CSC 466 Lab 4 Report:
Unsupervised Learning Cluster Analysis

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This report presents the implementation and evaluation of three clustering algorithms – k-means, hierarchical clustering, and DBSCAN – in Python. The algorithms were applied to diverse datasets to analyze their clustering performance and understand their behavior in different scenarios. Through rigorous testing, we examined how each algorithm segmented the data into distinct clusters, considering various factors. The results provide insights into the strengths and limitations of each algorithm, contributing to a comprehensive understanding of their applicability in real-world data clustering tasks.

I. Study Design

K Means

Our implementation of K Means clustering, used **euclidean distance** when determining the distance between points and centroids. Additionally, each variable was **standardized** to have a mean of 0 and a standard deviation of 1. The last design choice in our implementation was how we would select the initial cluster centroids. We used the KMeans++ procedure to select the k farthest points from each other as the starting cluster centroids.

Hierarchical

Our implementation of Hierarchical clustering used **euclidean distance** and **standardization** when calculating the distance between points. Additionally, when determining the distance between two clusters, we used **average-link**.

DBSCAN

For our implementation of DBSCAN, we used **euclidean distance** to measure the distance between pairs of points. Before calculating the distances between points, we **standardized** each variable.

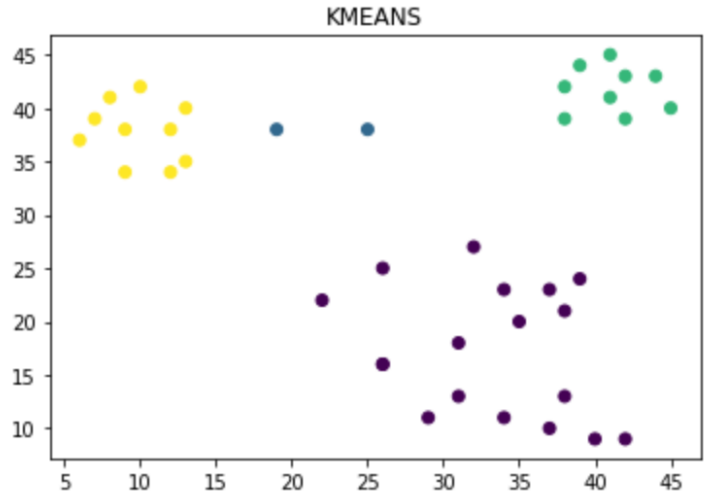
II. Results

4Clusters.csv

"4clusters.csv" is a 2D toy dataset designed for clustering analysis, featuring four distinct clusters. Each row represents a data point with X and Y coordinates.

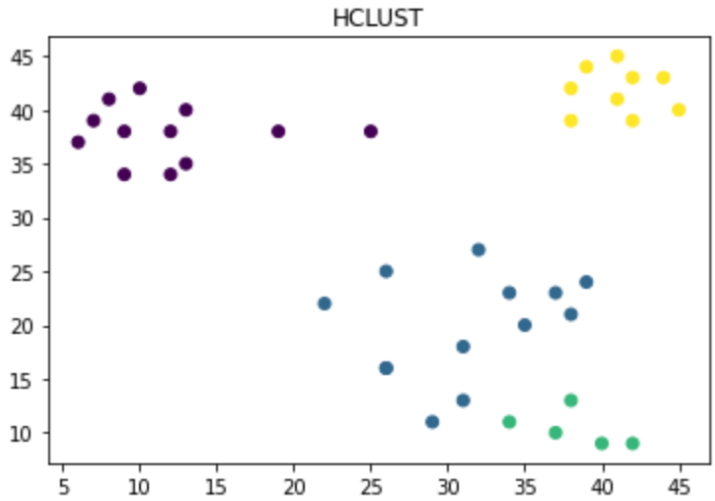
KMeans

Figure 2.1: 4Clusters Data KMeans Algorithm Clusters, K = 4 Clusters



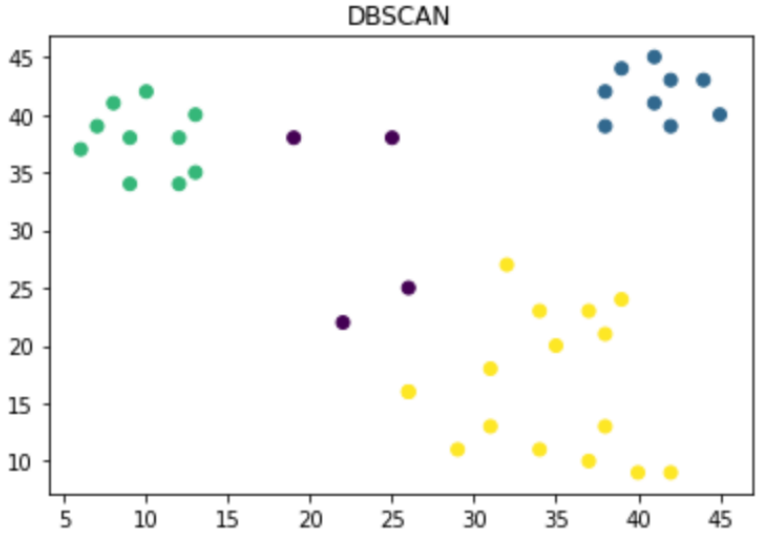
Hierarchical

Figure 2.2: 4Clusters Data Hierarchical Clustering, Dendrogram Cut at 4 Clusters



DBSCAN

Figure 2.3: 4Clusters Data DBSCAN Clustering, Vicinity Epsilon = 0.5, Minpts = 4



Discussion

From the three plots above, we can see that all three clustering algorithms produced different results. DBSCAN identified 4 outliers in the center of the data while KMeans identified two of these points as a separate cluster and the other two as part of the cluster towards the bottom. Hierarchical clustering had the most trouble and split the bottom cluster into two separate clusters instead of splitting the two outliers towards the top. This could likely be due to the use of average linkage instead of single or complete linkage which may have produced more desirable results. Overall, we feel KMeans had the most success clustering this dataset.

Mammal_milk.csv

The "mammal milk" dataset comprises a list of animals and the composition of their milk. Each entry includes the animal's name and the percentage composition of water, protein, fat, lactose, and ash in their milk.

KMeans

Table 2.1: Mammal Milk Data KMeans Clustering, K = 6 Clusters

Cluster	Mammals
1	Seal
2	Camel, Bison, Buffalo, Fox, Llama, Zebra, Sheep, Elephant
3	Rabbit, Rat, Deer, Reindeer
4	Guinea Pig, Cat, Pig, Dog
5	Whale, Dolphin
6	Horse, Orangutan, Monkey, Donkey, Hippo, Mule

Hierarchical

Table 2.2: Mammal Milk Data Hierarchical Clustering, Dendrogram Cut at 5 Clusters

Cluster	Mammals
1	Camel, Bison, Buffalo, Guinea Pig, Cat, Fox, Llama, Pig, Zebra, Sheep
2	Dog, Rat, Deer, Reindeer
3	Horse, Orangutan, Monkey, Donkey, Hippo, Mule
4	Seal, Dolphin
5	Rabbit

DBSCAN

Table 2.3: Mammal Milk Data DBSCAN Clustering, Vicinity Epsilon = 0.8, Minpts = 1

Cluster	Mammals
1	Horse, Orangutan, Monkey, Donkey, Camel, Bison, Llama, Mule, Zebra
2	Buffalo, Guinea Pig, Fox, Pig, Sheep
3	Dog, Rat
4	Deer, Reindeer
Outliers	Hippo, Cat, Elephant, Rabbit, Whale, Seal, Dolphin

Discussion

The three tables below show very different results among the three clustering algorithms. KMeans did well at creating more balanced group sizes while Hierarchical and DBSCAN had

more lopsided group sizes. KMeans identified the seal as an outlier due to it being in a single cluster by itself. Hierarchical clustering identified the rabbit as an outlier for the same reason. DBSCAN, on the other hand, identified 7 animals as outliers. Acommon animal grouping across the three algorithms includes the monkey, orangutan, donkey, horse, and mule which were grouped by all three algorithms.

Planets.csv

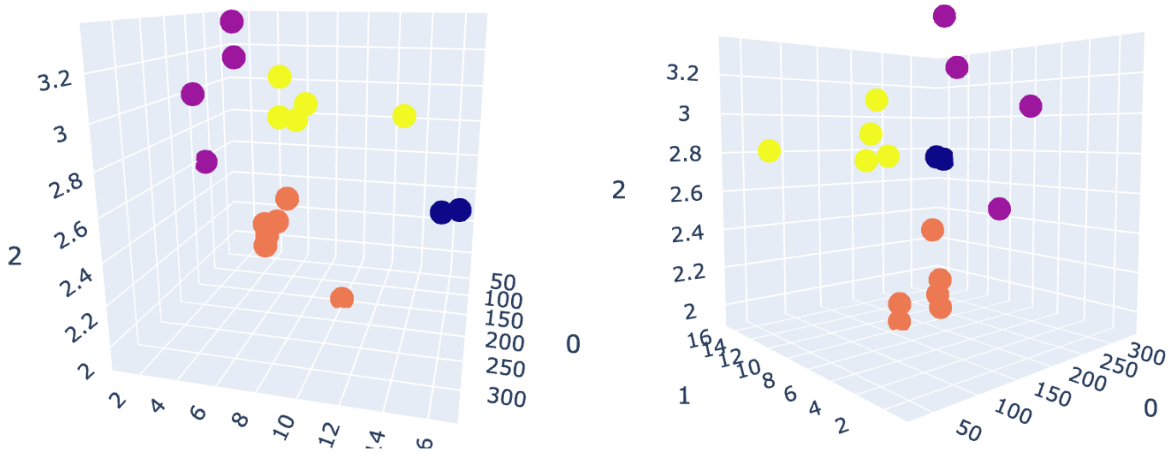
The "planets" dataset captures sightings of minor planets, with potential repeated sightings of the same planet grouped together. The data, sourced from "Sightings of Minor Planets, Hartigan page 2," features five columns and 19 rows. The columns include "Name," representing the year of sighting and astronomer initials; "Node," indicating the angle at which the minor planet crosses the Earth's orbit; "Inclination," representing the angle between the orbits of the Earth and the minor planet; and "Axis," denoting the maximum distance between the minor planet and the sun relative to the Earth.

KMeans

Table 2.4: Planets Data KMeans Clustering, K = 4 Clusters

Cluster	Planets
1	1940YL, 1953NH
2	1929EC, 1948RO, 1951AM, 1938DL, 1948RB
3	1935RF, 1941FD, 1955QT, 1930SY, 1949HM, 1951AX, 1948RH
4	1924TZ, 1931DQ, 1936AB, 1952DA, 1948TG

Figure 2.4: Planets Data KMeans Clustering, K = 4 Clusters

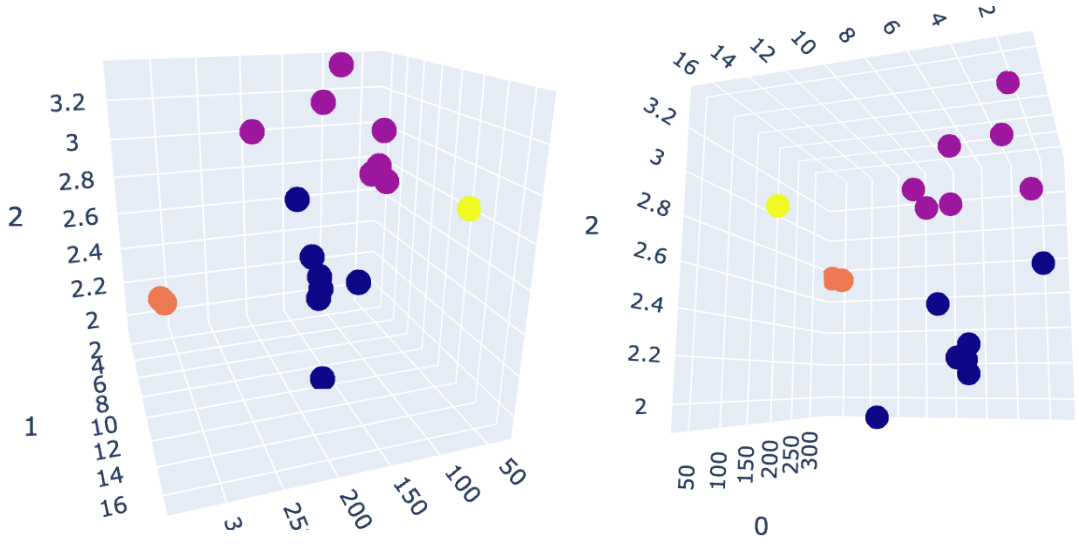


Hierarchical

Table 2.5: Planets Data Hierarchical Clustering, Dendrogram Cut at 4 Clusters

Cluster	Planets
1	1935RF, 1941FD, 1955QT, 1930SY, 1949HM, 1938DL, 1951AX, 1948RH
2	1929EC, 1948RO, 1951AM, 1924TZ, 1931DQ, 1936AB, 1952DA, 1948RB
3	1940YL, 1953NH
4	1948TG

