lab3

Rabnawaz jansher(rabsh696) & Saman Zahid(samza595)

March 7, 2018

In this lab we perform cluster analysis and then association anaysis of **monk** dataset. Then we will compare the results.

Cluster Analysis

We perform cluster analysis by using two different clustering algorithms that are `Simple K-means` and `Make Density Based Cluster`. We perform clustering by keeping different number of clusters and and also for different standard deviation.We have kept the seed value same throughout the experiments which is 10.

Experiment 1

1. Clustring Algorithm = SimpleKMean
2. Number of Cluster = 2

```
kMeans
======

Number of iterations: 3
Within cluster sum of squared errors: 358.0
Missing values globally replaced with mean/mode

Cluster centroids:
                              Cluster#
Attribute        Full Data          0              1
                  (124)           (77)           (47)
=================================================
attribute#1          1              1              3
attribute#2          3              2              3
attribute#3          1              1              2
attribute#4          3              1              3
attribute#5          4              4              2
attribute#6          2              2              1




Time taken to build model (full training data) : 0.03 seconds

=== Model and evaluation on training set ===

Clustered Instances

0       77 ( 62%)
1       47 ( 38%)


Class attribute: class
Classes to Clusters:

  0  1  <-- assigned to cluster
 40 22 | 0
 37 25 | 1

Cluster 0 <-- 0
Cluster 1 <-- 1

Incorrectly clustered instances :        59.0      47.5806 %
```

Experiment 2

1. Clustring Algorithm = SimpleKMeans
2. Number of Cluster = 5

```
kMeans
======

Number of iterations: 3
Within cluster sum of squared errors: 274.0
Missing values globally replaced with mean/mode

Cluster centroids:
                              Cluster#
Attribute        Full Data        0           1           2           3           4
                   (124)        (39)        (34)        (22)        (12)        (17)
==========================================================================================
attribute#1          1           1           3           2           2           2
attribute#2          3           2           1           3           3           1
attribute#3          1           1           2           1           1           1
attribute#4          3           1           3           2           3           1
attribute#5          4           4           2           1           1           3
attribute#6          2           2           1           1           2           2



Time taken to build model (full training data) : 0.03 seconds

=== Model and evaluation on training set ===

Clustered Instances

0        39 ( 31%)
1        34 ( 27%)
2        22 ( 18%)
3        12 ( 10%)
4        17 ( 14%)


Class attribute: class
Classes to Clusters:

  0   1   2   3   4   <-- assigned to cluster
 26  15   9   3   9 | 0
 13  19  13   9   8 | 1

Cluster 0 <-- 0
Cluster 1 <-- 1
Cluster 2 <-- No class
Cluster 3 <-- No class
Cluster 4 <-- No class

Incorrectly clustered instances :       79.0      63.7097 %
```

