Confidence
- Buttons:** TEXT, DATA, STATE BEFORE, STATE AFTER, B+A, DIFF ABS, DIFF REL, Export.

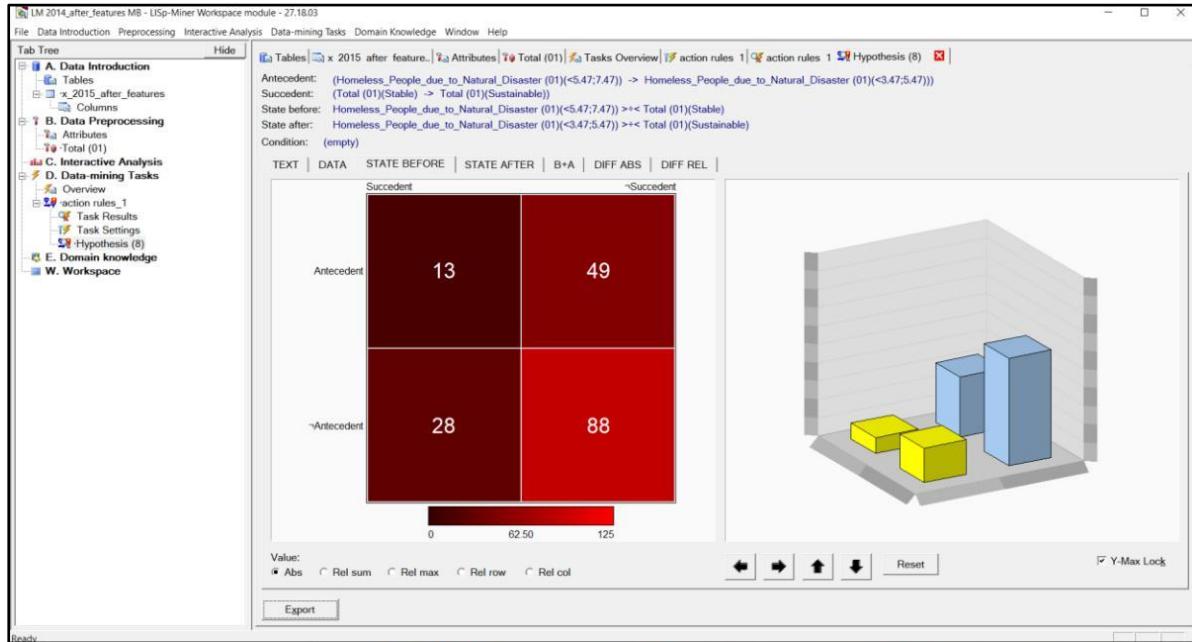
Data

The screenshot shows the LiSp-Miner software interface with the following details:

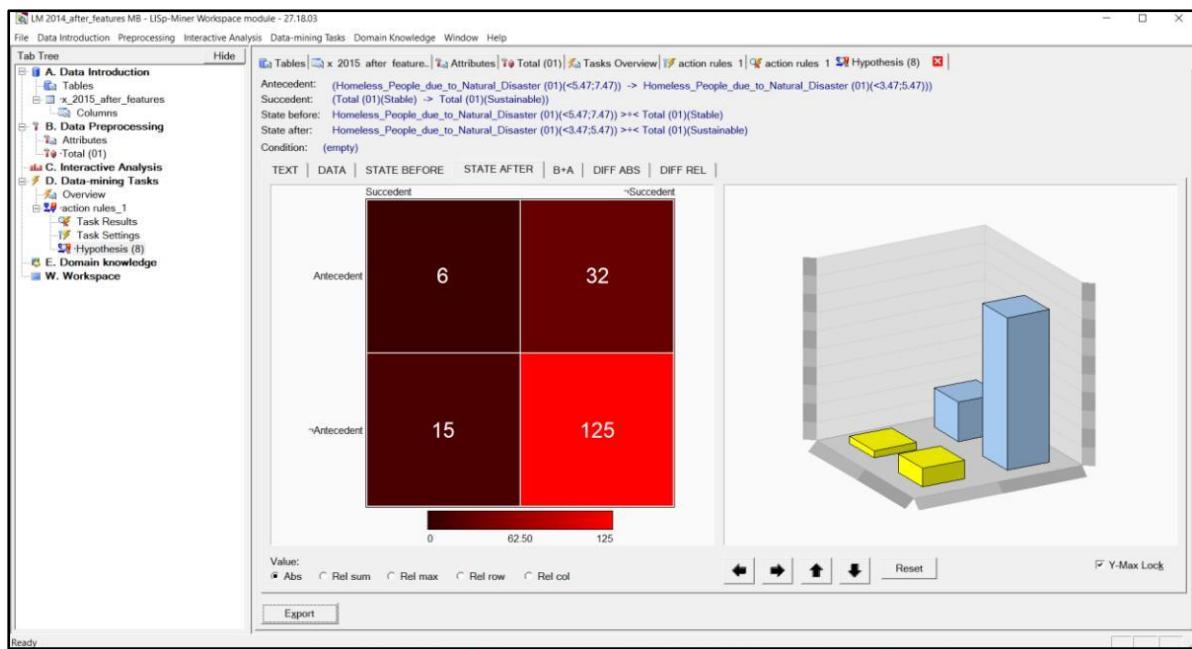
- Tab Tree:** Shows sections A. Data Introduction, B. Data Preprocessing, C. Interactive Analysis, D. Data-mining Tasks, E. Domain knowledge, and W. Workspace.
- Toolbar:** Includes File, Data Introduction, Preprocessing, Interactive Analysis, Data-mining Tasks, Domain Knowledge, Window, and Help.
- Central Panel:**
 - Hypothesis ID:** 8
 - Antecedent:** (Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47)) -> Homeless_People_due_to_Natural_Disaster (01)<3.47;5.47))
 - Succedent:** (Total (01)Stable) -> Total (01)(Sustainable)
 - State before:** Homeless_People_due_to_Natural_Disaster (01)<5.47;7.47)) >< Total (01)(Stable)
 - State after:** Homeless_People_due_to_Natural_Disaster (01)<3.47;5.47)) >< Total (01)(Sustainable)
 - Condition:** (empty)
 - Table:**

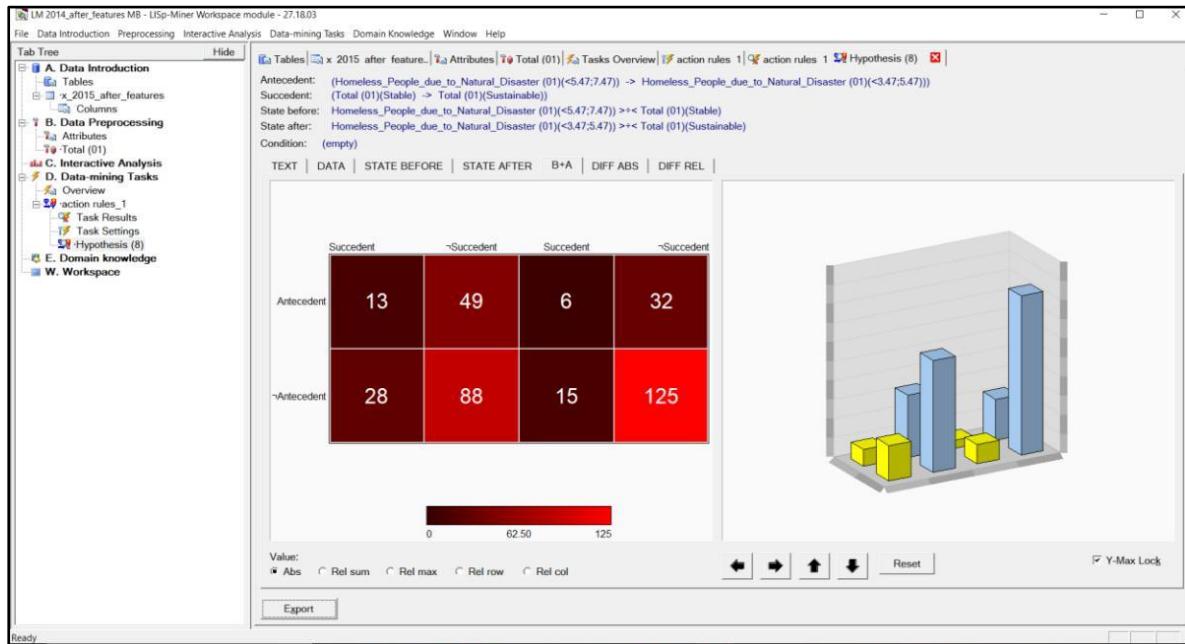
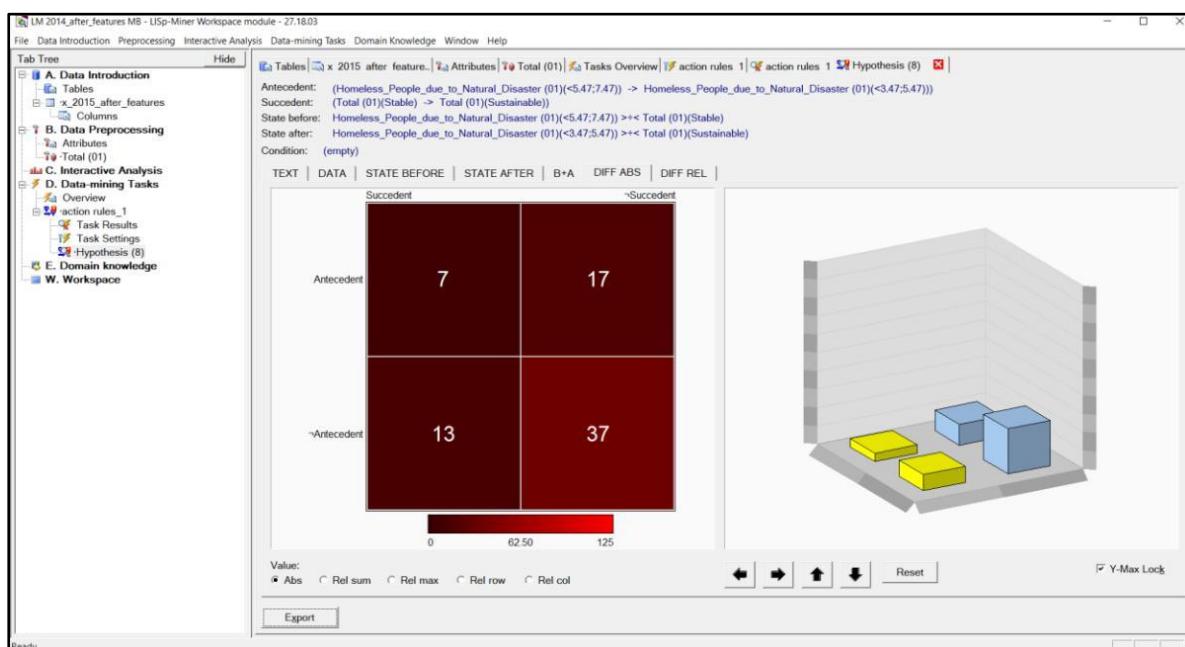
#	A	b	a	S	b	Homeless_People_d...	Homeless_People_d...	Total (01)	Total (01)
1	1	1	1	<5.47;5.47)	<5.47;5.47)	Alert	Alert	Alert	Alert
2	1	1	1	<5.47;9.47)	<5.47;9.47)	Alert	Alert	Alert	Alert
3	1	1	1	<5.47;5.47)	<5.47;5.47)	Alert	Alert	Alert	Alert
4	1	1	1	<5.47;9.47)	<5.47;9.47)	Alert	Alert	Alert	Alert
5	1	1	1	<5.47;9.47)	<5.47;9.47)	Alert	Alert	Alert	Alert
6	1	1	1	<5.47;5.47)	<5.47;5.47)	Alert	Alert	Alert	Alert
7	1	1	1	<5.47;9.47)	<5.47;9.47)	Alert	Alert	Alert	Alert
8	1	1	1	<5.47;5.47)	<5.47;5.47)	Alert	Alert	Alert	Alert
9	1	1	1	<5.47;5.47)	<5.47;5.47)	Alert	Alert	Alert	Alert
10	1	1	1	<5.47;7.47)	<5.47;7.47)	Alert	Alert	Alert	Alert
11	1	1	1	<5.47;9.47)	<5.47;9.47)	Alert	Alert	Alert	Alert
12	1	1	1	<5.47;5.47)	<5.47;5.47)	Warning	Warning	Warning	Warning
13	1	1	1	<5.47;7.47)	<5.47;7.47)	Warning	Warning	Warning	Warning
14	1	1	1	<5.47;7.47)	<5.47;7.47)	Warning	Warning	Warning	Warning
15	1	1	1	<5.47;9.47)	<5.47;9.47)	Warning	Warning	Warning	Warning
16	1	1	1	<5.47;7.47)	<5.47;7.47)	Warning	Warning	Warning	Warning
17	1	1	1	<5.47;5.47)	<5.47;5.47)	Warning	Warning	Warning	Warning
18	1	1	1	<5.47;5.47)	<5.47;5.47)	Warning	Warning	Warning	Warning
19	1	1	1	<5.47;9.47)	<5.47;9.47)	Warning	Warning	Warning	Warning
20	1	1	1	<5.47;7.47)	<5.47;7.47)	Warning	Warning	Warning	Warning
21	1	1	1	<5.47;9.47)	<5.47;9.47)	Warning	Warning	Warning	Warning
22	1	1	1	<5.47;9.47)	<5.47;9.47)	Warning	Warning	Warning	Warning
23	1	1	1	<5.47;7.47)	<5.47;7.47)	Warning	Warning	Warning	Warning
24	1	1	1	<5.47;9.47)	<5.47;9.47)	Warning	Warning	Warning	Warning
25	1	1	1	<5.47;7.47)	<5.47;7.47)	Warning	Warning	Warning	Warning
26	1	1	1	<5.47;9.47)	<5.47;9.47)	Warning	Warning	Warning	Warning
27	1	1	1	<5.47;7.47)	<5.47;7.47)	Warning	Warning	Warning	Warning
28	1	1	1	<5.47;7.47)	<5.47;7.47)	Warning	Warning	Warning	Warning
29	1	1	1	<5.47;7.47)	<5.47;7.47)	Warning	Warning	Warning	Warning
30	*	*	*	<5.47;0.47)	<5.47;0.47)	Warning	Warning	Warning	Warning
 - Buttons:** TEXT, DATA, STATE BEFORE, STATE AFTER, B+A, DIFF ABS, DIFF REL, Export.

