Data Mining Assignment

Group 2

Task 1:

You have already used the attached datasets (Dev and hold-out sample) for an in class exercise. You are required to build a neural network model on the same datasets. However this time, you have to also incorporate the Categorical Variables by converting them into dummy variables (1/0).

Solution 1:

We have already defined that DEVOUT_SAMPLE would be our training dataset and HOLDOUT_SAMPLE would be the testing dataset. Following are the columns present in our sample datasets:

data.frame': 14000 obs. of 10 variables:

$ Cust_ID : Factor w/ 14000 levels "C10","C100","C1000",..: 5091 5649....

$ Target : int 0 0 0 0 0 0 1 0 0 1 ...

$ Age : int 41 52 31 45 39 45 33 26 38 44 ...

$ Gender : Factor w/ 3 levels "F","M","O": 2 2 1 1 1 2 2 1 2 2 ...

$ Balance : num 91520 117289 259827 26678 43440 ...

$ Occupation : Factor w/ 4 levels "PROF","SAL","SELF-EMP",..: 3 2 4 1 4 4 2 3 2 3 ...

$ No_OF_CR_TXNS : int 38 17 8 14 1 11 24 18 19 17 ...

$ AGE_BKT : Factor w/ 7 levels "<25",">50","26-30",..: 6 2 4 6 5 6 4 3 5 6 ...

$ SCR : int 926 768 816 353 751 364 166 448 237 678 ...

$ Holding_Period: int 15 13 5 18 31 2 9 28 5 3 ...

Categorical Variables here are Occupation, Gender and Age Bracket. Dummy Variables are created for each category. These dummy variables are assigned a value of 0 & 1 respectively.

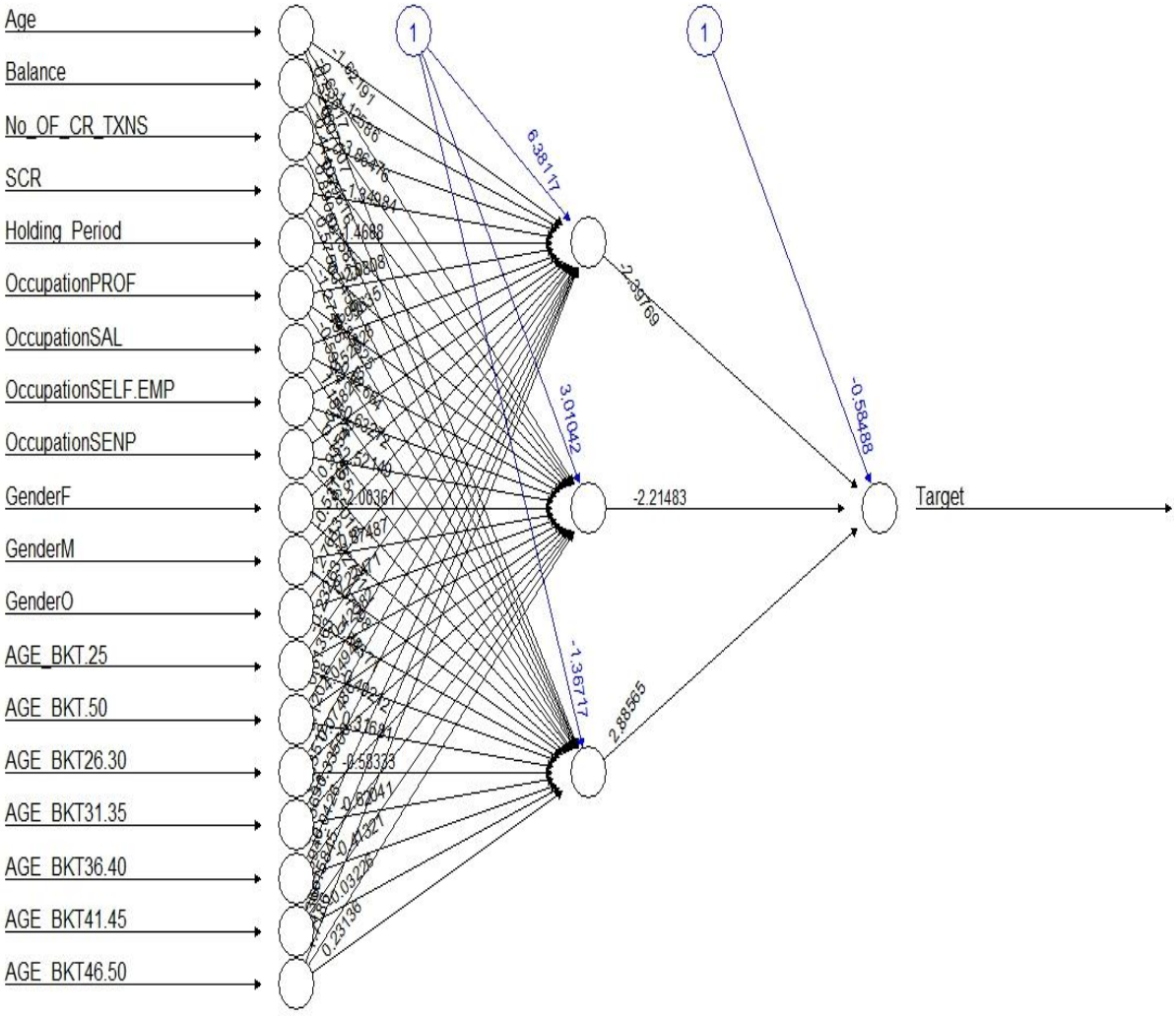
Thereafter the values are scaled since range of values vary a lot across variables. This would help in the performance of the neural network model.

Then create the neural network model by including the dummy variables created above.

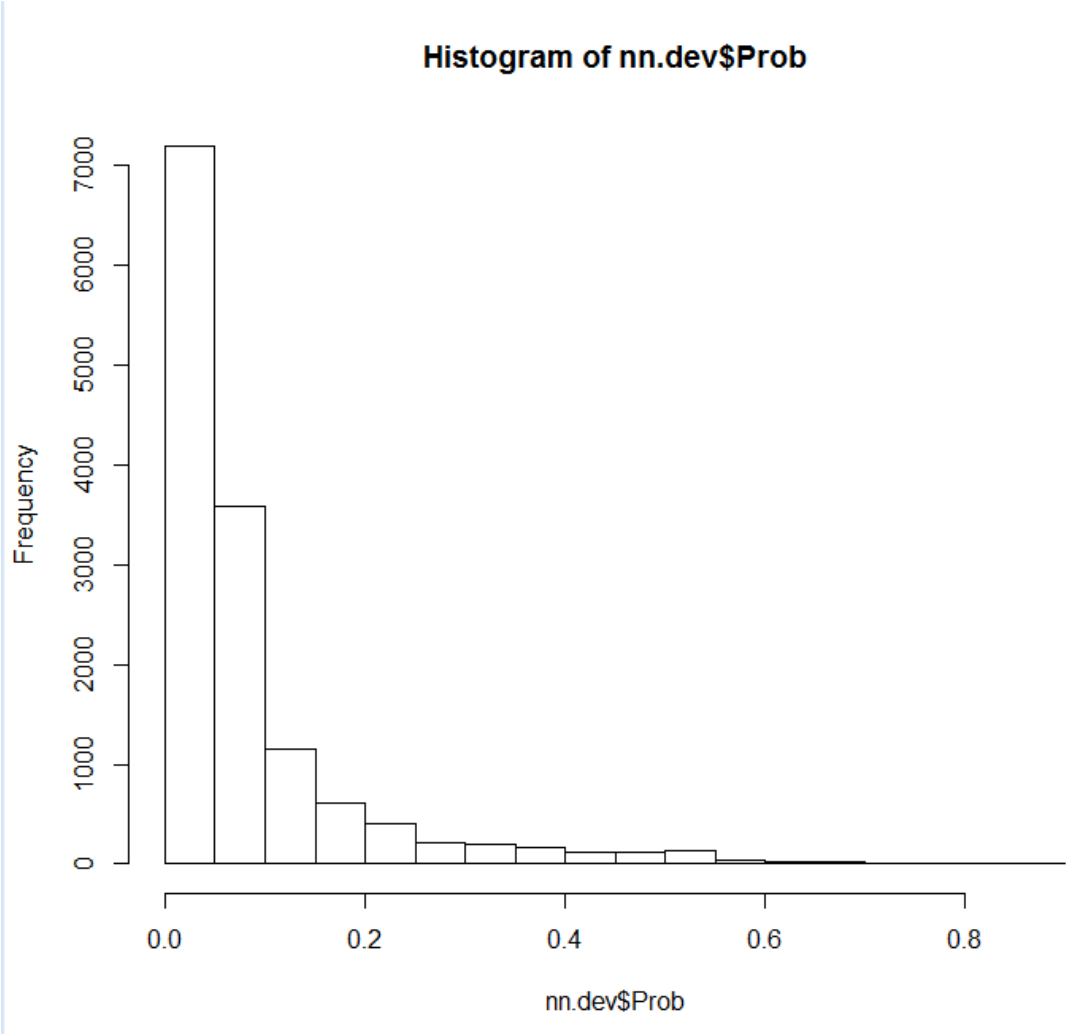
Following is how the neural network plot looks like:

The black lines show the connections between each layer and the weights on each connection while the blue lines show the bias term added in each step. The net is essentially a black box so we cannot say that much about the fitting, the weights and the model.