Experiment 3

1. Clustring Algorithm = MakeDensityBasedCluster
2. Number of Cluster = 2
3. Standard Deviation = 1x10^-6

```
MakeDensityBasedClusterer:

Wrapped clusterer:
kMeans
======

Number of iterations: 3
Within cluster sum of squared errors: 358.0
Missing values globally replaced with mean/mode

Cluster centroids:
                             Cluster#
Attribute        Full Data        0           1
                  (124)          (77)        (47)
==================================================
attribute#1           1            1           3
attribute#2           3            2           3
attribute#3           1            1           2
attribute#4           3            1           3
attribute#5           4            4           2
attribute#6           2            2           1


Fitted estimators (with ML estimates of variance):

Cluster: 0 Prior probability: 0.619

Attribute: attribute#1
Discrete Estimator. Counts =  35 30 15  (Total = 80)
Attribute: attribute#2
Discrete Estimator. Counts =  22 36 22  (Total = 80)
Attribute: attribute#3
Discrete Estimator. Counts =  53 26  (Total = 79)
Attribute: attribute#4
Discrete Estimator. Counts =  33 26 21  (Total = 80)
Attribute: attribute#5
Discrete Estimator. Counts =  18 15 20 28  (Total = 81)
Attribute: attribute#6
Discrete Estimator. Counts =  26 53  (Total = 79)

Cluster: 1 Prior probability: 0.381

Attribute: attribute#1
Discrete Estimator. Counts =  12 14 24  (Total = 50)
Attribute: attribute#2
Discrete Estimator. Counts =  15 8 27  (Total = 50)
Attribute: attribute#3
Discrete Estimator. Counts =  14 35  (Total = 49)
Attribute: attribute#4
Discrete Estimator. Counts =  11 15 24  (Total = 50)
Attribute: attribute#5
Discrete Estimator. Counts =  13 18 12 8  (Total = 51)
Attribute: attribute#6

Discrete Estimator. Counts =  14 35  (Total = 49)
Attribute: attribute#4
Discrete Estimator. Counts =  11 15 24  (Total = 50)
Attribute: attribute#5
Discrete Estimator. Counts =  13 18 12 8  (Total = 51)
Attribute: attribute#6
Discrete Estimator. Counts =  32 17  (Total = 49)


Time taken to build model (full training data) : 0.01 seconds

=== Model and evaluation on training set ===

Clustered Instances

0       83 ( 67%)
1       41 ( 33%)


Log likelihood: -6.09856


Class attribute: class
Classes to Clusters:

  0  1  <-- assigned to cluster
 44 18 | 0
 39 23 | 1

Cluster 0 <-- 0
Cluster 1 <-- 1

Incorrectly clustered instances :      57.0     45.9677 %
```

Experiment 4
1. Clustring Algorithm = MakeDensityBasedCluster
2. Number of Cluster = 2
3. Standard Deviation = 1

```
=== Run information ===

Scheme:weka.clusterers.MakeDensityBasedClusterer -M 1.0 -W weka.clusterers.SimpleKMeans -- -N 2 -A "weka.core.EuclideanDistance -R first-last" -I 500 -S 10
Relation:     monk1
Instances:    124
Attributes:   7
              attribute#1
              attribute#2
              attribute#3
              attribute#4
              attribute#5
              attribute#6
Ignored:
              class
Test mode:Classes to clusters evaluation on training data
=== Model and evaluation on training set ===

MakeDensityBasedClusterer:

Wrapped clusterer:
kMeans
======

Number of iterations: 3
Within cluster sum of squared errors: 358.0
Missing values globally replaced with mean/mode

Cluster centroids:
                          Cluster#
Attribute     Full Data        0           1
                (124)        (77)        (47)
==============================================
attribute#1        1           1           3
attribute#2        3           2           3
attribute#3        1           1           2
attribute#4        3           1           3
attribute#5        4           4           2
attribute#6        2           2           1


Fitted estimators (with ML estimates of variance):

Cluster: 0 Prior probability: 0.619

Attribute: attribute#1
Discrete Estimator. Counts =  35 30 15  (Total = 80)
Attribute: attribute#2
Discrete Estimator. Counts =  22 36 22  (Total = 80)
Attribute: attribute#3
Discrete Estimator. Counts =  53 26  (Total = 79)
Attribute: attribute#4
Discrete Estimator. Counts =  33 26 21  (Total = 80)
Attribute: attribute#5
Discrete Estimator. Counts =  18 15 20 28  (Total = 81)
Attribute: attribute#6
Discrete Estimator. Counts =  26 53  (Total = 79)

Cluster: 1 Prior probability: 0.381

Attribute: attribute#1
Discrete Estimator. Counts =  12 14 24  (Total = 50)
Attribute: attribute#2
Discrete Estimator. Counts =  15 8 27  (Total = 50)
Attribute: attribute#3
Discrete Estimator. Counts =  14 35  (Total = 49)
Attribute: attribute#4
Discrete Estimator. Counts =  11 15 24  (Total = 50)
Attribute: attribute#5
Discrete Estimator. Counts =  13 18 12 8  (Total = 51)
Attribute: attribute#6
Discrete Estimator. Counts =  32 17  (Total = 49)

Time taken to build model (full training data) : 0.01 seconds

=== Model and evaluation on training set ===

Clustered Instances

0       83 ( 67%)
1       41 ( 33%)


Log likelihood: -6.09856


Class attribute: class
Classes to Clusters:

  0  1  <-- assigned to cluster
 44 18 | 0
 39 23 | 1

Cluster 0 <-- 0
Cluster 1 <-- 1

Incorrectly clustered instances :      57.0     45.9677 %
```