State Before

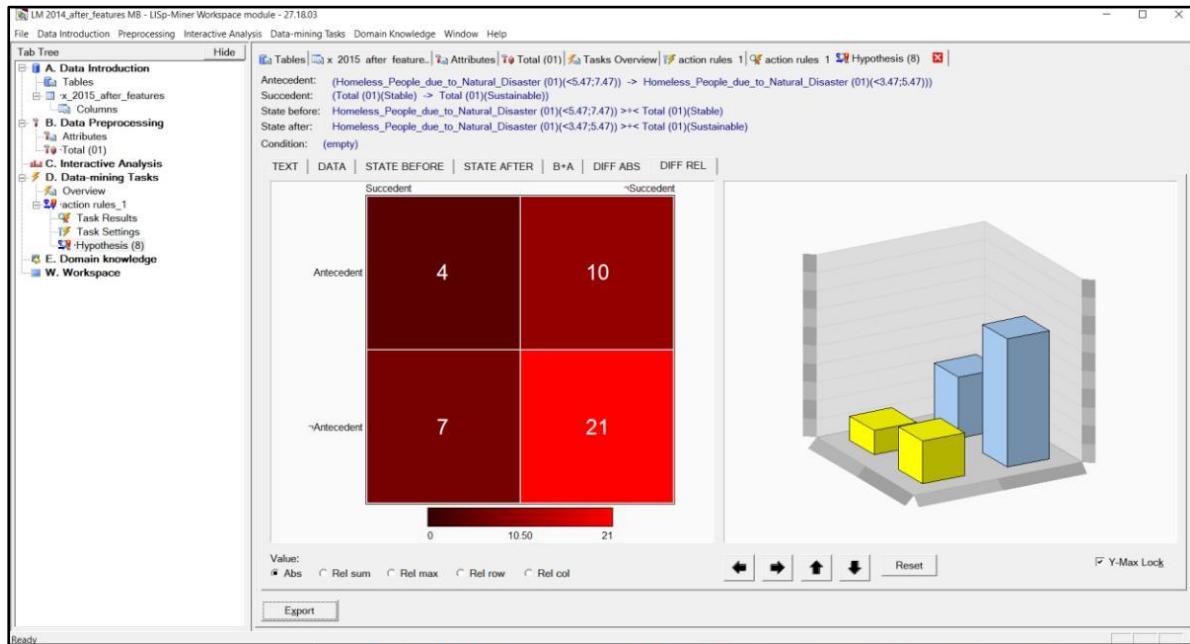


State After



B + A**Diff ABS**

Diff REL



ACTION RULES FOR 2016

Alert to Sustainable

The screenshot shows the "ACTION RULES FOR 2016" configuration interface. It includes several panels for defining rules:

- ANTECEDENT STABLE PART:** Lists "Default Partial Cedent" items like "d_Country (subset), 1 - 1" and "Rank_ (subset), 1 - 1".
- QUANTIFIERS:** Shows "Type" (a (BASE) Before, a (BASE) After), "Rel. Value" (>= 5.00), and "Units" (Abs).
- SUCCEDEDNT STABLE PART:** Lists "Default Partial Cedent" items like "Total (01)(Alert -> Sustainable)".
- (1) ANTECEDENT VARIABLE PART:** Lists "Default Partial Cedent" items like "Prison_Population (01) (subset), 1 - 1", "S2_Refugees_and_IDPs (01) (subset), 1 - 1", and "X1_External_Intervention (01) (subset), 1 - 1".
- CONDITION:** Lists "Default Partial Cedent" items like "Con, 0 - 5" and "B, pos".
- (2) SUCCEDEDNT VARIABLE PART:** Lists "Default Partial Cedent" items like "Total (01)(Alert -> Sustainable)".

At the bottom, there are "Task parameters" with settings for "Strict action", "Sets overlapping", and "Maximal number of hypotheses". There are also buttons for "Params", "Switch", "Validate", "Task Clone", "Run", "Bkgnd Run", "Grid Run", and "Show Results".

Actual group of hypotheses: All hypotheses						
Hypotheses in group:		2	Shown hypotheses:	2	Highlighted:	0
Nr.	Id	Df-Conf	B:Conf	A:Conf	Hypothesis	Delete hypotheses
1	1	-0.051	0.078	0.129	(empty) : (Prison_Population (01)(<7.47;9.47)) -> Prison_Population (01)(<5.47;7.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Sustainable))	
2	2	-0.080	0.078	0.158	(empty) : (Prison_Population (01)(<7.47;9.47)) -> Prison_Population (01)(<5.47)) >+< (empty) : (Total (01)(Alert) -> Total (01)(Sustainable))	

Rule

Antecedent: (Prison_Population (01)(<7.47;9.47)) -> Prison_Population (01)(<3.47;5.47))
 Succedent: (Total (01)(Alert) -> Total (01)(Sustainable))
 State before: Prison_Population (01)(<7.47;9.47)) >+< Total (01)(Alert)
 State after: Prison_Population (01)(<3.47;5.47)) >+< Total (01)(Sustainable)
 Condition: (empty)

Text

Tables	Attributes	Tasks Overview	action rules	action rules	Hypothesis (2)	Total (01)
Antecedent: (Prison_Population (01)(<7.47;9.47)) -> Prison_Population (01)(<3.47;5.47))						
Succedent: (Total (01)(Alert) -> Total (01)(Sustainable))						
State before: Prison_Population (01)(<7.47;9.47)) >+< Total (01)(Alert)						
State after: Prison_Population (01)(<3.47;5.47)) >+< Total (01)(Sustainable)						
Condition: (empty)						
TEXT	DATA	STATE BEFORE	STATE AFTER	B+A	DIFF ABS	DIFF REL
*** Hypothesis ID: 2						
Antecedent (empty)						
Variable antecedent Before						
Prison_Population (01)		<7.47;9.47)				
Variable antecedent After						
Prison_Population (01)		<3.47;5.47)				
Succedent (empty)						
Variable succedent Before						
Total (01)		Alert				
Variable succedent After						
Total (01)		Sustainable				
Quantifiers values:						
a-frequency	6	6			a-frequency (BASE) from source contingency table	
a-frequency	6	6			a-frequency (BASE) from source contingency table	
Various interest measures from the four-fold tables:						
D%_Sum	0.44	0.44			Sum of differences of relative frequencies between state before and after	
Di-Conf	-0.08	-0.0799726589			Difference of values of Confidence	
Di-DFUI	-0.04	-0.0400368155			Difference of values of D-Confidence	
Di-FUE	-0.16	-0.1629213483			Difference of values of E-Confidence	
Di-Avg	-0.08	-0.0774249674			Difference of values of Average Difference	
R-Conf	0.49	0.4935064935			Ratio of values of Confidence	
R-DFUI	0.65	0.6463414634			Ratio of values of D-Confidence	
R-FUE	0.78	0.7786259542			Ratio of values of E-Confidence	
R-Avg	0.77	0.7711662075			Ratio of values of Average Difference	
H-Conf	2.03	2.0263157895			Higher of ratios of values of Confidence	
H-DFUI	1.55	1.5471698113			Higher of ratios of values of D-Confidence	
H-FUE	1.28	1.2843137255			Higher of ratios of values of E-Confidence	
Export						

