Aim: Experiment to implement any one of the clustering algorithms using Rapid Miner and Python.

Theory:

Clustering or cluster analysis is a machine learning technique, which groups the unlabelled dataset. It can be defined as "A way of grouping the data points into different clusters, consisting of similar data points. The objects with the possible similarities remain in a group that has less or no similarities with another group."

Clustering Algorithms

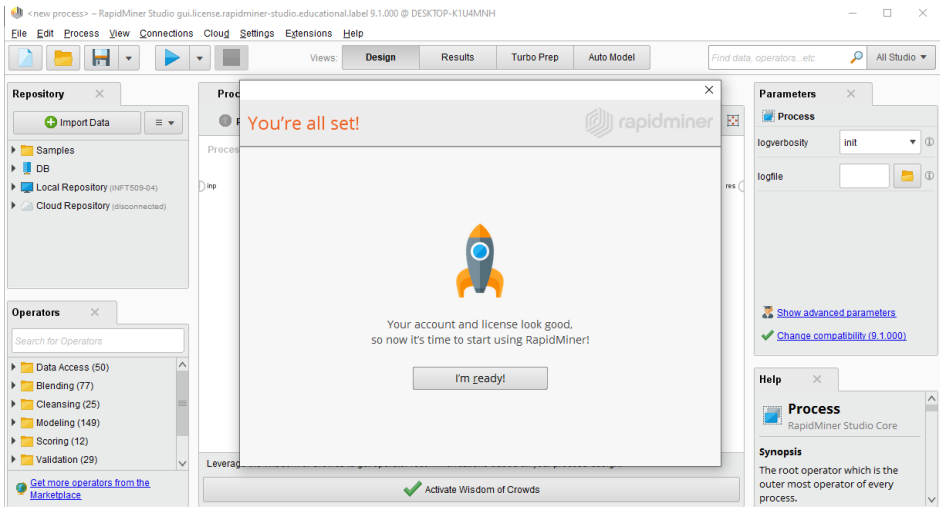
The Clustering algorithms can be divided based on their models that are explained above. There are different types of clustering algorithms published, but only a few are commonly used. The clustering algorithm is based on the kind of data that we are using.

Here we are discussing mainly popular Clustering algorithms that are widely used in machine learning:

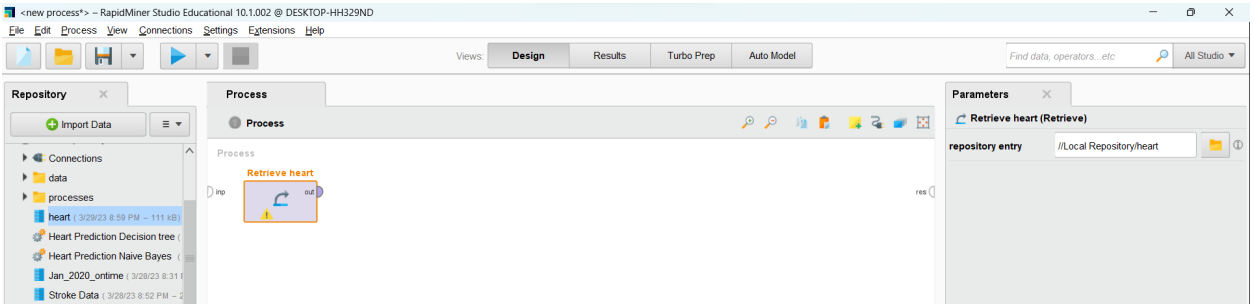
1. **K-Means algorithm:** The k-means algorithm is one of the most popular clustering algorithms. It classifies the dataset by dividing the samples into different clusters of equal variances. The number of clusters must be specified in this algorithm. It is fast with fewer computations required, with the linear complexity of O(n).
2. **Mean-shift algorithm**: Mean-shift algorithm tries to find the dense areas in the smooth density of data points. It is an example of a centroid-based model that works on updating the candidates for centroid to be the center of the points within a given region.
3. **DBSCAN Algorithm**: It stands for Density-Based Spatial Clustering of Applications with Noise. It is an example of a density-based model similar to the mean-shift, but with some remarkable advantages. In this algorithm, the areas of high density are separated by the areas of low density. Because of this, the clusters can be found in any arbitrary shape.