Experiment 5

1. Clustring Algorithm = MakeDensityBasedCluster
2. Number of Cluster = 2
3. Standard Deviation = 100

```
MakeDensityBasedClusterer:

Wrapped clusterer:
kMeans
======

Number of iterations: 3
Within cluster sum of squared errors: 358.0
Missing values globally replaced with mean/mode

Cluster centroids:
                          Cluster#
Attribute      Full Data         0           1
                  (124)        (77)        (47)
==================================================
attribute#1          1           1           3
attribute#2          3           2           3
attribute#3          1           1           2
attribute#4          3           1           3
attribute#5          4           4           2
attribute#6          2           2           1


Fitted estimators (with ML estimates of variance):

Cluster: 0 Prior probability: 0.619

Attribute: attribute#1
Discrete Estimator. Counts =  35 30 15  (Total = 80)
Attribute: attribute#2
Discrete Estimator. Counts =  22 36 22  (Total = 80)
Attribute: attribute#3
Discrete Estimator. Counts =  53 26  (Total = 79)
Attribute: attribute#4
Discrete Estimator. Counts =  33 26 21  (Total = 80)
Attribute: attribute#5
Discrete Estimator. Counts =  18 15 20 28  (Total = 81)
Attribute: attribute#6
Discrete Estimator. Counts =  26 53  (Total = 79)

Cluster: 1 Prior probability: 0.381

Time taken to build model (full training data) : 0.01 seconds

=== Model and evaluation on training set ===

Clustered Instances

0      83 ( 67%)
1      41 ( 33%)


Log likelihood: -6.09856


Class attribute: class
Classes to Clusters:

  0  1  <-- assigned to cluster
 44 18 | 0
 39 23 | 1

Cluster 0 <-- 0
Cluster 1 <-- 1

Incorrectly clustered instances :      57.0     45.9677 %
```

