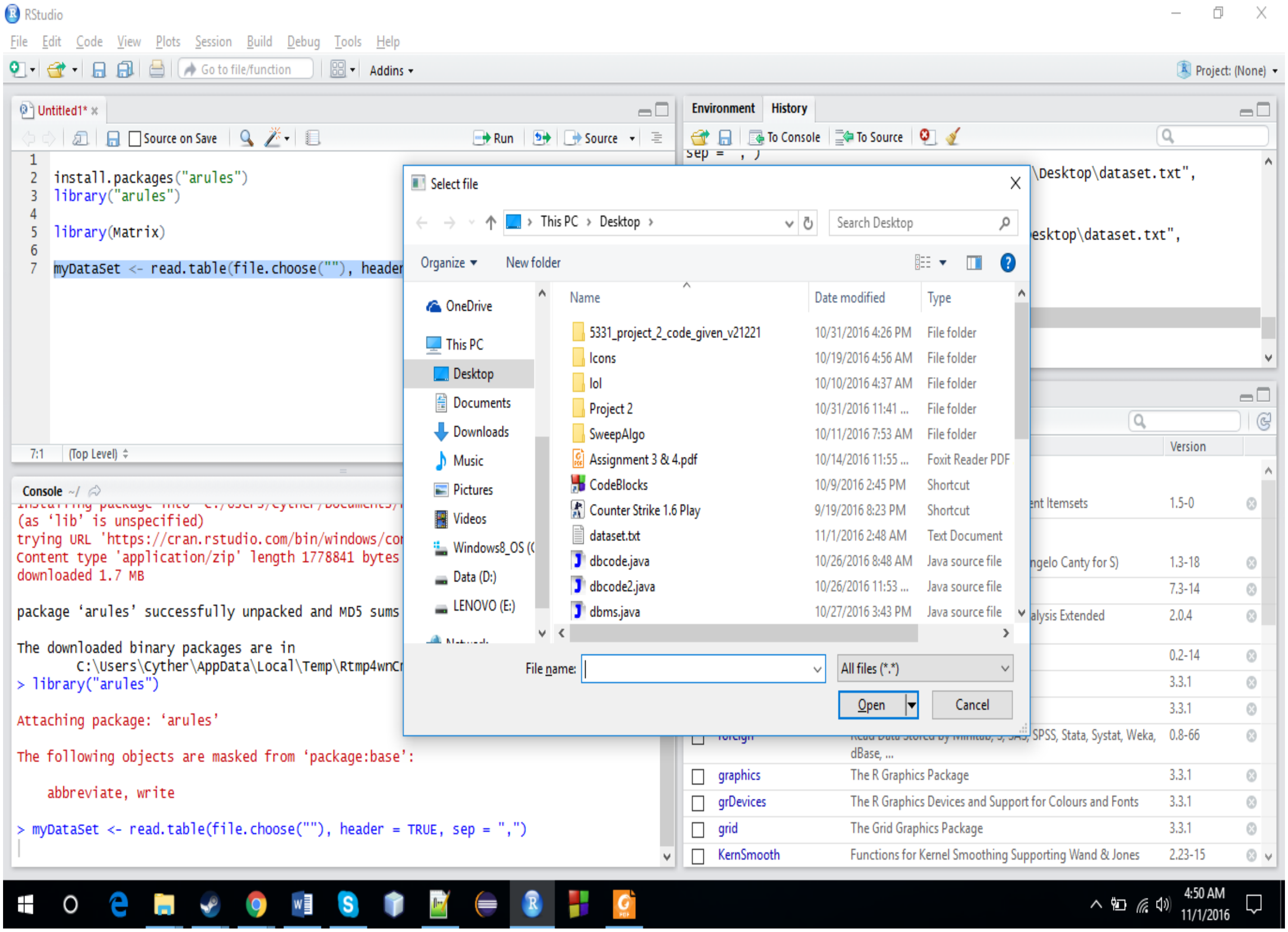
Last Name: Pandey
First Name: Aditya
Student ID: 1001405034
Course: Data Mining CSE 5334 Fall 2016
Topic: Home Work Assignment 5

1: After using ‘read.table()’ to get our dataset

Here we have also used ‘file.choose()’ to get a file explorer to choose our dataset from



```
install.packages("arules")
library("arules")

library(Matrix)

myDataSet <- read.table(file.choose(""), header
```

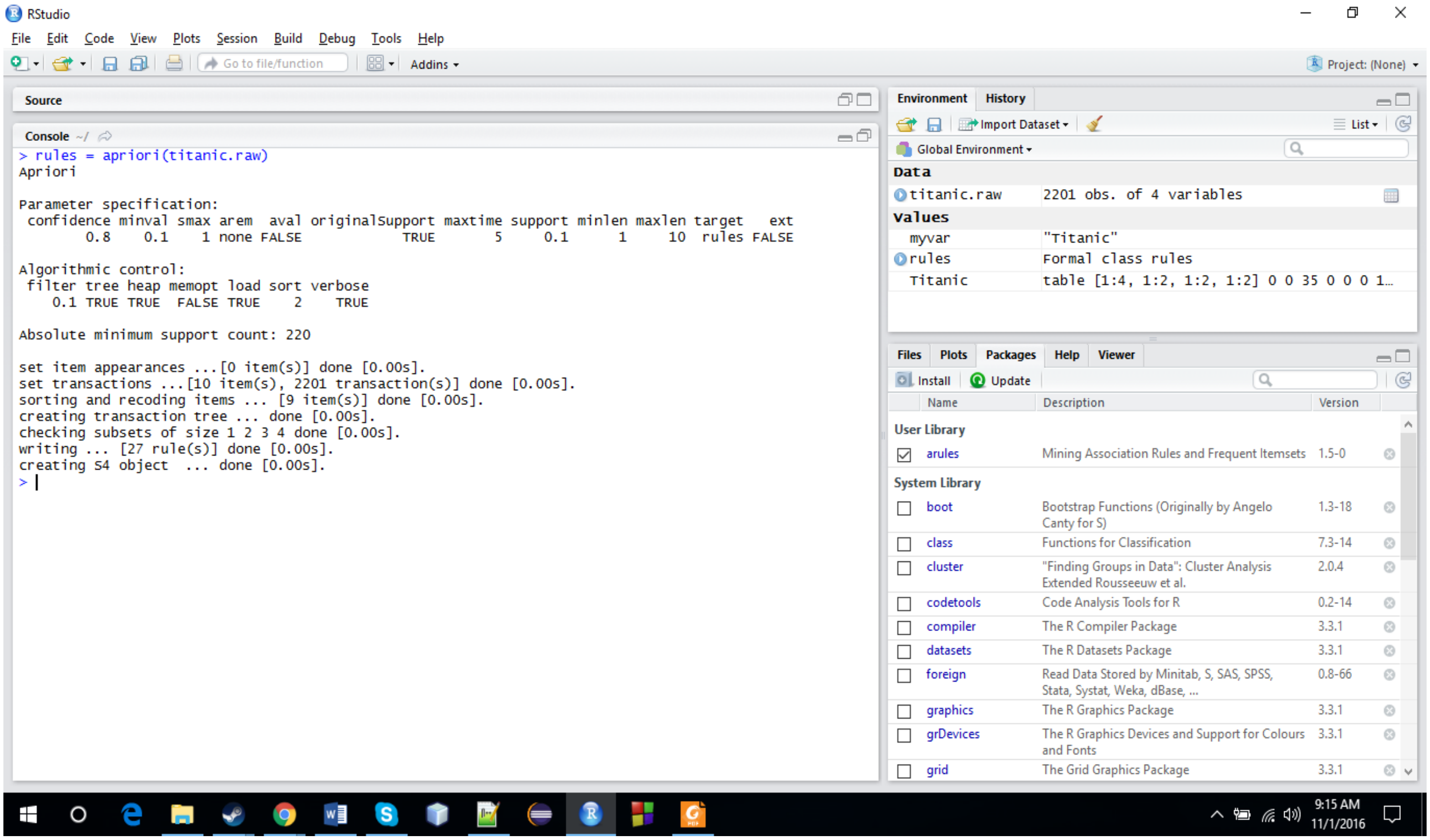
```
sep = ", ")
\Desktop\dataset.txt",
esktop\dataset.txt",
```

```
Installing package into 'C:/Users/Cyther/Documents/
(as ‘lib’ is unspecified)
trying URL 'https://cran.rstudio.com/bin/windows/cor
Content type 'application/zip' length 1778841 bytes
downloaded 1.7 MB

package ‘arules’ successfully unpacked and MD5 sums

The downloaded binary packages are in
        C:\Users\Cyther\AppData\Local\Temp\Rtmp4wnCr
> library("arules")

Attaching package: ‘arules’

The following objects are masked from ‘package:base’:

    abbreviate, write

> myDataSet <- read.table(file.choose(""), header = TRUE, sep = ",")
|
```