Figure 2.5: Planets Data Hierarchical Clustering, Dendrogram Cut at 4 Clusters

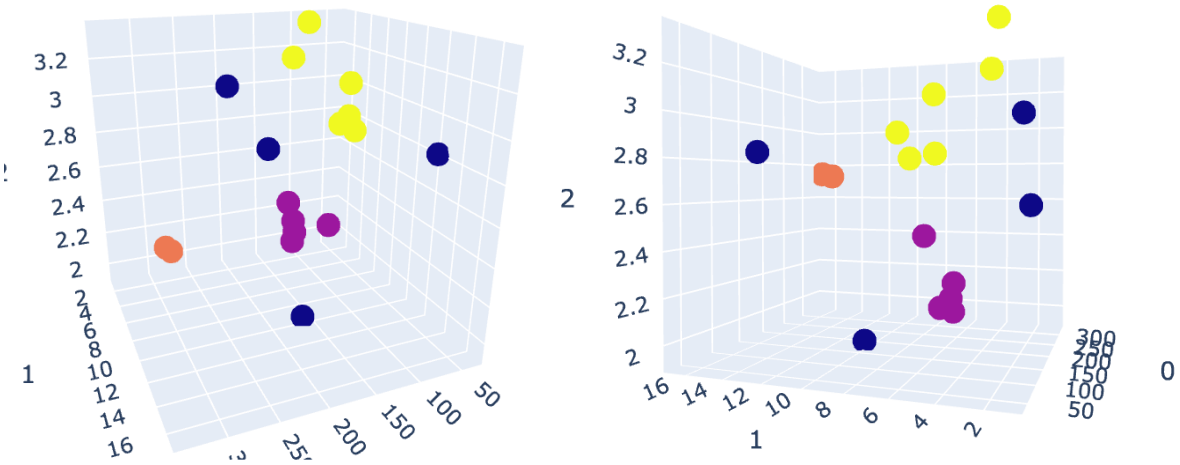


DBSCAN

Table 2.6: Planets Data DBSCAN Clustering, Vicinity Epsilon = 0.9, Minpts = 1

Cluster	Planets
1	1935RF, 1941FD, 1955QT, 1930SY, 1949HM, 1951AX
2	1940YL, 1953NH
3	1929EC, 1948RO, 1951AM, 1924TZ, 1931DQ, 1936AB, 1952DA
Outliers	1938DL, 1948RB, 1948RH, 1948TG

Figure 2.6: Planets Data DBSCAN Clustering, Vicinity Epsilon = 0.9, Minpts = 1



Discussion

From the three 3-D Scatterplots, we can see each algorithm once again clustered the data differently. The planet 1948TG was identified as an outlier by both Hierarchical clustering and DBSCAN. DBSCAN identified 3 additional observations as outliers. A common grouping of planets by all three algorithms consists of 1935RF, 1941FD, 1955QT, 1930SY, 1949HM, and 1951AX. These planets were grouped together for all three algorithms. Overall, we feel hierarchical clustering did the best job at clustering the data.

Iris.csv

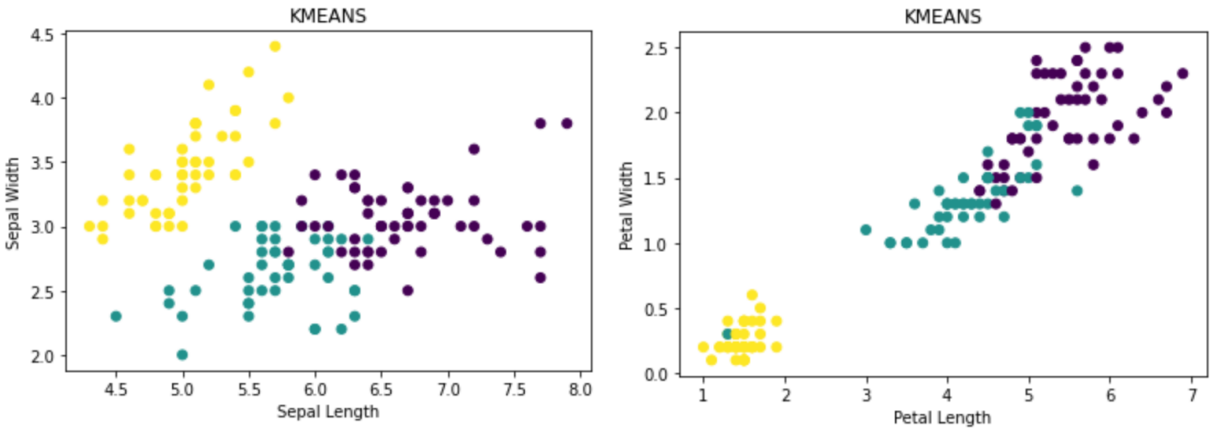
The “iris” dataset consists of 150 samples of iris flowers, each belonging to one of three species: setosa, versicolor, or virginica. Each sample comprises four features: sepal length, sepal width, petal length, and petal width, all measured in centimeters. Because a “target” feature of species is included, we were able to evaluate the homogeneity of the clusters as well.

KMeans

Table 2.7: Iris Data KMeans Clustering, K = 3 Clusters

Cluster	Composition
1	49 Setosa
2	37 Versicolor, 8 Virginica, 1 Setosa
3	42 Virginica, 13 Versicolor

Figure 2.7: Iris Data KMeans Clustering, K = 3 Clusters

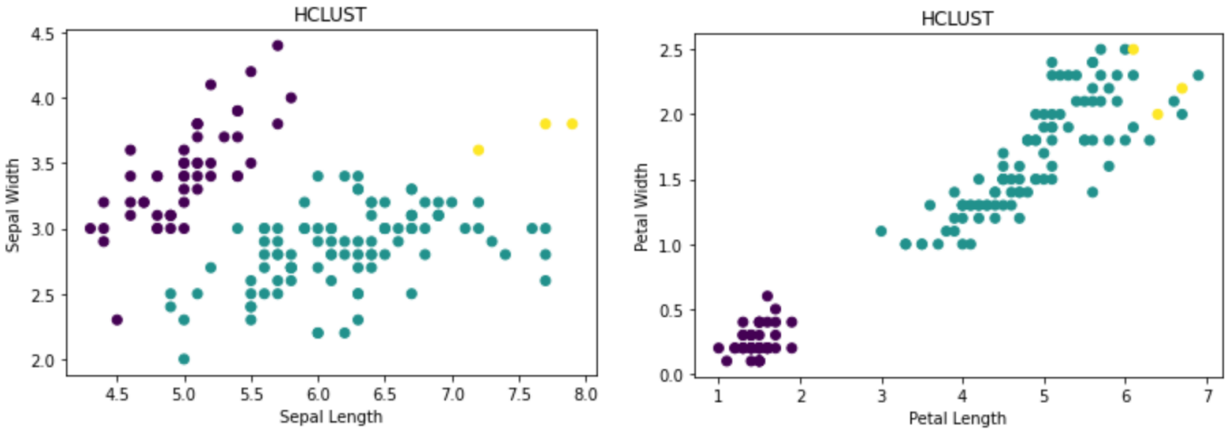


Hierarchical

Table 2.7: Iris Data Hierarchical Clustering, Dendrogram Cut at 3 Clusters

Cluster	Composition
1	50 Setosa
2	50 Versicolor, 47 Virginica
3	3 Virginica

Figure 2.7: Iris Data Hierarchical Clustering, Dendrogram Cut at 3 Clusters

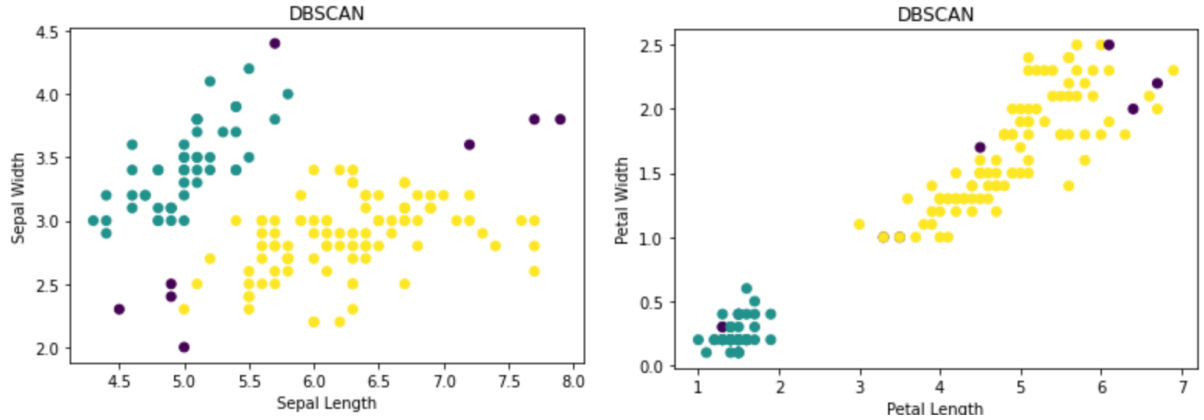


DBSCAN

Table 2.8: Planets Data DBSCAN Clustering, Vicinity Epsilon = 0.7, Minpts = 4

Cluster	Composition
1	48 Setosa
2	48 Versicolor, 46 Virginica
Outliers	4 Virginica, 2 Versicolor, 2 Setosa

Figure 2.8: Planets Data DBSCAN Clustering, Vicinity Epsilon = 0.7, Minpts = 4



Discussion

The three tables above give an indication of how well each of the three clustering algorithms were able to cluster the iris data. Because the iris data had labels for the different species, we have some ground truth for how well the data was clustered. From these tables we see that Hierarchical clustering and DBSCAN struggled to differentiate between the Versicolor and Virginica species and grouped these two together. KMeans, however, did the best at separating

all three species by far despite having some observations in the wrong clusters. The plots above display the clusters by plotting length and width of Iris petals and sepals to show how the algorithms split the data. From these plots we can see hierarchical and DBSCAN were only able to really identify 2 large groups while KMeans was able to identify the three species somewhat accurately. Overall, KMeans had the most success on the Iris dataset by far.

AccidentsSet03.csv

The "accidents" dataset includes information on a sample of car accidents with columns such as VE_TOTAL (total number of vehicles), PEDS (pedestrian involvement), NO_LANES (number of lanes), FATALS (number of fatalities), and DRUNK_DR (indication of drunk driving involvement).

KMeans

Table 2.9: Accidents Data KMeans Clustering, K = 4 Clusters

Cluster	Observations	VE_TOTAL	PEDS	NO_LANES	FATALS	DRUNK_DR
1	3	1.0	0.0	2.67	2.33	2.0
2	4	6.0	0.0	4.0	1.0	0.5
3	41	1.68	0.41	2.89	1.05	0.42
4	14	1.21	1.0	3.86	1.0	1.36

Hierarchical

Table 2.10: Accidents Data Hierarchical Clustering, Dendrogram Cut at 6 Clusters

Cluster	Observations	VE_TOTAL	PEDS	NO_LANES	FATALS	DRUNK_DR
1	31	1.74	0.71	4.0	1.0	0.68
2	25	1.72	0.36	2.0	1.0	0.64
3	2	1.0	0.0	2.0	2.0	1.5
4	2	1.5	0.0	4.0	2.0	0.0
5	1	1.0	0.0	4.0	3.0	3.0
6	1	10.0	0.0	4.0	1.0	1.0

DBSCAN

Table 2.11: Accidents Data DBSCAN Clustering, Vicinity Epsilon = 1.5, Minpts = 4

Cluster	Observations	VE_TOTAL	PEDS	NO_LANES	FATALS	DRUNK_DR
1	16	1.75	0.0	2.0	1.0	0.625
2	10	3.30	0.0	4.0	1.0	0.60
3	9	1.67	1.0	2.0	1.0	0.67
4	20	1.0	1.0	4.0	1.0	0.65
Outliers	7					

Discussion

The three tables above show the different clusters produced by the three different algorithms as well as the centers for each cluster. KMeans was able to identify 4 clusters with 3 of them being relatively small and size and 1 being significantly larger than the rest. This large cluster was characterized by higher values in NO_LANES, PEDS, and DRUNK_DR. Hierarchical clustering identified 2 main clusters and 4 outlier clusters with very small sizes. The two main clusters are very similar with the main difference being cluster 1 having larger values for NO_LANES. DBSCAN was able to identify 4 clusters with more balanced sizes than the clusters from the other two algorithms. We can see that observations in cluster 2 were characterized by large values for VE_TOTAL and NO_LANES. Additionally, DBSCAN identified 7 observations as outliers.

III. Analysis

The 5 different datasets were effective in showing the different strengths and weaknesses of the three clustering algorithms. Each algorithm produced different results for each dataset which reflected the different features of each method.

KMeans

Firstly, KMeans clustering was extremely effective for datasets where there was some ground truth grouping in which we were trying to find. In particular, KMeans excelled when we knew how many groups there were in the data beforehand. This is reflected in the success of KMeans for the Iris dataset and the 4Clusters dataset. KMeans was the only algorithm that was able to distinguish between the versicolor and virginica iris species. While the separation of the two species into different clusters wasn't perfect, it was night and day compared to Hierarchical and DBSCAN. Additionally, KMeans was the only algorithm to identify the most sensible 4 clusters in the 4Clusters dataset.

While KMeans was effective when we knew how many distinct groups existed in the data, it struggled with the presence of outliers which belonged to no group. Since KMeans has no outlier detection, outliers would often need to be given their own separate cluster. This wasn't a major problem for the Planets dataset since the two outlier planets, 1940YL and 1953NH, existed close together while being far apart from the rest of the data. However, this was a problem when the outliers were all far apart from each other. This led to outliers being included into the main clusters and thus shifting the center towards the outliers and away from the group.

DBSCAN

DBSCAN, on the other hand, really excelled with the presence of outliers in the data. DBSCAN was particularly effective at finding balanced groups of clusters when outliers existed in the data. This is shown by the Accidents dataset in which DBSCAN was able to identify 4 significantly large clusters and 7 outliers. KMeans and Hierarchical clustering struggled with clustering the data and clustered a majority of the data into 1 and 2 clusters respectively. Hierarchical clustering was able to sort out the outliers similarly to DBSCAN but instead included the outliers as their own separate clusters.

One weakness of DBSCAN is identifying groups that are close together. This weakness was shown when clustering the Iris dataset. DBSCAN was not able to differentiate the versicolor and virginica iris species due to the observations being very close to each other compared to iris-setosa.

Hierarchical

Hierarchical clustering served as a middle ground between KMeans clustering and DBSCAN throughout this lab. This is because Hierarchical clustering allows you to specify how many clusters you would like similarly to KMeans. It also allows you to specify a threshold in which you would no longer join two clusters similar to the eps parameter for DBSCAN. Additionally, Hierarchical clustering has some outlier detection with outlier observations often being in a cluster with only 0, 1, or 2 other points.