Experiment 6

1. Clustring Algorithm = MakeDensityBasedCluster
2. Number of Cluster = 5
3. Standard Deviation = 1x10^-6

```
MakeDensityBasedClusterer:

Wrapped clusterer:
kMeans
======

Number of iterations: 3
Within cluster sum of squared errors: 274.0
Missing values globally replaced with mean/mode

Cluster centroids:
                          Cluster#
Attribute      Full Data      0          1          2          3          4
                 (124)       (39)       (34)       (22)       (12)       (17)
==============================================================================
attribute#1         1          1          3          2          2          2
attribute#2         3          2          1          3          3          1
attribute#3         1          1          2          1          1          1
attribute#4         3          1          3          2          3          1
attribute#5         4          4          2          1          1          3
attribute#6         2          2          1          1          2          2



Fitted estimators (with ML estimates of variance):

Cluster: 0 Prior probability: 0.3101

Attribute: attribute#1
Discrete Estimator. Counts =  26 6 10  (Total = 42)
Attribute: attribute#2
Discrete Estimator. Counts =  2 27 13  (Total = 42)
Attribute: attribute#3
Discrete Estimator. Counts =  23 18  (Total = 41)
Attribute: attribute#4
Discrete Estimator. Counts =  20 13 9  (Total = 42)
Attribute: attribute#5
Discrete Estimator. Counts =  5 11 8 19  (Total = 43)
Attribute: attribute#6
Discrete Estimator. Counts =  12 29  (Total = 41)

Cluster: 1 Prior probability: 0.2713

Attribute: attribute#1
Discrete Estimator. Counts =  10 7 20  (Total = 37)
Attribute: attribute#2
Discrete Estimator. Counts =  18 8 11  (Total = 37)
Attribute: attribute#3
Discrete Estimator. Counts =  8 28  (Total = 36)
Attribute: attribute#4
Discrete Estimator. Counts =  9 8 20  (Total = 37)
Attribute: attribute#5
Discrete Estimator. Counts =  8 15 6 9  (Total = 38)
Attribute: attribute#6
Discrete Estimator. Counts =  24 12  (Total = 36)
```

```
Cluster: 2 Prior probability: 0.1783

Attribute: attribute#1
Discrete Estimator. Counts =  7 14 4  (Total = 25)
Attribute: attribute#2
Discrete Estimator. Counts =  6 4 15  (Total = 25)
Attribute: attribute#3
Discrete Estimator. Counts =  17 7  (Total = 24)
Attribute: attribute#4
Discrete Estimator. Counts =  4 17 4  (Total = 25)
Attribute: attribute#5
Discrete Estimator. Counts =  13 3 6 4  (Total = 26)
Attribute: attribute#6
Discrete Estimator. Counts =  19 5  (Total = 24)

Cluster: 3 Prior probability: 0.1008

Attribute: attribute#1
Discrete Estimator. Counts =  3 7 5  (Total = 15)
Attribute: attribute#2
Discrete Estimator. Counts =  1 4 10  (Total = 15)
Attribute: attribute#3
Discrete Estimator. Counts =  11 3  (Total = 14)
Attribute: attribute#4
Discrete Estimator. Counts =  1 1 13  (Total = 15)
Attribute: attribute#5
Discrete Estimator. Counts =  6 4 3 3  (Total = 16)
Attribute: attribute#6
Discrete Estimator. Counts =  1 13  (Total = 14)

Cluster: 4 Prior probability: 0.1395

Attribute: attribute#1
Discrete Estimator. Counts =  4 13 3  (Total = 20)
Attribute: attribute#2
Discrete Estimator. Counts =  13 4 3  (Total = 20)
Attribute: attribute#3
Discrete Estimator. Counts =  11 8  (Total = 19)
Attribute: attribute#4
Discrete Estimator. Counts =  13 5 2  (Total = 20)
Attribute: attribute#5
Discrete Estimator. Counts =  2 3 12 4  (Total = 21)
Attribute: attribute#6
Discrete Estimator. Counts =  5 14  (Total = 19)


Time taken to build model (full training data) : 0.01 seconds

=== Model and evaluation on training set ===
```

```
Time taken to build model (full training data) : 0.01 seconds

=== Model and evaluation on training set ===

Clustered Instances

0        41 ( 33%)
1        34 ( 27%)
2        19 ( 15%)
3        13 ( 10%)
4        17 ( 14%)


Log likelihood: -6.04188


Class attribute: class
Classes to Clusters:

  0  1  2  3  4  <-- assigned to cluster
 27 14  8  3 10 | 0
 14 20 11 10  7 | 1

Cluster 0 <-- 0
Cluster 1 <-- 1
Cluster 2 <-- No class
Cluster 3 <-- No class
Cluster 4 <-- No class

Incorrectly clustered instances :      77.0      62.0968 %
```

Experiment 7

1. Clustring Algorithm = MakeDensityBasedCluster
2. Number of Cluster = 5
3. Standard Deviation = 1

MakeDensityBasedClusterer:

Wrapped clusterer:
kMeans
======

Number of iterations: 3
Within cluster sum of squared errors: 274.0
Missing values globally replaced with mean/mode

Cluster centroids:

Attribute	Full Data	Cluster# 0	1	2	3	4
	(124)	(39)	(34)	(22)	(12)	(17)
attribute#1	1	1	3	2	2	2
attribute#2	3	2	1	3	3	1
attribute#3	1	1	2	1	1	1
attribute#4	3	1	3	2	3	1
attribute#5	4	4	2	1	1	3
attribute#6	2	2	1	1	2	2

Fitted estimators (with ML estimates of variance):