Suffice to say that the training algorithm has converged and therefore the model is ready to be used.



Following is how the histogram of probabilities looks like. The probability graph is skewed towards left. This somewhat aligns with the low success rate that we see in the training dataset.



After deciling, then we rank the output from the neural network to get the KS. This is how the ranking table looks like:

	deciles	cnt	cnt_resp	cnt_non_resp	rrate	cum_resp	cum_non_resp	cum_rel_resp	cum_rel_non_resp	ks
1	10	1400	507	893	36%	507	893	41%	7%	0.34
2	9	1400	196	1204	14%	703	2097	57%	16%	0.41
3	8	1400	124	1276	9%	827	3373	67%	26%	0.41
4	7	1400	98	1302	7%	925	4675	75%	37%	0.38
5	6	1400	85	1315	6%	1010	5990	82%	47%	0.35
6	5	1400	66	1334	5%	1076	7324	87%	57%	0.30
7	4	1400	61	1339	4%	1137	8663	92%	68%	0.24
8	3	1400	48	1352	3%	1185	10015	96%	78%	0.18
9	2	1400	24	1376	2%	1209	11391	98%	89%	0.09
10	1	1400	26	1374	2%	1235	12765	100%	100%	0.00

KS Test measures to check whether model is able to separate events and non-events. Since Ks score is 0.41. Ideally, it should be in first three deciles and score lies between 40 and 70. Hence model is able to distinguish between good and bad customers.

Since the 8th decile has the last ks value, we start with a threshold value of 0.21 and evaluate by the following table:

Target	0	1
0	11908	857
1	735	500

Sum squared errors comes out to be 484.27.

Confusion Matrix and Statistics

	Reference	
Prediction	0	1
0	11908	857
1	735	500

Accuracy: 0.8862857 ➔ It is a rate of true classified instances which is very high

No Information Rate: 0.9030714 ➔ We can achieve the max accuracy that you can achieve without any information at hand

Sensitivity: 0.9418651 ➔ It is a rate of true positive classified instances which is high as desired

Specificity: 0.3684598 ➔ It is a ratio of true negative instances and total observed negative instances. It is low.

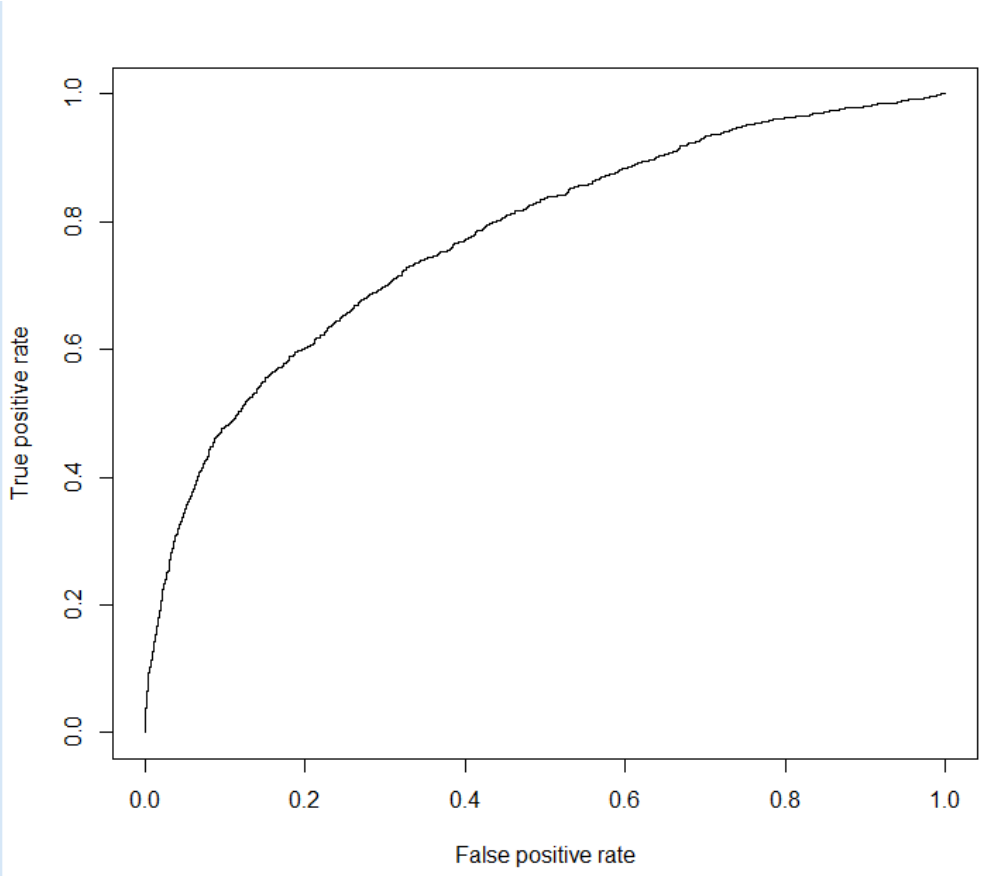
Overall Kappa: 0.323298 is between 30-40%, there is fair agreement between model's predictions and true value

ROC Curve

Receiver Operating Characteristic is commonly used to examine the trade-off between the detection of true positives, while avoiding the false positives. The points comprising ROC curves indicate the true positive rate at varying false positive thresholds

The perfect classifier has a curve that passes through the point at a 100 percent true positive rate and 0 percent false positive rate. It is able to correctly identify all of the positives before it incorrectly classifies any negative result

True Positive Rate v/s False Positive Rate graphs looks like:



AUC (Area under ROC curve)

The closer the curve is to the perfect classifier, the better it is at identifying positive values. This can be measured using a statistic known as the area under the ROC curve (abbreviated AUC).

- A convention to interpret AUC scores is
- A: Outstanding = 0.9 to 1.0
- B: Excellent/good = 0.8 to 0.9
- C: Acceptable/fair = 0.7 to 0.8
- D: Poor = 0.6 to 0.7
- E: No discrimination = 0.5 to 0.6

Since our model AUC score is 0.7736976265. Hence it is acceptable/fair.

Other performance scores of the neural network model:

KS: 0.4188730889 ➔ Model can fairly distinguish between good and bad customers

Gini: 0.5496561328 ➔ A Gini Coefficient is a scale of predictive power from 0 to 1. Our model has Gini coefficient significantly larger than 0 means that our model can distinguish good risks from bad risks, and therefore has fair predictive power

Evaluating future performance

Now we run the compute function on the holdout sample using the neural network model created on the training dataset. Following is the ranking table and KS statistics.

	deciles	cnt	cnt_resp	cnt_non_resp	rrate	cum_resp	cum_non_resp	cum_rel_resp	cum_rel_non_resp	ks
1	10	600	163	437	27%	163	437	33%	8%	0.25
2	9	600	91	509	15%	254	946	51%	17%	0.34
3	8	600	71	529	12%	325	1475	65%	27%	0.38
4	7	600	50	550	8%	375	2025	75%	37%	0.38
5	6	600	37	563	6%	412	2588	83%	47%	0.36
6	5	600	25	575	4%	437	3163	88%	57%	0.31
7	4	600	24	576	4%	461	3739	93%	68%	0.25
8	3	600	13	587	2%	474	4326	95%	79%	0.16
9	2	600	15	585	2%	489	4911	98%	89%	0.09
10	1	600	9	591	2%	498	5502	100%	100%	0.00

KS statistic is 0.38, almost similar to the test data. Model should generate better KS statistic but still model is able to separate events and non-events.

Model has performed fairly well on holdout sample. Also model performance measure helps to understand how model can perform on test data set.

Task 2:

You are supposed to build a market basket model on the attached dataset. You are supposed to do some preliminary data cleaning before running the MBA. You are expected to create buckets and club relevant items together to put into those buckets so as to get a better output of market basket analysis.

Solution:

The dataset consists of the following column names:

- Store_ID
- Invoice_No
- Till_No
- Item_No
- Txn_Date
- SKU_Code
- Item_Desc
- Qty
- Unit
- Unit_Price
- Price
- Cust_ID
- Emp_ID

Firstly we aggregate the invoices at transaction level. This is done because we want one row per transaction which would tell us what all was bought within that transaction.

Support shows the frequency of the patterns in the rule; it is the percentage of transactions that contain both A and B, i.e.

Support = Probability (A and B)

Support = (# of transactions involving A and B) / (total number of transactions).

Confidence is the strength of implication of a rule; it is the percentage of transactions that contain B if they contain A, ie.