Name	Date modified	Type
5331_project_2_code_given_v21221	10/31/2016 4:26 PM	File folder
Icons	10/19/2016 4:56 AM	File folder
lol	10/10/2016 4:37 AM	File folder
Project 2	10/31/2016 11:41 ...	File folder
SweepAlgo	10/11/2016 7:53 AM	File folder
Assignment 3 & 4.pdf	10/14/2016 11:55 ...	Foxit Reader PDF
CodeBlocks	10/9/2016 2:45 PM	Shortcut
Counter Strike 1.6 Play	9/19/2016 8:23 PM	Shortcut
dataset.txt	11/1/2016 2:48 AM	Text Document
dbcode.java	10/26/2016 8:48 AM	Java source file
dbcode2.java	10/26/2016 11:53 ...	Java source file
dbms.java	10/27/2016 3:43 PM	Java source file

			Version
		ent Itemsets	1.5-0
		ngelo Canty for S)	1.3-18
			7.3-14
		alysis Extended	2.0.4
			0.2-14
			3.3.1
			3.3.1
□	foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, Weka, dBase, ...	0.8-66
□	graphics	The R Graphics Package	3.3.1
□	grDevices	The R Graphics Devices and Support for Colours and Fonts	3.3.1
□	grid	The Grid Graphics Package	3.3.1
□	KernSmooth	Functions for Kernel Smoothing Supporting Wand & Jones	2.23-15

2: This is the result, after using the inbuilt function ‘apriori()’ and passing our dataset into it.
This will use the frequent pattern mining technique, apriori on our dataset and store it in a variable

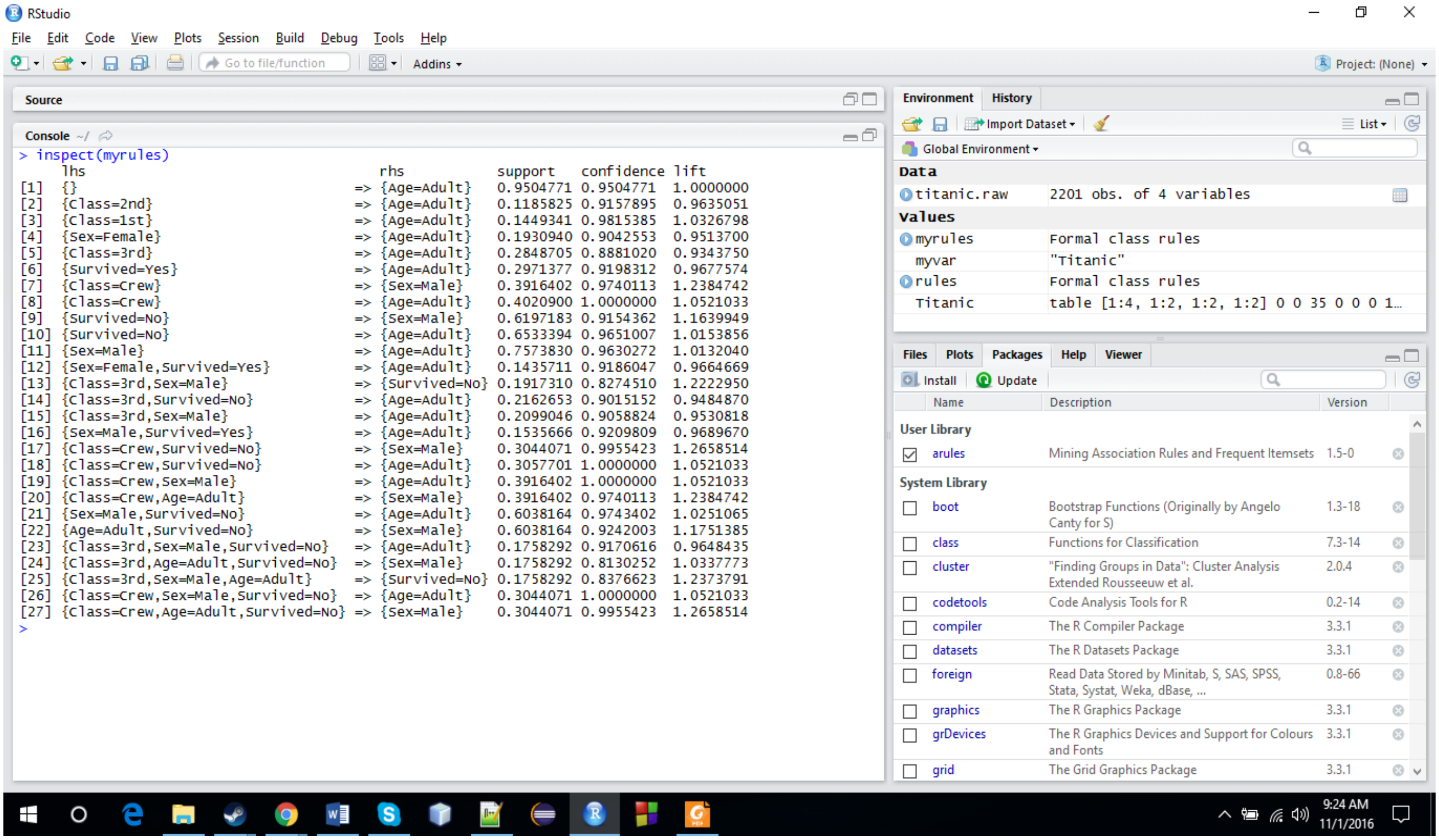


```
> rules = apriori(titanic.raw)
Apriori

Parameter specification:
 confidence minval smax arem  aval originalSupport maxtime support minlen maxlen target   ext
        0.8    0.1    1 none FALSE            TRUE       5     0.1      1     10  rules FALSE

Algorithmic control:
 filter tree heap memopt load sort verbose
    0.1 TRUE TRUE  FALSE TRUE    2    TRUE

Absolute minimum support count: 220

set item appearances ...[0 item(s)] done [0.00s].
set transactions ...[10 item(s), 2201 transaction(s)] done [0.00s].
sorting and recoding items ... [9 item(s)] done [0.00s].
creating transaction tree ... done [0.00s].
checking subsets of size 1 2 3 4 done [0.00s].
writing ... [27 rule(s)] done [0.00s].
creating S4 object  ... done [0.00s].
> |
```

```
Data
titanic.raw    2201 obs. of 4 variables
Values
 myvar         "Titanic"
rules          Formal class rules
 Titanic       table [1:4, 1:2, 1:2, 1:2] 0 0 35 0 0 0 1…
```

	Name	Description	Version
	User Library		
☑	arules	Mining Association Rules and Frequent Itemsets	1.5-0
	System Library		
□	boot	Bootstrap Functions (Originally by Angelo Canty for S)	1.3-18
□	class	Functions for Classification	7.3-14
□	cluster	"Finding Groups in Data": Cluster Analysis Extended Rousseeuw et al.	2.0.4
□	codetools	Code Analysis Tools for R	0.2-14
□	compiler	The R Compiler Package	3.3.1
□	datasets	The R Datasets Package	3.3.1
□	foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, Weka, dBase, ...	0.8-66
□	graphics	The R Graphics Package	3.3.1
□	grDevices	The R Graphics Devices and Support for Colours and Fonts	3.3.1
□	grid	The Grid Graphics Package	3.3.1

3: After using ‘inspect()’
We get the proper tabulated output form of ‘apriori()’ result
We can evaluate this output further



```
> inspect(myrules)
     lhs                                   rhs           support   confidence lift
[1]  {}                                 => {Age=Adult}   0.9504771 0.9504771  1.0000000
[2]  {Class=2nd}                        => {Age=Adult}   0.1185825 0.9157895  0.9635051
[3]  {Class=1st}                        => {Age=Adult}   0.1449341 0.9815385  1.0326798
[4]  {Sex=Female}                       => {Age=Adult}   0.1930940 0.9042553  0.9513700
[5]  {Class=3rd}                        => {Age=Adult}   0.2848705 0.8881020  0.9343750
[6]  {Survived=Yes}                     => {Age=Adult}   0.2971377 0.9198312  0.9677574
[7]  {Class=Crew}                       => {Sex=Male}    0.3916402 0.9740113  1.2384742
[8]  {Class=Crew}                       => {Age=Adult}   0.4020900 1.0000000  1.0521033
[9]  {Survived=No}                      => {Sex=Male}    0.6197183 0.9154362  1.1639949
[10] {Survived=No}                      => {Age=Adult}   0.6533394 0.9651007  1.0153856
[11] {Sex=Male}                         => {Age=Adult}   0.7573830 0.9630272  1.0132040
[12] {Sex=Female,Survived=Yes}          => {Age=Adult}   0.1435711 0.9186047  0.9664669
[13] {Class=3rd,Sex=Male}               => {Survived=No} 0.1917310 0.8274510  1.2222950
[14] {Class=3rd,Survived=No}            => {Age=Adult}   0.2162653 0.9015152  0.9484870
[15] {Class=3rd,Sex=Male}               => {Age=Adult}   0.2099046 0.9058824  0.9530818
[16] {Sex=Male,Survived=Yes}            => {Age=Adult}   0.1535666 0.9209809  0.9689670
[17] {Class=Crew,Survived=No}           => {Sex=Male}    0.3044071 0.9955423  1.2658514
[18] {Class=Crew,Survived=No}           => {Age=Adult}   0.3057701 1.0000000  1.0521033
[19] {Class=Crew,Sex=Male}              => {Age=Adult}   0.3916402 1.0000000  1.0521033
[20] {Class=Crew,Age=Adult}             => {Sex=Male}    0.3916402 0.9740113  1.2384742
[21] {Sex=Male,Survived=No}             => {Age=Adult}   0.6038164 0.9743402  1.0251065
[22] {Age=Adult,Survived=No}            => {Sex=Male}    0.6038164 0.9242003  1.1751385
[23] {Class=3rd,Sex=Male,Survived=No}   => {Age=Adult}   0.1758292 0.9170616  0.9648435
[24] {Class=3rd,Age=Adult,Survived=No}  => {Sex=Male}    0.1758292 0.8130252  1.0337773
[25] {Class=3rd,Sex=Male,Age=Adult}     => {Survived=No} 0.1758292 0.8376623  1.2373791
[26] {Class=Crew,Sex=Male,Survived=No}  => {Age=Adult}   0.3044071 1.0000000  1.0521033
[27] {Class=Crew,Age=Adult,Survived=No} => {Sex=Male}    0.3044071 0.9955423  1.2658514
>
```

```
Data
titanic.raw    2201 obs. of 4 variables
Values
myrules        Formal class rules
 myvar         "Titanic"
rules          Formal class rules
 Titanic       table [1:4, 1:2, 1:2, 1:2] 0 0 35 0 0 0 1…
```