Implementation using K-Means algorithm:

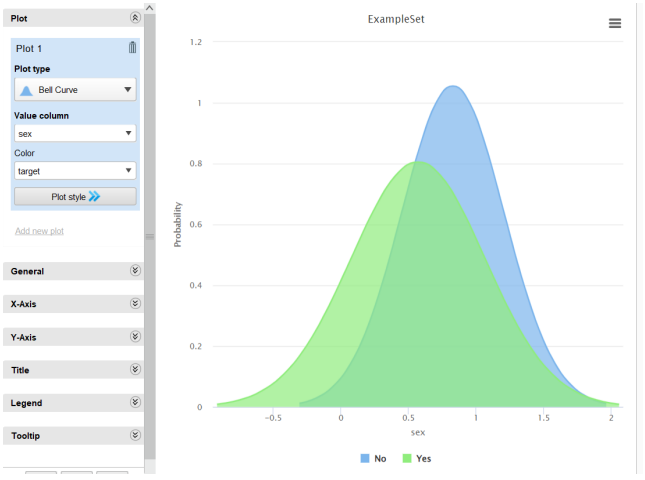
After the successful installation of RapidMiner:

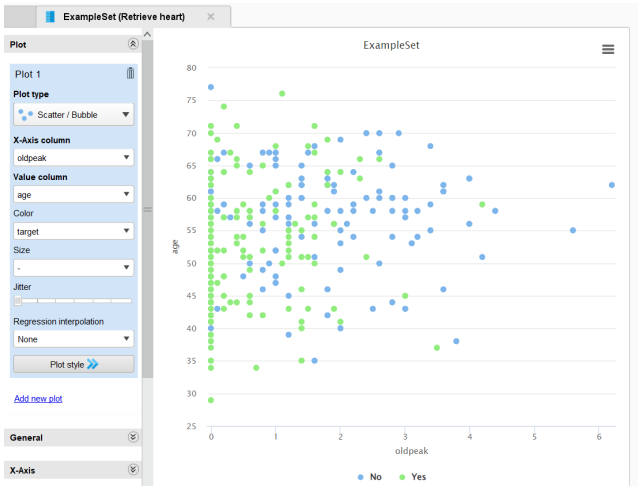


Step 1:Select a blank process
Dataset is imported

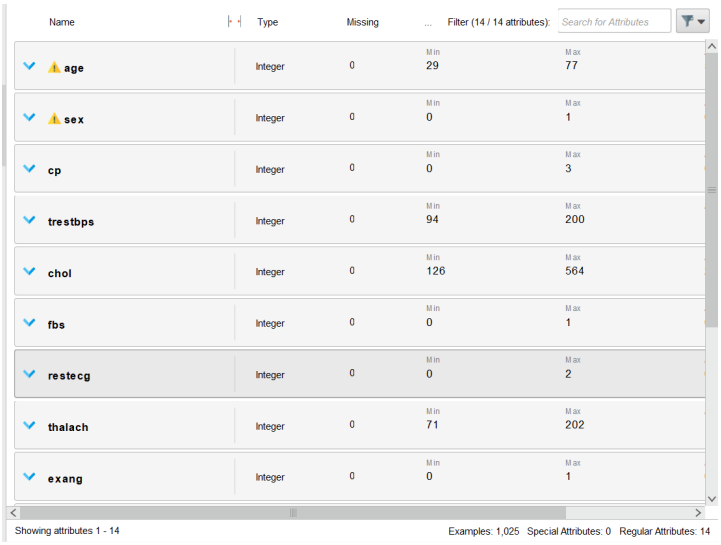


Step 2 :Visualizing the given Dataset in scatterplot and other kinds of Visualization techniques.