Hierarchical was able to use its outlier detection to effectively cluster the Planets dataset. It identified 1940YL, 1953NH as their own outlier cluster as well as 1948TG as another outlier. It was then able to effectively cluster the rest of the data into 3 sensible groups. One weakness that Hierarchical clustering had that it shared with DBSCAN was differentiating between groups that were close together. This is shown with the Iris dataset when it clustered iris-versicolor and iris-virginica together in the same group.

Hierarchical clustering did also struggle with the 4Cluster dataset. Instead of turning the two outlier points at the top into their own cluster, it decided to create an additional cluster out of the bottom, below cluster (See *Figure 2.2*). However this may highlight another strength of hierarchical clustering. This result was likely caused by the use of average linkage when joining clusters. Hierarchical clustering, however, offers other types of linkages such as single and complete linkage. Using these linkages might have led to more desirable results and thus adds more flexibility to using the algorithm.

Appendix Table of Contents

Appendix

Method: kmeans
Data: 4clusters.csv
Number of Clusters: 4
Standardized Data: True

Intercluster Distances (Standardized):

	0	1	2	3
0	0.000000	1.922725	2.113730	2.502638
1	1.922725	0.000000	1.547739	0.960076
2	2.113730	1.547739	0.000000	2.497659
3	2.502638	0.960076	2.497659	0.000000

Cluster: 0
Center (Standardized): 0.3732740264880947, -0.9864426350600236
Center (Unstandardized): 33.166666666666664, 17.27777777777778
Max Dist. to Center (Standardized): 0.9776368414515169
Min Dist. to Center (Standardized): 0.18188778012327594
Avg Dist. to Center (Standardized): 0.613848340200806
Sum of Squared Error (Standardized): 7.627921936185805
18 Points (Unstandardized):
32, 27
26, 25
39, 24
34, 23
37, 23
22, 22
38, 21
35, 20
31, 18
26, 16
31, 13
26, 16
38, 13
29, 11

34, 11
37, 10
40, 9
42, 9

Cluster: 1
Center (Standardized): -0.5126161017711162, 0.7200362580566566
Center (Unstandardized): 22.0, 38.0
Max Dist. to Center (Standardized): 0.23800033296516115
Min Dist. to Center (Standardized): 0.2380003329651611
Avg Dist. to Center (Standardized): 0.23800033296516113
Sum of Squared Error (Standardized): 0.11328831698305512
2 Points (Unstandardized):
19, 38
25, 38

Cluster: 2
Center (Standardized): 1.0035341674884288, 1.0311369677937459
Center (Unstandardized): 41.111111111111114, 41.77777777777778
Max Dist. to Center (Standardized): 0.34149231380667283
Min Dist. to Center (Standardized): 0.06465386605549846
Avg Dist. to Center (Standardized): 0.23514523020831263
Sum of Squared Error (Standardized): 0.5623816704729786
9 Points (Unstandardized):
41, 45
39, 44
42, 43
44, 43
38, 42
41, 41
45, 40
38, 39
42, 39

Cluster: 3
Center (Standardized): -1.4725507780639329, 0.7035662204823401
Center (Unstandardized): 9.899999999999999, 37.8
Max Dist. to Center (Standardized): 0.35451554178953953
Min Dist. to Center (Standardized): 0.073275073537574
Avg Dist. to Center (Standardized): 0.27750329122331996
Sum of Squared Error (Standardized): 0.8436761840561335
10 Points (Unstandardized):
10, 42
8, 41
13, 40
7, 39
9, 38
12, 38
6, 37
13, 35
9, 34
12, 34

Method: hclustering
Data: 4clusters.csv
Number of Clusters: 4
Standardized Data: True

Intercluster Distances (Standardized):

	0	1	2	3
0	0.0	2.126775	3.074338	2.338763
1	2.126775	0.0	0.959533	1.963025
2	3.074338	0.959533	0.0	2.594266
3	2.338763	1.963025	2.594266	0.0

Cluster: 0
Center (Standardized): -1.3125616653484633, 0.7063112267447261
Center (Unstandardized): 11.916666666666668, 37.83333333333333
Max Dist. to Center (Standardized): 1.0380366374237207
Min Dist. to Center (Standardized): 0.01523428360408765
Avg Dist. to Center (Standardized): 0.38817261552203003
Sum of Squared Error (Standardized): 2.493207575851012
12 Points (Unstandardized):
10, 42
8, 41
13, 40
7, 39
9, 38
12, 38
19, 38
25, 38
6, 37
13, 35
9, 34
12, 34

Cluster: 1
Center (Standardized): 0.21969261504476426, -0.7686017534681024
Center (Unstandardized): 31.23076923076923, 19.923076923076923
Max Dist. to Center (Standardized): 0.7558281051382056
Min Dist. to Center (Standardized): 0.15942045669266625
Avg Dist. to Center (Standardized): 0.5283307490477435
Sum of Squared Error (Standardized): 3.995595964497707
13 Points (Unstandardized):
32, 27
26, 25
39, 24
34, 23
37, 23
22, 22
38, 21
35, 20
31, 18
26, 16
31, 13
26, 16
29, 11

Cluster: 2
Center (Standardized): 0.772585696240754, -1.5528289271990183
Center (Unstandardized): 38.2, 10.399999999999999
Max Dist. to Center (Standardized): 0.3368440438581164
Min Dist. to Center (Standardized): 0.10073784745289126
Avg Dist. to Center (Standardized): 0.2317142293798732
Sum of Squared Error (Standardized): 0.3075650688322995
5 Points (Unstandardized):
38, 13
34, 11
37, 10
40, 9
42, 9

Cluster: 3
Center (Standardized): 1.003534167488429, 1.0311369677937459
Center (Unstandardized): 41.111111111111114, 41.77777777777778
Max Dist. to Center (Standardized): 0.34149231380667283
Min Dist. to Center (Standardized): 0.06465386605549836
Avg Dist. to Center (Standardized): 0.23514523020831268
Sum of Squared Error (Standardized): 0.5623816704729789
9 Points (Unstandardized):
41, 45
39, 44
42, 43
44, 43
38, 42
41, 41
45, 40
38, 39
42, 39

Method: dbscan
Data: 4clusters.csv
eps: 0.5
minpts: 4

Intercluster Distances (Standardized)

	0	1	2
0	0.000000	2.497659	2.150369
1	2.497659	0.000000	2.612975
2	2.150369	2.612975	0.000000

Cluster: 0
Center (Standardized): 1.00353, 1.03114
Center (Unstandardized): 41.11111, 41.77778
Max Dist. To Center (Standardized): 0.34149231380667266
Min Dist. To Center (Standardized): 0.06465386605549849
Avg Dist. To Center (Standardized): 0.23514523020831263
Sum of Squared Error (Standardized): 0.5623816704729787
9 Points (Unstandardized):
41, 45
39, 44
42, 43
44, 43
38, 42
41, 41
45, 40
38, 39
42, 39

Cluster: 1
Center (Standardized): -1.47255, 0.70357
Center (Unstandardized): 9.9, 37.8
Max Dist. To Center (Standardized): 0.35451554178953953

Min Dist. To Center (Standardized): 0.073275073537574
Avg Dist. To Center (Standardized): 0.27750329122331996
Sum of Squared Error (Standardized): 0.8436761840561335
10 Points (Unstandardized):
10, 42
8, 41
13, 40
7, 39
9, 38
12, 38
6, 37
13, 35
9, 34
12, 34

Cluster: 2
Center (Standardized): 0.46418, -1.05049
Center (Unstandardized): 34.3125, 16.5
Max Dist. To Center (Standardized): 0.8839249522875464
Min Dist. To Center (Standardized): 0.2903758745925261
Avg Dist. To Center (Standardized): 0.5735179233136817
Sum of Squared Error (Standardized): 5.766385236622975
16 Points (Unstandardized):
32, 27
39, 24
34, 23
37, 23
38, 21
35, 20
31, 18
26, 16
31, 13
26, 16
38, 13
29, 11
34, 11
37, 10
40, 9

42, 9

Outlier Percentage: 10.3%
4 Outliers (Unstandardized):
19, 38
25, 38
26, 25
22, 22

Method: kmeans
Data: mammal_milk.csv
Number of Clusters: 6
Standardized Data: True

Intercluster Distances (Standardized):

	0	1	2	3	4	5
0	0.000000	5.432548	3.692989	4.682548	1.694836	6.480061
1	5.432548	0.000000	3.156398	1.474136	4.072964	1.522462
2	3.692989	3.156398	0.000000	2.035619	2.607148	4.648708
3	4.682548	1.474136	2.035619	0.000000	3.205344	2.818667
4	1.694836	4.072964	2.607148	3.205344	0.000000	5.160332
5	6.480061	1.522462	4.648708	2.818667	5.160332	0.000000

Cluster: 0
Center (Standardized): -2.479654791561009, 0.9549500515772608, 3.0131211458663216, -2.255668215589315, 0.04390156373980654
Center (Unstandardized): 46.4, 9.7, 42.0, 0.0, 0.85
Max Dist. to Center (Standardized): 0.0
Min Dist. to Center (Standardized): 0.0
Avg Dist. to Center (Standardized): 0.0
Sum of Squared Error (Standardized): 0.0
1 Points (Unstandardized):
Seal, 46.4, 9.7, 42.0, 0.0, 0.85

Cluster: 1
Center (Standardized): 0.3727985911614099, -0.43791359159914817, -0.3751189410897252, 0.5625522982005784, -0.07218430191833607
Center (Unstandardized): 82.9625, 4.6125, 6.362500000000001, 5.1625, 0.795
Max Dist. to Center (Standardized): 1.5204850613191463
Min Dist. to Center (Standardized): 0.4487837652462534
Avg Dist. to Center (Standardized): 0.6785429933307893

Sum of Squared Error (Standardized): 4.536367986271106
8 Points (Unstandardized):
Camel, 87.7, 3.5, 3.4, 4.8, 0.71
Bison, 86.9, 4.8, 1.7, 5.7, 0.9
Buffalo, 82.1, 5.9, 7.9, 4.7, 0.78
Fox, 81.6, 6.6, 5.9, 4.9, 0.93
Llama, 86.5, 3.9, 3.2, 5.6, 0.8
Zebra, 86.2, 3.0, 4.8, 5.3, 0.7
Sheep, 82.0, 5.6, 6.4, 4.7, 0.91
Elephant, 70.7, 3.6, 17.6, 5.6, 0.63

Cluster: 2
Center (Standardized): -0.7457532139608516, 1.215042525487352, 0.581574594511684, -0.8499698479362445, 1.6796569434681805
Center (Unstandardized): 68.625, 10.649999999999999, 16.425, 2.575, 1.625
Max Dist. to Center (Standardized): 1.5852692452977528
Min Dist. to Center (Standardized): 0.6103652128033988
Avg Dist. to Center (Standardized): 0.9354503563095273
Sum of Squared Error (Standardized): 4.101200338996456
4 Points (Unstandardized):
Rabbit, 71.3, 12.3, 13.1, 1.9, 2.3
Rat, 72.5, 9.2, 12.6, 3.3, 1.4
Deer, 65.9, 10.4, 19.7, 2.6, 1.4
Reindeer, 64.8, 10.7, 20.3, 2.5, 1.4

Cluster: 3
Center (Standardized): 0.19238700969007722, 0.6195676510089856, -0.312131664832738, -0.3723053540735507, 0.3077330765992218
Center (Unstandardized): 80.65, 8.475, 7.025, 3.45, 0.975
Max Dist. to Center (Standardized): 0.8382458937384218
Min Dist. to Center (Standardized): 0.5399794988081146
Avg Dist. to Center (Standardized): 0.6670474129270747
Sum of Squared Error (Standardized): 1.8353130623414995
4 Points (Unstandardized):
Guinea Pig, 81.9, 7.4, 7.2, 2.7, 0.85
Cat, 81.6, 10.1, 6.3, 4.4, 0.75

Pig, 82.8, 7.1, 5.1, 3.7, 1.1
Dog, 76.3, 9.3, 9.5, 3.0, 1.2

Cluster: 4
Center (Standardized): -1.8204211208873837, 1.2697988357842132, 1.6868230269456101, -1.573290367214038, -0.2938027727202448
Center (Unstandardized): 54.849999999999994, 10.849999999999998, 28.05, 1.25, 0.6900000000000001
Max Dist. to Center (Standardized): 1.087178157522704
Min Dist. to Center (Standardized): 1.087178157522704
Avg Dist. to Center (Standardized): 1.087178157522704
Sum of Squared Error (Standardized): 2.3639126923889227
2 Points (Unstandardized):
Whale, 64.8, 11.1, 21.2, 1.6, 0.85
Dolphin, 44.9, 10.6, 34.9, 0.9, 0.53

Cluster: 5
Center (Standardized): 0.891928853521262, -1.2216132827229753, -0.7439312316259206, 0.9651552287419919, -1.1380636138703735
Center (Unstandardized): 89.61666666666667, 1.75, 2.4833333333333343, 5.9, 0.2899999999999999
Max Dist. to Center (Standardized): 0.985376995687541
Min Dist. to Center (Standardized): 0.20057907165254793
Avg Dist. to Center (Standardized): 0.49294493016795454
Sum of Squared Error (Standardized): 1.849913278607844
6 Points (Unstandardized):
Horse, 90.1, 2.6, 1.0, 6.9, 0.35
Orangutan, 88.5, 1.4, 3.5, 6.0, 0.24
Monkey, 88.4, 2.2, 2.7, 6.4, 0.18
Donkey, 90.3, 1.7, 1.4, 6.2, 0.4
Hippo, 90.4, 0.6, 4.5, 4.4, 0.1
Mule, 90.0, 2.0, 1.8, 5.5, 0.47