Cluster: 0 Prior probability: 0.3101

Attribute: attribute#1
Discrete Estimator. Counts = 26 6 10 (Total = 42)
Attribute: attribute#2
Discrete Estimator. Counts = 2 27 13 (Total = 42)
Attribute: attribute#3
Discrete Estimator. Counts = 23 18 (Total = 41)
Attribute: attribute#4
Discrete Estimator. Counts = 20 13 9 (Total = 42)
Attribute: attribute#5
Discrete Estimator. Counts = 5 11 8 19 (Total = 43)
Attribute: attribute#6
Discrete Estimator. Counts = 12 29 (Total = 41)

Cluster: 1 Prior probability: 0.2713

Attribute: attribute#1
Discrete Estimator. Counts = 10 7 20 (Total = 37)
Attribute: attribute#2
Discrete Estimator. Counts = 18 8 11 (Total = 37)
Attribute: attribute#3
Discrete Estimator. Counts = 8 28 (Total = 36)
Attribute: attribute#4
Discrete Estimator. Counts = 9 8 20 (Total = 37)
Attribute: attribute#5
Discrete Estimator. Counts = 8 15 6 9 (Total = 38)
Attribute: attribute#6
Discrete Estimator. Counts = 24 12 (Total = 36)

```
Cluster: 2 Prior probability: 0.1783

Attribute: attribute#1
Discrete Estimator. Counts =   7 14 4  (Total = 25)
Attribute: attribute#2
Discrete Estimator. Counts =   6 4 15  (Total = 25)
Attribute: attribute#3
Discrete Estimator. Counts =   17 7  (Total = 24)
Attribute: attribute#4
Discrete Estimator. Counts =   4 17 4  (Total = 25)
Attribute: attribute#5
Discrete Estimator. Counts =   13 3 6 4  (Total = 26)
Attribute: attribute#6
Discrete Estimator. Counts =   19 5  (Total = 24)

Cluster: 3 Prior probability: 0.1008

Attribute: attribute#1
Discrete Estimator. Counts =   3 7 5  (Total = 15)
Attribute: attribute#2
Discrete Estimator. Counts =   1 4 10  (Total = 15)
Attribute: attribute#3
Discrete Estimator. Counts =   11 3  (Total = 14)
Attribute: attribute#4
Discrete Estimator. Counts =   1 1 13  (Total = 15)
Attribute: attribute#5
Discrete Estimator. Counts =   6 4 3 3  (Total = 16)
Attribute: attribute#6
Discrete Estimator. Counts =   1 13  (Total = 14)

Cluster: 4 Prior probability: 0.1395

Attribute: attribute#1
Discrete Estimator. Counts =   4 13 3  (Total = 20)
Attribute: attribute#2
Discrete Estimator. Counts =   13 4 3  (Total = 20)
Attribute: attribute#3
Discrete Estimator. Counts =   11 8  (Total = 19)
Attribute: attribute#4
Discrete Estimator. Counts =   13 5 2  (Total = 20)
Attribute: attribute#5
Discrete Estimator. Counts =   2 3 12 4  (Total = 21)
Attribute: attribute#6
Discrete Estimator. Counts =   5 14  (Total = 19)
```

```
Time taken to build model (full training data) : 0.01 seconds

=== Model and evaluation on training set ===

Clustered Instances

0        41 ( 33%)
1        34 ( 27%)
2        19 ( 15%)
3        13 ( 10%)
4        17 ( 14%)


Log likelihood: -6.04188


Class attribute: class
Classes to Clusters:

  0  1  2  3  4   <-- assigned to cluster
 27 14  8  3 10 | 0
 14 20 11 10  7 | 1

Cluster 0 <-- 0
Cluster 1 <-- 1
Cluster 2 <-- No class
Cluster 3 <-- No class
Cluster 4 <-- No class

Incorrectly clustered instances :       77.0      62.0968 %
```