Data

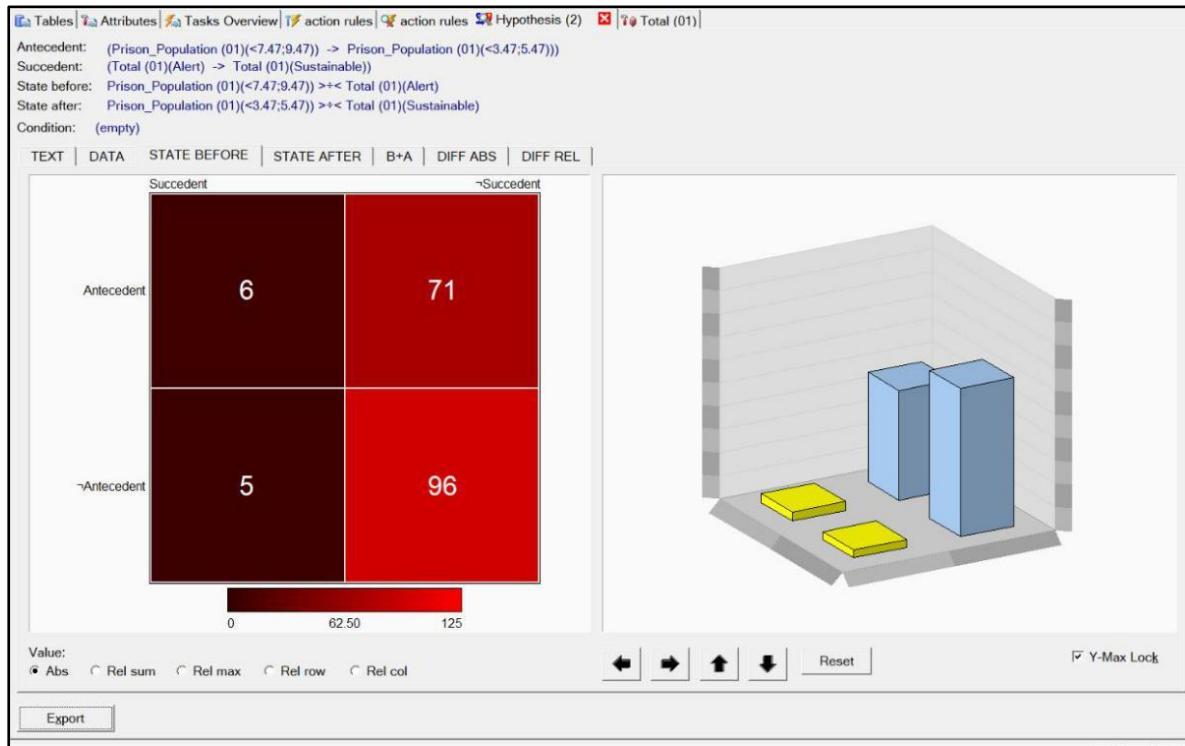
Tables | Attributes | Tasks Overview | action rules | action rules | Hypothesis (2) | Total (01)

Antecedent: (Prison_Population (01)<7.47;9.47) -> Prison_Population (01)<3.47;5.47))
 Succeedent: (Total (01)(Alert) -> Total (01)(Sustainable))
 State before: Prison_Population (01)<7.47;9.47) >=< Total (01)(Alert)
 State after: Prison_Population (01)<3.47;5.47)) >=< Total (01)(Sustainable)
 Condition: (empty)

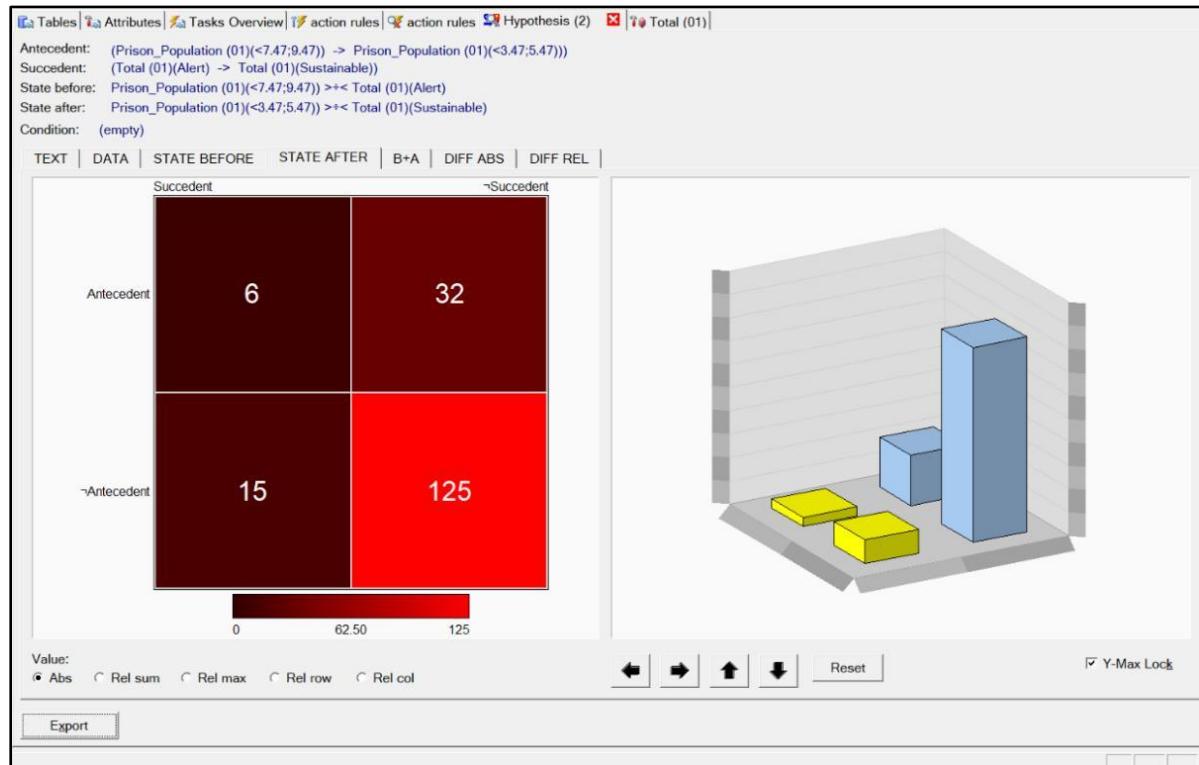
TEXT	DATA	STATE BEFORE	STATE AFTER	B+A	DIFF ABS	DIFF REL				
#	A	b	a	S	b	a	Prison_Population (0...)	Prison_Population (0...)	Total (01)	Total (01)
1	1	1	1	1			<7.47;9.47)	<7.47;9.47)	Alert	Alert
2	1	1	1	1			<7.47;9.47)	<7.47;9.47)	Alert	Alert
3	1	1	1	1			<3.47;5.47)	<3.47;5.47)	Alert	Alert
4	1	1	1	1			<7.47;9.47)	<7.47;9.47)	Alert	Alert
5	1	1	1	1			<7.47;9.47)	<7.47;9.47)	Alert	Alert
6	1	1	1	1			<3.47;5.47)	<3.47;5.47)	Alert	Alert
7	1	1	1	1			<7.47;9.47)	<7.47;9.47)	Alert	Alert
8	1	1	1	1			<3.47;5.47)	<3.47;5.47)	Alert	Alert
9	1	1	1	1			<3.47;5.47)	<3.47;5.47)	Alert	Alert
10	1	1	1	1			<5.47;7.47)	<5.47;7.47)	Alert	Alert
11	1	1	1	1			<7.47;9.47)	<7.47;9.47)	Alert	Alert
12	1	1	1	1			<3.47;5.47)	<3.47;5.47)	Warning	Warning
13	1			1			<5.47;7.47)	<5.47;7.47)	Warning	Warning
14	1			1			<5.47;7.47)	<5.47;7.47)	Warning	Warning
15	1			1			<7.47;9.47)	<7.47;9.47)	Warning	Warning
16	1			1			<5.47;7.47)	<5.47;7.47)	Warning	Warning
17	1			1			<3.47;5.47)	<3.47;5.47)	Warning	Warning
18	1			1			<3.47;5.47)	<3.47;5.47)	Warning	Warning
19	1			1			<7.47;9.47)	<7.47;9.47)	Warning	Warning
20	1			1			<5.47;7.47)	<5.47;7.47)	Warning	Warning
21	1			1			<7.47;9.47)	<7.47;9.47)	Warning	Warning
22	1			1			<7.47;9.47)	<7.47;9.47)	Warning	Warning
23	1			1			<5.47;7.47)	<5.47;7.47)	Warning	Warning
24	1			1			<7.47;9.47)	<7.47;9.47)	Warning	Warning
25	1			1			<5.47;7.47)	<5.47;7.47)	Warning	Warning
26	1			1			<7.47;9.47)	<7.47;9.47)	Warning	Warning
27	1			1			<7.47;9.47)	<7.47;9.47)	Warning	Warning
28	1			1			<5.47;7.47)	<5.47;7.47)	Warning	Warning
29	1			1			<5.47;7.47)	<5.47;7.47)	Warning	Warning
30	1			1			>7.47;9.47)	>7.47;9.47)	Warning	Warning