Method: hclustering
Data: mammal_milk.csv
Number of Clusters: 5
Standardized Data: True

Intercluster Distances (Standardized):

	0	1	2	3	4
0	0.0	2.4204	1.788781	4.981235	4.085578
1	2.4204	0.0	4.13113	3.21641	2.357544
2	1.788781	4.13113	0.0	6.189677	5.845501
3	4.981235	3.21641	6.189677	0.0	4.725859
4	4.085578	2.357544	5.845501	4.725859	0.0

Cluster: 0
Center (Standardized): 0.3544471428250138, -0.1700432327037074, -0.3793324981635202, 0.32992348625446133, -0.011742900790542759
Center (Unstandardized): 82.72727272727272, 5.590909090909091, 6.318181818181818, 4.736363636363636, 0.8236363636363636
Max Dist. to Center (Standardized): 1.6484448802089706
Min Dist. to Center (Standardized): 0.19211289341937063
Avg Dist. to Center (Standardized): 0.8244742321983829
Sum of Squared Error (Standardized): 9.50486920453857
11 Points (Unstandardized):
Camel, 87.7, 3.5, 3.4, 4.8, 0.71
Bison, 86.9, 4.8, 1.7, 5.7, 0.9
Buffalo, 82.1, 5.9, 7.9, 4.7, 0.78
Guinea Pig, 81.9, 7.4, 7.2, 2.7, 0.85
Cat, 81.6, 10.1, 6.3, 4.4, 0.75
Fox, 81.6, 6.6, 5.9, 4.9, 0.93
Llama, 86.5, 3.9, 3.2, 5.6, 0.8
Pig, 82.8, 7.1, 5.1, 3.7, 1.1
Zebra, 86.2, 3.0, 4.8, 5.3, 0.7
Sheep, 82.0, 5.6, 6.4, 4.7, 0.91
Elephant, 70.7, 3.6, 17.6, 5.6, 0.63

Cluster: 1
Center (Standardized): -0.7274194964924134, 1.075413934230356, 0.6039172509952946, -0.8363222909687391, 0.8881624048899349
Center (Unstandardized): 68.86, 10.14, 16.66, 2.5999999999999996, 1.25
Max Dist. to Center (Standardized): 1.168976636783501
Min Dist. to Center (Standardized): 0.49210348867591136
Avg Dist. to Center (Standardized): 0.7882567862128724
Sum of Squared Error (Standardized): 3.4096397703463044
5 Points (Unstandardized):
Dog, 76.3, 9.3, 9.5, 3.0, 1.2
Rat, 72.5, 9.2, 12.6, 3.3, 1.4
Deer, 65.9, 10.4, 19.7, 2.6, 1.4
Reindeer, 64.8, 10.7, 20.3, 2.5, 1.4
Whale, 64.8, 11.1, 21.2, 1.6, 0.85

Cluster: 2
Center (Standardized): 0.891928853521262, -1.2216132827229753, -0.7439312316259207, 0.9651552287419918, -1.1380636138703735
Center (Unstandardized): 89.61666666666667, 1.75, 2.4833333333333334, 5.9, 0.2899999999999999
Max Dist. to Center (Standardized): 0.985376995687541
Min Dist. to Center (Standardized): 0.20057907165254807
Avg Dist. to Center (Standardized): 0.49294493016795465
Sum of Squared Error (Standardized): 1.8499132786078443
6 Points (Unstandardized):
Horse, 90.1, 2.6, 1.0, 6.9, 0.35
Orangutan, 88.5, 1.4, 3.5, 6.0, 0.24
Monkey, 88.4, 2.2, 2.7, 6.4, 0.18
Donkey, 90.3, 1.7, 1.4, 6.2, 0.4
Hippo, 90.4, 0.6, 4.5, 4.4, 0.1
Mule, 90.0, 2.0, 1.8, 5.5, 0.47

Cluster: 3

Center (Standardized): -2.538166655821982, 1.0781517497451987, 2.675604420262843, -2.010012190174215, -0.29380277272024485
Center (Unstandardized): 45.65, 10.149999999999999, 38.45, 0.44999999999999973, 0.69
Max Dist. to Center (Standardized): 0.5539954317857861
Min Dist. to Center (Standardized): 0.5539954317857861
Avg Dist. to Center (Standardized): 0.5539954317857861
Sum of Squared Error (Standardized): 0.6138218768790392
2 Points (Unstandardized):
Seal, 46.4, 9.7, 42.0, 0.0, 0.85
Dolphin, 44.9, 10.6, 34.9, 0.9, 0.53

Cluster: 4
Center (Standardized): -0.5370608980967159, 1.666782085436458, 0.2654497740520879, -1.218453886058894, 3.104347112909022
Center (Unstandardized): 71.3, 12.3, 13.1, 1.9, 2.3
Max Dist. to Center (Standardized): 0.0
Min Dist. to Center (Standardized): 0.0
Avg Dist. to Center (Standardized): 0.0
Sum of Squared Error (Standardized): 0.0
1 Points (Unstandardized):
Rabbit, 71.3, 12.3, 13.1, 1.9, 2.3

Method: dbscan
Data: mammal_milk.csv
eps: 0.8
minpts: 1

Intercluster Distances (Standardized)

	0	1	2	3
0	0.000000	1.709582	3.119537	4.126853
1	1.709582	0.000000	1.435481	2.524667
2	3.119537	1.435481	0.000000	1.225183
3	4.126853	2.524667	1.225183	0.000000

Cluster: 0
Center (Standardized): 0.78834, -0.93718, -0.73178, 0.9227, -0.6362
Center (Unstandardized): 88.28889, 2.78889, 2.61111, 5.82222, 0.52778
Max Dist. To Center (Standardized): 0.9716374682047885
Min Dist. To Center (Standardized): 0.34092411263822625
Avg Dist. To Center (Standardized): 0.6669123957997631
Sum of Squared Error (Standardized): 4.281755028055929
9 Points (Unstandardized):
90.1, 2.6, 1.0, 6.9, 0.35, Horse
88.5, 1.4, 3.5, 6.0, 0.24, Orangutan
88.4, 2.2, 2.7, 6.4, 0.18, Monkey
90.3, 1.7, 1.4, 6.2, 0.4, Donkey
87.7, 3.5, 3.4, 4.8, 0.71, Camel
86.9, 4.8, 1.7, 5.7, 0.9, Bison
86.5, 3.9, 3.2, 5.6, 0.8, Llama
90.0, 2.0, 1.8, 5.5, 0.47, Mule
86.2, 3.0, 4.8, 5.3, 0.7, Zebra

Cluster: 1
Center (Standardized): 0.30395, 0.08432, -0.36205, 0.00437, 0.17898
Center (Unstandardized): 82.08, 6.52, 6.5, 4.14, 0.914

Max Dist. To Center (Standardized): 0.8359855217174945
Min Dist. To Center (Standardized): 0.39635764668800105
Avg Dist. To Center (Standardized): 0.5263172194590148
Sum of Squared Error (Standardized): 1.5122598570764798
5 Points (Unstandardized):
82.1, 5.9, 7.9, 4.7, 0.78, Buffalo
81.9, 7.4, 7.2, 2.7, 0.85, Guinea Pig
81.6, 6.6, 5.9, 4.9, 0.93, Fox
82.8, 7.1, 5.1, 3.7, 1.1, Pig
82.0, 5.6, 6.4, 4.7, 0.91, Sheep

Cluster: 2
Center (Standardized): -0.29521, 0.83175, 0.07055, -0.53608, 0.9937
Center (Unstandardized): 74.4, 9.25, 11.05, 3.15, 1.3
Max Dist. To Center (Standardized): 0.3084317516458949
Min Dist. To Center (Standardized): 0.30843175164589487
Avg Dist. To Center (Standardized): 0.30843175164589487
Sum of Squared Error (Standardized): 0.19026029084670998
2 Points (Unstandardized):
76.3, 9.3, 9.5, 3.0, 1.2, Dog
72.5, 9.2, 12.6, 3.3, 1.4, Rat

Cluster: 3
Center (Standardized): -1.00126, 1.18766, 0.92147, -0.86362, 1.20476
Center (Unstandardized): 65.35, 10.55, 20.0, 2.55, 1.4
Max Dist. To Center (Standardized): 0.07131782892247152
Min Dist. To Center (Standardized): 0.07131782892247152
Avg Dist. To Center (Standardized): 0.07131782892247152
Sum of Squared Error (Standardized): 0.01017246544442983
2 Points (Unstandardized):
65.9, 10.4, 19.7, 2.6, 1.4, Deer
64.8, 10.7, 20.3, 2.5, 1.4, Reindeer

Outlier Percentage: 28.0%

7 Outliers (Unstandardized):
90.4, 0.6, 4.5, 4.4, 0.1, Hippo
81.6, 10.1, 6.3, 4.4, 0.75, Cat
70.7, 3.6, 17.6, 5.6, 0.63, Elephant
71.3, 12.3, 13.1, 1.9, 2.3, Rabbit
64.8, 11.1, 21.2, 1.6, 0.85, Whale
46.4, 9.7, 42.0, 0.0, 0.85, Seal
44.9, 10.6, 34.9, 0.9, 0.53, Dolphin

Method: kmeans
Data: planets.csv
Number of Clusters: 4
Standardized Data: True

Intercluster Distances (Standardized):

	0	1	2	3
0	0.000000	4.113561	3.732876	3.970732
1	4.113561	0.000000	2.252963	1.425170
2	3.732876	2.252963	0.000000	1.834575
3	3.970732	1.425170	1.834575	0.000000

Cluster: 0
Center (Standardized): 2.4792858960154533, 2.267904385984089, 0.20156608203799334
Center (Unstandardized): 338.97900000000004, 16.419999999999998, 2.74
Max Dist. to Center (Standardized): 0.07995275903083886
Min Dist. to Center (Standardized): 0.07995275903083841
Avg Dist. to Center (Standardized): 0.07995275903083864
Sum of Squared Error (Standardized): 0.012784887353286698
2 Points (Unstandardized):
1940YL, 338.333, 16.773, 2.7465
1953NH, 339.625, 16.067, 2.7335

Cluster: 1
Center (Standardized): -0.01648019983843425, -0.9087460177396937, 0.9770831279393931
Center (Unstandardized): 130.0488, 2.0464, 3.06104
Max Dist. to Center (Standardized): 1.1393950832858104
Min Dist. to Center (Standardized): 0.34207946445657467
Avg Dist. to Center (Standardized): 0.6899774429487622
Sum of Squared Error (Standardized): 2.857025507548891
5 Points (Unstandardized):
1929EC, 115.072, 2.666, 3.1676
1948RO, 89.9, 2.1, 3.35

1951AM, 115.072, 2.666, 3.1676
1938DL, 135.6, 1.0, 2.6
1948RB, 194.6, 1.8, 3.02

Cluster: 2
Center (Standardized): -0.08192012730660071, -0.10149986753087419, -1.1252759179737055
Center (Unstandardized): 124.57057142857143, 5.699, 2.1907285714285716
Max Dist. to Center (Standardized): 1.2341756858331288
Min Dist. to Center (Standardized): 0.21139074400106508
Avg Dist. to Center (Standardized): 0.556937883297047
Sum of Squared Error (Standardized): 2.9297679183207155
7 Points (Unstandardized):
1935RF, 130.916, 4.659, 2.2562
1941FD, 132.2, 4.7, 2.13
1955QT, 130.07, 4.79, 2.1893
1930SY, 80.804, 4.622, 2.189
1949HM, 80.804, 4.622, 2.1906
1951AX, 153.1, 6.5, 2.45
1948RH, 164.1, 10.0, 1.93

Cluster: 3
Center (Standardized): -0.8605459803385042, 0.1436840778892825, 0.5176767244085924
Center (Unstandardized): 59.38879999999999, 6.8084, 2.87086
Max Dist. to Center (Standardized): 1.2991863725423
Min Dist. to Center (Standardized): 0.23881941473255588
Avg Dist. to Center (Standardized): 0.5989541059690533
Sum of Squared Error (Standardized): 2.506072795267041
5 Points (Unstandardized):
1924TZ, 59.9, 5.7, 2.79
1931DQ, 69.6, 4.7, 2.81
1936AB, 78.1, 6.6, 2.9
1952DA, 55.144, 4.542, 3.0343
1948TG, 34.2, 12.5, 2.82

Method: hclustering
Data: planets.csv
Number of Clusters: 4
Standardized Data: True

Intercluster Distances (Standardized):

	0	1	2	3
0	0.0	1.954525	3.764254	2.411993
1	1.954525	0.0	4.068827	2.116697
2	3.764254	4.068827	0.0	3.747368
3	2.411993	2.116697	3.747368	0.0

Cluster: 0
Center (Standardized): -0.06545118583403381, -0.23131320802227903, -1.001694366898466
Center (Unstandardized): 125.94924999999999, 5.111625, 2.2418875
Max Dist. to Center (Standardized): 1.3937319036733151
Min Dist. to Center (Standardized): 0.12133412493459299
Avg Dist. to Center (Standardized): 0.6280341168376851
Sum of Squared Error (Standardized): 4.743895151780592
8 Points (Unstandardized):
1935RF, 130.916, 4.659, 2.2562
1941FD, 132.2, 4.7, 2.13
1955QT, 130.07, 4.79, 2.1893
1930SY, 80.804, 4.622, 2.189
1949HM, 80.804, 4.622, 2.1906
1938DL, 135.6, 1.0, 2.6
1951AX, 153.1, 6.5, 2.45
1948RH, 164.1, 10.0, 1.93

Cluster: 1
Center (Standardized): -0.4091905841247907, -0.5108580457393519, 0.9019506867478023
Center (Unstandardized): 97.17349999999999, 3.8467500000000006, 3.0299375
Max Dist. to Center (Standardized): 1.248851642276786