Experiment 8

1. Clustring Algorithm = MakeDensityBasedCluster
2. Number of Cluster = 5
3. Standard Deviation = 100

```
MakeDensityBasedClusterer:

Wrapped clusterer:
kMeans
======

Number of iterations: 3
Within cluster sum of squared errors: 274.0
Missing values globally replaced with mean/mode

Cluster centroids:
                          Cluster#
Attribute     Full Data      0           1           2           3           4
               (124)        (39)        (34)        (22)        (12)        (17)
==================================================================================
attribute#1       1           1           3           2           2           2
attribute#2       3           2           1           3           3           1
attribute#3       1           1           2           1           1           1
attribute#4       3           1           3           2           3           1
attribute#5       4           4           2           1           1           3
attribute#6       2           2           1           1           2           2


Fitted estimators (with ML estimates of variance):

Cluster: 0 Prior probability: 0.3101

Attribute: attribute#1
Discrete Estimator. Counts =  26 6 10  (Total = 42)
Attribute: attribute#2
Discrete Estimator. Counts =  2 27 13  (Total = 42)
Attribute: attribute#3
Discrete Estimator. Counts =  23 18  (Total = 41)
Attribute: attribute#4
Discrete Estimator. Counts =  20 13 9  (Total = 42)
Attribute: attribute#5
Discrete Estimator. Counts =  5 11 8 19  (Total = 43)
Attribute: attribute#6
Discrete Estimator. Counts =  12 29  (Total = 41)

Cluster: 1 Prior probability: 0.2713

Attribute: attribute#1
Discrete Estimator. Counts =  10 7 20  (Total = 37)
Attribute: attribute#2
Discrete Estimator. Counts =  18 8 11  (Total = 37)
Attribute: attribute#3
Discrete Estimator. Counts =  8 28  (Total = 36)
Attribute: attribute#4
Discrete Estimator. Counts =  9 8 20  (Total = 37)
Attribute: attribute#5
Discrete Estimator. Counts =  8 15 6 9  (Total = 38)
Attribute: attribute#6
Discrete Estimator. Counts =  24 12  (Total = 36)
```

```
Cluster: 2 Prior probability: 0.1783

Attribute: attribute#1
Discrete Estimator. Counts =  7 14 4  (Total = 25)
Attribute: attribute#2
Discrete Estimator. Counts =  6 4 15  (Total = 25)
Attribute: attribute#3
Discrete Estimator. Counts =  17 7  (Total = 24)
Attribute: attribute#4
Discrete Estimator. Counts =  4 17 4  (Total = 25)
Attribute: attribute#5
Discrete Estimator. Counts =  13 3 6 4  (Total = 26)
Attribute: attribute#6
Discrete Estimator. Counts =  19 5  (Total = 24)

Cluster: 3 Prior probability: 0.1008

Attribute: attribute#1
Discrete Estimator. Counts =  3 7 5  (Total = 15)
Attribute: attribute#2
Discrete Estimator. Counts =  1 4 10  (Total = 15)
Attribute: attribute#3
Discrete Estimator. Counts =  11 3  (Total = 14)
Attribute: attribute#4
Discrete Estimator. Counts =  1 1 13  (Total = 15)
Attribute: attribute#5
Discrete Estimator. Counts =  6 4 3 3  (Total = 16)
Attribute: attribute#6
Discrete Estimator. Counts =  1 13  (Total = 14)

Cluster: 4 Prior probability: 0.1395

Attribute: attribute#1
Discrete Estimator. Counts =  4 13 3  (Total = 20)
Attribute: attribute#2
Discrete Estimator. Counts =  13 4 3  (Total = 20)
Attribute: attribute#3
Discrete Estimator. Counts =  11 8  (Total = 19)
Attribute: attribute#4
Discrete Estimator. Counts =  13 5 2  (Total = 20)
Attribute: attribute#5
Discrete Estimator. Counts =  2 3 12 4  (Total = 21)
Attribute: attribute#6
Discrete Estimator. Counts =  5 14  (Total = 19)
```

```
Time taken to build model (full training data) : 0.01 seconds

=== Model and evaluation on training set ===

Clustered Instances

0        41 ( 33%)
1        34 ( 27%)
2        19 ( 15%)
3        13 ( 10%)
4        17 ( 14%)


Log likelihood: -6.04188


Class attribute: class
Classes to Clusters:

  0  1  2  3  4  <-- assigned to cluster
 27 14  8  3 10 | 0
 14 20 11 10  7 | 1

Cluster 0 <-- 0
Cluster 1 <-- 1
Cluster 2 <-- No class
Cluster 3 <-- No class
Cluster 4 <-- No class

Incorrectly clustered instances :       77.0      62.0968 %
```

Analysis:

From the above 8 experiments, it can be observed that for every clustering method, the sum of squared error is too high. And it can also be seen that if number of clusters is increased, the data is classified in such a way that except for cluster 0 and 1 other clusters do not belong to any specified class (that is no class is assiggned to it).