Export

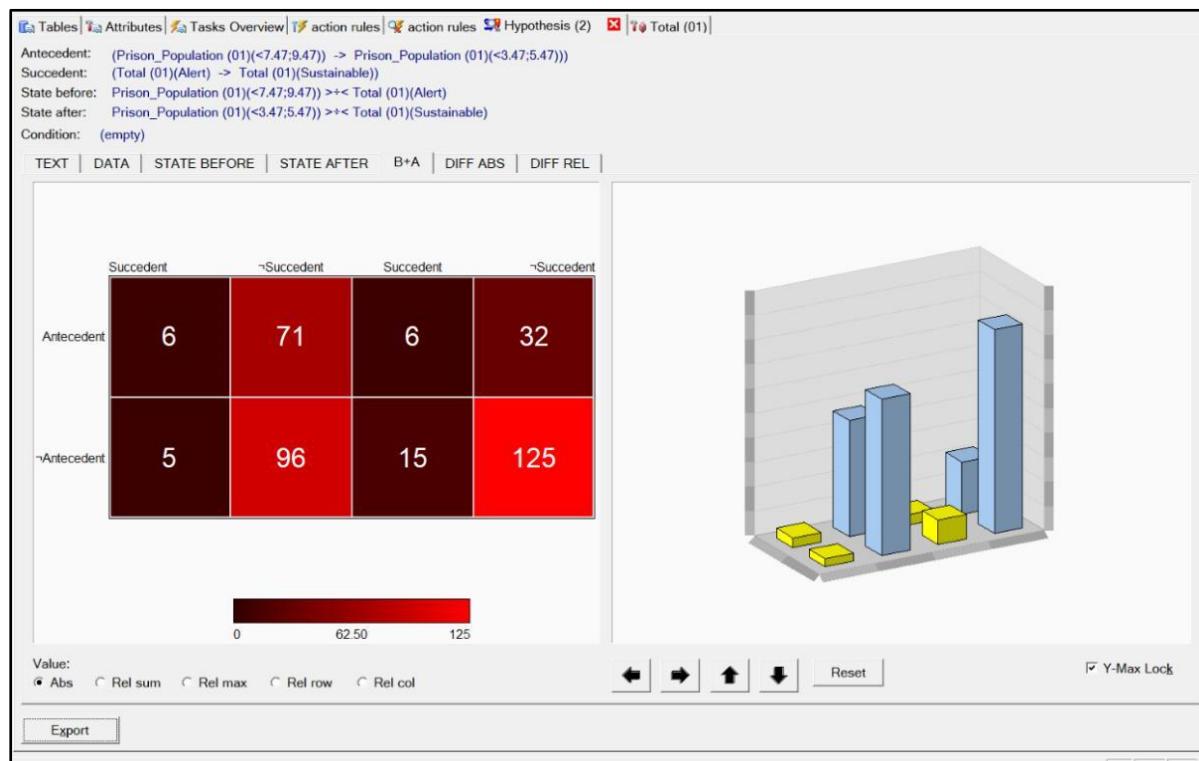
State Before



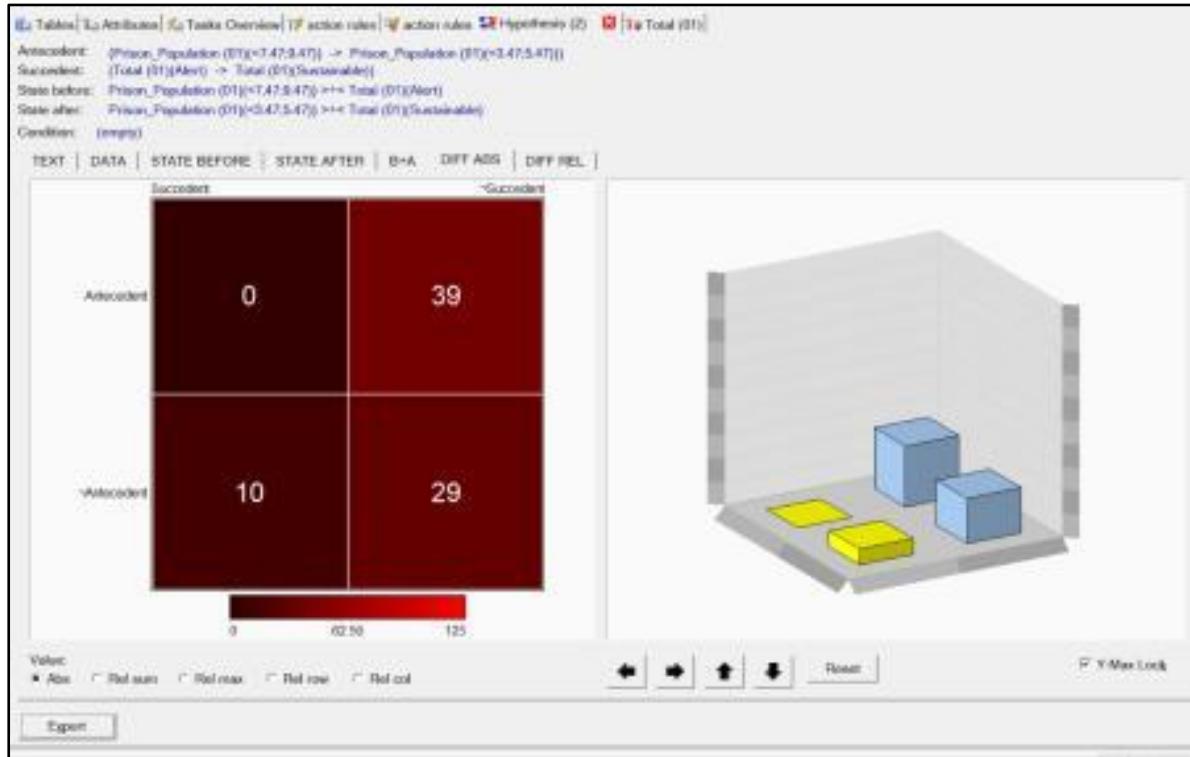
State After



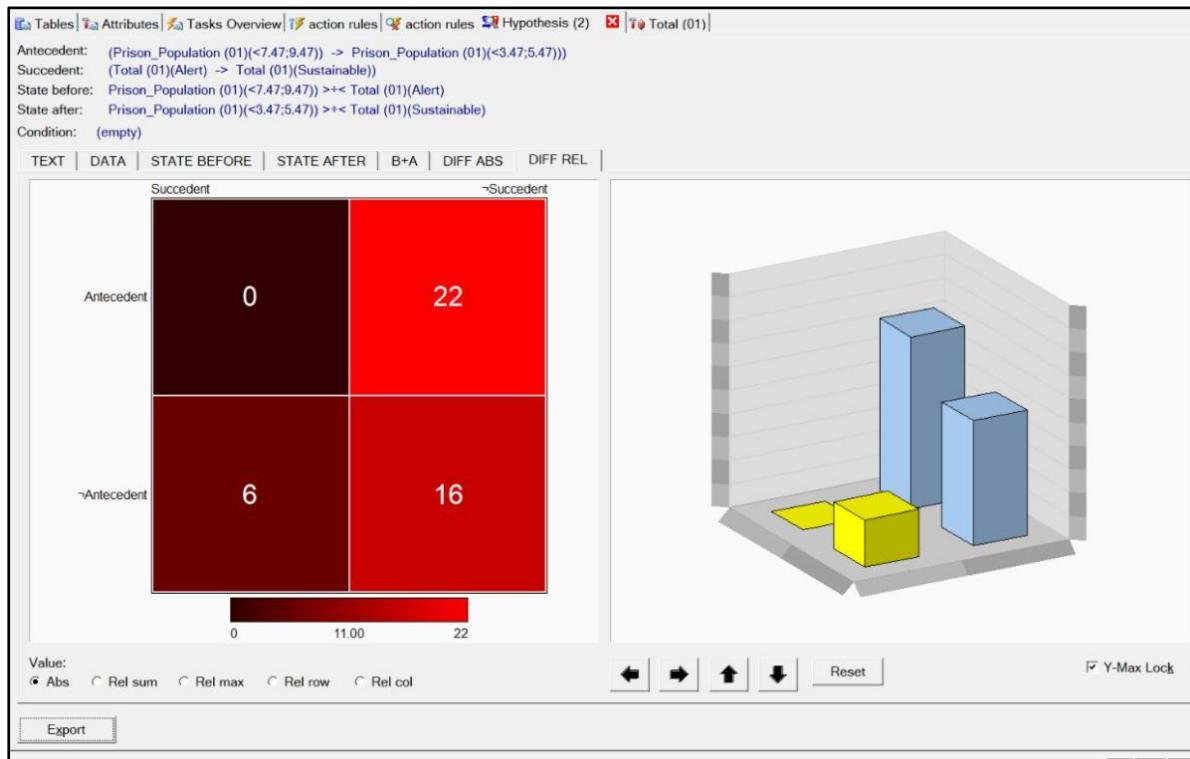
B + A



Diff ABS



Diff REL



Stable to Sustainable

ANTECEDENT STABLE PART

Default Partial Cedent	Con, 0 - 5
» d_Country (subset), 1 - 1	B, pos
» Rank_(subset), 1 - 1	B, pos

Total length: 0 - 5 {0 - 2}

(1) ANTECEDENT VARIABLE PART

Default Partial Cedent	Con, 1 - 5
» Prison_Population (01) (subset), 1 - 1	B, pos
» S2_Refugees_and_IDPs (01) (subset), 1 - 1	B, pos
» P2_Public_Services (01) (subset), 1 - 1	B, pos

Total length: 0 - 5 {1 - 3}

QUANTIFIERS

Type	Rel.	Value	Units
a (BASE) Before	>=	5.00	Abs
a (BASE) After	>=	5.00	Abs

Generation information
Status: Solved, 3 run(s)
Mode: Standard

SUCCEDEDENT STABLE PART

Default Partial Cedent	Con, 0 - 5
------------------------	------------

Total length: 0

CONDITION

Default Partial Cedent	Con, 0 - 5
------------------------	------------

Total length: 0

(2) SUCCEDENT VARIABLE PART

Default Partial Cedent	Con, 1 - 5
» Total (01)(Stable -> Sustainable)	B, pos

Total length: 1

Task parameters

Strict action: States must be represented by the same sets of attributes which differ in coefficients only (the strict meaning of an action)
Sets overlapping: Sets must differ in all rows (i.e. not overlapping sets)
Maximal number of hypotheses: 1000

Params **Switch** **Validate** **Task Clone**
Run **Bkgnd Run** **Grid Run** **Show Results**

Actual group of hypotheses: All hypotheses
Hypotheses in group: 6 Shown hypotheses: 6 Highlighted: 0

Nr.	Id	Df-Conf	B:Conf	A:Conf	Hypothesis
1	5	0.172	0.263	0.091	(empty) : (Prison_Population (01)(<5.47) -> Prison_Population (01)(<7.47;9.47))) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))
2	6	0.134	0.263	0.129	(empty) : (Prison_Population (01)(<5.47) -> Prison_Population (01)(<5.47;7.47))) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))
3	3	0.119	0.210	0.091	(empty) : (Prison_Population (01)(<5.47;7.47)) -> Prison_Population (01)(<5.47;9.47)) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))
4	1	0.105	0.234	0.128	(empty) : (Prison_Population (01)(<7.47;9.47)) -> Prison_Population (01)(<5.47;7.47)) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))
5	2	0.076	0.234	0.158	(empty) : (Prison_Population (01)(<7.47;9.47)) -> Prison_Population (01)(<5.47)) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))
6	4	0.052	0.210	0.158	(empty) : (Prison_Population (01)(<5.47;7.47)) -> Prison_Population (01)(<5.47)) >+< (empty) : (Total (01)(Stable) -> Total (01)(Sustainable))

Rule

Antecedent:	(Prison_Population (01)(<5.47;7.47)) -> Prison_Population (01)(<3.47;5.47))
Succedent:	(Total (01)(Stable) -> Total (01)(Sustainable))
State before:	Prison_Population (01)(<5.47;7.47)) >+< Total (01)(Stable)
State after:	Prison_Population (01)(<3.47;5.47)) >+< Total (01)(Sustainable)
Condition:	(empty)

Text

Antecedent: (Prison_Population (01)(<5.47;7.47) → Prison_Population (01)(<3.47;5.47))
 Succeedent: (Total (01)(Stable) → Total (01)(Sustainable))
 State before: Prison_Population (01)(<5.47;7.47)) >=< Total (01)(Stable)
 State after: Prison_Population (01)(<3.47;5.47)) >=< Total (01)(Sustainable)
 Condition: (empty)

TEXT	DATA	STATE BEFORE	STATE AFTER	B+A	DIFF ABS	DIFF REL
*** Hypothesis ID: 4						
Antecedent	(empty)					
Variable antecedent Before	Prison_Population (01)	<5.47;7.47)				
Variable antecedent After	Prison_Population (01)	<3.47;5.47)				
Succeedent	(empty)					
Variable succeedent Before	Total (01)	Stable				
Variable succeedent After	Total (01)	Sustainable				
Quantifiers values:						
a-frequency	13	13				a-frequency (BASE) from source contingency table
a-frequency	6	6				a-frequency (BASE) from source contingency table
Various interest measures from the four-fold tables:						
D%-Sum	0.42	0.42				Sum of differences of relative frequencies between state before and after
DI-Conf	0.05	0.0517826825				Difference of values of Confidence
DI-AFUI	0.03	0.0312368973				Difference of values of D-Confidence
DI-FUE	-0.17	-0.1685393258				Difference of values of E-Confidence
DI-Avg	-0.43	-0.4280390197				Difference of values of Average Difference
R-Conf	1.33	1.3279569892				Ratio of values of Confidence
R-DFUI	1.28	1.2759259259				Ratio of values of D-Confidence
R-FUE	0.77	0.7709923064				Ratio of values of E-Confidence
R-Avg	-0.27	-0.2650931025				Ratio of values of Average Difference
H-Conf	1.33	1.3279569892				Higher of ratios of values of Confidence
H-DFUI	1.28	1.2759259259				Higher of ratios of values of D-Confidence
H-FUE	1.3	1.297029703				Higher of ratios of values of E-Confidence