Confidence = Probability (B if A) = P (B/A)

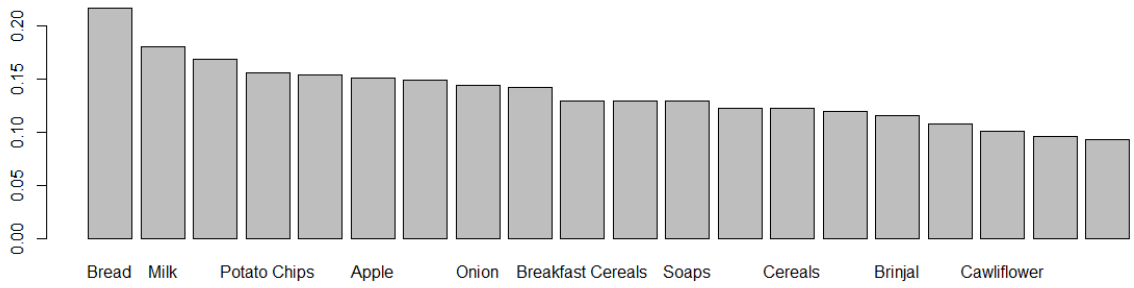
Confidence = (# of transactions involving A and B) / (total no. of transactions having A).

Support: The fraction of which our item set occurs in our dataset.

Confidence: probability that a rule is correct for a new transaction with items on the left.

Lift: The ratio by which by the confidence of a rule exceeds the expected confidence.
Note: if the lift is 1 it indicates that the items on the left and right are independent.

Following is how the frequency plot of how items are bought looks like:



Data preparation – creating a sparse matrix for transaction data

> Txns

Transactions in sparse format with

415 transactions (rows) and

301 items (columns

Each row in the sparse matrix indicates a transaction. There are 301 different items in our data, our sparse matrix will contain 301 columns.

```
> summary(Txns)
transactions as itemMatrix in sparse format with
 415 rows (elements/itemsets/transactions) and
 301 columns (items) and a density of 0.02783493

most frequent items:
       Bread         Milk Fruit Juices Potato Chips   Rawa Sooji      (Other)
          90           75           70           65           64         3113

element (itemset/transaction) length distribution:
sizes
 1  2  3  4  5  6  7  8  9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 27 28 29 31
79 67 36 25 23 21 18 18 16  8 10  9  6  6  4  7  5  4  4  5  3  4  4  3  2  3  1  3  2
32 33 35 36 37 38 40 41 44 46 47 49 50 52 53 65
 2  2  1  1  1  1  1  1  1  1  1  1  2  1  1  1

   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
  1.000   2.000   5.000   8.378  10.500  65.000
```

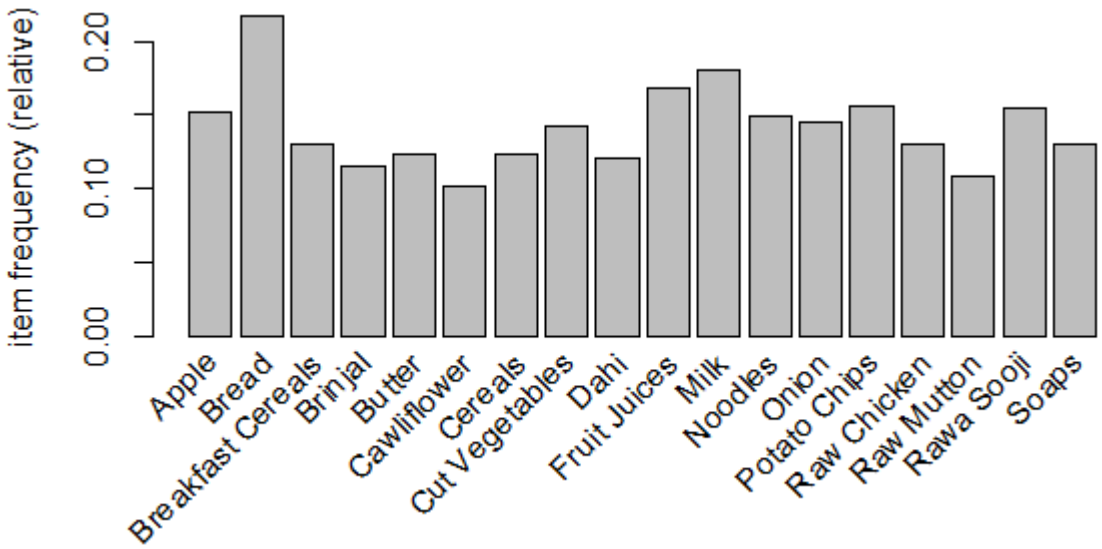
Above summary is self-explanatory.

We are presented with a set of statistics about the size of the transactions. A total of 796,736 transactions contained 1, 2 and 3 items respectively, while one transaction had 65 items. The first quartile and median purchase sizes are two and five items, respectively, implying that 25 percent of the transactions contained two or fewer items and the transactions were split in half between those with less than five items. The mean is 8.378 items per transaction.

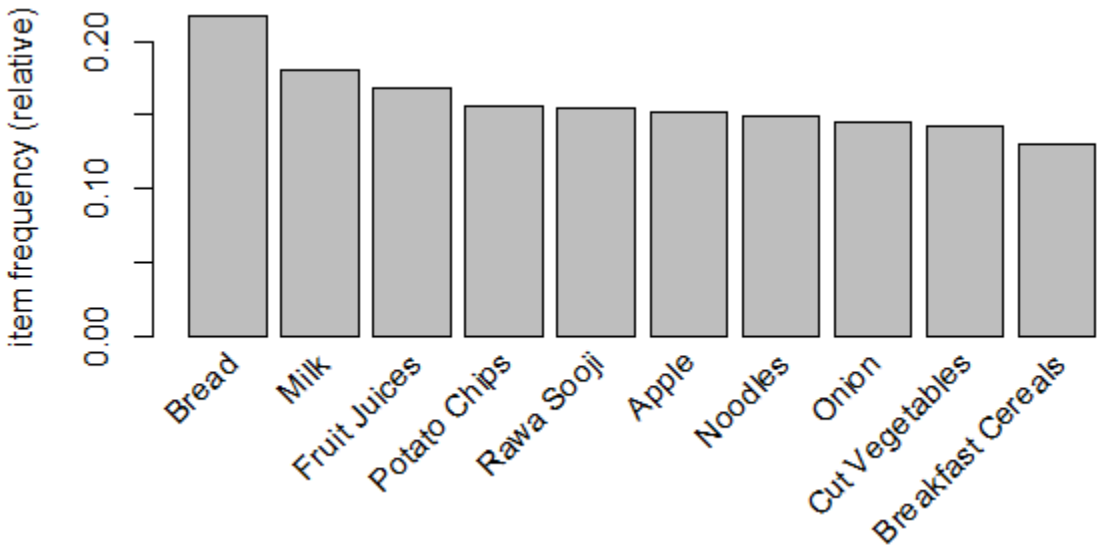
Visualizing item support – item frequency plots

Item Frequency Plot with a support of 0.10:

Below bar chart depicts the proportion of transactions containing certain items. Histogram showing the eighteen items in the data with at least 10 percent support



Item Frequency Plot for top 10 items:



Evaluating model performance

The rule length distribution tells us how many rules have each count of items. In our rule set, 152 rules have two items (since we have chosen maxlen=2)

```
> summary(arules2)
set of 152 rules

rule length distribution (lhs + rhs):sizes
  2
152

   Min. 1st Qu.  Median    Mean 3rd Qu.    Max.
      2       2       2       2       2       2

summary of quality measures:
    support         confidence          lift
 Min.   :0.05060   Min.   :0.5000   Min.   : 2.306
 1st Qu.:0.05542   1st Qu.:0.6000   1st Qu.: 4.348
 Median :0.06506   Median :0.6571   Median : 5.370
 Mean   :0.06807   Mean   :0.6904   Mean   : 6.022
 3rd Qu.:0.07530   3rd Qu.:0.7719   3rd Qu.: 7.176
 Max.   :0.11807   Max.   :1.0000   Max.   :10.641

mining info:
 data ntransactions support confidence
 Txns           415    0.05        0.5
```

Association rules

The lift of a rule measures how much more likely one item or item set is purchased relative to its typical rate of purchase, given that you know another item or item set has been purchased

$$\text{lift}(X \to Y) = \frac{\text{confidence}(X \to Y)}{\text{support}(Y)}$$

A large lift value is a strong indicator that a rule is important, and reflects a true connection between the items.

```
    lhs                    rhs                support      confidence   lift
[1] {Dahi}              => {Cut Vegetables}   0.1180722892 0.9800000000 6.893220339
[2] {Cut Vegetables}    => {Dahi}             0.1180722892 0.8305084746 6.893220339
[3] {Butter}            => {Bread}            0.1036144578 0.8431372549 3.887799564
[4] {Breakfast Cereals} => {Bread}            0.1060240964 0.8148148148 3.757201646
```

The first rule can be read as, "If a customer buys Dahi, they will also buy Cut Vegetables.

With support of 0.118 and confidence of 0.98, we can determine that this rule covers 11.8 % of the transactions and is correct in 98% of purchases involving Dahi.

The lift value of 6.89 tells us how much more likely a customer is to buy Cut Vegetables relative to the average customer, given that he or she bought a Dahi. Note that the column labeled support indicates the support value for the rule, not the support value for the lhs or rhs alone.