It can also be seen that for every experiment, the percentage of **incorrectly clustered instances** is approximately 50% or more.Increasing the number of clusters does not improve the clustering.

In Make Density based clustering, for the same number of clusters, the log likelihood and incorrectly clustered instances remain same even if the standard deviation is changed.

It implies that clustering algorithm does not perform well on monk dataset. The primary reason for this misclassification is the distribution of data.

Visualization:

By visually innspecting the clustering result, we get the following output:
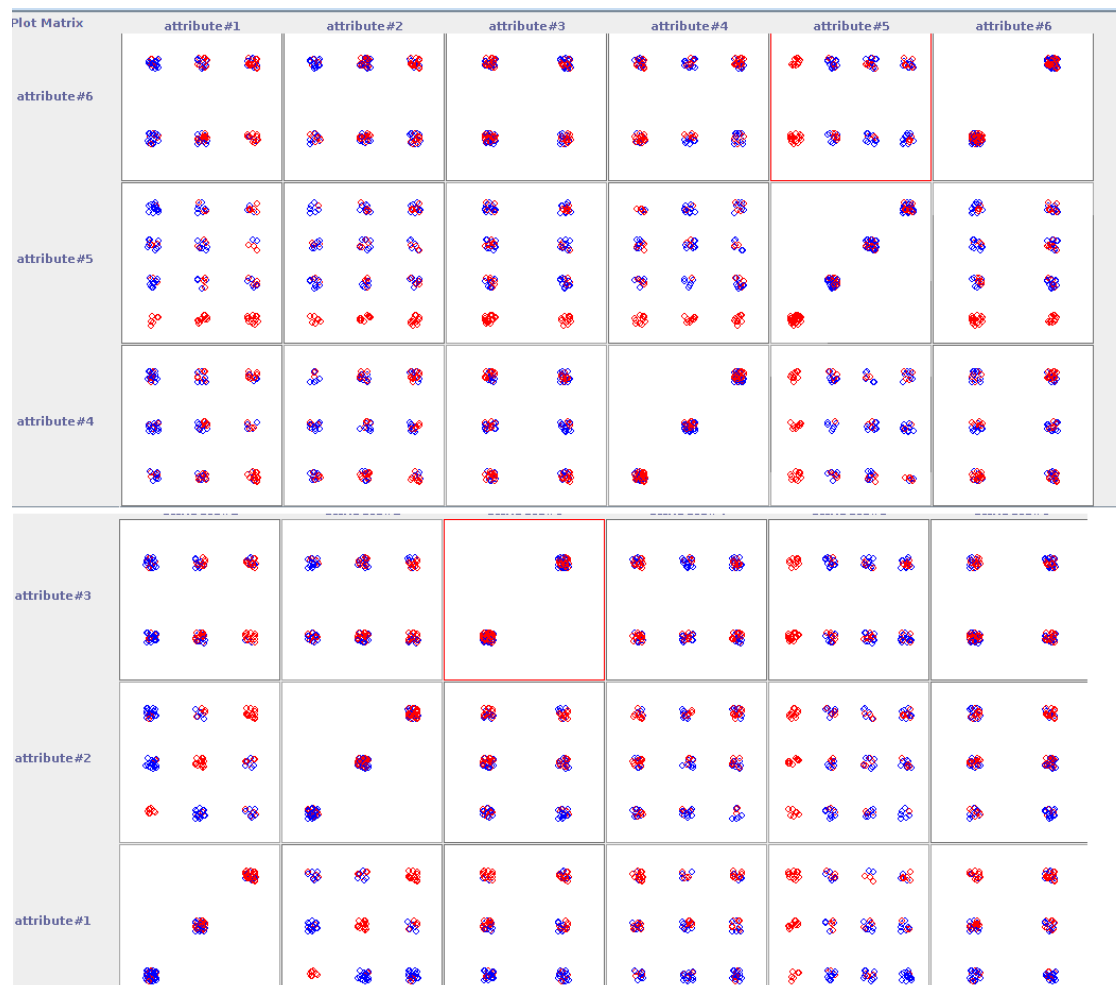
By visually inspecting clustering, it can be observed that the data off diffferent attributes in the dataset are closely related to each other and it is difficult to classify them.