[Export](#)

Data

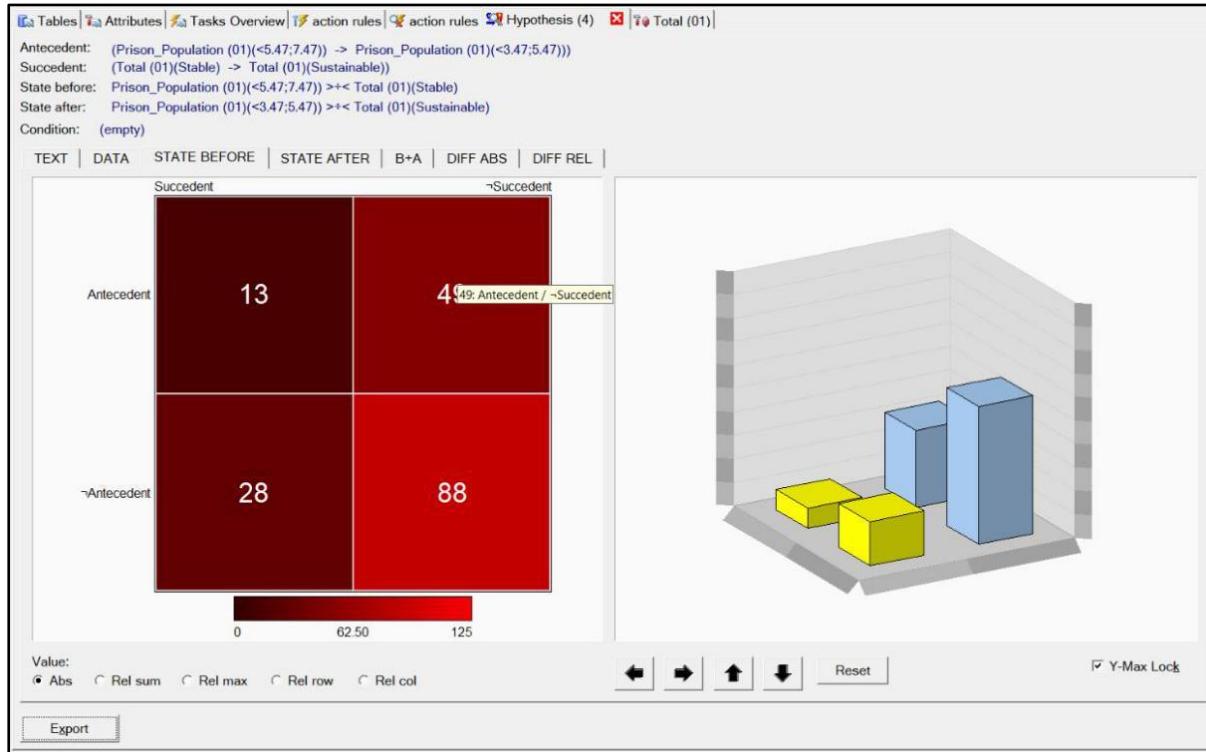
Tables | Attributes | Tasks Overview | action rules | action rules | Hypothesis (4) | Total (01)

Antecedent: (Prison_Population (01)(<5.47;7.47) → Prison_Population (01)(<3.47;5.47))
 Succeedent: (Total (01)(Stable) → Total (01)(Sustainable))
 State before: Prison_Population (01)(<5.47;7.47)) >=< Total (01)(Stable)
 State after: Prison_Population (01)(<3.47;5.47)) >=< Total (01)(Sustainable)
 Condition: (empty)

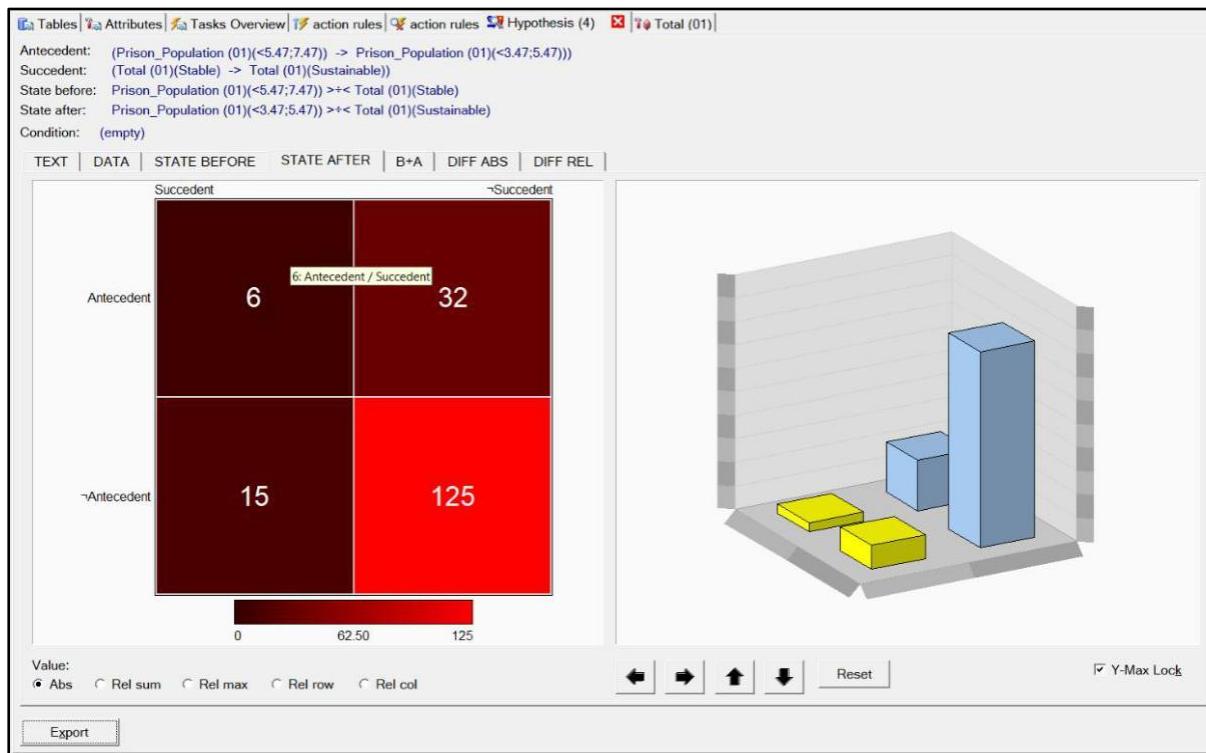
TEXT	DATA	STATE BEFORE	STATE AFTER	B+A	DIFF ABS	DIFF REL
# A b a S b a Prison_Population (01)(<5.47;7.47) Prison_Population (01)(<3.47;5.47) Total (01) Total (01)						
1 1 1 1 <5.47;7.47) <3.47;5.47) <7.47;9.47) <7.47;9.47) Alert Alert Alert						
2 1 1 1 <7.47;9.47) <3.47;5.47) <7.47;9.47) <7.47;9.47) Alert Alert Alert						
3 1 1 1 <3.47;5.47) <7.47;9.47) <3.47;5.47) <7.47;9.47) Alert Alert Alert						
4 1 1 1 <7.47;9.47) <7.47;9.47) <7.47;9.47) <7.47;9.47) Alert Alert Alert						
5 1 1 1 <7.47;9.47) <7.47;9.47) <7.47;9.47) <7.47;9.47) Alert Alert Alert						
6 1 1 1 <3.47;5.47) <7.47;9.47) <3.47;5.47) <7.47;9.47) Alert Alert Alert						
7 1 1 1 <7.47;9.47) <7.47;9.47) <7.47;9.47) <7.47;9.47) Alert Alert Alert						
8 1 1 1 <3.47;5.47) <7.47;9.47) <3.47;5.47) <7.47;9.47) Alert Alert Alert						
9 1 1 1 <3.47;5.47) <5.47;7.47) <3.47;5.47) <5.47;7.47) Alert Alert Alert						
10 1 1 1 <5.47;7.47) <7.47;9.47) <5.47;7.47) <7.47;9.47) Alert Alert Alert						
11 1 1 1 <7.47;9.47) <5.47;7.47) <7.47;9.47) <7.47;9.47) Alert Alert Alert						
12 1 1 1 <3.47;5.47) <5.47;7.47) <3.47;5.47) <5.47;7.47) Warning Warning Warning						
13 1 1 1 <5.47;7.47) <7.47;9.47) <5.47;7.47) <7.47;9.47) Warning Warning Warning						
14 1 1 1 <5.47;7.47) <7.47;9.47) <5.47;7.47) <7.47;9.47) Warning Warning Warning						
15 1 1 1 <7.47;9.47) <7.47;9.47) <7.47;9.47) <7.47;9.47) Warning Warning Warning						
16 1 1 1 <5.47;7.47) <5.47;7.47) <5.47;7.47) <5.47;7.47) Warning Warning Warning						
17 1 1 1 <3.47;5.47) <5.47;7.47) <3.47;5.47) <5.47;7.47) Warning Warning Warning						
18 1 1 1 <3.47;5.47) <7.47;9.47) <3.47;5.47) <7.47;9.47) Warning Warning Warning						
19 1 1 1 <7.47;9.47) <7.47;9.47) <7.47;9.47) <7.47;9.47) Warning Warning Warning						
20 1 1 1 <5.47;7.47) <7.47;9.47) <5.47;7.47) <7.47;9.47) Warning Warning Warning						
21 1 1 1 <7.47;9.47) <7.47;9.47) <7.47;9.47) <7.47;9.47) Warning Warning Warning						
22 1 1 1 <7.47;9.47) <7.47;9.47) <7.47;9.47) <7.47;9.47) Warning Warning Warning						
23 1 1 1 <5.47;7.47) <5.47;7.47) <5.47;7.47) <5.47;7.47) Warning Warning Warning						
24 1 1 1 <7.47;9.47) <7.47;9.47) <7.47;9.47) <7.47;9.47) Warning Warning Warning						
25 1 1 1 <5.47;7.47) <7.47;9.47) <5.47;7.47) <7.47;9.47) Warning Warning Warning						
26 1 1 1 <7.47;9.47) <7.47;9.47) <7.47;9.47) <7.47;9.47) Warning Warning Warning						
27 1 1 1 <7.47;9.47) <7.47;9.47) <7.47;9.47) <7.47;9.47) Warning Warning Warning						
28 1 1 1 <5.47;7.47) <5.47;7.47) <5.47;7.47) <5.47;7.47) Warning Warning Warning						
29 1 1 1 <5.47;7.47) <7.47;9.47) <5.47;7.47) <7.47;9.47) Warning Warning Warning						
30 1 1 1 <7.47;9.47) <7.47;9.47) <7.47;9.47) <7.47;9.47) Warning Warning Warning						