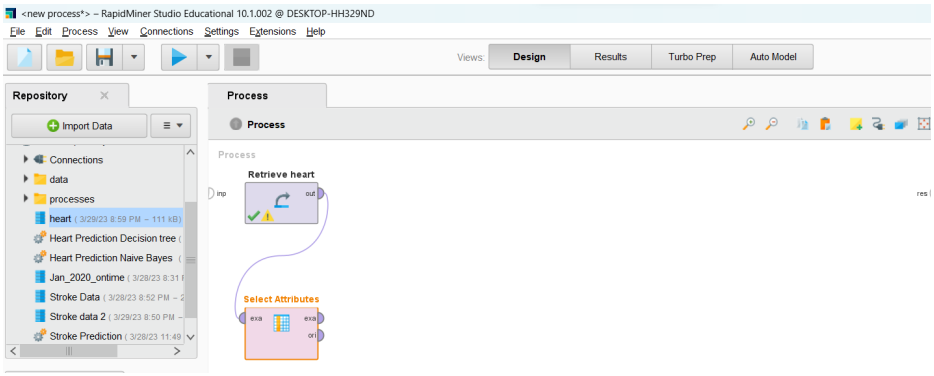


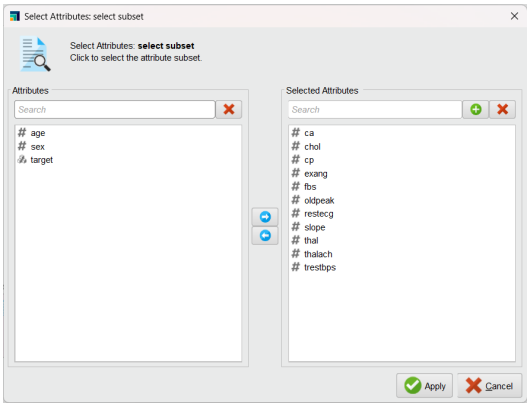


Step 3: Showing the statistics of The dataset

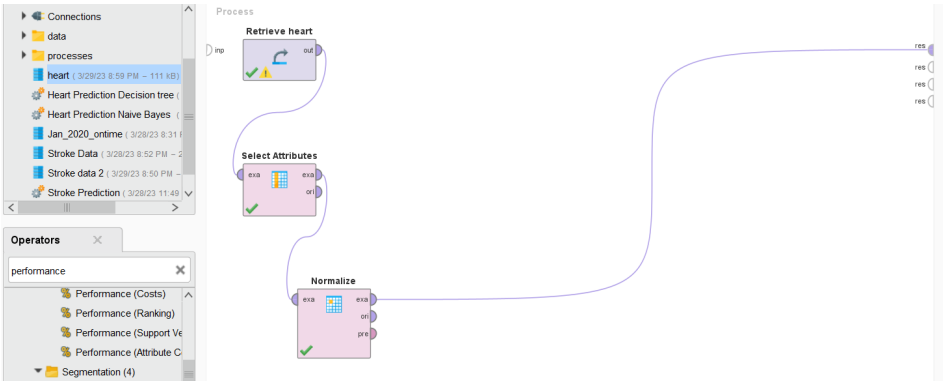


Step 4: Adding Select attribute operator and connect it with the Dataset
Then we will select the required attributes from our dataset as follows.