	Name	Description	Version
	User Library		
☑	arules	Mining Association Rules and Frequent Itemsets	1.5-0
	System Library		
□	boot	Bootstrap Functions (Originally by Angelo Canty for S)	1.3-18
□	class	Functions for Classification	7.3-14
□	cluster	"Finding Groups in Data": Cluster Analysis Extended Rousseeuw et al.	2.0.4
□	codetools	Code Analysis Tools for R	0.2-14
□	compiler	The R Compiler Package	3.3.1
□	datasets	The R Datasets Package	3.3.1
□	foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, Weka, dBase, ...	0.8-66
□	graphics	The R Graphics Package	3.3.1
□	grDevices	The R Graphics Devices and Support for Colours and Fonts	3.3.1
□	grid	The Grid Graphics Package	3.3.1

Let’s inspect each line of rules here.

Example rule 21:

	lhs(A)	rhs(B)	Support	Confidence	Lift
[21]	{Sex=Male, Survived=No}	=> {Age=Adult}	0.6038164	0.9743402	1.025106

LHS: The lhs of the output is considered as ‘A’
RHS: The rhs of the output is considered as ‘B’
We use 3 measures, support, confidence and lift to get the relationship measure between ‘A’ and ‘B’

$$\text{SUPPORT} = \frac{\text{number of transactions containing X and Y}}{\text{total number of transactions}}$$

$$\text{CONFIDENCE} = \frac{\text{number of transactions containing X and Y}}{\text{number of transactions containing X}}$$

Support: This says how popular an item set is, as measured by the proportion of transactions in which an itemset appears.

Hence, a support of 0.6038164 says that 60% of all the data, a Male with age adult as not survived.

Confidence: This says how likely item Y is purchased when item X is purchased, expressed as {X -> Y}. This is measured by the proportion of transactions with item X, in which item Y also appears.

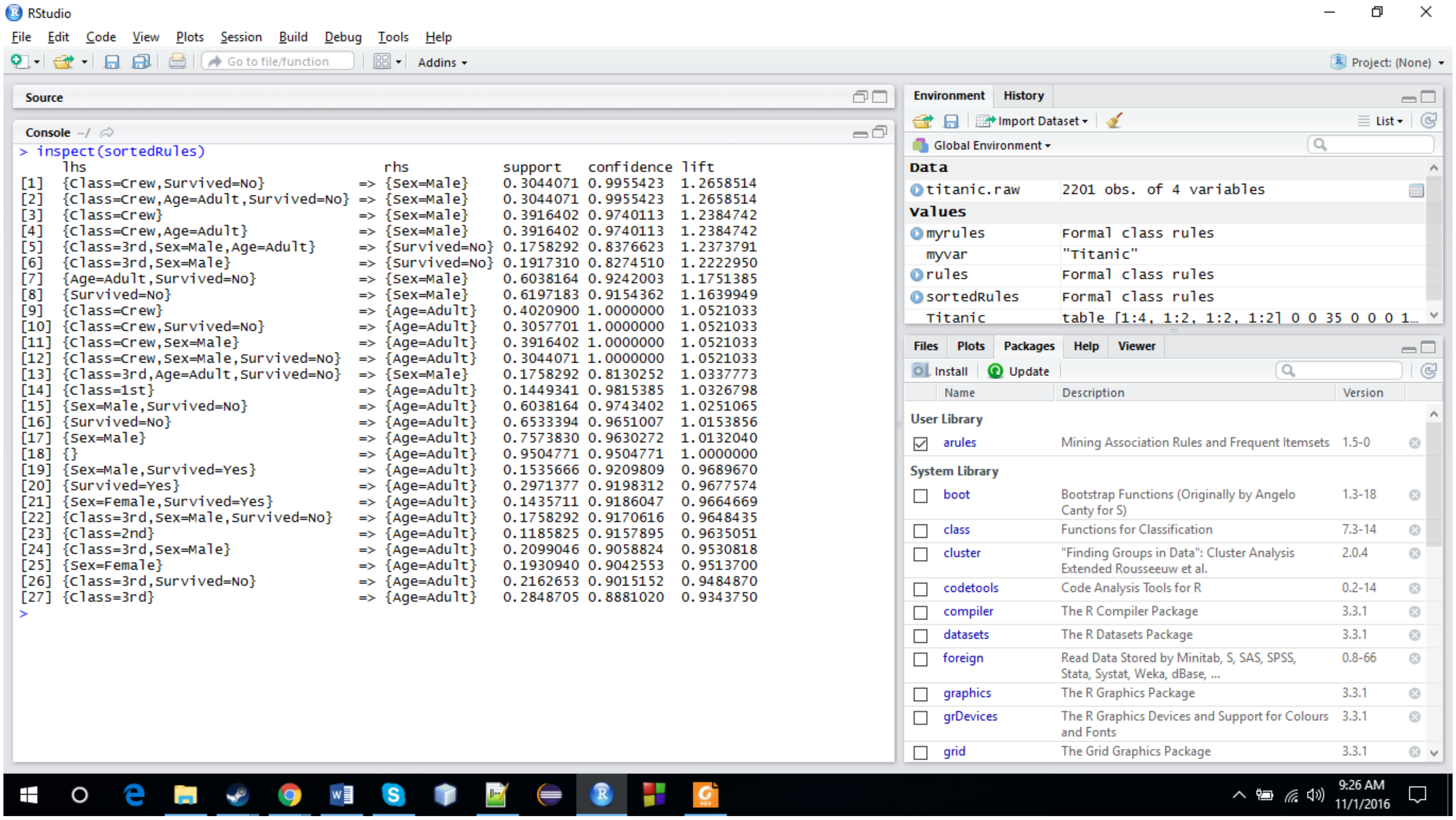
Hence, a confidence of 0. 9743402 says that in 97% of the cases the above support holds true for the attribute of the dataset.

Lift: It is a measure of performance of a target model at classifying or predicting the cases. It is a ratio.

It is the total number of events captured with above support and confidence.

4: **After we sort the rules according to the ‘lift’ value**

For this we use the ‘sort()’ and pass our dataset into it and 2nd parameter which says sort by “lift”