Improving model performance

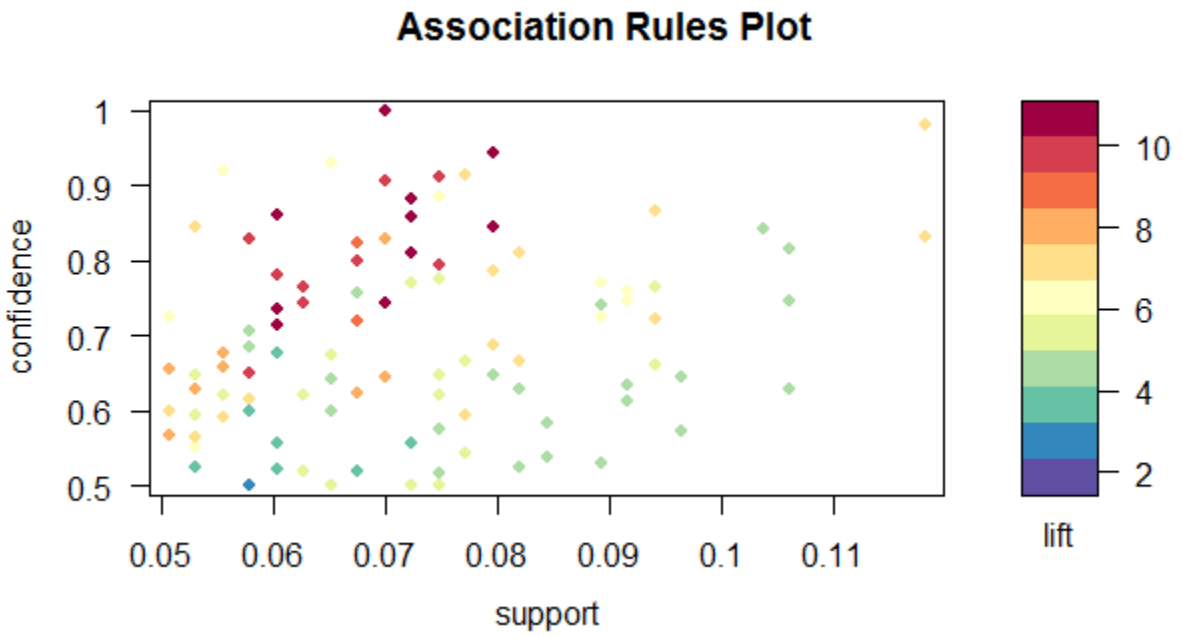
Sorting the set of association rules

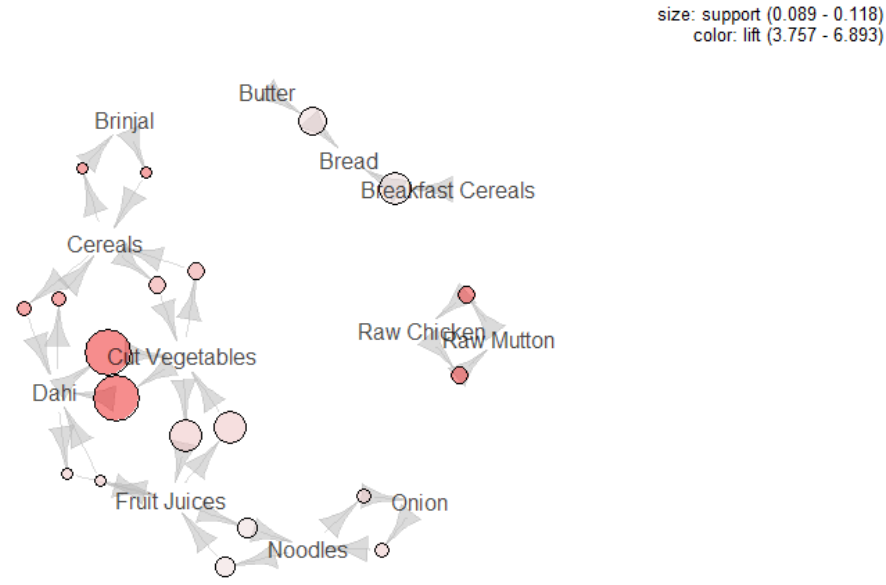
⇨ The 15th rule, with a lift of about 9.89, implies that people who buy body lotion are nearly

10 times more likely to buy boiled rice than the typical customer

```
     lhs                    rhs                support       confidence   lift
[1]  {Other Cereals}    => {Other Dals}       0.06987951807 1.0000000000 10.641025641
[2]  {Other Dals}       => {Other Cereals}    0.06987951807 0.7435897436 10.641025641
[3]  {Others}           => {Other Cereals}    0.06024096386 0.7352941176 10.522312373
[4]  {Other Cereals}    => {Others}           0.06024096386 0.8620689655 10.522312373
[5]  {Others}           => {Other Flours}     0.07228915663 0.8823529412 10.462184874
[6]  {Other Flours}     => {Others}           0.07228915663 0.8571428571 10.462184874
[7]  {Other Flours}     => {Other Cereals}    0.06024096386 0.7142857143 10.221674877
[8]  {Other Cereals}    => {Other Flours}     0.06024096386 0.8620689655 10.221674877
[9]  {Other Flours}     => {Other Dals}       0.07951807229 0.9428571429 10.032967033
[10] {Other Dals}       => {Other Flours}     0.07951807229 0.8461538462 10.032967033
[11] {Boiled Rice}      => {Body Lotion}      0.07228915663 0.8108108108  9.896661367
[12] {Body Lotion}      => {Boiled Rice}      0.07228915663 0.8823529412  9.896661367
[13] {Others}           => {Other Dals}       0.07469879518 0.9117647059  9.702111614
[14] {Other Dals}       => {Others}           0.07469879518 0.7948717949  9.702111614
[15] {Biscuits}         => {Black Chocolate}  0.06987951807 0.9062500000  9.643429487
[16] {Black Chocolate}  => {Biscuits}         0.06987951807 0.7435897436  9.643429487
[17] {Body Lotion}      => {Biscuits}         0.06024096386 0.7352941176  9.535845588
[18] {Biscuits}         => {Body Lotion}      0.06024096386 0.7812500000  9.535845588
[19] {Raw Rice}         => {Pulses}           0.06746987952 0.8000000000  9.485714286
[20] {Pulses}           => {Raw Rice}         0.06746987952 0.8000000000  9.485714286
[21] {Potato}           => {Pulses}           0.06746987952 0.8000000000  9.485714286
[22] {Pulses}           => {Potato}           0.06746987952 0.8000000000  9.485714286
[23] {Groundnut Oil}    => {Garlic}           0.05783132530 0.6486486486  9.282385834
[24] {Garlic}           => {Groundnut Oil}    0.05783132530 0.8275862069  9.282385834
[25] {Potato}           => {Others}           0.06265060241 0.7428571429  9.067226891
[26] {Others}           => {Potato}           0.06265060241 0.7647058824  9.067226891
[27] {Black Chocolate}  => {Body Lotion}      0.06746987952 0.7179487179  8.763197587
[28] {Body Lotion}      => {Black Chocolate}  0.06746987952 0.8235294118  8.763197587
[29] {Pulses}           => {Others}           0.05542168675 0.6571428571  8.021008403
[30] {Others}           => {Pulses}           0.05542168675 0.6764705882  8.021008403
```

Graphical Representation:

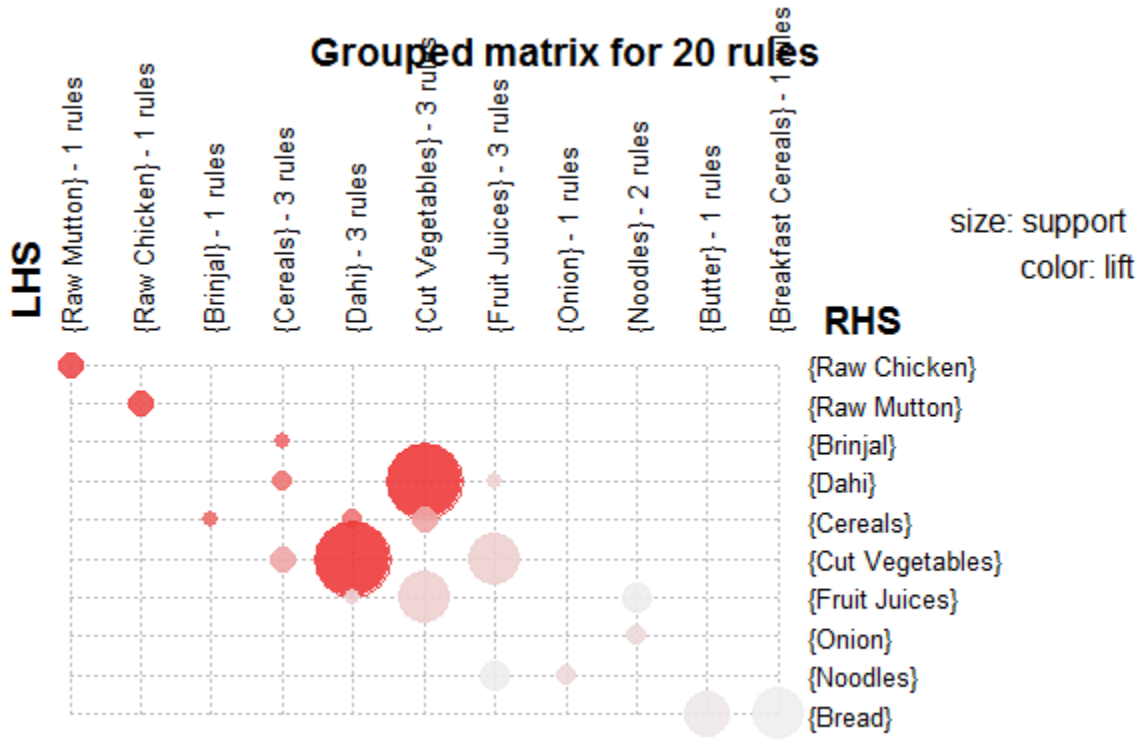




Association Rules sorted by Support:

	lhs		rhs	support	confidence	lift
[1]	{Dahi}	=>	{Cut Vegetables}	0.11807228916	0.9800000000	6.893220339
[2]	{Cut Vegetables}	=>	{Dahi}	0.11807228916	0.8305084746	6.893220339
[3]	{Breakfast Cereals}	=>	{Bread}	0.10602409639	0.8148148148	3.757201646
[4]	{Cut Vegetables}	=>	{Fruit Juices}	0.10602409639	0.7457627119	4.421307506
[5]	{Fruit Juices}	=>	{Cut Vegetables}	0.10602409639	0.6285714286	4.421307506
[6]	{Butter}	=>	{Bread}	0.10361445783	0.8431372549	3.887799564
[7]	{Noodles}	=>	{Fruit Juices}	0.09638554217	0.6451612903	3.824884793
[8]	{Fruit Juices}	=>	{Noodles}	0.09638554217	0.5714285714	3.824884793
[9]	{Raw Mutton}	=>	{Raw Chicken}	0.09397590361	0.8666666667	6.660493827
[10]	{Raw Chicken}	=>	{Raw Mutton}	0.09397590361	0.7222222222	6.660493827
[11]	{Cereals}	=>	{Cut Vegetables}	0.09397590361	0.7647058824	5.378863410
[12]	{Cut Vegetables}	=>	{Cereals}	0.09397590361	0.6610169492	5.378863410
[13]	{Dahi}	=>	{Cereals}	0.09156626506	0.7600000000	6.184313725
[14]	{Cereals}	=>	{Dahi}	0.09156626506	0.7450980392	6.184313725
[15]	{Onion}	=>	{Noodles}	0.09156626506	0.6333333333	4.239247312
[16]	{Noodles}	=>	{Onion}	0.09156626506	0.6129032258	4.239247312
[17]	{Brinjal}	=>	{Cereals}	0.08915662651	0.7708333333	6.272467320
[18]	{Cereals}	=>	{Brinjal}	0.08915662651	0.7254901961	6.272467320
[19]	{Dahi}	=>	{Fruit Juices}	0.08915662651	0.7400000000	4.387142857
[20]	{Fruit Juices}	=>	{Dahi}	0.08915662651	0.5285714286	4.387142857

Interactive Plot:



Below is the output of the association rules in a csv:

Some of the inferences that we can draw from the association rules are:

- 10% of the customers bought Butter & Bread together
- 84% of customers who bought Bread from those who bought Butter
- Likelihood of customer purchasing Bread is 3.88 times higher if the customer has purchased Butter
- The highest support is between Dahi and Cut Vegetables
- The highest confidence is between the association of Other Cereals and Other Dals
- Similarly the highest lift is also between Other Cereals and Other Dals

Rules	Support	Confidence	Lift	Lhs_suuport	Rhs_support
{Butter} => {Bread}	0.103614458	0.843137255	3.887799564	0.122891566	0.21686747
{Banana} => {Apple}	0.055421687	0.92	6.06031746	0.060240964	0.151807229
{Regular Eggs} => {Raw Chicken}	0.053012048	0.846153846	6.502849003	0.062650602	0.130120482
{Other Cereals} => {Others}	0.060240964	0.862068966	10.52231237	0.069879518	0.081927711
{Others} => {Other Cereals}	0.060240964	0.735294118	10.52231237	0.081927711	0.069879518
{Other Cereals} => {Other Flours}	0.060240964	0.862068966	10.22167488	0.069879518	0.084337349
{Other Flours} => {Other Cereals}	0.060240964	0.714285714	10.22167488	0.084337349	0.069879518
{Other Cereals} => {Other Dals}	0.069879518	1	10.64102564	0.069879518	0.093975904
{Other Dals} => {Other Cereals}	0.069879518	0.743589744	10.64102564	0.093975904	0.069879518
{Other Cereals} => {Potato Chips}	0.05060241	0.724137931	4.623342175	0.069879518	0.156626506
{Other Cereals} => {Onion}	0.060240964	0.862068966	5.962643678	0.069879518	0.144578313
{Other Cereals} => {Noodles}	0.05060241	0.724137931	4.84705228	0.069879518	0.14939759
{Garlic} => {Groundnut Oil}	0.057831325	0.827586207	9.282385834	0.069879518	0.089156627
{Groundnut Oil} => {Garlic}	0.057831325	0.648648649	9.282385834	0.089156627	0.069879518
{Garlic} => {Dahi}	0.05060241	0.724137931	6.010344828	0.069879518	0.120481928
{Garlic} => {Fruit Juices}	0.065060241	0.931034483	5.519704433	0.069879518	0.168674699
{Cawliflower} => {Brinjal}	0.079518072	0.785714286	6.793154762	0.101204819	0.115662651
{Brinjal} => {Cawliflower}	0.079518072	0.6875	6.793154762	0.115662651	0.101204819
{Cawliflower} => {Dahi}	0.062650602	0.619047619	5.138095238	0.101204819	0.120481928
{Dahi} => {Cawliflower}	0.062650602	0.52	5.138095238	0.120481928	0.101204819
{Cawliflower} => {Cereals}	0.081927711	0.80952381	6.587301587	0.101204819	0.122891566
{Cereals} => {Cawliflower}	0.081927711	0.666666667	6.587301587	0.122891566	0.101204819
{Cawliflower} => {Cut Vegetables}	0.065060241	0.642857143	4.521791768	0.101204819	0.142168675
{Cawliflower} => {Fruit Juices}	0.053012048	0.523809524	3.105442177	0.101204819	0.168674699
{Groundnut Oil} => {Dahi}	0.053012048	0.594594595	4.935135135	0.089156627	0.120481928
{Groundnut Oil} => {Cut Vegetables}	0.053012048	0.594594595	4.182317911	0.089156627	0.142168675
{Groundnut Oil} => {Soaps}	0.055421687	0.621621622	4.777277277	0.089156627	0.130120482
{Groundnut Oil} => {Fruit Juices}	0.06746988	0.756756757	4.486486486	0.089156627	0.168674699
{Raw Rice} => {Potato}	0.05060241	0.6	7.114285714	0.084337349	0.084337349
{Potato} => {Raw Rice}	0.05060241	0.6	7.114285714	0.084337349	0.084337349