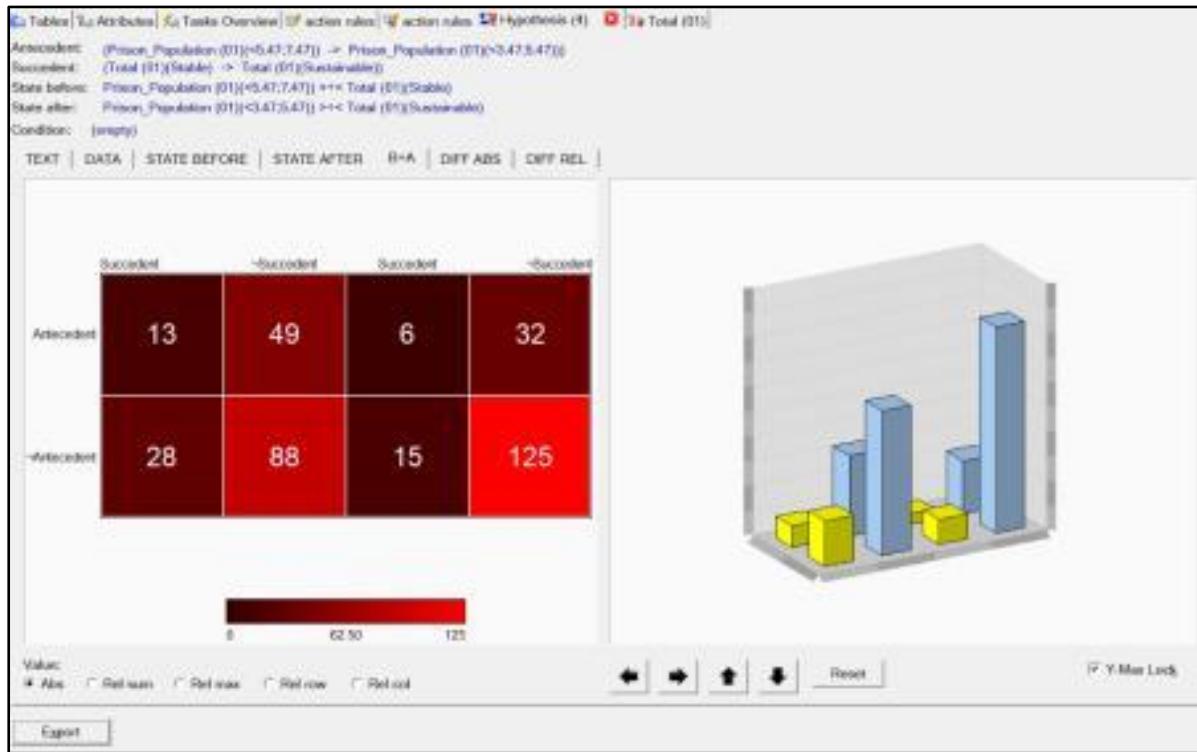
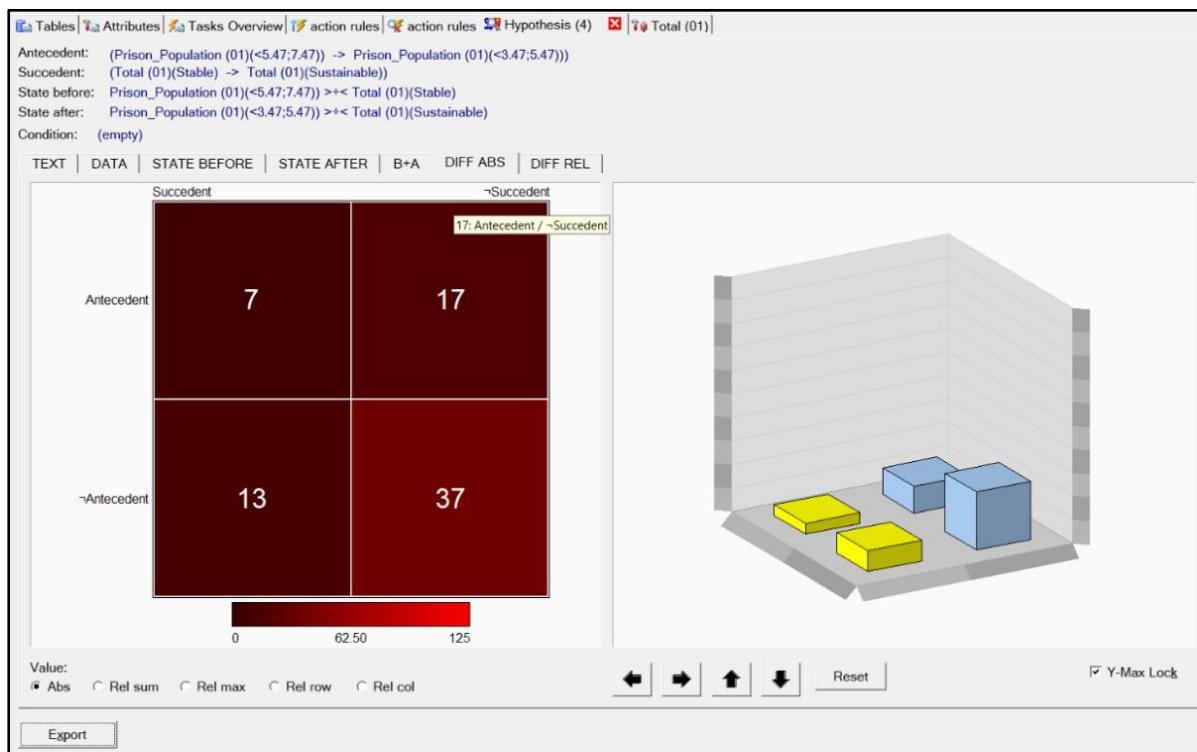
[Export](#)

State Before

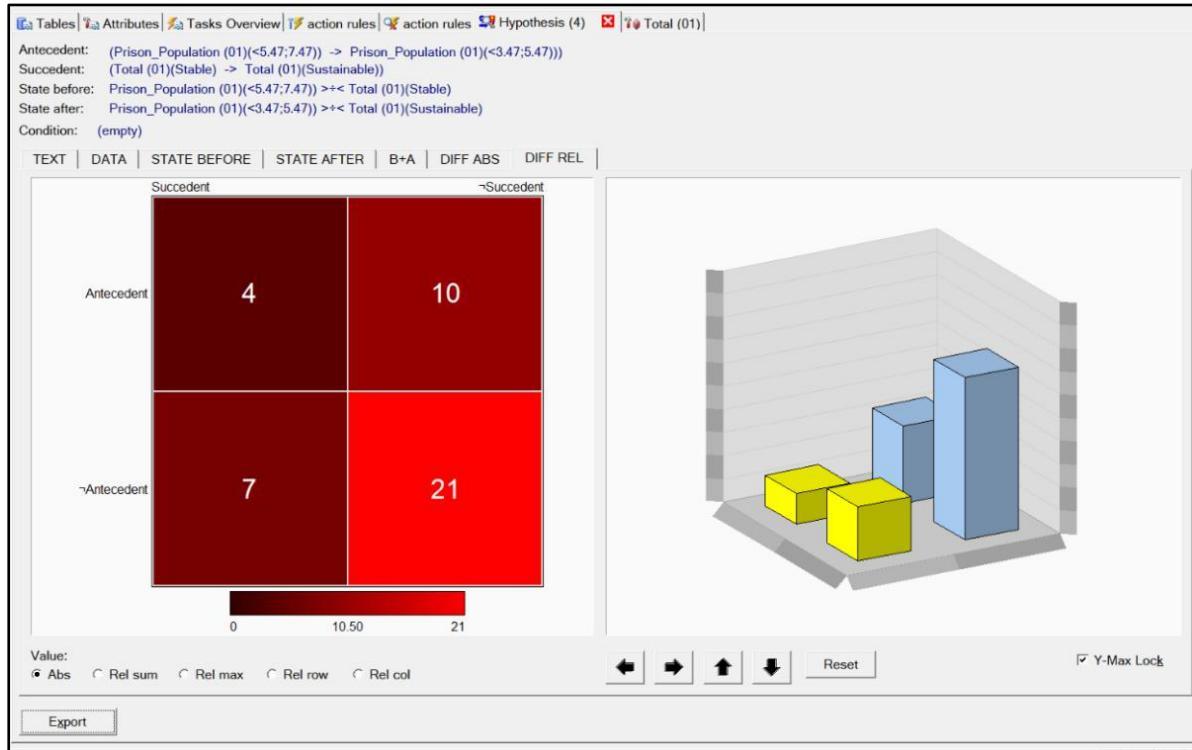


State After

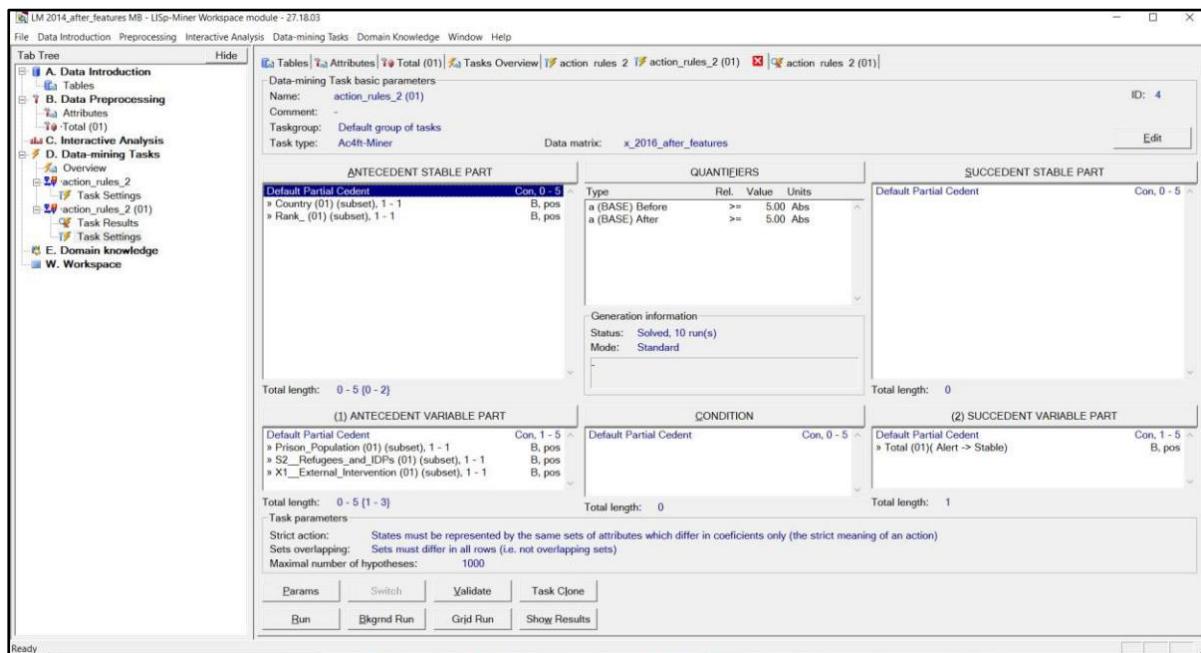


B + A**Diff ABS**

Diff REL



Alert to Stable



ITCS 6162 KNOWLEDGE DISCOVERY IN DATABASES (KDD)