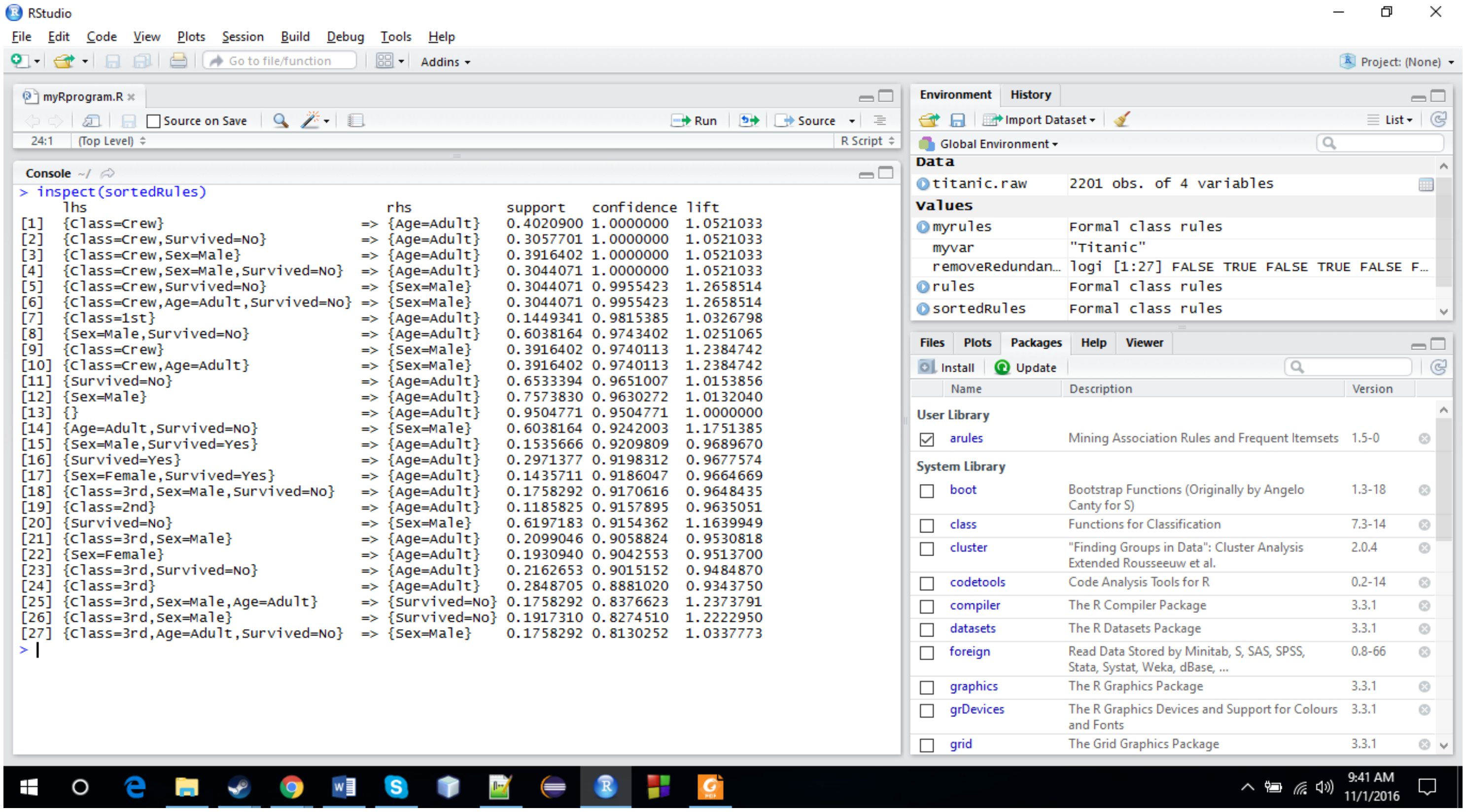
```
> inspect(sortedRules)
     lhs                                  rhs           support   confidence lift
[1]  {Class=Crew,Survived=No}          => {Sex=Male}    0.3044071 0.9955423  1.2658514
[2]  {Class=Crew,Age=Adult,Survived=No} => {Sex=Male}    0.3044071 0.9955423  1.2658514
[3]  {Class=Crew}                      => {Sex=Male}    0.3916402 0.9740113  1.2384742
[4]  {Class=Crew,Age=Adult}            => {Sex=Male}    0.3916402 0.9740113  1.2384742
[5]  {Class=3rd,Sex=Male,Age=Adult}    => {Survived=No} 0.1758292 0.8376623  1.2373791
[6]  {Class=3rd,Sex=Male}              => {Survived=No} 0.1917310 0.8274510  1.2222950
[7]  {Age=Adult,Survived=No}           => {Sex=Male}    0.6038164 0.9242003  1.1751385
[8]  {Survived=No}                     => {Sex=Male}    0.6197183 0.9154362  1.1639949
[9]  {Class=Crew}                      => {Age=Adult}   0.4020900 1.0000000  1.0521033
[10] {Class=Crew,Survived=No}          => {Age=Adult}   0.3057701 1.0000000  1.0521033
[11] {Class=Crew,Sex=Male}             => {Age=Adult}   0.3916402 1.0000000  1.0521033
[12] {Class=Crew,Sex=Male,Survived=No} => {Age=Adult}   0.3044071 1.0000000  1.0521033
[13] {Class=3rd,Age=Adult,Survived=No} => {Sex=Male}    0.1758292 0.8130252  1.0337773
[14] {Class=1st}                       => {Age=Adult}   0.1449341 0.9815385  1.0326798
[15] {Sex=Male,Survived=No}            => {Age=Adult}   0.6038164 0.9743402  1.0251065
[16] {Survived=No}                     => {Age=Adult}   0.6533394 0.9651007  1.0153856
[17] {Sex=Male}                        => {Age=Adult}   0.7573830 0.9630272  1.0132040
[18] {}                                => {Age=Adult}   0.9504771 0.9504771  1.0000000
[19] {Sex=Male,Survived=Yes}           => {Age=Adult}   0.1535666 0.9209809  0.9689670
[20] {Survived=Yes}                    => {Age=Adult}   0.2971377 0.9198312  0.9677574
[21] {Sex=Female,Survived=Yes}         => {Age=Adult}   0.1435711 0.9186047  0.9664669
[22] {Class=3rd,Sex=Male,Survived=No}  => {Age=Adult}   0.1758292 0.9170616  0.9648435
[23] {Class=2nd}                       => {Age=Adult}   0.1185825 0.9157895  0.9635051
[24] {Class=3rd,Sex=Male}              => {Age=Adult}   0.2099046 0.9058824  0.9530818
[25] {Sex=Female}                      => {Age=Adult}   0.1930940 0.9042553  0.9513700
[26] {Class=3rd,Survived=No}           => {Age=Adult}   0.2162653 0.9015152  0.9484870
[27] {Class=3rd}                       => {Age=Adult}   0.2848705 0.8881020  0.9343750
>
```

```
Data
titanic.raw    2201 obs. of 4 variables
Values
myrules        Formal class rules
myvar          "Titanic"
rules          Formal class rules
sortedRules    Formal class rules
Titanic        table [1:4, 1:2, 1:2, 1:2] 0 0 35 0 0 0 1…
```

	Name	Description	Version
	User Library		
☑	arules	Mining Association Rules and Frequent Itemsets	1.5-0
	System Library		
□	boot	Bootstrap Functions (Originally by Angelo Canty for S)	1.3-18
□	class	Functions for Classification	7.3-14
□	cluster	"Finding Groups in Data": Cluster Analysis Extended Rousseeuw et al.	2.0.4
□	codetools	Code Analysis Tools for R	0.2-14
□	compiler	The R Compiler Package	3.3.1
□	datasets	The R Datasets Package	3.3.1
□	foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, Weka, dBase, ...	0.8-66
□	graphics	The R Graphics Package	3.3.1
□	grDevices	The R Graphics Devices and Support for Colours and Fonts	3.3.1
□	grid	The Grid Graphics Package	3.3.1

5: **After we sort the rules according to the ‘confidence’ value**

For this we use the ‘sort()’ and pass our dataset into it and 2nd parameter which says sort by “confidence”



```
> inspect(sortedRules)
     lhs                                  rhs           support   confidence lift
[1]  {Class=Crew}                      => {Age=Adult}   0.4020900 1.0000000  1.0521033
[2]  {Class=Crew,Survived=No}          => {Age=Adult}   0.3057701 1.0000000  1.0521033
[3]  {Class=Crew,Sex=Male}             => {Age=Adult}   0.3916402 1.0000000  1.0521033
[4]  {Class=Crew,Sex=Male,Survived=No} => {Age=Adult}   0.3044071 1.0000000  1.0521033
[5]  {Class=Crew,Survived=No}          => {Sex=Male}    0.3044071 0.9955423  1.2658514
[6]  {Class=Crew,Age=Adult,Survived=No} => {Sex=Male}    0.3044071 0.9955423  1.2658514
[7]  {Class=1st}                       => {Age=Adult}   0.1449341 0.9815385  1.0326798
[8]  {Sex=Male,Survived=No}            => {Age=Adult}   0.6038164 0.9743402  1.0251065
[9]  {Class=Crew}                      => {Sex=Male}    0.3916402 0.9740113  1.2384742
[10] {Class=Crew,Age=Adult}            => {Sex=Male}    0.3916402 0.9740113  1.2384742
[11] {Survived=No}                     => {Age=Adult}   0.6533394 0.9651007  1.0153856
[12] {Sex=Male}                        => {Age=Adult}   0.7573830 0.9630272  1.0132040
[13] {}                                => {Age=Adult}   0.9504771 0.9504771  1.0000000
[14] {Age=Adult,Survived=No}           => {Sex=Male}    0.6038164 0.9242003  1.1751385
[15] {Sex=Male,Survived=Yes}           => {Age=Adult}   0.1535666 0.9209809  0.9689670
[16] {Survived=Yes}                    => {Age=Adult}   0.2971377 0.9198312  0.9677574
[17] {Sex=Female,Survived=Yes}         => {Age=Adult}   0.1435711 0.9186047  0.9664669
[18] {Class=3rd,Sex=Male,Survived=No}  => {Age=Adult}   0.1758292 0.9170616  0.9648435
[19] {Class=2nd}                       => {Age=Adult}   0.1185825 0.9157895  0.9635051
[20] {Survived=No}                     => {Sex=Male}    0.6197183 0.9154362  1.1639949
[21] {Class=3rd,Sex=Male}              => {Age=Adult}   0.2099046 0.9058824  0.9530818
[22] {Sex=Female}                      => {Age=Adult}   0.1930940 0.9042553  0.9513700
[23] {Class=3rd,Survived=No}           => {Age=Adult}   0.2162653 0.9015152  0.9484870
[24] {Class=3rd}                       => {Age=Adult}   0.2848705 0.8881020  0.9343750
[25] {Class=3rd,Sex=Male,Age=Adult}    => {Survived=No} 0.1758292 0.8376623  1.2373791
[26] {Class=3rd,Sex=Male}              => {Survived=No} 0.1917310 0.8274510  1.2222950
[27] {Class=3rd,Age=Adult,Survived=No} => {Sex=Male}    0.1758292 0.8130252  1.0337773
> |
```