Min Dist. to Center (Standardized): 0.47370251220084386
Avg Dist. to Center (Standardized): 0.7252848227866251
Sum of Squared Error (Standardized): 4.68749900952387
8 Points (Unstandardized):
1929EC, 115.072, 2.666, 3.1676
1948RO, 89.9, 2.1, 3.35
1951AM, 115.072, 2.666, 3.1676
1924TZ, 59.9, 5.7, 2.79
1931DQ, 69.6, 4.7, 2.81
1936AB, 78.1, 6.6, 2.9
1952DA, 55.144, 4.542, 3.0343
1948RB, 194.6, 1.8, 3.02

Cluster: 2
Center (Standardized): 2.479285896015453, 2.267904385984089, 0.2015660820379933
Center (Unstandardized): 338.979, 16.419999999999998, 2.7399999999999998
Max Dist. to Center (Standardized): 0.07995275903083886
Min Dist. to Center (Standardized): 0.07995275903083837
Avg Dist. to Center (Standardized): 0.07995275903083862
Sum of Squared Error (Standardized): 0.012784887353286692
2 Points (Unstandardized):
1940YL, 338.333, 16.773, 2.7465
1953NH, 339.625, 16.067, 2.7335

Cluster: 3
Center (Standardized): -1.1614376323603008, 1.4015612581248729, 0.3948172771292961
Center (Unstandardized): 34.2, 12.5, 2.82
Max Dist. to Center (Standardized): 0.0
Min Dist. to Center (Standardized): 0.0
Avg Dist. to Center (Standardized): 0.0
Sum of Squared Error (Standardized): 0.0
1 Points (Unstandardized):
1948TG, 34.2, 12.5, 2.82

Method: dbscan
Data: planets.csv
eps: 0.9
minpts: 1

Intercluster Distances (Standardized)

	0	1	2
0	0.000000	3.853828	1.978650
1	3.853828	0.000000	4.146483
2	1.978650	4.146483	0.000000

Cluster: 0
Center (Standardized): -0.16062, -0.25992, -1.0203
Center (Unstandardized): 117.98233, 4.98217, 2.23418
Max Dist. To Center (Standardized): 0.7485283103489526
Min Dist. To Center (Standardized): 0.17832395153764424
Avg Dist. To Center (Standardized): 0.3916354014721842
Sum of Squared Error (Standardized): 1.152713357568763
6 Points (Unstandardized):
130.916, 4.659, 2.2562, 1935RF
132.2, 4.7, 2.13, 1941FD
130.07, 4.79, 2.1893, 1955QT
80.804, 4.622, 2.189, 1930SY
80.804, 4.622, 2.1906, 1949HM
153.1, 6.5, 2.45, 1951AX

Cluster: 1
Center (Standardized): 2.47929, 2.2679, 0.20157
Center (Unstandardized): 338.979, 16.42, 2.74
Max Dist. To Center (Standardized): 0.07995275903083886
Min Dist. To Center (Standardized): 0.07995275903083841
Avg Dist. To Center (Standardized): 0.07995275903083864
Sum of Squared Error (Standardized): 0.012784887353286698

2 Points (Unstandardized):
338.333, 16.773, 2.7465, 1940YL
339.625, 16.067, 2.7335, 1953NH

Cluster: 2
Center (Standardized): -0.57545, -0.44624, 0.90538
Center (Unstandardized): 83.25543, 4.13914, 3.03136
Max Dist. To Center (Standardized): 0.8954750201394835
Min Dist. To Center (Standardized): 0.34747910947334615
Avg Dist. To Center (Standardized): 0.625545273328007
Sum of Squared Error (Standardized): 2.9050642387610988
7 Points (Unstandardized):
115.072, 2.666, 3.1676, 1929EC
89.9, 2.1, 3.35, 1948RO
115.072, 2.666, 3.1676, 1951AM
59.9, 5.7, 2.79, 1924TZ
69.6, 4.7, 2.81, 1931DQ
78.1, 6.6, 2.9, 1936AB
55.144, 4.542, 3.0343, 1952DA

Outlier Percentage: 21.1%
4 Outliers (Unstandardized):
135.6, 1.0, 2.6, 1938DL
194.6, 1.8, 3.02, 1948RB
164.1, 10.0, 1.93, 1948RH
34.2, 12.5, 2.82, 1948TG

Method: kmeans
Data: iris.csv
Number of Clusters: 3
Standardized Data: True

Intercluster Distances (Standardized):

	0	1	2
0	0.000000	1.868531	3.851805
1	1.868531	0.000000	2.934372
2	3.851805	2.934372	0.000000

Cluster: 0
Center (Standardized): 1.0301475621438605, 0.013837819922382666, 0.940544063506162, 0.9690162387900197
Center (Unstandardized): 6.696363636363636, 3.06, 5.418181818181818, 1.9381818181818184
Max Dist. to Center (Standardized): 2.31121531993463
Min Dist. to Center (Standardized): 0.28622040788172576
Avg Dist. to Center (Standardized): 0.9279295567394238
Sum of Squared Error (Standardized): 57.35043007894123
55 Points (Unstandardized):
7.0, 3.2, 4.7, 1.4, Iris-versicolor
6.4, 3.2, 4.5, 1.5, Iris-versicolor
6.9, 3.1, 4.9, 1.5, Iris-versicolor
6.5, 2.8, 4.6, 1.5, Iris-versicolor
6.3, 3.3, 4.7, 1.6, Iris-versicolor
6.6, 2.9, 4.6, 1.3, Iris-versicolor
6.7, 3.1, 4.4, 1.4, Iris-versicolor
5.9, 3.2, 4.8, 1.8, Iris-versicolor
6.6, 3.0, 4.4, 1.4, Iris-versicolor
6.8, 2.8, 4.8, 1.4, Iris-versicolor
6.7, 3.0, 5.0, 1.7, Iris-versicolor
6.0, 3.4, 4.5, 1.6, Iris-versicolor
6.7, 3.1, 4.7, 1.5, Iris-versicolor
6.3, 3.3, 6.0, 2.5, Iris-virginica
7.1, 3.0, 5.9, 2.1, Iris-virginica

6.3, 2.9, 5.6, 1.8, Iris-virginica
6.5, 3.0, 5.8, 2.2, Iris-virginica
7.6, 3.0, 6.6, 2.1, Iris-virginica
7.3, 2.9, 6.3, 1.8, Iris-virginica
6.7, 2.5, 5.8, 1.8, Iris-virginica
7.2, 3.6, 6.1, 2.5, Iris-virginica
6.5, 3.2, 5.1, 2.0, Iris-virginica
6.4, 2.7, 5.3, 1.9, Iris-virginica
6.8, 3.0, 5.5, 2.1, Iris-virginica
5.8, 2.8, 5.1, 2.4, Iris-virginica
6.4, 3.2, 5.3, 2.3, Iris-virginica
6.5, 3.0, 5.5, 1.8, Iris-virginica
7.7, 3.8, 6.7, 2.2, Iris-virginica
7.7, 2.6, 6.9, 2.3, Iris-virginica
6.9, 3.2, 5.7, 2.3, Iris-virginica
7.7, 2.8, 6.7, 2.0, Iris-virginica
6.3, 2.7, 4.9, 1.8, Iris-virginica
6.7, 3.3, 5.7, 2.1, Iris-virginica
7.2, 3.2, 6.0, 1.8, Iris-virginica
6.2, 2.8, 4.8, 1.8, Iris-virginica
6.1, 3.0, 4.9, 1.8, Iris-virginica
6.4, 2.8, 5.6, 2.1, Iris-virginica
7.2, 3.0, 5.8, 1.6, Iris-virginica
7.4, 2.8, 6.1, 1.9, Iris-virginica
7.9, 3.8, 6.4, 2.0, Iris-virginica
6.4, 2.8, 5.6, 2.2, Iris-virginica
6.3, 2.8, 5.1, 1.5, Iris-virginica
7.7, 3.0, 6.1, 2.3, Iris-virginica
6.3, 3.4, 5.6, 2.4, Iris-virginica
6.4, 3.1, 5.5, 1.8, Iris-virginica
6.0, 3.0, 4.8, 1.8, Iris-virginica
6.9, 3.1, 5.4, 2.1, Iris-virginica
6.7, 3.1, 5.6, 2.4, Iris-virginica
6.9, 3.1, 5.1, 2.3, Iris-virginica
6.8, 3.2, 5.9, 2.3, Iris-virginica
6.7, 3.3, 5.7, 2.5, Iris-virginica
6.7, 3.0, 5.2, 2.3, Iris-virginica
6.5, 3.0, 5.2, 2.0, Iris-virginica
6.2, 3.4, 5.4, 2.3, Iris-virginica
5.9, 3.0, 5.1, 1.8, Iris-virginica

Cluster: 1
Center (Standardized): -0.16784348803854668, -0.9668424615335501, 0.2587539338555326, 0.1755095901382358
Center (Unstandardized): 5.7043478260869565, 2.634782608695652, 4.215217391304348, 1.3326086956521739
Max Dist. to Center (Standardized): 2.696683306020861
Min Dist. to Center (Standardized): 0.20100522139462693
Avg Dist. to Center (Standardized): 0.8704547186083056
Sum of Squared Error (Standardized): 42.8338905103294
46 Points (Unstandardized):
4.5, 2.3, 1.3, 0.3, Iris-setosa
5.5, 2.3, 4.0, 1.3, Iris-versicolor
5.7, 2.8, 4.5, 1.3, Iris-versicolor
4.9, 2.4, 3.3, 1.0, Iris-versicolor
5.2, 2.7, 3.9, 1.4, Iris-versicolor
5.0, 2.0, 3.5, 1.0, Iris-versicolor
5.9, 3.0, 4.2, 1.5, Iris-versicolor
6.0, 2.2, 4.0, 1.0, Iris-versicolor
6.1, 2.9, 4.7, 1.4, Iris-versicolor
5.6, 2.9, 3.6, 1.3, Iris-versicolor
5.6, 3.0, 4.5, 1.5, Iris-versicolor
5.8, 2.7, 4.1, 1.0, Iris-versicolor
6.2, 2.2, 4.5, 1.5, Iris-versicolor
5.6, 2.5, 3.9, 1.1, Iris-versicolor
6.1, 2.8, 4.0, 1.3, Iris-versicolor
6.3, 2.5, 4.9, 1.5, Iris-versicolor
6.1, 2.8, 4.7, 1.2, Iris-versicolor
6.4, 2.9, 4.3, 1.3, Iris-versicolor
6.0, 2.9, 4.5, 1.5, Iris-versicolor
5.7, 2.6, 3.5, 1.0, Iris-versicolor
5.5, 2.4, 3.8, 1.1, Iris-versicolor
5.5, 2.4, 3.7, 1.0, Iris-versicolor
5.8, 2.7, 3.9, 1.2, Iris-versicolor
6.0, 2.7, 5.1, 1.6, Iris-versicolor
5.4, 3.0, 4.5, 1.5, Iris-versicolor
6.3, 2.3, 4.4, 1.3, Iris-versicolor
5.6, 3.0, 4.1, 1.3, Iris-versicolor

5.5, 2.5, 4.0, 1.3, Iris-versicolor
5.5, 2.6, 4.4, 1.2, Iris-versicolor
6.1, 3.0, 4.6, 1.4, Iris-versicolor
5.8, 2.6, 4.0, 1.2, Iris-versicolor
5.0, 2.3, 3.3, 1.0, Iris-versicolor
5.6, 2.7, 4.2, 1.3, Iris-versicolor
5.7, 3.0, 4.2, 1.2, Iris-versicolor
5.7, 2.9, 4.2, 1.3, Iris-versicolor
6.2, 2.9, 4.3, 1.3, Iris-versicolor
5.1, 2.5, 3.0, 1.1, Iris-versicolor
5.7, 2.8, 4.1, 1.3, Iris-versicolor
5.8, 2.7, 5.1, 1.9, Iris-virginica
4.9, 2.5, 4.5, 1.7, Iris-virginica
5.7, 2.5, 5.0, 2.0, Iris-virginica
6.0, 2.2, 5.0, 1.5, Iris-virginica
5.6, 2.8, 4.9, 2.0, Iris-virginica
6.1, 2.6, 5.6, 1.4, Iris-virginica
5.8, 2.7, 5.1, 1.9, Iris-virginica
6.3, 2.5, 5.0, 1.9, Iris-virginica

Cluster: 2
Center (Standardized): -0.9987207238395798, 0.8921157782614696, -1.298624580616197, -1.25243539346551
Center (Unstandardized): 5.016326530612245, 3.440816326530612, 1.4673469387755094, 0.24285714285714355
Max Dist. to Center (Standardized): 2.3702511377887734
Min Dist. to Center (Standardized): 0.11289928232894526
Avg Dist. to Center (Standardized): 0.7845521580838924
Sum of Squared Error (Standardized): 40.97891229423101
49 Points (Unstandardized):
5.1, 3.5, 1.4, 0.2, Iris-setosa
4.9, 3.0, 1.4, 0.2, Iris-setosa
4.7, 3.2, 1.3, 0.2, Iris-setosa
4.6, 3.1, 1.5, 0.2, Iris-setosa
5.0, 3.6, 1.4, 0.2, Iris-setosa
5.4, 3.9, 1.7, 0.4, Iris-setosa
4.6, 3.4, 1.4, 0.3, Iris-setosa
5.0, 3.4, 1.5, 0.2, Iris-setosa