{Raw Rice} => {Rawa Sooji}	0.06746988	0.8	5.1875	0.084337349	0.154216867
{Raw Rice} => {Pulses}	0.06746988	0.8	9.485714286	0.084337349	0.084337349
{Pulses} => {Raw Rice}	0.06746988	0.8	9.485714286	0.084337349	0.084337349
{Raw Rice} => {Raw Mutton}	0.069879518	0.828571429	7.641269841	0.084337349	0.108433735
{Raw Mutton} => {Raw Rice}	0.069879518	0.644444444	7.641269841	0.108433735	0.084337349
{Raw Rice} => {Raw Chicken}	0.077108434	0.914285714	7.026455026	0.084337349	0.130120482
{Raw Chicken} => {Raw Rice}	0.077108434	0.592592593	7.026455026	0.130120482	0.084337349
{Raw Rice} => {Potato Chips}	0.057831325	0.685714286	4.378021978	0.084337349	0.156626506
{Raw Rice} => {Onion}	0.053012048	0.628571429	4.347619048	0.084337349	0.144578313
{Biscuits} => {Boiled Rice}	0.05060241	0.65625	7.360641892	0.077108434	0.089156627
{Boiled Rice} => {Biscuits}	0.05060241	0.567567568	7.360641892	0.089156627	0.077108434
{Biscuits} => {Black Chocolate}	0.069879518	0.90625	9.643429487	0.077108434	0.093975904
{Black Chocolate} => {Biscuits}	0.069879518	0.743589744	9.643429487	0.093975904	0.077108434
{Biscuits} => {Body Lotion}	0.060240964	0.78125	9.535845588	0.077108434	0.081927711
{Body Lotion} => {Biscuits}	0.060240964	0.735294118	9.535845588	0.081927711	0.077108434
{Potato} => {Pulses}	0.06746988	0.8	9.485714286	0.084337349	0.084337349
{Pulses} => {Potato}	0.06746988	0.8	9.485714286	0.084337349	0.084337349
{Potato} => {Raw Mutton}	0.05060241	0.6	5.533333333	0.084337349	0.108433735
{Potato} => {Others}	0.062650602	0.742857143	9.067226891	0.084337349	0.081927711
{Others} => {Potato}	0.062650602	0.764705882	9.067226891	0.081927711	0.084337349
{Potato} => {Other Flours}	0.053012048	0.628571429	7.453061224	0.084337349	0.084337349
{Other Flours} => {Potato}	0.053012048	0.628571429	7.453061224	0.084337349	0.084337349
{Potato} => {Other Dals}	0.055421687	0.657142857	6.992673993	0.084337349	0.093975904
{Other Dals} => {Potato}	0.055421687	0.58974359	6.992673993	0.093975904	0.084337349
{Potato} => {Raw Chicken}	0.060240964	0.714285714	5.489417989	0.084337349	0.130120482
{Potato} => {Potato Chips}	0.077108434	0.914285714	5.837362637	0.084337349	0.156626506
{Potato} => {Onion}	0.053012048	0.628571429	4.347619048	0.084337349	0.144578313
{Potato} => {Milk}	0.05060241	0.6	3.32	0.084337349	0.180722892
{Boiled Rice} => {Black Chocolate}	0.057831325	0.648648649	6.902286902	0.089156627	0.093975904
{Black Chocolate} => {Boiled Rice}	0.057831325	0.615384615	6.902286902	0.093975904	0.089156627
{Boiled Rice} => {Body Lotion}	0.072289157	0.810810811	9.896661367	0.089156627	0.081927711
{Body Lotion} => {Boiled Rice}	0.072289157	0.882352941	9.896661367	0.081927711	0.089156627
{Boiled Rice} => {Breakfast Cereals }	0.057831325	0.648648649	4.984984985	0.089156627	0.130120482
{Boiled Rice} => {Bread}	0.060240964	0.675675676	3.115615616	0.089156627	0.21686747
{Black Chocolate} => {Body Lotion}	0.06746988	0.717948718	8.763197587	0.093975904	0.081927711
{Body Lotion} => {Black Chocolate}	0.06746988	0.823529412	8.763197587	0.081927711	0.093975904
{Black Chocolate} => {Bread}	0.053012048	0.564102564	2.601139601	0.093975904	0.21686747
{Pulses} => {Rawa Sooji}	0.053012048	0.628571429	4.075892857	0.084337349	0.154216867
{Raw Mutton} => {Rawa Sooji}	0.060240964	0.555555556	3.602430556	0.108433735	0.154216867
{Raw Chicken} => {Rawa Sooji}	0.065060241	0.5	3.2421875	0.130120482	0.154216867
{Body Lotion} => {Breakfast Cereal	0.053012048	0.647058824	4.972766885	0.081927711	0.130120482

s}					
{Body Lotion} => {Bread}	0.057831325	0.705882353	3.254901961	0.081927711	0.21686747
{Pulses} => {Raw Mutton}	0.06746988	0.8	7.377777778	0.084337349	0.108433735
{Raw Mutton} => {Pulses}	0.06746988	0.622222222	7.377777778	0.108433735	0.084337349
{Pulses} => {Others}	0.055421687	0.657142857	8.021008403	0.084337349	0.081927711
{Others} => {Pulses}	0.055421687	0.676470588	8.021008403	0.081927711	0.084337349
{Pulses} => {Other Dals}	0.053012048	0.628571429	6.688644689	0.084337349	0.093975904
{Other Dals} => {Pulses}	0.053012048	0.564102564	6.688644689	0.093975904	0.084337349
{Pulses} => {Raw Chicken}	0.077108434	0.914285714	7.026455026	0.084337349	0.130120482
{Raw Chicken} => {Pulses}	0.077108434	0.592592593	7.026455026	0.130120482	0.084337349
{Pulses} => {Potato Chips}	0.074698795	0.885714286	5.654945055	0.084337349	0.156626506
{Pulses} => {Onion}	0.055421687	0.657142857	4.545238095	0.084337349	0.144578313
{Pulses} => {Milk}	0.055421687	0.657142857	3.636190476	0.084337349	0.180722892
{Other Flours} => {Raw Mutton}	0.053012048	0.628571429	5.796825397	0.084337349	0.108433735
{Other Dals} => {Raw Mutton}	0.053012048	0.564102564	5.202279202	0.093975904	0.108433735
{Raw Mutton} => {Raw Chicken}	0.093975904	0.866666667	6.660493827	0.108433735	0.130120482
{Raw Chicken} => {Raw Mutton}	0.093975904	0.722222222	6.660493827	0.130120482	0.108433735
{Raw Mutton} => {Potato Chips}	0.065060241	0.6	3.830769231	0.108433735	0.156626506
{Others} => {Other Flours}	0.072289157	0.882352941	10.46218487	0.081927711	0.084337349
{Other Flours} => {Others}	0.072289157	0.857142857	10.46218487	0.084337349	0.081927711
{Others} => {Other Dals}	0.074698795	0.911764706	9.702111614	0.081927711	0.093975904
{Other Dals} => {Others}	0.074698795	0.794871795	9.702111614	0.093975904	0.081927711
{Others} => {Raw Chicken}	0.053012048	0.647058824	4.972766885	0.081927711	0.130120482
{Others} => {Potato Chips}	0.057831325	0.705882353	4.50678733	0.081927711	0.156626506
{Others} => {Onion}	0.062650602	0.764705882	5.289215686	0.081927711	0.144578313
{Others} => {Milk}	0.053012048	0.647058824	3.580392157	0.081927711	0.180722892
{Others} => {Noodles}	0.060240964	0.735294118	4.921726755	0.081927711	0.14939759
{Breakfast Cereals} => {Bread}	0.106024096	0.814814815	3.757201646	0.130120482	0.21686747
{Breakfast Cereals} => {Noodles}	0.06746988	0.518518519	3.470728793	0.130120482	0.14939759
{Breakfast Cereals} => {Fruit Juices }	0.072289157	0.555555556	3.293650794	0.130120482	0.168674699
{Other Flours} => {Other Dals}	0.079518072	0.942857143	10.03296703	0.084337349	0.093975904
{Other Dals} => {Other Flours}	0.079518072	0.846153846	10.03296703	0.093975904	0.084337349
{Other Flours} => {Raw Chicken}	0.05060241	0.6	4.611111111	0.084337349	0.130120482
{Other Flours} => {Potato Chips}	0.053012048	0.628571429	4.013186813	0.084337349	0.156626506
{Other Flours} => {Onion}	0.060240964	0.714285714	4.94047619	0.084337349	0.144578313
{Other Flours} => {Milk}	0.05060241	0.6	3.32	0.084337349	0.180722892
{Other Flours} => {Noodles}	0.060240964	0.714285714	4.781105991	0.084337349	0.14939759
{Masalas} => {Other Dals}	0.053012048	0.55	5.852564103	0.096385542	0.093975904
{Other Dals} => {Masalas}	0.053012048	0.564102564	5.852564103	0.093975904	0.096385542
{Masalas} => {Milk}	0.057831325	0.6	3.32	0.096385542	0.180722892
{Masalas} => {Soaps}	0.065060241	0.675	5.1875	0.096385542	0.130120482