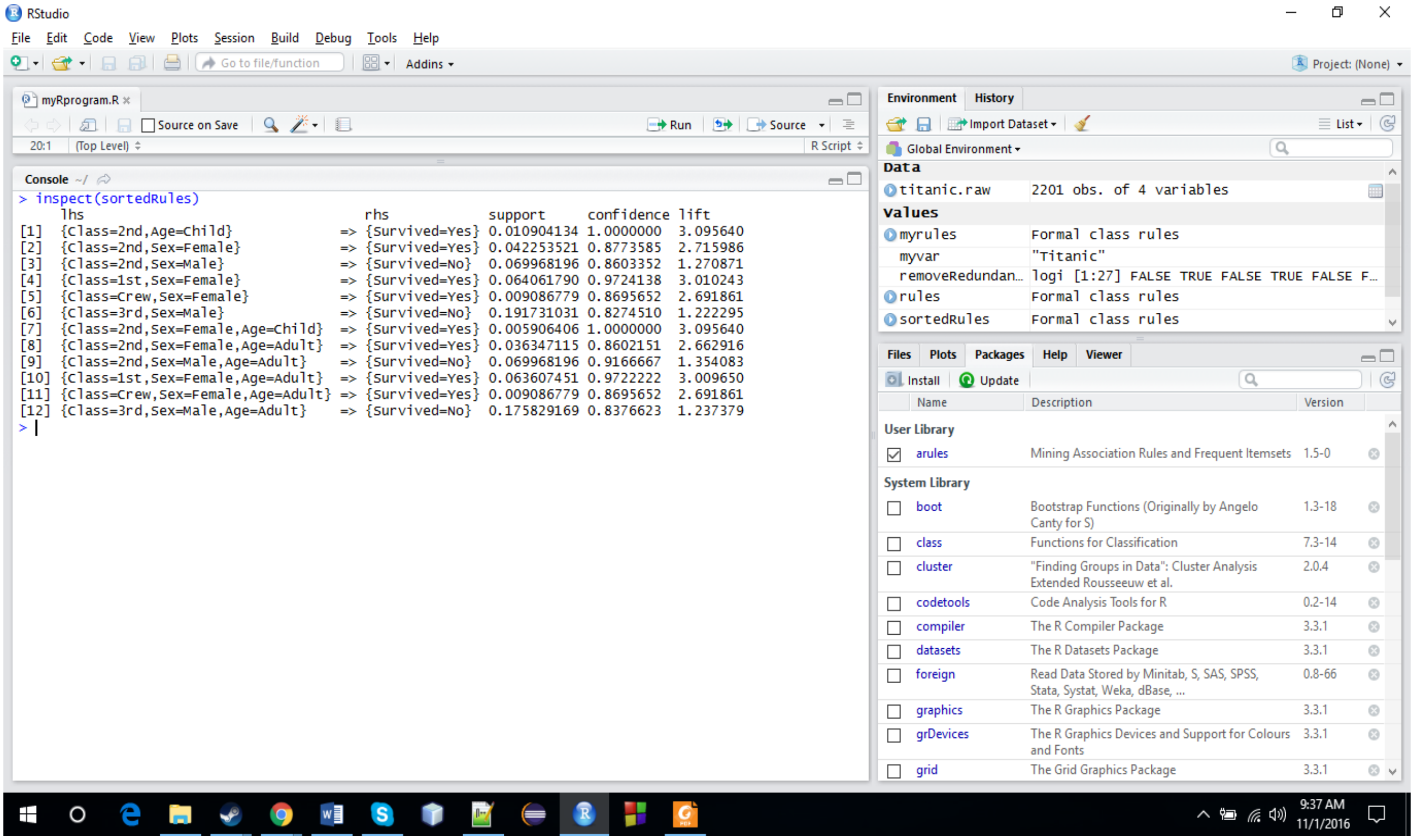
```
Data
titanic.raw    2201 obs. of 4 variables
Values
myrules        Formal class rules
myvar          "Titanic"
removeRedundan… logi [1:27] FALSE TRUE FALSE TRUE FALSE F…
rules          Formal class rules
sortedRules    Formal class rules
```

	Name	Description	Version
	User Library		
☑	arules	Mining Association Rules and Frequent Itemsets	1.5-0
	System Library		
□	boot	Bootstrap Functions (Originally by Angelo Canty for S)	1.3-18
□	class	Functions for Classification	7.3-14
□	cluster	"Finding Groups in Data": Cluster Analysis Extended Rousseeuw et al.	2.0.4
□	codetools	Code Analysis Tools for R	0.2-14
□	compiler	The R Compiler Package	3.3.1
□	datasets	The R Datasets Package	3.3.1
□	foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, Weka, dBase, ...	0.8-66
□	graphics	The R Graphics Package	3.3.1
□	grDevices	The R Graphics Devices and Support for Colours and Fonts	3.3.1
□	grid	The Grid Graphics Package	3.3.1

6: This is the output when we set the RHS only by factor ("Survived=No" or "Survived=Yes")

We use the 'apriori()' where we specify the appearance parameter in the 'rhs column' as only Survived

This helps us get the rules only for which the passengers have survived the titanic incident



```
> inspect(sortedRules)
     lhs                                rhs            support     confidence lift
[1]  {Class=2nd,Age=Child}           => {Survived=Yes} 0.010904134 1.0000000  3.095640
[2]  {Class=2nd,Sex=Female}          => {Survived=Yes} 0.042253521 0.8773585  2.715986
[3]  {Class=2nd,Sex=Male}            => {Survived=No}  0.069968196 0.8603352  1.270871
[4]  {Class=1st,Sex=Female}          => {Survived=Yes} 0.064061790 0.9724138  3.010243
[5]  {Class=Crew,Sex=Female}         => {Survived=Yes} 0.009086779 0.8695652  2.691861
[6]  {Class=3rd,Sex=Male}            => {Survived=No}  0.191731031 0.8274510  1.222295
[7]  {Class=2nd,Sex=Female,Age=Child} => {Survived=Yes} 0.005906406 1.0000000  3.095640
[8]  {Class=2nd,Sex=Female,Age=Adult} => {Survived=Yes} 0.036347115 0.8602151  2.662916
[9]  {Class=2nd,Sex=Male,Age=Adult}   => {Survived=No}  0.069968196 0.9166667  1.354083
[10] {Class=1st,Sex=Female,Age=Adult} => {Survived=Yes} 0.063607451 0.9722222  3.009650
[11] {Class=Crew,Sex=Female,Age=Adult} => {Survived=Yes} 0.009086779 0.8695652  2.691861
[12] {Class=3rd,Sex=Male,Age=Adult}   => {Survived=No}  0.175829169 0.8376623  1.237379
> |
```

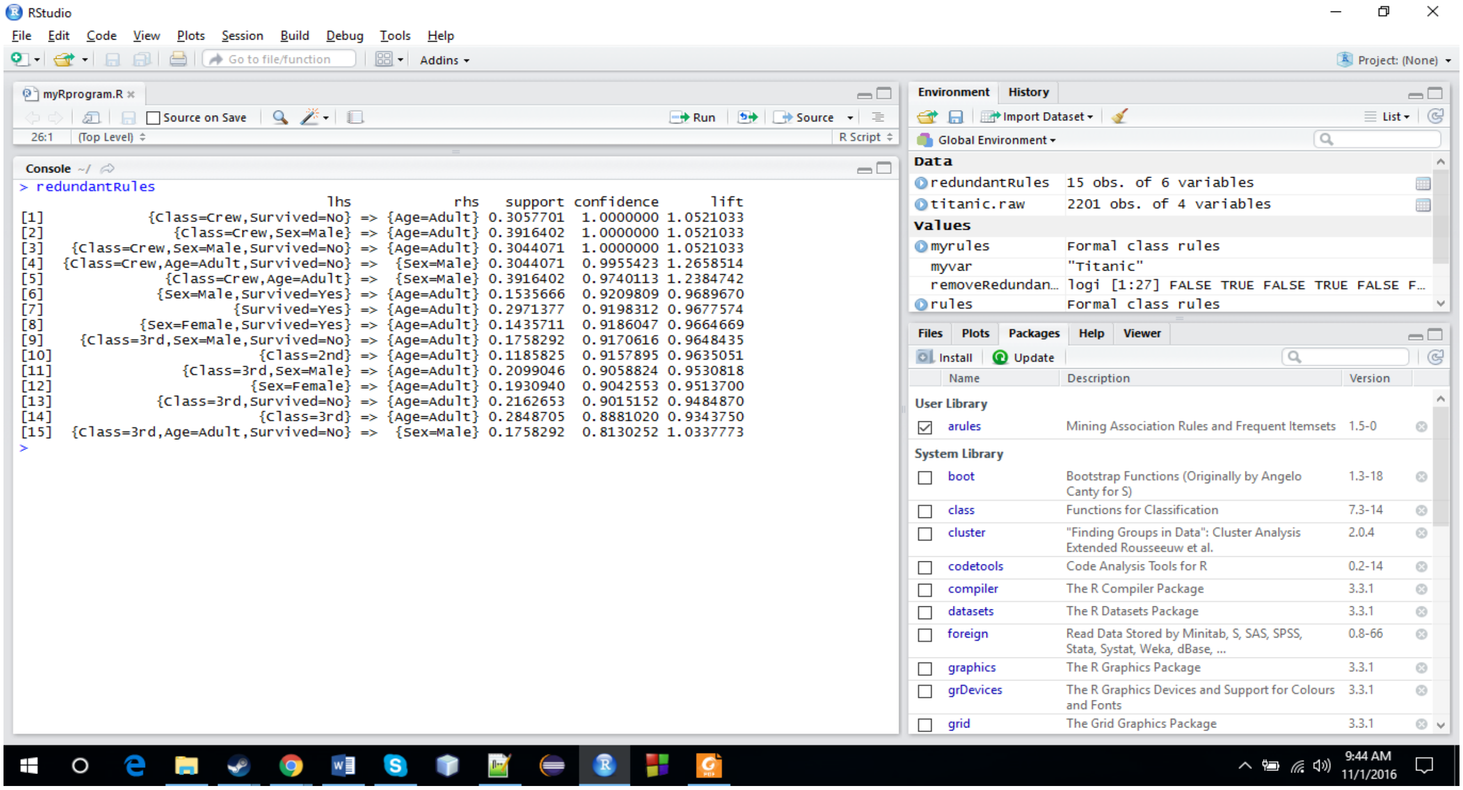
```
Data
titanic.raw        2201 obs. of 4 variables
Values
myrules            Formal class rules
myvar              "Titanic"
removeRedundan…    logi [1:27] FALSE TRUE FALSE TRUE FALSE F…
rules              Formal class rules
sortedRules        Formal class rules
```