LM 2014_after_features MB - LiSp-Miner Workspace module - 27.18.03

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Tables Attributes Total (01) Tasks Overview action rules 2 (01) action rules 2 (01) Hypothesis (8) |

Task: action_rules_2 (01)
Comment:
Taskgroup: Default group of tasks
Data matrix: x_2016_after_features
Task type: Ac4Mr-Miner

Task run
Start: 1.5.2019 20:24:38 Total time: 0h 0m 0s
Number of verifications: 136 Number of hypotheses: 11 Mode: Standard

Add group Del group Edit group |

Actual group of hypotheses: All hypotheses Hypotheses in group: 11 Shown hypotheses: 11 Highlighted: 0 Delete hypotheses

Nr. Id	Df-Conf	B-Conf	A-Conf	Hypothesis
1	9	0.403	0.606	0.143 (empty) : (S2_Refugees_and_IDPs (01)>=7.52) >< (empty) : (Total (01)Alert) > Total (01)Stable))
2	11	0.439	0.667	0.227 (empty) : (Prison_Population (01)>=7.52) & S2_Refugees_and_IDPs (01)>=7.52) > Prison_Population (01)<5.52;7.52) & S2_Refugees_and_IDPs (01)>=7.52) > Prison_Population (01)<5.52;7.52) & S2_Refugees_and_IDPs (01)>=7.52) >< (empty) : (Total (01)Alert) > Total (01)Stable))
3	6	0.251	0.463	0.212 (empty) : (X1_External_Intervention (01)>=7.52) > X1_External_Intervention (01)<5.52) >< (empty) : (Total (01)Alert) > Total (01)Stable))
4	3	0.062	0.194	0.132 (empty) : (Prison_Population (01)<5.52;7.52) > Prison_Population (01)>=7.52) >< (empty) : (Total (01)Alert) > Total (01)Stable))
5	10	0.039	0.182	0.143 (empty) : (S2_Refugees_and_IDPs (01)<5.52;7.52) > S2_Refugees_and_IDPs (01)<5.52;7.52) >< (empty) : (Total (01)Alert) > Total (01)Stable))
6	1	0.034	0.276	0.242 (empty) : (Prison_Population (01)>=7.52) > Prison_Population (01)<5.52;7.52) >< (empty) : (Total (01)Alert) > Total (01)Stable))
7	2	0.028	0.276	0.250 (empty) : (Prison_Population (01)>=7.52) > Prison_Population (01)<5.52;7.52) >< (empty) : (Total (01)Alert) > Total (01)Stable))
8	7	-0.007	0.125	0.132 (empty) : (Prison_Population (01)<5.52) > Prison_Population (01)>=7.52) >< (empty) : (Total (01)Alert) > Total (01)Stable))
9	5	-0.048	0.164	0.212 (empty) : (X1_External_Intervention (01)<5.52;7.52) > X1_External_Intervention (01)<5.52) >< (empty) : (Total (01)Alert) > Total (01)Stable))
10	4	-0.056	0.194	0.250 (empty) : (Prison_Population (01)<5.52;7.52) > Prison_Population (01)<5.52) >< (empty) : (Total (01)Alert) > Total (01)Stable))
11	8	-0.117	0.125	0.242 (empty) : (Prison_Population (01)<5.52) > Prison_Population (01)<5.52;7.52) >< (empty) : (Total (01)Alert) > Total (01)Stable))

Detail Goto ID Copy Remove Filter Sorting Export |

Rule

Antecedent: (*Prison_Population (01)<3.52;5.52)* \rightarrow *Prison_Population (01)<5.52;7.52))*)
 Succedent: (*Total (01)Alert* \rightarrow *Total (01)Stable))*)
 State before: *Prison_Population (01)<3.52;5.52)* $>\div<$ *Total (01)Alert*
 State after: *Prison_Population (01)<5.52;7.52)* $>\div<$ *Total (01)Stable))*
 Condition: (empty)

Text

LM 2014_after_features MB - LiSp-Miner Workspace module - 27.18.03

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Tables Attributes Total (01) Tasks Overview action rules 2 (01) action rules 2 (01) Hypothesis (8) |

Antecedent: (*Prison_Population (01)<3.52;5.52)* \rightarrow *Prison_Population (01)<5.52;7.52))*)
 Succedent: (*Total (01)Alert* \rightarrow *Total (01)Stable))*)
 State before: *Prison_Population (01)<3.52;5.52)* $>\div<$ *Total (01)Alert*
 State after: *Prison_Population (01)<5.52;7.52)* $>\div<$ *Total (01)Stable))*
 Condition: (empty)

TEXT DATA STATE BEFORE STATE AFTER B+A DIFF ABS DIFF REL |

*** Hypothesis ID: 8

Antecedent	(empty)		
Variable antecedent Before	<i>Prison_Population (01)</i> <3.52;5.52)		
Variable antecedent After	<i>Prison_Population (01)</i> <5.52;7.52)		
Succedent	(empty)		
Variable succedent Before	<i>Total (01)</i> Alert		
Variable succedent After	<i>Total (01)</i> Stable		
Quantifiers values:			
a-frequency	5	5	a-frequency (BASE) from source contingency table
a-frequency	15	15	a-frequency (BASE) from source contingency table
Various interest measures from the four-fold tables:			
D%Sum	0.26	0.25	Sum of differences of relative frequencies between state before and after
Df-Conf	-0.12	-0.169354839	Difference of values of Confidence
Df-AFUI	-0.11	-0.1144336786	Difference of values of D-Confidence
Df-FUE	-0.01	-0.005619775	Difference of values of E-Confidence
Df-Avg	-0.64	-0.6448884308	Difference of values of Average Difference
R-Conf	0.52	0.5166666667	Ratio of values of Confidence
R-DfUI	0.37	0.3744292237	Ratio of values of D-Confidence
R-E	0.59	0.5900000000	Ratio of values of E-Confidence
R-Avg	-1.8	-1.7088157895	Ratio of values of Average Difference
H-Conf	1.94	1.935483671	Higher of ratios of values of Confidence
H-DfUI	2.67	2.6707317073	Higher of ratios of values of D-Confidence
H-FUE	1.01	1.0090090091	Higher of ratios of values of E-Confidence

Export |

Data

LM 2014_after_features MB - LiSp-Miner Workspace module - 27.18.03

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- C. Interactive Analysis
 - Overview
 - action_rules_2
 - Task Settings
 - Task Results
 - Hypothesis (8)
- D. Data-mining Tasks
- E. Domain knowledge
- F. Workspace

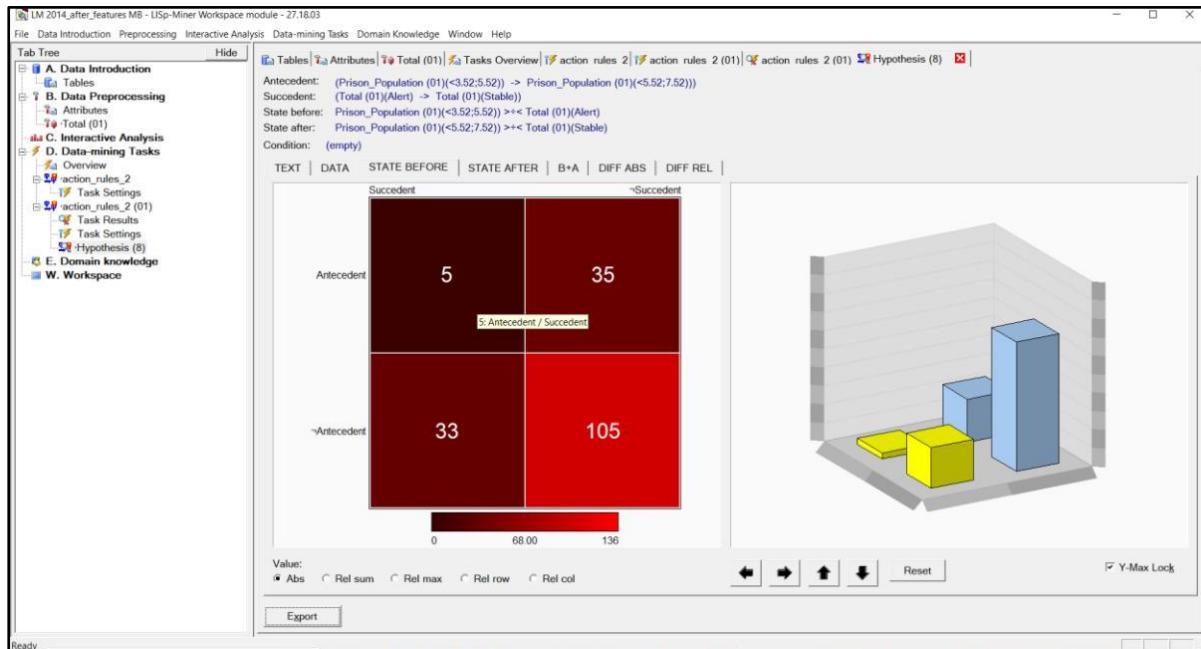
Antecedent: (Prison_Population (01)<3.52;5.52)) -> Prison_Population (01)<5.52;7.52)))
 Succedent: (Total (01)Alert) -> Total (01)Stable)
 State before: Prison_Population (01)<3.52;5.52)) >< Total (01)Alert
 State after: Prison_Population (01)<5.52;7.52)) >< Total (01)Stable)
 Condition: (empty)

	TEXT	DATA	STATE BEFORE	STATE AFTER	B+A	DIFF ABS	DIFF REL					
#	A	b	a	S	b	a	Prison_Population (01)<3.52;5.52))	Prison_Population (01)<5.52;7.52))	Total (01)	Total (01)	Total (01)	Total (01)
1	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
2	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
3	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
4	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
5	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
6	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
7	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
8	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
9	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
10	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
11	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
12	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
13	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
14	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
15	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
16	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
17	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
18	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
19	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
20	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
21	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
22	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
23	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
24	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
25	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
26	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
27	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
28	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
29	1	1	1	1	1	1	<3.52;5.52))	<3.52;5.52))	Alert	Alert	Alert	Alert
30	-	-	-	-	-	-	<3.52;5.52))	<3.52;5.52))	All true	All true	All true	All true