Association Analysis

In this part we have performed association analysis using "Apriori" algorithm.

We have kept the settings as follows :

1. Minimum support = 0.05
2. Number of Rules = 19

Rest of the settings are kept default.

We get the following result:

```
=== Run information ===

Scheme:        weka.associations.Apriori -N 19 -T 0 -C 0.9 -D 0.05 -U 1.0 -M 0.05 -S -1.0 -c -1
Relation:      monk1
Instances:     124
Attributes:    7
               attribute#1
               attribute#2
               attribute#3
               attribute#4
               attribute#5
               attribute#6
               class
=== Associator model (full training set) ===


Apriori
=======

Minimum support: 0.05 (6 instances)
Minimum metric <confidence>: 0.9
Number of cycles performed: 19

Generated sets of large itemsets:

Size of set of large itemsets L(1): 19

Size of set of large itemsets L(2): 151

Size of set of large itemsets L(3): 378

Size of set of large itemsets L(4): 125

Size of set of large itemsets L(5): 6

Best rules found:

 1. attribute#5=1 29 ==> class=1 29     conf:(1)
 2. attribute#1=3 attribute#2=3 17 ==> class=1 17     conf:(1)
 3. attribute#3=1 attribute#5=1 17 ==> class=1 17     conf:(1)
 4. attribute#5=1 attribute#6=1 16 ==> class=1 16     conf:(1)
 5. attribute#1=2 attribute#2=2 15 ==> class=1 15     conf:(1)
 6. attribute#1=3 attribute#5=1 13 ==> class=1 13     conf:(1)
 7. attribute#5=1 attribute#6=2 13 ==> class=1 13     conf:(1)
 8. attribute#2=3 attribute#5=1 12 ==> class=1 12     conf:(1)
 9. attribute#3=2 attribute#5=1 12 ==> class=1 12     conf:(1)
10. attribute#1=3 attribute#2=3 attribute#6=2 12 ==> class=1 12     conf:(1)
11. attribute#4=1 attribute#5=1 11 ==> class=1 11     conf:(1)
12. attribute#1=2 attribute#5=1 10 ==> class=1 10     conf:(1)
13. attribute#2=2 attribute#5=1 10 ==> class=1 10     conf:(1)
14. attribute#1=1 attribute#2=1 9 ==> class=1 9     conf:(1)
15. attribute#4=2 attribute#5=1 9 ==> class=1 9     conf:(1)
16. attribute#4=3 attribute#5=1 9 ==> class=1 9     conf:(1)
17. attribute#1=2 attribute#2=2 attribute#3=1 9 ==> class=1 9     conf:(1)
18. attribute#1=3 attribute#2=3 attribute#3=1 9 ==> class=1 9     conf:(1)
19. attribute#3=1 attribute#5=1 attribute#6=1 9 ==> class=1 9     conf:(1)
```

Selected Rules For Class 1:

The selected rules for the above experiment are:

```
10. attribute#1=3 attribute#2=3 attribute#6=2 12 ==> class=1 12     conf:(1)
17. attribute#1=2 attribute#2=2 attribute#3=1 9 ==> class=1 9     conf:(1)
18. attribute#1=3 attribute#2=3 attribute#3=1 9 ==> class=1 9     conf:(1)
19. attribute#3=1 attribute#5=1 attribute#6=1 9 ==> class=1 9     conf:(1)
```