	Name	Description	Version
	User Library		
☑	arules	Mining Association Rules and Frequent Itemsets	1.5-0
	System Library		
□	boot	Bootstrap Functions (Originally by Angelo Canty for S)	1.3-18
□	class	Functions for Classification	7.3-14
□	cluster	"Finding Groups in Data": Cluster Analysis Extended Rousseeuw et al.	2.0.4
□	codetools	Code Analysis Tools for R	0.2-14
□	compiler	The R Compiler Package	3.3.1
□	datasets	The R Datasets Package	3.3.1
□	foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, Weka, dBase, ...	0.8-66
□	graphics	The R Graphics Package	3.3.1
□	grDevices	The R Graphics Devices and Support for Colours and Fonts	3.3.1
□	grid	The Grid Graphics Package	3.3.1

7: After using the 'is.redundant()' function in package "arules"

Function of the method: A rule is redundant if a more general rule with the same or a higher confidence exists. That is, a more specific rule is redundant if it is only equally or even less predictive than a more general rule. A rule is more general if it has the same RHS but one or more items removed from the LHS. Formally, a rule *X) Y* is redundant if

$9X_0 \subset X \; conf(X_0) Y) \geq conf(X) Y)$



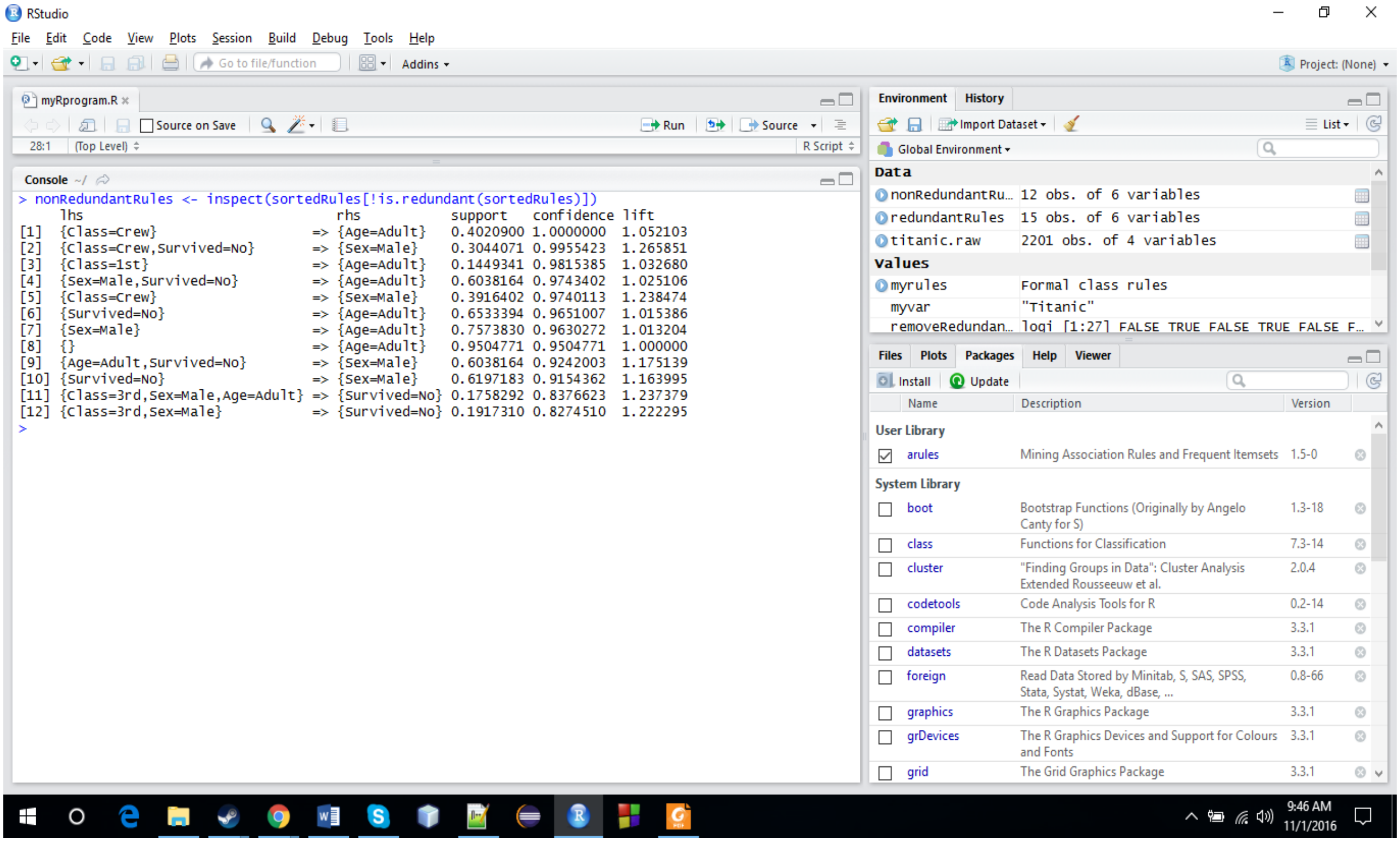
```
> redundantRules
                                    lhs            rhs   support confidence      lift
[1]              {Class=Crew,Survived=No} => {Age=Adult} 0.3057701  1.0000000 1.0521033
[2]                 {Class=Crew,Sex=Male} => {Age=Adult} 0.3916402  1.0000000 1.0521033
[3]     {Class=Crew,Sex=Male,Survived=No} => {Age=Adult} 0.3044071  1.0000000 1.0521033
[4]    {Class=Crew,Age=Adult,Survived=No} =>  {Sex=Male} 0.3044071  0.9955423 1.2658514
[5]               {Class=Crew,Age=Adult} =>  {Sex=Male} 0.3916402  0.9740113 1.2384742
[6]              {Sex=Male,Survived=Yes} => {Age=Adult} 0.1535666  0.9209809 0.9689670
[7]                       {Survived=Yes} => {Age=Adult} 0.2971377  0.9198312 0.9677574
[8]            {Sex=Female,Survived=Yes} => {Age=Adult} 0.1435711  0.9186047 0.9664669
[9]      {Class=3rd,Sex=Male,Survived=No} => {Age=Adult} 0.1758292  0.9170616 0.9648435
[10]                         {Class=2nd} => {Age=Adult} 0.1185825  0.9157895 0.9635051
[11]                {Class=3rd,Sex=Male} => {Age=Adult} 0.2099046  0.9058824 0.9530818
[12]                        {Sex=Female} => {Age=Adult} 0.1930940  0.9042553 0.9513700
[13]             {Class=3rd,Survived=No} => {Age=Adult} 0.2162653  0.9015152 0.9484870
[14]                         {Class=3rd} => {Age=Adult} 0.2848705  0.8881020 0.9343750
[15]   {Class=3rd,Age=Adult,Survived=No} =>  {Sex=Male} 0.1758292  0.8130252 1.0337773
>
```

```
Data
redundantRules     15 obs. of 6 variables
titanic.raw        2201 obs. of 4 variables
Values
myrules            Formal class rules
myvar              "Titanic"
removeRedundan…    logi [1:27] FALSE TRUE FALSE TRUE FALSE F…
rules              Formal class rules
```

	Name	Description	Version
	User Library		
☑	arules	Mining Association Rules and Frequent Itemsets	1.5-0
	System Library		
□	boot	Bootstrap Functions (Originally by Angelo Canty for S)	1.3-18
□	class	Functions for Classification	7.3-14
□	cluster	"Finding Groups in Data": Cluster Analysis Extended Rousseeuw et al.	2.0.4
□	codetools	Code Analysis Tools for R	0.2-14
□	compiler	The R Compiler Package	3.3.1
□	datasets	The R Datasets Package	3.3.1
□	foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, Weka, dBase, ...	0.8-66
□	graphics	The R Graphics Package	3.3.1
□	grDevices	The R Graphics Devices and Support for Colours and Fonts	3.3.1
□	grid	The Grid Graphics Package	3.3.1

8: This is after using is.redundant function with a negation(!is.redundant). It will give the non-redundant dataset rules.