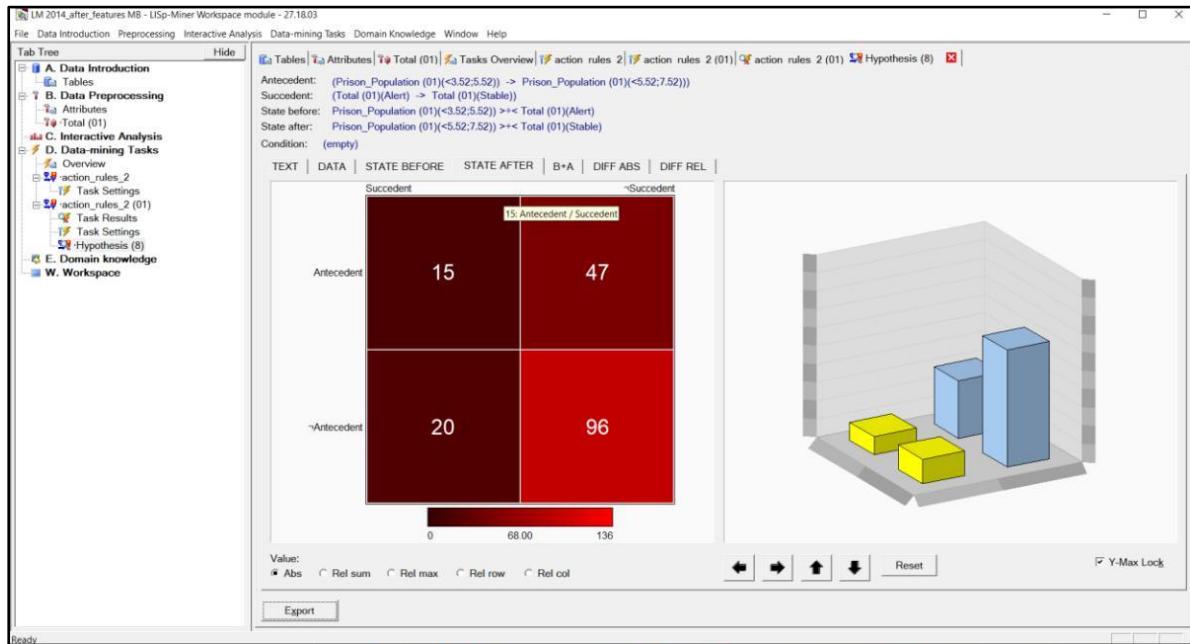
Export

Ready

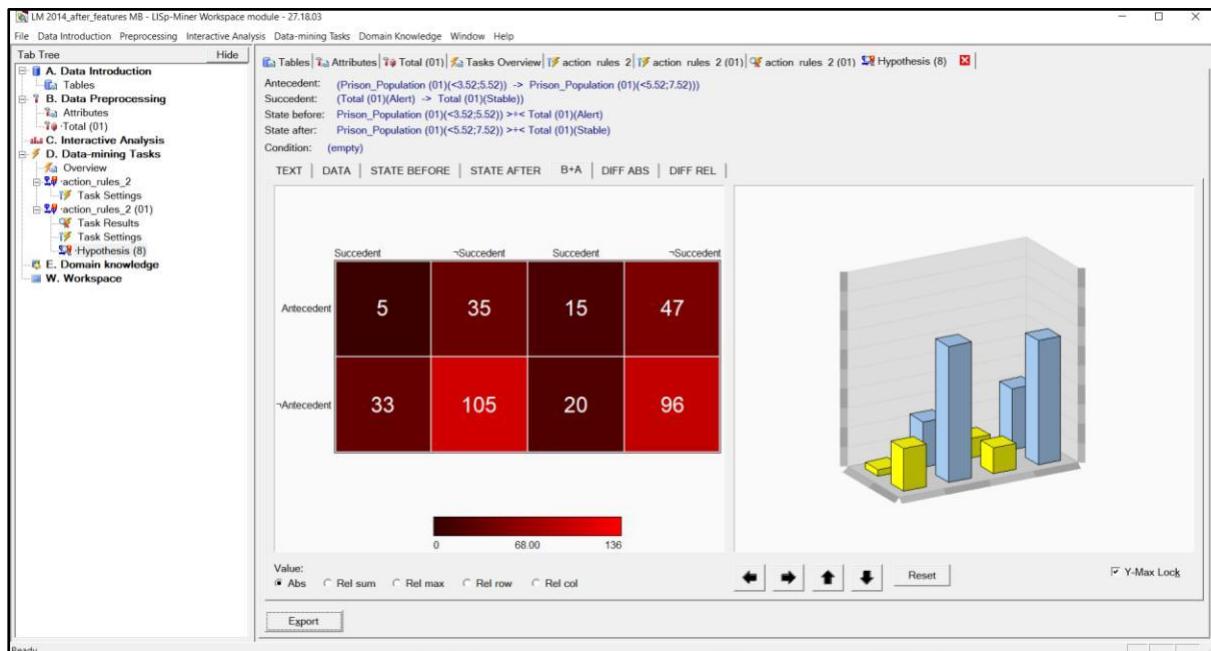
State Before



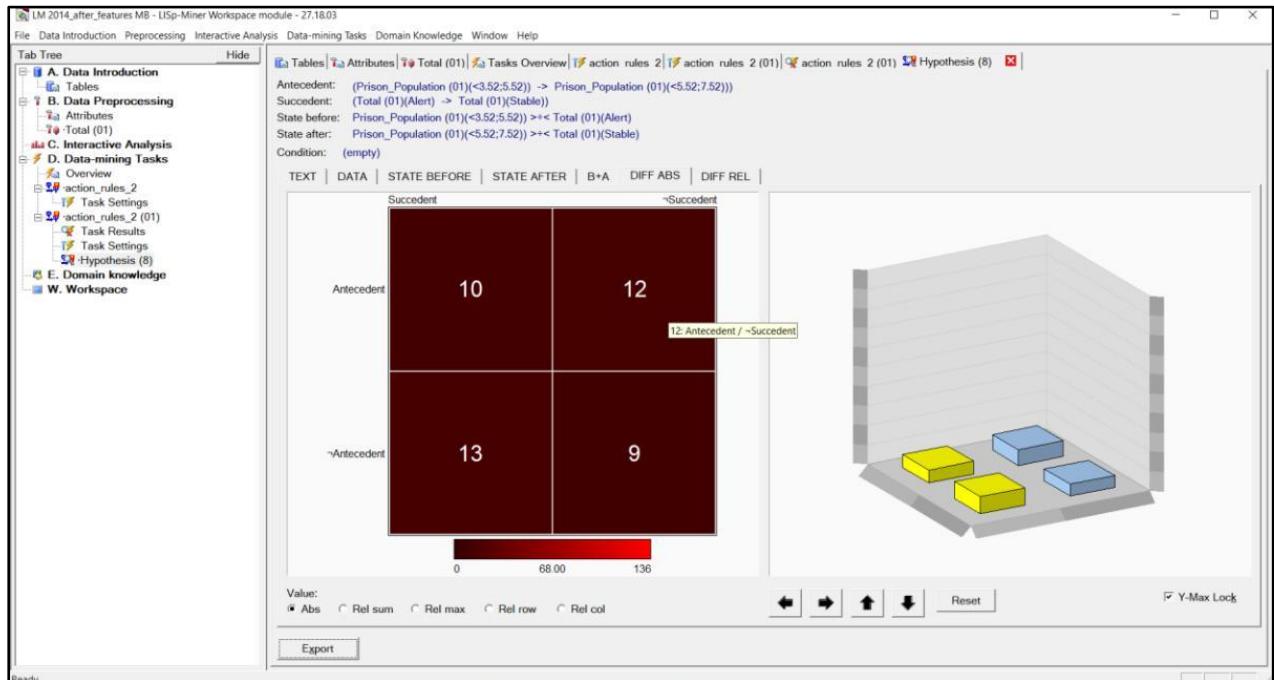
State After



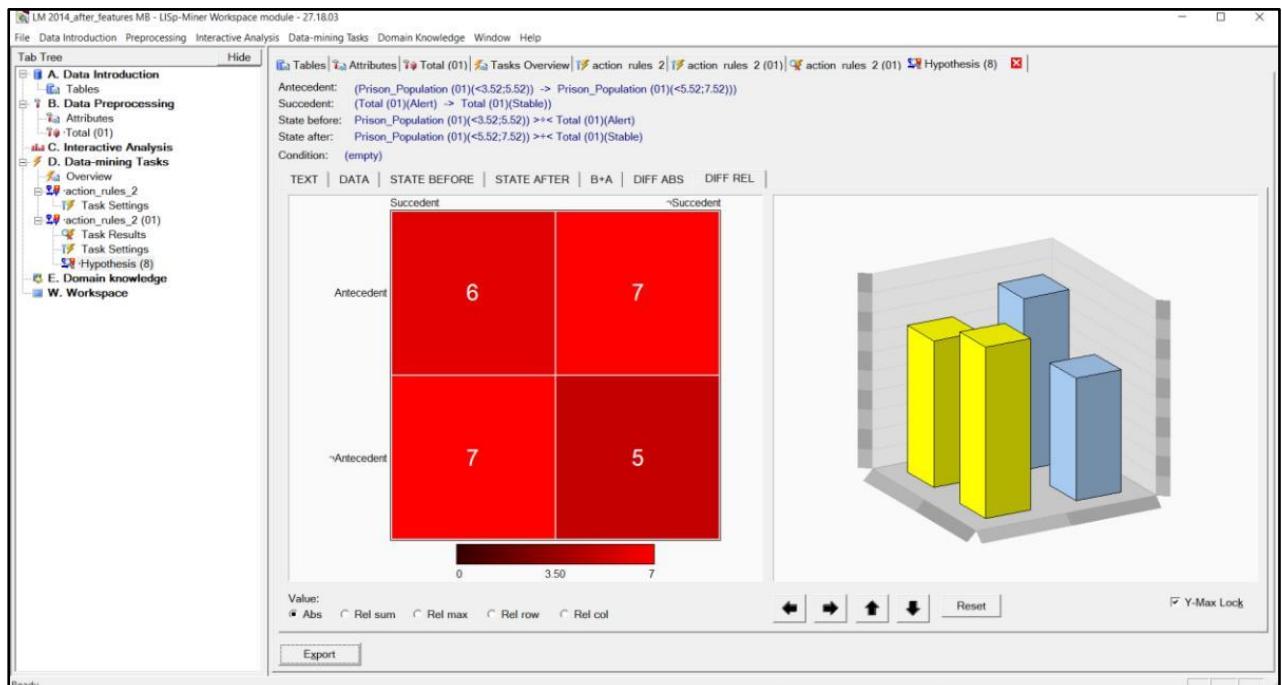
B + A



Diff ABS



Diff REL



CONCLUSION

This added six additional features to the dataset and collected data from various internet sources for those features. Information was washed, pre-processed, arbitrary and sorted by WEKA, and the rules of operation were developed by LISP miner. We found the patterns:

1. For the years 2014-15, the lesser the prison population, the better the FSI for a country. This implies that countries should put in efforts in accelerating the reformation process for criminals so that they can be reintroduced into society. This leads to lesser population in prisons, which ultimately leads to better FSI.
2. For the year 2015, the lesser the homeless people due to natural disasters, the better the FSI for a country. This implies that countries should draft schemes which favors accommodation for the people affected due to disasters as soon as possible.

These action rules can be used to improve the countries by changing their status to less fragile.

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