4.4, 2.9, 1.4, 0.2, Iris-setosa
4.9, 3.1, 1.5, 0.1, Iris-setosa
5.4, 3.7, 1.5, 0.2, Iris-setosa
4.8, 3.4, 1.6, 0.2, Iris-setosa
4.8, 3.0, 1.4, 0.1, Iris-setosa
4.3, 3.0, 1.1, 0.1, Iris-setosa
5.8, 4.0, 1.2, 0.2, Iris-setosa
5.7, 4.4, 1.5, 0.4, Iris-setosa
5.4, 3.9, 1.3, 0.4, Iris-setosa
5.1, 3.5, 1.4, 0.3, Iris-setosa
5.7, 3.8, 1.7, 0.3, Iris-setosa
5.1, 3.8, 1.5, 0.3, Iris-setosa
5.4, 3.4, 1.7, 0.2, Iris-setosa
5.1, 3.7, 1.5, 0.4, Iris-setosa
4.6, 3.6, 1.0, 0.2, Iris-setosa
5.1, 3.3, 1.7, 0.5, Iris-setosa
4.8, 3.4, 1.9, 0.2, Iris-setosa
5.0, 3.0, 1.6, 0.2, Iris-setosa
5.0, 3.4, 1.6, 0.4, Iris-setosa
5.2, 3.5, 1.5, 0.2, Iris-setosa
5.2, 3.4, 1.4, 0.2, Iris-setosa
4.7, 3.2, 1.6, 0.2, Iris-setosa
4.8, 3.1, 1.6, 0.2, Iris-setosa
5.4, 3.4, 1.5, 0.4, Iris-setosa
5.2, 4.1, 1.5, 0.1, Iris-setosa
5.5, 4.2, 1.4, 0.2, Iris-setosa
4.9, 3.1, 1.5, 0.1, Iris-setosa
5.0, 3.2, 1.2, 0.2, Iris-setosa
5.5, 3.5, 1.3, 0.2, Iris-setosa
4.9, 3.1, 1.5, 0.1, Iris-setosa
4.4, 3.0, 1.3, 0.2, Iris-setosa
5.1, 3.4, 1.5, 0.2, Iris-setosa
5.0, 3.5, 1.3, 0.3, Iris-setosa
4.4, 3.2, 1.3, 0.2, Iris-setosa
5.0, 3.5, 1.6, 0.6, Iris-setosa
5.1, 3.8, 1.9, 0.4, Iris-setosa
4.8, 3.0, 1.4, 0.3, Iris-setosa
5.1, 3.8, 1.6, 0.2, Iris-setosa
4.6, 3.2, 1.4, 0.2, Iris-setosa
5.3, 3.7, 1.5, 0.2, Iris-setosa

5.0, 3.3, 1.4, 0.2, Iris-setosa

Method: hclustering
Data: iris.csv
Number of Clusters: 3
Standardized Data: True

Intercluster Distances (Standardized):

	0	1	2
0	0.0	3.322115	4.996308
1	3.322115	0.0	2.880574
2	4.996308	2.880574	0.0

Cluster: 0
Center (Standardized): -1.0111913832028152, 0.8394944086246475, -1.3005214861029288, -1.2509378621062455
Center (Unstandardized): 5.006, 3.418, 1.464, 0.2440000000000001
Max Dist. to Center (Standardized): 2.652510233336254
Min Dist. to Center (Standardized): 0.07427151343361287
Avg Dist. to Center (Standardized): 0.8197913516779218
Sum of Squared Error (Standardized): 48.15831080234686
50 Points (Unstandardized):
5.1, 3.5, 1.4, 0.2, Iris-setosa
4.9, 3.0, 1.4, 0.2, Iris-setosa
4.7, 3.2, 1.3, 0.2, Iris-setosa
4.6, 3.1, 1.5, 0.2, Iris-setosa
5.0, 3.6, 1.4, 0.2, Iris-setosa
5.4, 3.9, 1.7, 0.4, Iris-setosa
4.6, 3.4, 1.4, 0.3, Iris-setosa
5.0, 3.4, 1.5, 0.2, Iris-setosa
4.4, 2.9, 1.4, 0.2, Iris-setosa
4.9, 3.1, 1.5, 0.1, Iris-setosa
5.4, 3.7, 1.5, 0.2, Iris-setosa
4.8, 3.4, 1.6, 0.2, Iris-setosa
4.8, 3.0, 1.4, 0.1, Iris-setosa
4.3, 3.0, 1.1, 0.1, Iris-setosa
5.8, 4.0, 1.2, 0.2, Iris-setosa

5.7, 4.4, 1.5, 0.4, Iris-setosa
5.4, 3.9, 1.3, 0.4, Iris-setosa
5.1, 3.5, 1.4, 0.3, Iris-setosa
5.7, 3.8, 1.7, 0.3, Iris-setosa
5.1, 3.8, 1.5, 0.3, Iris-setosa
5.4, 3.4, 1.7, 0.2, Iris-setosa
5.1, 3.7, 1.5, 0.4, Iris-setosa
4.6, 3.6, 1.0, 0.2, Iris-setosa
5.1, 3.3, 1.7, 0.5, Iris-setosa
4.8, 3.4, 1.9, 0.2, Iris-setosa
5.0, 3.0, 1.6, 0.2, Iris-setosa
5.0, 3.4, 1.6, 0.4, Iris-setosa
5.2, 3.5, 1.5, 0.2, Iris-setosa
5.2, 3.4, 1.4, 0.2, Iris-setosa
4.7, 3.2, 1.6, 0.2, Iris-setosa
4.8, 3.1, 1.6, 0.2, Iris-setosa
5.4, 3.4, 1.5, 0.4, Iris-setosa
5.2, 4.1, 1.5, 0.1, Iris-setosa
5.5, 4.2, 1.4, 0.2, Iris-setosa
4.9, 3.1, 1.5, 0.1, Iris-setosa
5.0, 3.2, 1.2, 0.2, Iris-setosa
5.5, 3.5, 1.3, 0.2, Iris-setosa
4.9, 3.1, 1.5, 0.1, Iris-setosa
4.4, 3.0, 1.3, 0.2, Iris-setosa
5.1, 3.4, 1.5, 0.2, Iris-setosa
5.0, 3.5, 1.3, 0.3, Iris-setosa
4.5, 2.3, 1.3, 0.3, Iris-setosa
4.4, 3.2, 1.3, 0.2, Iris-setosa
5.0, 3.5, 1.6, 0.6, Iris-setosa
5.1, 3.8, 1.9, 0.4, Iris-setosa
4.8, 3.0, 1.4, 0.3, Iris-setosa
5.1, 3.8, 1.6, 0.2, Iris-setosa
4.6, 3.2, 1.4, 0.2, Iris-setosa
5.3, 3.7, 1.5, 0.2, Iris-setosa
5.0, 3.3, 1.4, 0.2, Iris-setosa

Cluster: 1

Center (Standardized): 0.45562209420282246, -0.4811852226618814, 0.6240730017147005, 0.6028824529231726
Center (Unstandardized): 6.220618556701031, 2.845360824742268, 4.85979381443299, 1.658762886597938
Max Dist. to Center (Standardized): 2.7042703403717003
Min Dist. to Center (Standardized): 0.21671017673161028
Avg Dist. to Center (Standardized): 1.1292202699032583
Sum of Squared Error (Standardized): 149.13949425383757
97 Points (Unstandardized):
7.0, 3.2, 4.7, 1.4, Iris-versicolor
6.4, 3.2, 4.5, 1.5, Iris-versicolor
6.9, 3.1, 4.9, 1.5, Iris-versicolor
5.5, 2.3, 4.0, 1.3, Iris-versicolor
6.5, 2.8, 4.6, 1.5, Iris-versicolor
5.7, 2.8, 4.5, 1.3, Iris-versicolor
6.3, 3.3, 4.7, 1.6, Iris-versicolor
4.9, 2.4, 3.3, 1.0, Iris-versicolor
6.6, 2.9, 4.6, 1.3, Iris-versicolor
5.2, 2.7, 3.9, 1.4, Iris-versicolor
5.0, 2.0, 3.5, 1.0, Iris-versicolor
5.9, 3.0, 4.2, 1.5, Iris-versicolor
6.0, 2.2, 4.0, 1.0, Iris-versicolor
6.1, 2.9, 4.7, 1.4, Iris-versicolor
5.6, 2.9, 3.6, 1.3, Iris-versicolor
6.7, 3.1, 4.4, 1.4, Iris-versicolor
5.6, 3.0, 4.5, 1.5, Iris-versicolor
5.8, 2.7, 4.1, 1.0, Iris-versicolor
6.2, 2.2, 4.5, 1.5, Iris-versicolor
5.6, 2.5, 3.9, 1.1, Iris-versicolor
5.9, 3.2, 4.8, 1.8, Iris-versicolor
6.1, 2.8, 4.0, 1.3, Iris-versicolor
6.3, 2.5, 4.9, 1.5, Iris-versicolor
6.1, 2.8, 4.7, 1.2, Iris-versicolor
6.4, 2.9, 4.3, 1.3, Iris-versicolor
6.6, 3.0, 4.4, 1.4, Iris-versicolor
6.8, 2.8, 4.8, 1.4, Iris-versicolor
6.7, 3.0, 5.0, 1.7, Iris-versicolor
6.0, 2.9, 4.5, 1.5, Iris-versicolor
5.7, 2.6, 3.5, 1.0, Iris-versicolor
5.5, 2.4, 3.8, 1.1, Iris-versicolor

5.5, 2.4, 3.7, 1.0, Iris-versicolor
5.8, 2.7, 3.9, 1.2, Iris-versicolor
6.0, 2.7, 5.1, 1.6, Iris-versicolor
5.4, 3.0, 4.5, 1.5, Iris-versicolor
6.0, 3.4, 4.5, 1.6, Iris-versicolor
6.7, 3.1, 4.7, 1.5, Iris-versicolor
6.3, 2.3, 4.4, 1.3, Iris-versicolor
5.6, 3.0, 4.1, 1.3, Iris-versicolor
5.5, 2.5, 4.0, 1.3, Iris-versicolor
5.5, 2.6, 4.4, 1.2, Iris-versicolor
6.1, 3.0, 4.6, 1.4, Iris-versicolor
5.8, 2.6, 4.0, 1.2, Iris-versicolor
5.0, 2.3, 3.3, 1.0, Iris-versicolor
5.6, 2.7, 4.2, 1.3, Iris-versicolor
5.7, 3.0, 4.2, 1.2, Iris-versicolor
5.7, 2.9, 4.2, 1.3, Iris-versicolor
6.2, 2.9, 4.3, 1.3, Iris-versicolor
5.1, 2.5, 3.0, 1.1, Iris-versicolor
5.7, 2.8, 4.1, 1.3, Iris-versicolor
6.3, 3.3, 6.0, 2.5, Iris-virginica
5.8, 2.7, 5.1, 1.9, Iris-virginica
7.1, 3.0, 5.9, 2.1, Iris-virginica
6.3, 2.9, 5.6, 1.8, Iris-virginica
6.5, 3.0, 5.8, 2.2, Iris-virginica
7.6, 3.0, 6.6, 2.1, Iris-virginica
4.9, 2.5, 4.5, 1.7, Iris-virginica
7.3, 2.9, 6.3, 1.8, Iris-virginica
6.7, 2.5, 5.8, 1.8, Iris-virginica
6.5, 3.2, 5.1, 2.0, Iris-virginica
6.4, 2.7, 5.3, 1.9, Iris-virginica
6.8, 3.0, 5.5, 2.1, Iris-virginica
5.7, 2.5, 5.0, 2.0, Iris-virginica
5.8, 2.8, 5.1, 2.4, Iris-virginica
6.4, 3.2, 5.3, 2.3, Iris-virginica
6.5, 3.0, 5.5, 1.8, Iris-virginica
7.7, 2.6, 6.9, 2.3, Iris-virginica
6.0, 2.2, 5.0, 1.5, Iris-virginica
6.9, 3.2, 5.7, 2.3, Iris-virginica
5.6, 2.8, 4.9, 2.0, Iris-virginica
7.7, 2.8, 6.7, 2.0, Iris-virginica

6.3, 2.7, 4.9, 1.8, Iris-virginica
6.7, 3.3, 5.7, 2.1, Iris-virginica
7.2, 3.2, 6.0, 1.8, Iris-virginica
6.2, 2.8, 4.8, 1.8, Iris-virginica
6.1, 3.0, 4.9, 1.8, Iris-virginica
6.4, 2.8, 5.6, 2.1, Iris-virginica
7.2, 3.0, 5.8, 1.6, Iris-virginica
7.4, 2.8, 6.1, 1.9, Iris-virginica
6.4, 2.8, 5.6, 2.2, Iris-virginica
6.3, 2.8, 5.1, 1.5, Iris-virginica
6.1, 2.6, 5.6, 1.4, Iris-virginica
7.7, 3.0, 6.1, 2.3, Iris-virginica
6.3, 3.4, 5.6, 2.4, Iris-virginica
6.4, 3.1, 5.5, 1.8, Iris-virginica
6.0, 3.0, 4.8, 1.8, Iris-virginica
6.9, 3.1, 5.4, 2.1, Iris-virginica
6.7, 3.1, 5.6, 2.4, Iris-virginica
6.9, 3.1, 5.1, 2.3, Iris-virginica
5.8, 2.7, 5.1, 1.9, Iris-virginica
6.8, 3.2, 5.9, 2.3, Iris-virginica
6.7, 3.3, 5.7, 2.5, Iris-virginica
6.7, 3.0, 5.2, 2.3, Iris-virginica
6.3, 2.5, 5.0, 1.9, Iris-virginica
6.5, 3.0, 5.2, 2.0, Iris-virginica
6.2, 3.4, 5.4, 2.3, Iris-virginica
5.9, 3.0, 5.1, 1.8, Iris-virginica

Cluster: 2
Center (Standardized): 2.121408674155583, 1.5667487223232903, 1.496997712940091, 1.3557650572548123
Center (Unstandardized): 7.6000000000000005, 3.7333333333333334, 6.4, 2.2333333333333334
Max Dist. to Center (Standardized): 0.6920314278913682
Min Dist. to Center (Standardized): 0.262756637109049
Avg Dist. to Center (Standardized): 0.48438671821113105
Sum of Squared Error (Standardized): 0.7963232872593615
3 Points (Unstandardized):
7.2, 3.6, 6.1, 2.5, Iris-virginica