{Soaps} => {Masalas}	0.065060241	0.5	5.1875	0.130120482	0.096385542
{Masalas} => {Noodles}	0.074698795	0.775	5.1875	0.096385542	0.14939759
{Noodles} => {Masalas}	0.074698795	0.5	5.1875	0.14939759	0.096385542
{Brinjal} => {Dahi}	0.074698795	0.645833333	5.360416667	0.115662651	0.120481928
{Dahi} => {Brinjal}	0.074698795	0.62	5.360416667	0.120481928	0.115662651
{Brinjal} => {Cereals}	0.089156627	0.770833333	6.27246732	0.115662651	0.122891566
{Cereals} => {Brinjal}	0.089156627	0.725490196	6.27246732	0.122891566	0.115662651
{Brinjal} => {Bread}	0.057831325	0.5	2.305555556	0.115662651	0.21686747
{Brinjal} => {Cut Vegetables}	0.077108434	0.666666667	4.689265537	0.115662651	0.142168675
{Cut Vegetables} => {Brinjal}	0.077108434	0.542372881	4.689265537	0.142168675	0.115662651
{Brinjal} => {Fruit Juices}	0.060240964	0.520833333	3.087797619	0.115662651	0.168674699
{Other Dals} => {Raw Chicken}	0.057831325	0.615384615	4.729344729	0.093975904	0.130120482
{Other Dals} => {Potato Chips}	0.057831325	0.615384615	3.928994083	0.093975904	0.156626506
{Other Dals} => {Onion}	0.072289157	0.769230769	5.320512821	0.093975904	0.144578313
{Onion} => {Other Dals}	0.072289157	0.5	5.320512821	0.144578313	0.093975904
{Other Dals} => {Milk}	0.057831325	0.615384615	3.405128205	0.093975904	0.180722892
{Other Dals} => {Soaps}	0.053012048	0.564102564	4.335232669	0.093975904	0.130120482
{Other Dals} => {Noodles}	0.069879518	0.743589744	4.977253929	0.093975904	0.14939759
{Raw Chicken} => {Potato Chips}	0.081927711	0.62962963	4.01994302	0.130120482	0.156626506
{Potato Chips} => {Raw Chicken}	0.081927711	0.523076923	4.01994302	0.156626506	0.130120482
{Raw Chicken} => {Onion}	0.074698795	0.574074074	3.970679012	0.130120482	0.144578313
{Onion} => {Raw Chicken}	0.074698795	0.516666667	3.970679012	0.144578313	0.130120482
{Dahi} => {Cereals}	0.091566265	0.76	6.184313725	0.120481928	0.122891566
{Cereals} => {Dahi}	0.091566265	0.745098039	6.184313725	0.122891566	0.120481928
{Dahi} => {Cut Vegetables}	0.118072289	0.98	6.893220339	0.120481928	0.142168675
{Cut Vegetables} => {Dahi}	0.118072289	0.830508475	6.893220339	0.142168675	0.120481928
{Dahi} => {Fruit Juices}	0.089156627	0.74	4.387142857	0.120481928	0.168674699
{Fruit Juices} => {Dahi}	0.089156627	0.528571429	4.387142857	0.168674699	0.120481928
{Cereals} => {Cut Vegetables}	0.093975904	0.764705882	5.37886341	0.122891566	0.142168675
{Cut Vegetables} => {Cereals}	0.093975904	0.661016949	5.37886341	0.142168675	0.122891566
{Cereals} => {Fruit Juices}	0.079518072	0.647058824	3.836134454	0.122891566	0.168674699
{Potato Chips} => {Onion}	0.084337349	0.538461538	3.724358974	0.156626506	0.144578313
{Onion} => {Potato Chips}	0.084337349	0.583333333	3.724358974	0.144578313	0.156626506
{Noodles} => {Potato Chips}	0.074698795	0.5	3.192307692	0.14939759	0.156626506
{Cut Vegetables} => {Fruit Juices}	0.106024096	0.745762712	4.421307506	0.142168675	0.168674699
{Fruit Juices} => {Cut Vegetables}	0.106024096	0.628571429	4.421307506	0.168674699	0.142168675
{Onion} => {Noodles}	0.091566265	0.633333333	4.239247312	0.144578313	0.14939759
{Noodles} => {Onion}	0.091566265	0.612903226	4.239247312	0.14939759	0.144578313
{Soaps} => {Noodles}	0.06746988	0.518518519	3.470728793	0.130120482	0.14939759
{Noodles} => {Fruit Juices}	0.096385542	0.64516129	3.824884793	0.14939759	0.168674699
{Fruit Juices} => {Noodles}	0.096385542	0.571428571	3.824884793	0.168674699	0.14939759

After running market basket on the given data, a few items were clubbed into being one item and the analysis was run again. Following are the items that were clubbed.

1. Canned Food and Canned Fruits clubbed as Canned Items
2. Other Cereals, Other Dals clubbed together as Other Pulses
3. Raw Chicken and Raw Meat clubbed together as Raw Meat
4. Mens Denim and Mens Basic Denim clubbed together as Mens Jeans
5. Frozen Chicken, Fish, Parathas, Peas, Pizzas, Pork, Starters and Vegetables all clubbed together as Frozen Food items
6. Mosquito Coil, Mosquito Repellant and Mosquito Repeller all clubbed together as Mosquito Repellant
7. Pasta and Pastas clubbed together as Pasta

On performing the market basket on the modified data, following were the conclusions derived:

- The highest support is between Dahi and Cut Vegetables
- The highest confidence is now between Dahi and Cut Vegetables instead of Other Cereals and Other Dals
- Similarly the highest lift has also changed from being between Other Cereals and Other Dals to Others and Other Flours.

rules	support	confidence	lift	lhs_suuport	rhs_support
{Butter} => {Bread}	0.103614458	0.843137255	3.887799564	0.122891566	0.21686747
{Regular Eggs} => {Raw Meat}	0.053012048	0.846153846	5.852564103	0.062650602	0.144578313
{Banana} => {Apple}	0.055421687	0.92	6.06031746	0.060240964	0.151807229
{Garlic} => {Groundnut Oil}	0.057831325	0.827586207	9.282385834	0.069879518	0.089156627
{Groundnut Oil} => {Garlic}	0.057831325	0.648648649	9.282385834	0.089156627	0.069879518
{Garlic} => {Dahi}	0.05060241	0.724137931	6.010344828	0.069879518	0.120481928
{Garlic} => {Fruit Juices}	0.065060241	0.931034483	5.519704433	0.069879518	0.168674699
{Groundnut Oil} => {Dahi}	0.053012048	0.594594595	4.935135135	0.089156627	0.120481928
{Groundnut Oil} => {Cut Vegetables}	0.053012048	0.594594595	4.182317911	0.089156627	0.142168675
{Groundnut Oil} => {Soaps}	0.055421687	0.621621622	4.777277277	0.089156627	0.130120482
{Groundnut Oil} => {Fruit Juices}	0.06746988	0.756756757	4.486486486	0.089156627	0.168674699
{Cawliflower} => {Brinjal}	0.079518072	0.785714286	6.793154762	0.101204819	0.115662651
{Brinjal} => {Cawliflower}	0.079518072	0.6875	6.793154762	0.115662651	0.101204819
{Cawliflower} => {Dahi}	0.062650602	0.619047619	5.138095238	0.101204819	0.120481928
{Dahi} => {Cawliflower}	0.062650602	0.52	5.138095238	0.120481928	0.101204819
{Cawliflower} => {Cereals}	0.081927711	0.80952381	6.587301587	0.101204819	0.122891566
{Cereals} => {Cawliflower}	0.081927711	0.666666667	6.587301587	0.122891566	0.101204819
{Cawliflower} => {Cut Vegetables}	0.065060241	0.642857143	4.521791768	0.101204819	0.142168675
{Cawliflower} => {Fruit Juices}	0.053012048	0.523809524	3.105442177	0.101204819	0.168674699
{Raw Rice} => {Potato}	0.05060241	0.6	7.114285714	0.084337349	0.084337349
{Potato} => {Raw Rice}	0.05060241	0.6	7.114285714	0.084337349	0.084337349
{Raw Rice} => {Pulses}	0.06746988	0.8	9.485714286	0.084337349	0.084337349

{Pulses} => {Raw Rice}	0.06746988	0.8	9.485714286	0.084337349	0.084337349
{Raw Rice} => {Rawa Sooji}	0.06746988	0.8	5.1875	0.084337349	0.154216867
{Raw Rice} => {Raw Meat}	0.077108434	0.914285714	6.323809524	0.084337349	0.144578313
{Raw Meat} => {Raw Rice}	0.077108434	0.533333333	6.323809524	0.144578313	0.084337349
{Raw Rice} => {Potato Chips}	0.057831325	0.685714286	4.378021978	0.084337349	0.156626506
{Raw Rice} => {Onion}	0.053012048	0.628571429	4.347619048	0.084337349	0.144578313
{Potato} => {Pulses}	0.06746988	0.8	9.485714286	0.084337349	0.084337349
{Pulses} => {Potato}	0.06746988	0.8	9.485714286	0.084337349	0.084337349
{Potato} => {Others}	0.062650602	0.742857143	9.067226891	0.084337349	0.081927711
{Others} => {Potato}	0.062650602	0.764705882	9.067226891	0.081927711	0.084337349
{Potato} => {Other Flours}	0.053012048	0.628571429	7.453061224	0.084337349	0.084337349
{Other Flours} => {Potato}	0.053012048	0.628571429	7.453061224	0.084337349	0.084337349
{Potato} => {Other Pulses}	0.055421687	0.657142857	6.992673993	0.084337349	0.093975904
{Other Pulses} => {Potato}	0.055421687	0.58974359	6.992673993	0.093975904	0.084337349
{Potato} => {Raw Meat}	0.060240964	0.714285714	4.94047619	0.084337349	0.144578313
{Potato} => {Potato Chips}	0.077108434	0.914285714	5.837362637	0.084337349	0.156626506
{Potato} => {Onion}	0.053012048	0.628571429	4.347619048	0.084337349	0.144578313
{Potato} => {Milk}	0.05060241	0.6	3.32	0.084337349	0.180722892
{Biscuits} => {Boiled Rice}	0.05060241	0.65625	7.360641892	0.077108434	0.089156627
{Boiled Rice} => {Biscuits}	0.05060241	0.567567568	7.360641892	0.089156627	0.077108434
{Biscuits} => {Black Chocolate}	0.069879518	0.90625	9.643429487	0.077108434	0.093975904
{Black Chocolate} => {Biscuits}	0.069879518	0.743589744	9.643429487	0.093975904	0.077108434
{Biscuits} => {Body Lotion}	0.060240964	0.78125	9.535845588	0.077108434	0.081927711
{Body Lotion} => {Biscuits}	0.060240964	0.735294118	9.535845588	0.081927711	0.077108434
{Boiled Rice} => {Black Chocolate}	0.057831325	0.648648649	6.902286902	0.089156627	0.093975904
{Black Chocolate} => {Boiled Rice}	0.057831325	0.615384615	6.902286902	0.093975904	0.089156627
{Boiled Rice} => {Body Lotion}	0.072289157	0.810810811	9.896661367	0.089156627	0.081927711
{Body Lotion} => {Boiled Rice}	0.072289157	0.882352941	9.896661367	0.081927711	0.089156627
{Boiled Rice} => {Breakfast Cereals}	0.057831325	0.648648649	4.984984985	0.089156627	0.130120482
{Boiled Rice} => {Bread}	0.060240964	0.675675676	3.115615616	0.089156627	0.21686747
{Pulses} => {Rawa Sooji}	0.053012048	0.628571429	4.075892857	0.084337349	0.154216867
{Pulses} => {Others}	0.055421687	0.657142857	8.021008403	0.084337349	0.081927711
{Others} => {Pulses}	0.055421687	0.676470588	8.021008403	0.081927711	0.084337349
{Pulses} => {Other Pulses}	0.053012048	0.628571429	6.688644689	0.084337349	0.093975904
{Other Pulses} => {Pulses}	0.053012048	0.564102564	6.688644689	0.093975904	0.084337349
{Pulses} => {Raw Meat}	0.077108434	0.914285714	6.323809524	0.084337349	0.144578313
{Raw Meat} => {Pulses}	0.077108434	0.533333333	6.323809524	0.144578313	0.084337349
{Pulses} => {Potato Chips}	0.074698795	0.885714286	5.654945055	0.084337349	0.156626506
{Pulses} => {Onion}	0.055421687	0.657142857	4.545238095	0.084337349	0.144578313
{Pulses} => {Milk}	0.055421687	0.657142857	3.636190476	0.084337349	0.180722892
{Black Chocolate} => {Body Lotion}	0.06746988	0.717948718	8.763197587	0.093975904	0.081927711