We can store this in a variable, which will have non-redundant rules.



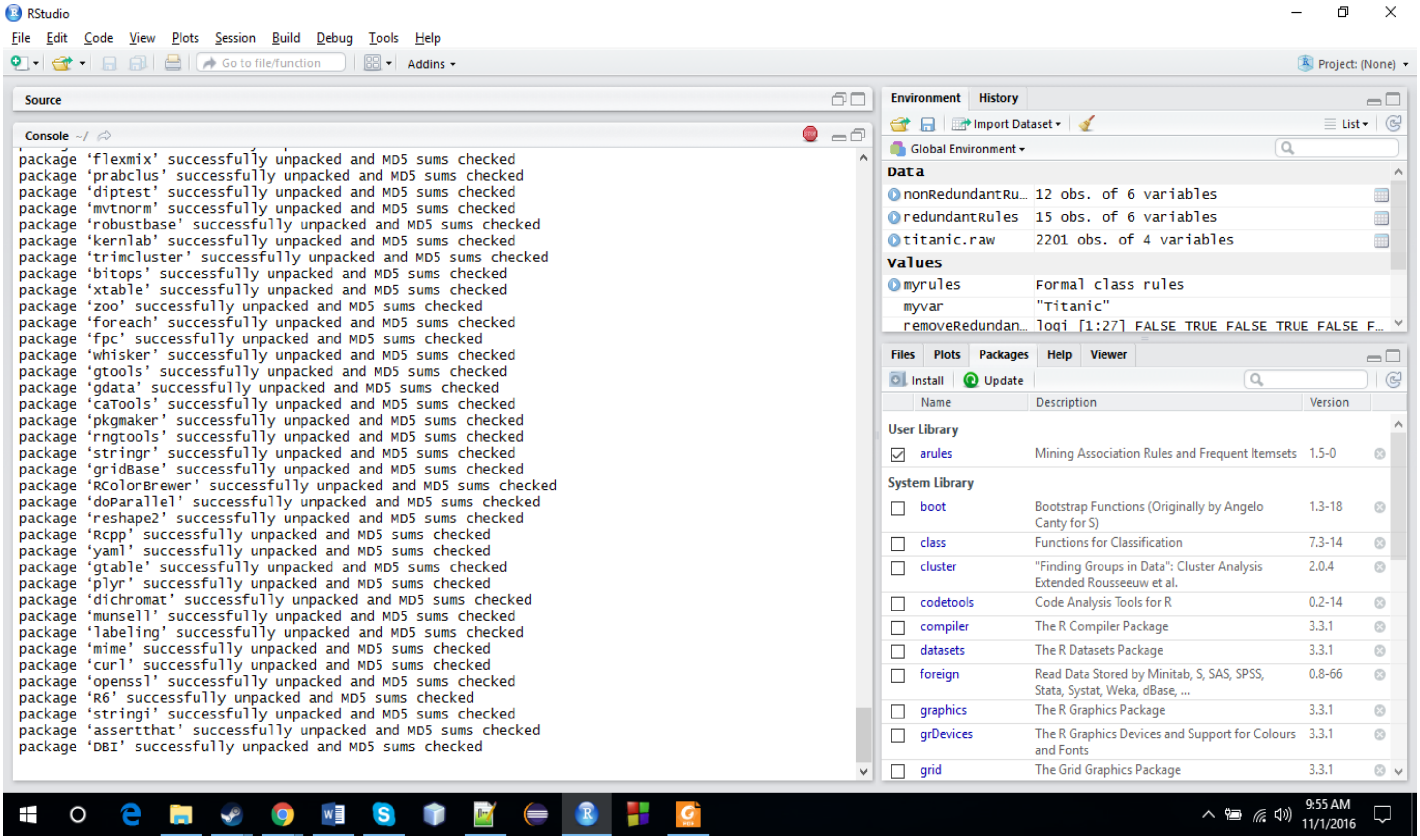
```
> nonRedundantRules <- inspect(sortedRules[!is.redundant(sortedRules)])
     lhs                               rhs            support   confidence lift
[1]  {Class=Crew}                   => {Age=Adult}    0.4020900 1.0000000  1.052103
[2]  {Class=Crew,Survived=No}       => {Sex=Male}     0.3044071 0.9955423  1.265851
[3]  {Class=1st}                    => {Age=Adult}    0.1449341 0.9815385  1.032680
[4]  {Sex=Male,Survived=No}         => {Age=Adult}    0.6038164 0.9743402  1.025106
[5]  {Class=Crew}                   => {Sex=Male}     0.3916402 0.9740113  1.238474
[6]  {Survived=No}                  => {Age=Adult}    0.6533394 0.9651007  1.015386
[7]  {Sex=Male}                     => {Age=Adult}    0.7573830 0.9630272  1.013204
[8]  {}                             => {Age=Adult}    0.9504771 0.9504771  1.000000
[9]  {Age=Adult,Survived=No}        => {Sex=Male}     0.6038164 0.9242003  1.175139
[10] {Survived=No}                  => {Sex=Male}     0.6197183 0.9154362  1.163995
[11] {Class=3rd,Sex=Male,Age=Adult} => {Survived=No}  0.1758292 0.8376623  1.237379
[12] {Class=3rd,Sex=Male}           => {Survived=No}  0.1917310 0.8274510  1.222295
>
```

```
Data
nonRedundantRu…   12 obs. of 6 variables
redundantRules    15 obs. of 6 variables
titanic.raw       2201 obs. of 4 variables
Values
myrules           Formal class rules
myvar             "Titanic"
removeRedundan…   logi [1:27] FALSE TRUE FALSE TRUE FALSE F…
```

	Name	Description	Version
	User Library		
☑	arules	Mining Association Rules and Frequent Itemsets	1.5-0
	System Library		
□	boot	Bootstrap Functions (Originally by Angelo Canty for S)	1.3-18
□	class	Functions for Classification	7.3-14
□	cluster	"Finding Groups in Data": Cluster Analysis Extended Rousseeuw et al.	2.0.4
□	codetools	Code Analysis Tools for R	0.2-14
□	compiler	The R Compiler Package	3.3.1
□	datasets	The R Datasets Package	3.3.1
□	foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, Weka, dBase, ...	0.8-66
□	graphics	The R Graphics Package	3.3.1
□	grDevices	The R Graphics Devices and Support for Colours and Fonts	3.3.1
□	grid	The Grid Graphics Package	3.3.1

9: After installing all the related packages such as 'arulesViz', which says arules visualization.

This package is used to plot graphs for our dataset and rules. This is the output we get.