7.7, 3.8, 6.7, 2.2, Iris-virginica
7.9, 3.8, 6.4, 2.0, Iris-virginica

Method: dbscan
Data: iris.csv
eps: 0.7
minpts: 4

Intercluster Distances (Standardized)

	0	1
0	0.000000	3.357051
1	3.357051	0.000000

Cluster: 0
Center (Standardized): -1.01592, 0.84603, -1.29901, -1.25673
Center (Unstandardized): 5.00208, 3.42083, 1.46667, 0.23958
Max Dist. To Center (Standardized): 1.8960142774132203
Min Dist. To Center (Standardized): 0.07322632424709276
Avg Dist. To Center (Standardized): 0.7485442071073529
Sum of Squared Error (Standardized): 35.24377828687142
48 Points (Unstandardized):
5.1, 3.5, 1.4, 0.2, Iris-setosa
4.9, 3.0, 1.4, 0.2, Iris-setosa
4.7, 3.2, 1.3, 0.2, Iris-setosa
4.6, 3.1, 1.5, 0.2, Iris-setosa
5.0, 3.6, 1.4, 0.2, Iris-setosa
5.4, 3.9, 1.7, 0.4, Iris-setosa
4.6, 3.4, 1.4, 0.3, Iris-setosa
5.0, 3.4, 1.5, 0.2, Iris-setosa
4.4, 2.9, 1.4, 0.2, Iris-setosa
4.9, 3.1, 1.5, 0.1, Iris-setosa
5.4, 3.7, 1.5, 0.2, Iris-setosa
4.8, 3.4, 1.6, 0.2, Iris-setosa
4.8, 3.0, 1.4, 0.1, Iris-setosa
4.3, 3.0, 1.1, 0.1, Iris-setosa
5.8, 4.0, 1.2, 0.2, Iris-setosa
5.4, 3.9, 1.3, 0.4, Iris-setosa
5.1, 3.5, 1.4, 0.3, Iris-setosa

5.7, 3.8, 1.7, 0.3, Iris-setosa
5.1, 3.8, 1.5, 0.3, Iris-setosa
5.4, 3.4, 1.7, 0.2, Iris-setosa
5.1, 3.7, 1.5, 0.4, Iris-setosa
4.6, 3.6, 1.0, 0.2, Iris-setosa
5.1, 3.3, 1.7, 0.5, Iris-setosa
4.8, 3.4, 1.9, 0.2, Iris-setosa
5.0, 3.0, 1.6, 0.2, Iris-setosa
5.0, 3.4, 1.6, 0.4, Iris-setosa
5.2, 3.5, 1.5, 0.2, Iris-setosa
5.2, 3.4, 1.4, 0.2, Iris-setosa
4.7, 3.2, 1.6, 0.2, Iris-setosa
4.8, 3.1, 1.6, 0.2, Iris-setosa
5.4, 3.4, 1.5, 0.4, Iris-setosa
5.2, 4.1, 1.5, 0.1, Iris-setosa
5.5, 4.2, 1.4, 0.2, Iris-setosa
4.9, 3.1, 1.5, 0.1, Iris-setosa
5.0, 3.2, 1.2, 0.2, Iris-setosa
5.5, 3.5, 1.3, 0.2, Iris-setosa
4.9, 3.1, 1.5, 0.1, Iris-setosa
4.4, 3.0, 1.3, 0.2, Iris-setosa
5.1, 3.4, 1.5, 0.2, Iris-setosa
5.0, 3.5, 1.3, 0.3, Iris-setosa
4.4, 3.2, 1.3, 0.2, Iris-setosa
5.0, 3.5, 1.6, 0.6, Iris-setosa
5.1, 3.8, 1.9, 0.4, Iris-setosa
4.8, 3.0, 1.4, 0.3, Iris-setosa
5.1, 3.8, 1.6, 0.2, Iris-setosa
4.6, 3.2, 1.4, 0.2, Iris-setosa
5.3, 3.7, 1.5, 0.2, Iris-setosa
5.0, 3.3, 1.4, 0.2, Iris-setosa

Cluster: 1
Center (Standardized): 0.50524, -0.44104, 0.64385, 0.62067
Center (Unstandardized): 6.2617, 2.86277, 4.89468, 1.67234
Max Dist. To Center (Standardized): 2.3662525282920366
Min Dist. To Center (Standardized): 0.23951662577364766
Avg Dist. To Center (Standardized): 1.0921750478751961

Sum of Squared Error (Standardized): 133.0295869091378
94 Points (Unstandardized):
7.0, 3.2, 4.7, 1.4, Iris-versicolor
6.4, 3.2, 4.5, 1.5, Iris-versicolor
6.9, 3.1, 4.9, 1.5, Iris-versicolor
5.5, 2.3, 4.0, 1.3, Iris-versicolor
6.5, 2.8, 4.6, 1.5, Iris-versicolor
5.7, 2.8, 4.5, 1.3, Iris-versicolor
6.3, 3.3, 4.7, 1.6, Iris-versicolor
6.6, 2.9, 4.6, 1.3, Iris-versicolor
5.2, 2.7, 3.9, 1.4, Iris-versicolor
5.9, 3.0, 4.2, 1.5, Iris-versicolor
6.0, 2.2, 4.0, 1.0, Iris-versicolor
6.1, 2.9, 4.7, 1.4, Iris-versicolor
5.6, 2.9, 3.6, 1.3, Iris-versicolor
6.7, 3.1, 4.4, 1.4, Iris-versicolor
5.6, 3.0, 4.5, 1.5, Iris-versicolor
5.8, 2.7, 4.1, 1.0, Iris-versicolor
6.2, 2.2, 4.5, 1.5, Iris-versicolor
5.6, 2.5, 3.9, 1.1, Iris-versicolor
5.9, 3.2, 4.8, 1.8, Iris-versicolor
6.1, 2.8, 4.0, 1.3, Iris-versicolor
6.3, 2.5, 4.9, 1.5, Iris-versicolor
6.1, 2.8, 4.7, 1.2, Iris-versicolor
6.4, 2.9, 4.3, 1.3, Iris-versicolor
6.6, 3.0, 4.4, 1.4, Iris-versicolor
6.8, 2.8, 4.8, 1.4, Iris-versicolor
6.7, 3.0, 5.0, 1.7, Iris-versicolor
6.0, 2.9, 4.5, 1.5, Iris-versicolor
5.7, 2.6, 3.5, 1.0, Iris-versicolor
5.5, 2.4, 3.8, 1.1, Iris-versicolor
5.5, 2.4, 3.7, 1.0, Iris-versicolor
5.8, 2.7, 3.9, 1.2, Iris-versicolor
6.0, 2.7, 5.1, 1.6, Iris-versicolor
5.4, 3.0, 4.5, 1.5, Iris-versicolor
6.0, 3.4, 4.5, 1.6, Iris-versicolor
6.7, 3.1, 4.7, 1.5, Iris-versicolor
6.3, 2.3, 4.4, 1.3, Iris-versicolor
5.6, 3.0, 4.1, 1.3, Iris-versicolor
5.5, 2.5, 4.0, 1.3, Iris-versicolor

5.5, 2.6, 4.4, 1.2, Iris-versicolor
6.1, 3.0, 4.6, 1.4, Iris-versicolor
5.8, 2.6, 4.0, 1.2, Iris-versicolor
5.0, 2.3, 3.3, 1.0, Iris-versicolor
5.6, 2.7, 4.2, 1.3, Iris-versicolor
5.7, 3.0, 4.2, 1.2, Iris-versicolor
5.7, 2.9, 4.2, 1.3, Iris-versicolor
6.2, 2.9, 4.3, 1.3, Iris-versicolor
5.1, 2.5, 3.0, 1.1, Iris-versicolor
5.7, 2.8, 4.1, 1.3, Iris-versicolor
6.3, 3.3, 6.0, 2.5, Iris-virginica
5.8, 2.7, 5.1, 1.9, Iris-virginica
7.1, 3.0, 5.9, 2.1, Iris-virginica
6.3, 2.9, 5.6, 1.8, Iris-virginica
6.5, 3.0, 5.8, 2.2, Iris-virginica
7.6, 3.0, 6.6, 2.1, Iris-virginica
7.3, 2.9, 6.3, 1.8, Iris-virginica
6.7, 2.5, 5.8, 1.8, Iris-virginica
6.5, 3.2, 5.1, 2.0, Iris-virginica
6.4, 2.7, 5.3, 1.9, Iris-virginica
6.8, 3.0, 5.5, 2.1, Iris-virginica
5.7, 2.5, 5.0, 2.0, Iris-virginica
5.8, 2.8, 5.1, 2.4, Iris-virginica
6.4, 3.2, 5.3, 2.3, Iris-virginica
6.5, 3.0, 5.5, 1.8, Iris-virginica
7.7, 2.6, 6.9, 2.3, Iris-virginica
6.0, 2.2, 5.0, 1.5, Iris-virginica
6.9, 3.2, 5.7, 2.3, Iris-virginica
5.6, 2.8, 4.9, 2.0, Iris-virginica
7.7, 2.8, 6.7, 2.0, Iris-virginica
6.3, 2.7, 4.9, 1.8, Iris-virginica
6.7, 3.3, 5.7, 2.1, Iris-virginica
7.2, 3.2, 6.0, 1.8, Iris-virginica
6.2, 2.8, 4.8, 1.8, Iris-virginica
6.1, 3.0, 4.9, 1.8, Iris-virginica
6.4, 2.8, 5.6, 2.1, Iris-virginica
7.2, 3.0, 5.8, 1.6, Iris-virginica
7.4, 2.8, 6.1, 1.9, Iris-virginica
6.4, 2.8, 5.6, 2.2, Iris-virginica
6.3, 2.8, 5.1, 1.5, Iris-virginica

6.1, 2.6, 5.6, 1.4, Iris-virginica
7.7, 3.0, 6.1, 2.3, Iris-virginica
6.3, 3.4, 5.6, 2.4, Iris-virginica
6.4, 3.1, 5.5, 1.8, Iris-virginica
6.0, 3.0, 4.8, 1.8, Iris-virginica
6.9, 3.1, 5.4, 2.1, Iris-virginica
6.7, 3.1, 5.6, 2.4, Iris-virginica
6.9, 3.1, 5.1, 2.3, Iris-virginica
5.8, 2.7, 5.1, 1.9, Iris-virginica
6.8, 3.2, 5.9, 2.3, Iris-virginica
6.7, 3.3, 5.7, 2.5, Iris-virginica
6.7, 3.0, 5.2, 2.3, Iris-virginica
6.3, 2.5, 5.0, 1.9, Iris-virginica
6.5, 3.0, 5.2, 2.0, Iris-virginica
6.2, 3.4, 5.4, 2.3, Iris-virginica
5.9, 3.0, 5.1, 1.8, Iris-virginica

Outlier Percentage: 5.3%
8 Outliers (Unstandardized):
5.7, 4.4, 1.5, 0.4, Iris-setosa
4.5, 2.3, 1.3, 0.3, Iris-setosa
4.9, 2.4, 3.3, 1.0, Iris-versicolor
5.0, 2.0, 3.5, 1.0, Iris-versicolor
4.9, 2.5, 4.5, 1.7, Iris-virginica
7.2, 3.6, 6.1, 2.5, Iris-virginica
7.7, 3.8, 6.7, 2.2, Iris-virginica
7.9, 3.8, 6.4, 2.0, Iris-virginica

Method: kmeans
Data: AccidentsSet03.csv
Number of Clusters: 4
Standardized Data: True

Intercluster Distances (Standardized):

	0	1	2	3
0	0.000000	5.613891	4.401486	4.512080
1	5.613891	0.000000	3.154683	3.837833
2	4.401486	3.154683	0.000000	2.031135
3	4.512080	3.837833	2.031135	0.000000

Cluster: 0
Center (Standardized): -0.5371578432367621, -0.933503385868831, -0.46248789416189745, 3.5456571447072567, 1.8166441914177751
Center (Unstandardized): 1.0, 0.0, 2.6666666666666665, 2.333333333333333, 2.0
Max Dist. to Center (Standardized): 2.7230506742686416
Min Dist. to Center (Standardized): 1.165421027047077
Avg Dist. to Center (Standardized): 1.9053813727647835
Sum of Squared Error (Standardized): 12.113597608702879
3 Points (Unstandardized):
1.0, 0.0, 4.0, 3.0, 3.0,
1.0, 0.0, 2.0, 2.0, 2.0,
1.0, 0.0, 2.0, 2.0, 1.0,

Cluster: 1
Center (Standardized): 2.727919243104341, -0.933503385868831, 0.8711981262119465, -0.27748621132491547, -0.29520468110538856
Center (Unstandardized): 6.0, 0.0, 4.0, 1.0, 0.5
Max Dist. to Center (Standardized): 2.705256223801191
Min Dist. to Center (Standardized): 0.9601948805139766
Avg Dist. to Center (Standardized): 1.5273277278330413
Sum of Squared Error (Standardized): 11.363621267680793

4 Points (Unstandardized):
5.0, 0.0, 4.0, 1.0, 1.0,
5.0, 0.0, 4.0, 1.0, 0.0,
4.0, 0.0, 4.0, 1.0, 0.0,
10.0, 0.0, 4.0, 1.0, 1.0,