{Body Lotion} => {Black Chocolate}	0.06746988	0.823529412	8.763197587	0.081927711	0.093975904
{Black Chocolate} => {Bread}	0.053012048	0.564102564	2.601139601	0.093975904	0.21686747
{Others} => {Other Flours}	0.072289157	0.882352941	10.46218487	0.081927711	0.084337349
{Other Flours} => {Others}	0.072289157	0.857142857	10.46218487	0.084337349	0.081927711
{Others} => {Other Pulses}	0.074698795	0.911764706	9.702111614	0.081927711	0.093975904
{Other Pulses} => {Others}	0.074698795	0.794871795	9.702111614	0.093975904	0.081927711
{Others} => {Raw Meat}	0.055421687	0.676470588	4.678921569	0.081927711	0.144578313
{Others} => {Potato Chips}	0.057831325	0.705882353	4.50678733	0.081927711	0.156626506
{Others} => {Onion}	0.062650602	0.764705882	5.289215686	0.081927711	0.144578313
{Others} => {Milk}	0.053012048	0.647058824	3.580392157	0.081927711	0.180722892
{Others} => {Noodles}	0.060240964	0.735294118	4.921726755	0.081927711	0.14939759
{Body Lotion} => {Breakfast Cereals}	0.053012048	0.647058824	4.972766885	0.081927711	0.130120482
{Body Lotion} => {Bread}	0.057831325	0.705882353	3.254901961	0.081927711	0.21686747
{Other Flours} => {Other Pulses}	0.079518072	0.942857143	10.03296703	0.084337349	0.093975904
{Other Pulses} => {Other Flours}	0.079518072	0.846153846	10.03296703	0.093975904	0.084337349
{Other Flours} => {Raw Meat}	0.055421687	0.657142857	4.545238095	0.084337349	0.144578313
{Other Flours} => {Potato Chips}	0.053012048	0.628571429	4.013186813	0.084337349	0.156626506
{Other Flours} => {Onion}	0.060240964	0.714285714	4.94047619	0.084337349	0.144578313
{Other Flours} => {Milk}	0.05060241	0.6	3.32	0.084337349	0.180722892
{Other Flours} => {Noodles}	0.060240964	0.714285714	4.781105991	0.084337349	0.14939759
{Masalas} => {Other Pulses}	0.053012048	0.55	5.852564103	0.096385542	0.093975904
{Other Pulses} => {Masalas}	0.053012048	0.564102564	5.852564103	0.093975904	0.096385542
{Masalas} => {Soaps}	0.065060241	0.675	5.1875	0.096385542	0.130120482
{Soaps} => {Masalas}	0.065060241	0.5	5.1875	0.130120482	0.096385542
{Masalas} => {Milk}	0.057831325	0.6	3.32	0.096385542	0.180722892
{Masalas} => {Noodles}	0.074698795	0.775	5.1875	0.096385542	0.14939759
{Noodles} => {Masalas}	0.074698795	0.5	5.1875	0.14939759	0.096385542
{Breakfast Cereals} => {Bread}	0.106024096	0.814814815	3.757201646	0.130120482	0.21686747
{Breakfast Cereals} => {Noodles}	0.06746988	0.518518519	3.470728793	0.130120482	0.14939759
{Breakfast Cereals} => {Fruit Juices}	0.072289157	0.555555556	3.293650794	0.130120482	0.168674699
{Brinjal} => {Dahi}	0.074698795	0.645833333	5.360416667	0.115662651	0.120481928
{Dahi} => {Brinjal}	0.074698795	0.62	5.360416667	0.120481928	0.115662651
{Brinjal} => {Cereals}	0.089156627	0.770833333	6.27246732	0.115662651	0.122891566
{Cereals} => {Brinjal}	0.089156627	0.725490196	6.27246732	0.122891566	0.115662651
{Brinjal} => {Bread}	0.057831325	0.5	2.305555556	0.115662651	0.21686747
{Brinjal} => {Cut Vegetables}	0.077108434	0.666666667	4.689265537	0.115662651	0.142168675
{Cut Vegetables} => {Brinjal}	0.077108434	0.542372881	4.689265537	0.142168675	0.115662651
{Brinjal} => {Fruit Juices}	0.060240964	0.520833333	3.087797619	0.115662651	0.168674699
{Other Pulses} => {Raw Meat}	0.062650602	0.666666667	4.611111111	0.093975904	0.144578313
{Other Pulses} => {Potato Chips}	0.057831325	0.615384615	3.928994083	0.093975904	0.156626506
{Other Pulses} => {Onion}	0.072289157	0.769230769	5.320512821	0.093975904	0.144578313

{Onion} => {Other Pulses}	0.072289157	0.5	5.320512821	0.144578313	0.093975904
{Other Pulses} => {Soaps}	0.053012048	0.564102564	4.335232669	0.093975904	0.130120482
{Other Pulses} => {Milk}	0.057831325	0.615384615	3.405128205	0.093975904	0.180722892
{Other Pulses} => {Noodles}	0.069879518	0.743589744	4.977253929	0.093975904	0.14939759
{Dahi} => {Cereals}	0.091566265	0.76	6.184313725	0.120481928	0.122891566
{Cereals} => {Dahi}	0.091566265	0.745098039	6.184313725	0.122891566	0.120481928
{Dahi} => {Cut Vegetables}	0.118072289	0.98	6.893220339	0.120481928	0.142168675
{Cut Vegetables} => {Dahi}	0.118072289	0.830508475	6.893220339	0.142168675	0.120481928
{Dahi} => {Fruit Juices}	0.089156627	0.74	4.387142857	0.120481928	0.168674699
{Fruit Juices} => {Dahi}	0.089156627	0.528571429	4.387142857	0.168674699	0.120481928
{Cereals} => {Cut Vegetables}	0.093975904	0.764705882	5.37886341	0.122891566	0.142168675
{Cut Vegetables} => {Cereals}	0.093975904	0.661016949	5.37886341	0.142168675	0.122891566
{Cereals} => {Fruit Juices}	0.079518072	0.647058824	3.836134454	0.122891566	0.168674699
{Raw Meat} => {Potato Chips}	0.084337349	0.583333333	3.724358974	0.144578313	0.156626506
{Potato Chips} => {Raw Meat}	0.084337349	0.538461538	3.724358974	0.156626506	0.144578313
{Raw Meat} => {Onion}	0.074698795	0.516666667	3.573611111	0.144578313	0.144578313
{Onion} => {Raw Meat}	0.074698795	0.516666667	3.573611111	0.144578313	0.144578313
{Potato Chips} => {Onion}	0.084337349	0.538461538	3.724358974	0.156626506	0.144578313
{Onion} => {Potato Chips}	0.084337349	0.583333333	3.724358974	0.144578313	0.156626506
{Noodles} => {Potato Chips}	0.074698795	0.5	3.192307692	0.14939759	0.156626506
{Onion} => {Noodles}	0.091566265	0.633333333	4.239247312	0.144578313	0.14939759
{Noodles} => {Onion}	0.091566265	0.612903226	4.239247312	0.14939759	0.144578313
{Cut Vegetables} => {Fruit Juices}	0.106024096	0.745762712	4.421307506	0.142168675	0.168674699
{Fruit Juices} => {Cut Vegetables}	0.106024096	0.628571429	4.421307506	0.168674699	0.142168675
{Soaps} => {Noodles}	0.06746988	0.518518519	3.470728793	0.130120482	0.14939759
{Noodles} => {Fruit Juices}	0.096385542	0.64516129	3.824884793	0.14939759	0.168674699
{Fruit Juices} => {Noodles}	0.096385542	0.571428571	3.824884793	0.168674699	0.14939759