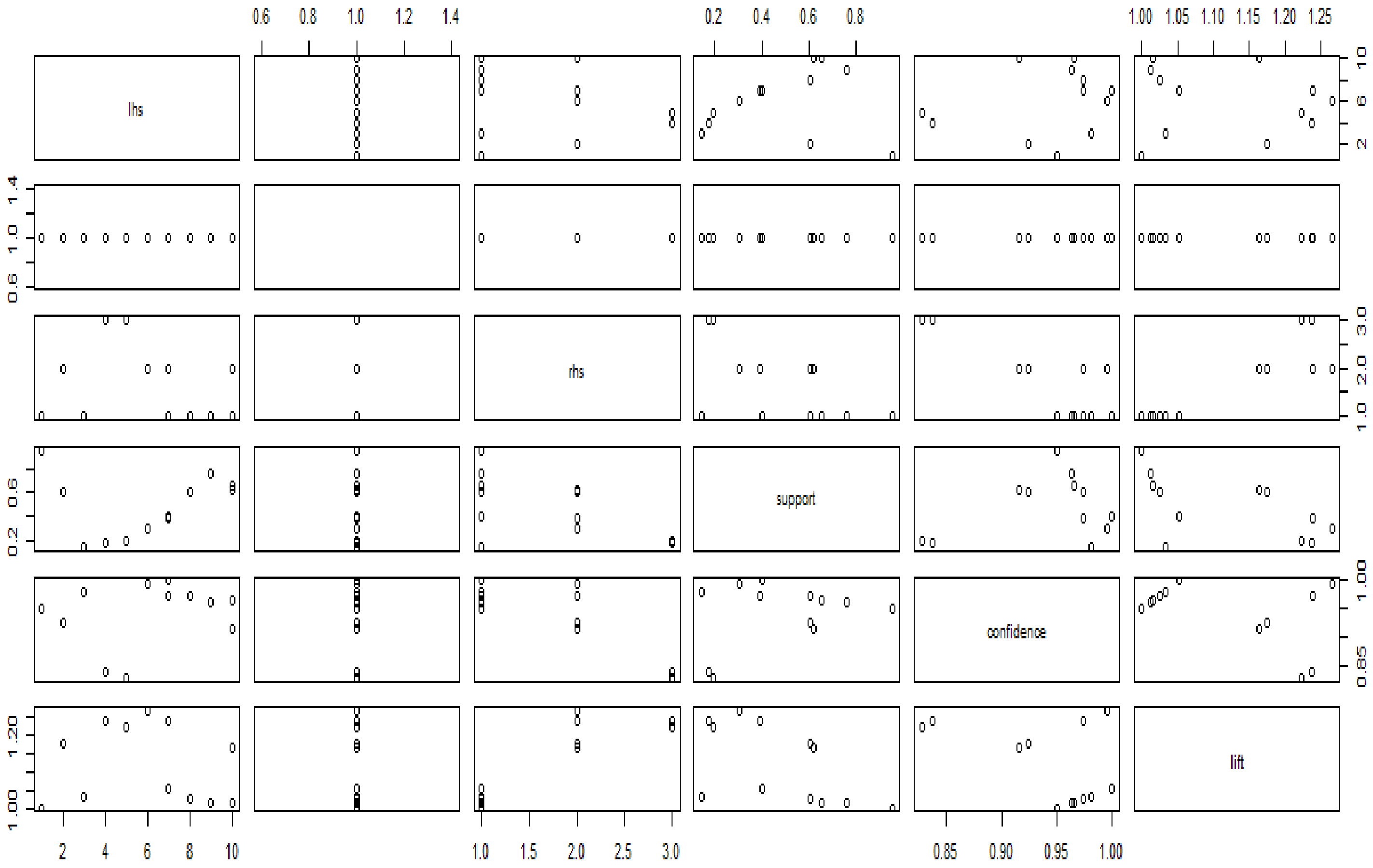


```
package ‘flexmix’ successfully unpacked and MD5 sums checked
package ‘prabclus’ successfully unpacked and MD5 sums checked
package ‘diptest’ successfully unpacked and MD5 sums checked
package ‘mvtnorm’ successfully unpacked and MD5 sums checked
package ‘robustbase’ successfully unpacked and MD5 sums checked
package ‘kernlab’ successfully unpacked and MD5 sums checked
package ‘trimcluster’ successfully unpacked and MD5 sums checked
package ‘bitops’ successfully unpacked and MD5 sums checked
package ‘xtable’ successfully unpacked and MD5 sums checked
package ‘zoo’ successfully unpacked and MD5 sums checked
package ‘foreach’ successfully unpacked and MD5 sums checked
package ‘fpc’ successfully unpacked and MD5 sums checked
package ‘whisker’ successfully unpacked and MD5 sums checked
package ‘gtools’ successfully unpacked and MD5 sums checked
package ‘gdata’ successfully unpacked and MD5 sums checked
package ‘caTools’ successfully unpacked and MD5 sums checked
package ‘pkgmaker’ successfully unpacked and MD5 sums checked
package ‘rngtools’ successfully unpacked and MD5 sums checked
package ‘stringr’ successfully unpacked and MD5 sums checked
package ‘gridBase’ successfully unpacked and MD5 sums checked
package ‘RColorBrewer’ successfully unpacked and MD5 sums checked
package ‘doParallel’ successfully unpacked and MD5 sums checked
package ‘reshape2’ successfully unpacked and MD5 sums checked
package ‘Rcpp’ successfully unpacked and MD5 sums checked
package ‘yaml’ successfully unpacked and MD5 sums checked
package ‘gtable’ successfully unpacked and MD5 sums checked
package ‘plyr’ successfully unpacked and MD5 sums checked
package ‘dichromat’ successfully unpacked and MD5 sums checked
package ‘munsell’ successfully unpacked and MD5 sums checked
package ‘labeling’ successfully unpacked and MD5 sums checked
package ‘mime’ successfully unpacked and MD5 sums checked
package ‘curl’ successfully unpacked and MD5 sums checked
package ‘openssl’ successfully unpacked and MD5 sums checked
package ‘R6’ successfully unpacked and MD5 sums checked
package ‘stringi’ successfully unpacked and MD5 sums checked
package ‘assertthat’ successfully unpacked and MD5 sums checked
package ‘DBI’ successfully unpacked and MD5 sums checked
```

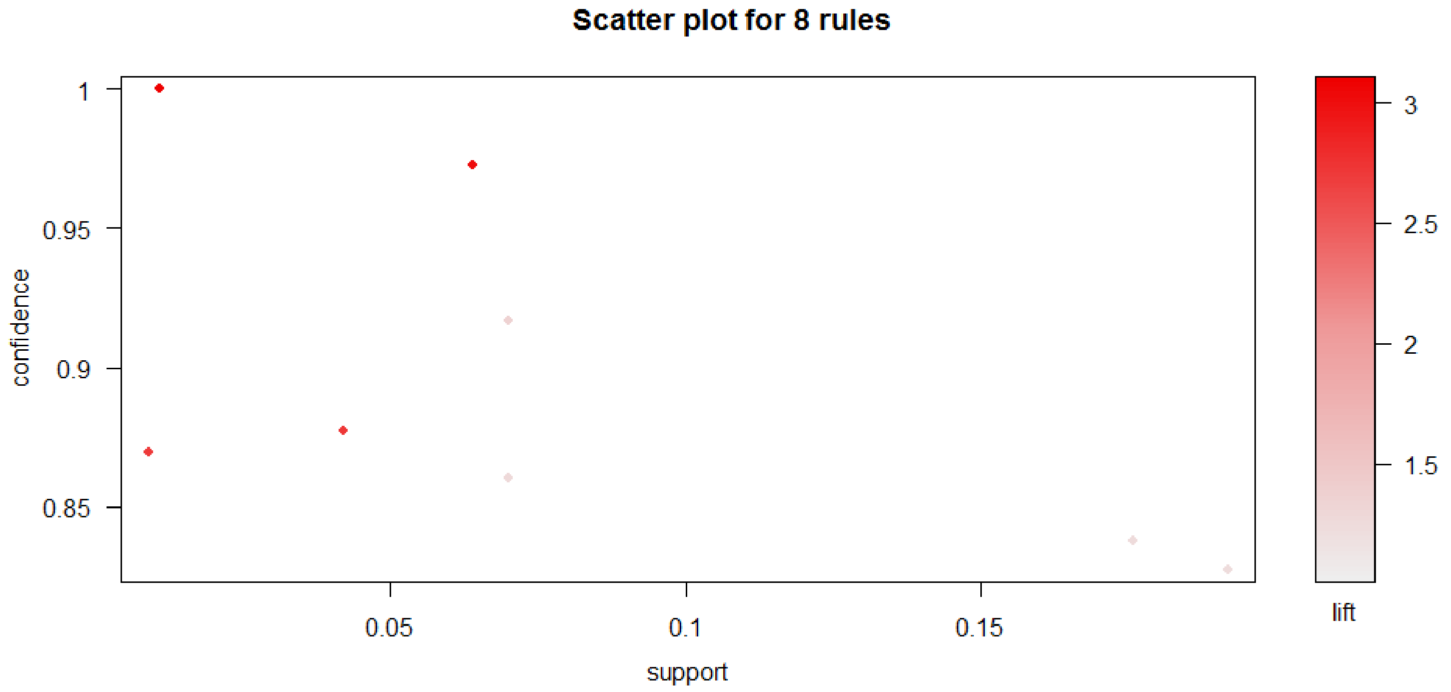
```
Data
nonRedundantRu…   12 obs. of 6 variables
redundantRules    15 obs. of 6 variables
titanic.raw       2201 obs. of 4 variables
Values
myrules           Formal class rules
myvar             "Titanic"
removeRedundan…   logi [1:27] FALSE TRUE FALSE TRUE FALSE F…
```

	Name	Description	Version
	User Library		
☑	arules	Mining Association Rules and Frequent Itemsets	1.5-0
	System Library		
□	boot	Bootstrap Functions (Originally by Angelo Canty for S)	1.3-18
□	class	Functions for Classification	7.3-14
□	cluster	"Finding Groups in Data": Cluster Analysis Extended Rousseeuw et al.	2.0.4
□	codetools	Code Analysis Tools for R	0.2-14
□	compiler	The R Compiler Package	3.3.1
□	datasets	The R Datasets Package	3.3.1
□	foreign	Read Data Stored by Minitab, S, SAS, SPSS, Stata, Systat, Weka, dBase, ...	0.8-66
□	graphics	The R Graphics Package	3.3.1
□	grDevices	The R Graphics Devices and Support for Colours and Fonts	3.3.1
□	grid	The Grid Graphics Package	3.3.1

10: This is the output when we used ‘plot()’ on non-redundant rules, which in our example are 12.



10: This is the output when we used ‘plot()’ on non-redundant rules. Here we have used a parameter method whose value is “graph” to get a scatter plot.



REFERENCES:

[1] Mining Association Rules and Frequent Itemsets, version 1.5-0, Package ‘arules’

[2] www.quora.com

[3] www.stackoverflow.com

[4] www.youtube.com

[5] www.Wikipedia.com

[6] www.cran.r-project.org