Cluster: 2
Center (Standardized): -0.09119609485846492, -0.15937862685565407, -0.29984325753094065, -0.1376151129334945 4, -0.415391202305894
Center (Unstandardized): 1.6829268292682928, 0.4146341463414634, 2.829268292682927, 1.048780487804878, 0.4146341463414633
Max Dist. to Center (Standardized): 3.1542749515842563
Min Dist. to Center (Standardized): 1.3002051396223473
Avg Dist. to Center (Standardized): 1.718434825609884
Sum of Squared Error (Standardized): 126.45824814756341
41 Points (Unstandardized):
3.0, 0.0, 2.0, 1.0, 0.0,
2.0, 0.0, 2.0, 1.0, 0.0,
3.0, 0.0, 2.0, 1.0, 1.0,
4.0, 0.0, 2.0, 1.0, 0.0,
2.0, 0.0, 2.0, 1.0, 0.0,
3.0, 1.0, 2.0, 1.0, 0.0,
3.0, 1.0, 2.0, 1.0, 1.0,
4.0, 0.0, 2.0, 1.0, 0.0,
1.0, 0.0, 4.0, 2.0, 0.0,
3.0, 0.0, 4.0, 1.0, 1.0,
3.0, 0.0, 4.0, 1.0, 0.0,
1.0, 0.0, 2.0, 1.0, 0.0,
2.0, 0.0, 4.0, 2.0, 0.0,
3.0, 0.0, 4.0, 1.0, 0.0,
3.0, 0.0, 4.0, 1.0, 1.0,
1.0, 0.0, 4.0, 1.0, 1.0,
3.0, 0.0, 4.0, 1.0, 0.0,
1.0, 1.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,

1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
2.0, 1.0, 2.0, 1.0, 1.0,
1.0, 1.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 1.0, 2.0, 1.0, 0.0,
1.0, 1.0, 2.0, 1.0, 0.0,
1.0, 1.0, 2.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 0.0,

Cluster: 3
Center (Standardized): -0.3972259681078576, 0.9335033858688305, 0.7283031954576061, -0.27748621132491547, 0.9115661031935623
Center (Unstandardized): 1.2142857142857144, 0.9999999999999998, 3.857142857142857, 1.0, 1.3571428571428572
Max Dist. to Center (Standardized): 2.384341916727655
Min Dist. to Center (Standardized): 0.5411367756689527
Avg Dist. to Center (Standardized): 0.9515694484549609
Sum of Squared Error (Standardized): 18.916985977260687
14 Points (Unstandardized):
3.0, 0.0, 4.0, 1.0, 2.0,
2.0, 1.0, 2.0, 1.0, 2.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 2.0,
1.0, 1.0, 4.0, 1.0, 2.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 2.0, 4.0, 1.0, 2.0,

1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 1.0,

Method: hclustering
Data: AccidentsSet03.csv
Number of Clusters: 6
Standardized Data: True

Intercluster Distances (Standardized):

	0	1	2	3	4	5
0	0.0	2.105068	3.944029	3.303312	6.750547	5.571572
1	2.105068	0.0	3.218784	3.675343	6.971502	5.826324
2	3.944029	3.218784	0.0	2.927222	4.084576	6.874603
3	3.303312	3.675343	2.927222	0.0	5.115464	6.404172
4	6.750547	6.971502	4.084576	5.115464	0.0	8.680809
5	5.571572	5.826324	6.874603	6.404172	8.680809	0.0

Cluster: 0
Center (Standardized): -0.05266253365066286, 0.3914691618159614, 0.8711981262119465, -0.2774862113249154, -0.045416104785444396
Center (Unstandardized): 1.7419354838709677, 0.7096774193548387, 4.0, 1.0, 0.6774193548387097
Max Dist. to Center (Standardized): 3.083096296113177
Min Dist. to Center (Standardized): 0.8572042128009946
Avg Dist. to Center (Standardized): 1.4728622842198598
Sum of Squared Error (Standardized): 78.9612252774683
31 Points (Unstandardized):
5.0, 0.0, 4.0, 1.0, 1.0,
5.0, 0.0, 4.0, 1.0, 0.0,
4.0, 0.0, 4.0, 1.0, 0.0,
3.0, 0.0, 4.0, 1.0, 1.0,
3.0, 0.0, 4.0, 1.0, 0.0,
3.0, 0.0, 4.0, 1.0, 0.0,
3.0, 0.0, 4.0, 1.0, 1.0,
1.0, 0.0, 4.0, 1.0, 1.0,
3.0, 0.0, 4.0, 1.0, 0.0,
3.0, 0.0, 4.0, 1.0, 2.0,
1.0, 1.0, 4.0, 1.0, 0.0,

1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 2.0,
1.0, 1.0, 4.0, 1.0, 2.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 2.0, 4.0, 1.0, 2.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 1.0,
1.0, 1.0, 4.0, 1.0, 0.0,
1.0, 1.0, 4.0, 1.0, 1.0,

Cluster: 1
Center (Standardized): -0.06698674280364321, -0.26138094804327267, -1.129330904348819, -0.2774862113249154, -0.09809878633655991
Center (Unstandardized): 1.72, 0.36, 2.0, 1.0, 0.64
Max Dist. to Center (Standardized): 2.2643809941100916
Min Dist. to Center (Standardized): 0.9642095213950116
Avg Dist. to Center (Standardized): 1.311698607508367
Sum of Squared Error (Standardized): 46.137218908439735
25 Points (Unstandardized):
3.0, 0.0, 2.0, 1.0, 0.0,
2.0, 0.0, 2.0, 1.0, 0.0,
3.0, 0.0, 2.0, 1.0, 1.0,
4.0, 0.0, 2.0, 1.0, 0.0,
2.0, 0.0, 2.0, 1.0, 0.0,
3.0, 1.0, 2.0, 1.0, 0.0,
3.0, 1.0, 2.0, 1.0, 1.0,
4.0, 0.0, 2.0, 1.0, 0.0,

1.0, 0.0, 2.0, 1.0, 0.0,
1.0, 1.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
2.0, 1.0, 2.0, 1.0, 2.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
2.0, 1.0, 2.0, 1.0, 1.0,
1.0, 1.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 0.0, 2.0, 1.0, 1.0,
1.0, 1.0, 2.0, 1.0, 0.0,
1.0, 1.0, 2.0, 1.0, 0.0,
1.0, 1.0, 2.0, 1.0, 0.0,

Cluster: 2
Center (Standardized): -0.5371578432367621, -0.933503385868831, -1.129330904348819, 2.589871305699213, 1.1126945672433874
Center (Unstandardized): 1.0, 0.0, 2.0, 1.9999999999999998, 1.5
Max Dist. to Center (Standardized): 0.7039496241743881
Min Dist. to Center (Standardized): 0.7039496241743881
Avg Dist. to Center (Standardized): 0.7039496241743881
Sum of Squared Error (Standardized): 0.9910901467505245
2 Points (Unstandardized):
1.0, 0.0, 2.0, 2.0, 2.0,
1.0, 0.0, 2.0, 2.0, 1.0,

Cluster: 3
Center (Standardized): -0.2106501346026518, -0.933503385868831, 0.8711981262119465, 2.589871305699213, -0.9991543052797764
Center (Unstandardized): 1.5, 0.0, 4.0, 1.9999999999999998, 0.0
Max Dist. to Center (Standardized): 0.32650770863411027
Min Dist. to Center (Standardized): 0.32650770863411027

Avg Dist. to Center (Standardized): 0.32650770863411027
Sum of Squared Error (Standardized): 0.2132145675949941
2 Points (Unstandardized):
1.0, 0.0, 4.0, 2.0, 0.0,
2.0, 0.0, 4.0, 2.0, 0.0,

Cluster: 4
Center (Standardized): -0.5371578432367621, -0.933503385868831, 0.8711981262119465, 5.457228822723343, 3.224543439766551
Center (Unstandardized): 1.0, 0.0, 4.0, 3.0, 3.0
Max Dist. to Center (Standardized): 0.0
Min Dist. to Center (Standardized): 0.0
Avg Dist. to Center (Standardized): 0.0
Sum of Squared Error (Standardized): 0.0
1 Points (Unstandardized):
1.0, 0.0, 4.0, 3.0, 3.0,

Cluster: 5
Center (Standardized): 5.339980912177224, -0.933503385868831, 0.8711981262119465, -0.2774862113249154, 0.4087449430689994
Center (Unstandardized): 10.0, 0.0, 4.0, 1.0, 1.0
Max Dist. to Center (Standardized): 0.0
Min Dist. to Center (Standardized): 0.0
Avg Dist. to Center (Standardized): 0.0
Sum of Squared Error (Standardized): 0.0
1 Points (Unstandardized):
10.0, 0.0, 4.0, 1.0, 1.0,

Method: dbscan
Data: AccidentsSet03.csv
eps: 1.5
minpts: 4

Intercluster Distances (Standardized)

	0	1	2	3
0	0.000000	2.242287	1.868721	2.780096
1	2.242287	0.000000	2.938411	2.397182
2	1.868721	2.938411	0.000000	2.047484
3	2.780096	2.397182	2.047484	0.000000

Cluster: 0
Center (Standardized): -0.0474, -0.9335, -1.12933, -0.27749, -0.11922
Center (Unstandardized): 1.75, 0.0, 2.0, 1.0, 0.625
Max Dist. To Center (Standardized): 1.7126256666441044
Min Dist. To Center (Standardized): 0.7201461603854826
Avg Dist. To Center (Standardized): 0.9297438072420839
Sum of Squared Error (Standardized): 15.535329669238708
16 Points (Unstandardized):
3.0, 0.0, 2.0, 1.0, 0.0
2.0, 0.0, 2.0, 1.0, 0.0
3.0, 0.0, 2.0, 1.0, 1.0
4.0, 0.0, 2.0, 1.0, 0.0
2.0, 0.0, 2.0, 1.0, 0.0
4.0, 0.0, 2.0, 1.0, 0.0
1.0, 0.0, 2.0, 1.0, 0.0
1.0, 0.0, 2.0, 1.0, 1.0
1.0, 0.0, 2.0, 1.0, 1.0
1.0, 0.0, 2.0, 1.0, 1.0
1.0, 0.0, 2.0, 1.0, 1.0
1.0, 0.0, 2.0, 1.0, 1.0
1.0, 0.0, 2.0, 1.0, 1.0
1.0, 0.0, 2.0, 1.0, 1.0
1.0, 0.0, 2.0, 1.0, 1.0

1.0, 0.0, 2.0, 1.0, 1.0

Cluster: 1
Center (Standardized): 0.96478, -0.9335, 0.8712, -0.27749, -0.15441
Center (Unstandardized): 3.3, 0.0, 4.0, 1.0, 0.6
Max Dist. To Center (Standardized): 1.980770556482793
Min Dist. To Center (Standardized): 0.5962612423487431
Avg Dist. To Center (Standardized): 1.0979078815616106
Sum of Squared Error (Standardized): 13.881385827203472
10 Points (Unstandardized):
5.0, 0.0, 4.0, 1.0, 1.0
5.0, 0.0, 4.0, 1.0, 0.0
4.0, 0.0, 4.0, 1.0, 0.0
3.0, 0.0, 4.0, 1.0, 1.0
3.0, 0.0, 4.0, 1.0, 0.0
3.0, 0.0, 4.0, 1.0, 0.0
3.0, 0.0, 4.0, 1.0, 1.0
1.0, 0.0, 4.0, 1.0, 1.0
3.0, 0.0, 4.0, 1.0, 0.0
3.0, 0.0, 4.0, 1.0, 2.0

Cluster: 2
Center (Standardized): -0.10181, 0.9335, -1.12933, -0.27749, -0.06055
Center (Unstandardized): 1.66667, 1.0, 2.0, 1.0, 0.66667
Max Dist. To Center (Standardized): 1.8897769954035069
Min Dist. To Center (Standardized): 0.51732317738002
Avg Dist. To Center (Standardized): 1.0067409854929186
Sum of Squared Error (Standardized): 10.487295985144122
9 Points (Unstandardized):
3.0, 1.0, 2.0, 1.0, 0.0
3.0, 1.0, 2.0, 1.0, 1.0
1.0, 1.0, 2.0, 1.0, 1.0
2.0, 1.0, 2.0, 1.0, 2.0
2.0, 1.0, 2.0, 1.0, 1.0
1.0, 1.0, 2.0, 1.0, 1.0
1.0, 1.0, 2.0, 1.0, 0.0

1.0, 1.0, 2.0, 1.0, 0.0
1.0, 1.0, 2.0, 1.0, 0.0

Cluster: 3
Center (Standardized): -0.53716, 0.9335, 0.8712, -0.27749, -0.08402
Center (Unstandardized): 1.0, 1.0, 4.0, 1.0, 0.65
Max Dist. To Center (Standardized): 1.9006639852708476
Min Dist. To Center (Standardized): 0.49276473692207157
Avg Dist. To Center (Standardized): 0.8236210602840336
Sum of Squared Error (Standardized): 16.94764150943396
20 Points (Unstandardized):
1.0, 1.0, 4.0, 1.0, 0.0
1.0, 1.0, 4.0, 1.0, 1.0
1.0, 1.0, 4.0, 1.0, 2.0
1.0, 1.0, 4.0, 1.0, 2.0
1.0, 1.0, 4.0, 1.0, 0.0
1.0, 1.0, 4.0, 1.0, 1.0
1.0, 1.0, 4.0, 1.0, 1.0
1.0, 1.0, 4.0, 1.0, 0.0
1.0, 1.0, 4.0, 1.0, 1.0
1.0, 1.0, 4.0, 1.0, 0.0
1.0, 1.0, 4.0, 1.0, 1.0
1.0, 1.0, 4.0, 1.0, 0.0
1.0, 1.0, 4.0, 1.0, 1.0
1.0, 1.0, 4.0, 1.0, 1.0
1.0, 1.0, 4.0, 1.0, 0.0
1.0, 1.0, 4.0, 1.0, 0.0
1.0, 1.0, 4.0, 1.0, 0.0
1.0, 1.0, 4.0, 1.0, 1.0
1.0, 1.0, 4.0, 1.0, 0.0
1.0, 1.0, 4.0, 1.0, 1.0

Outlier Percentage: 11.3%
7 Outliers (Unstandardized):
10.0, 0.0, 4.0, 1.0, 1.0
1.0, 0.0, 4.0, 2.0, 0.0

2.0, 0.0, 4.0, 2.0, 0.0
1.0, 0.0, 4.0, 3.0, 3.0
1.0, 0.0, 2.0, 2.0, 2.0
1.0, 0.0, 2.0, 2.0, 1.0
1.0, 2.0, 4.0, 1.0, 2.0