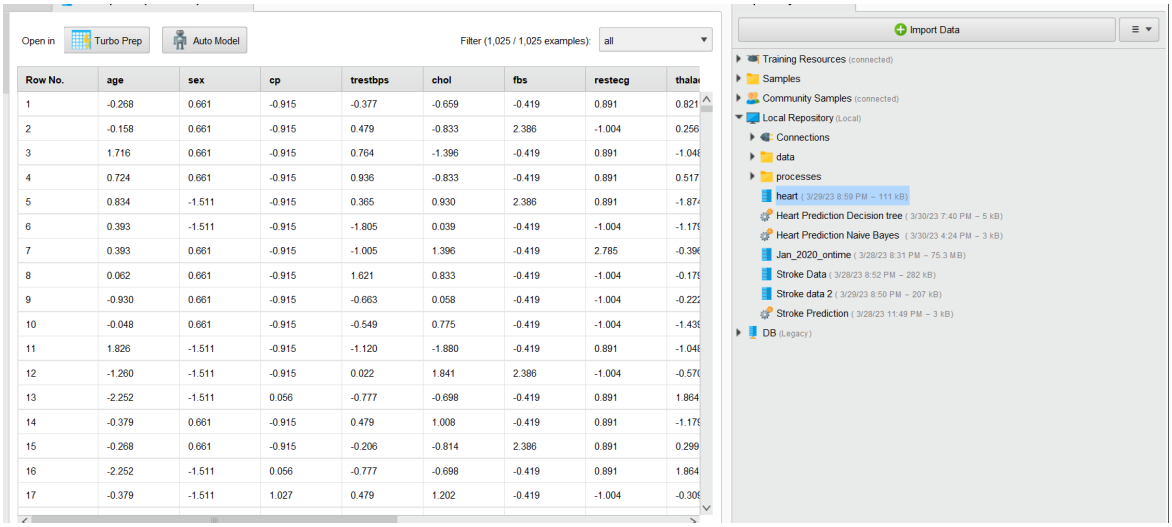




Step 5: Now import normalize operator as shown below
We will connect as shown in below

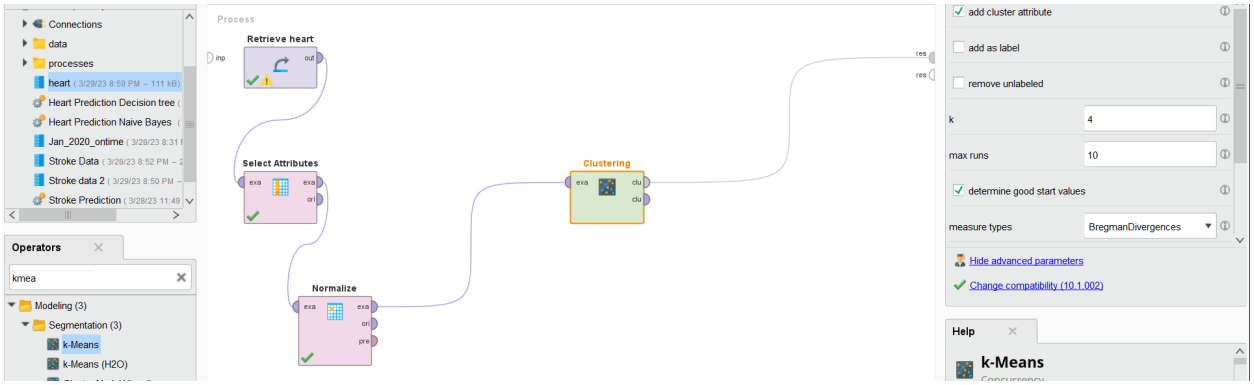


After running it will show:

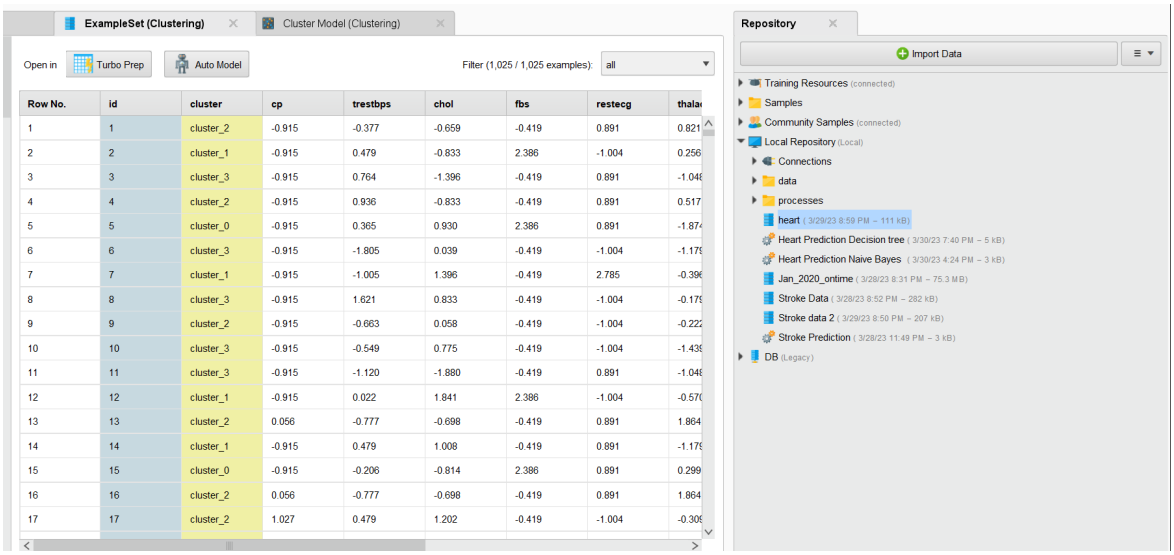


Step 6:Now drag K Means from Clustering

Step 7:Select respecting k value that you want



After running, the following output will be displayed.

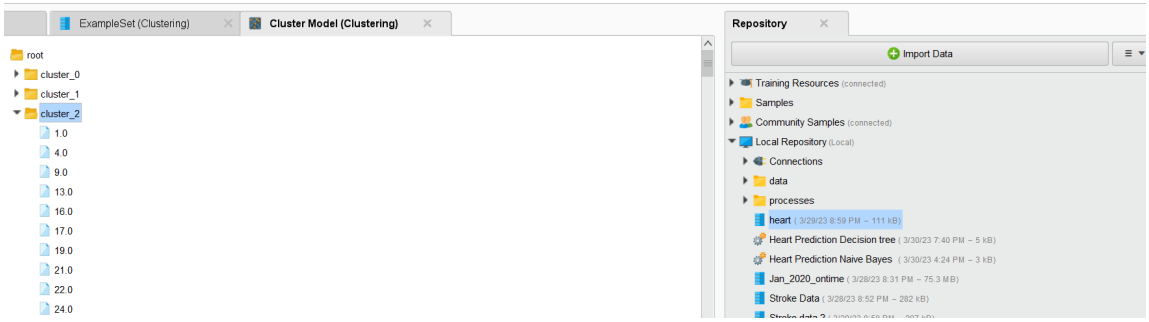


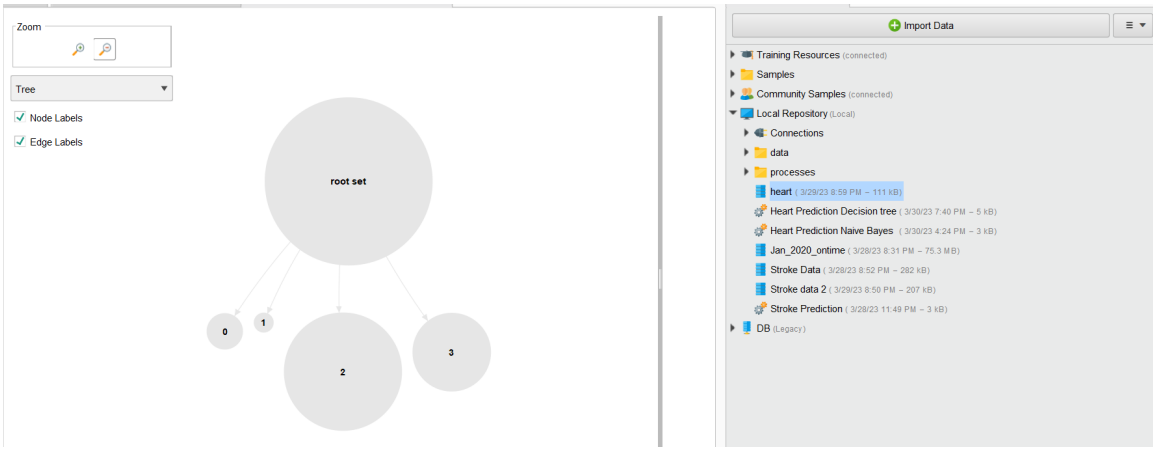
Summary of Clustering Model

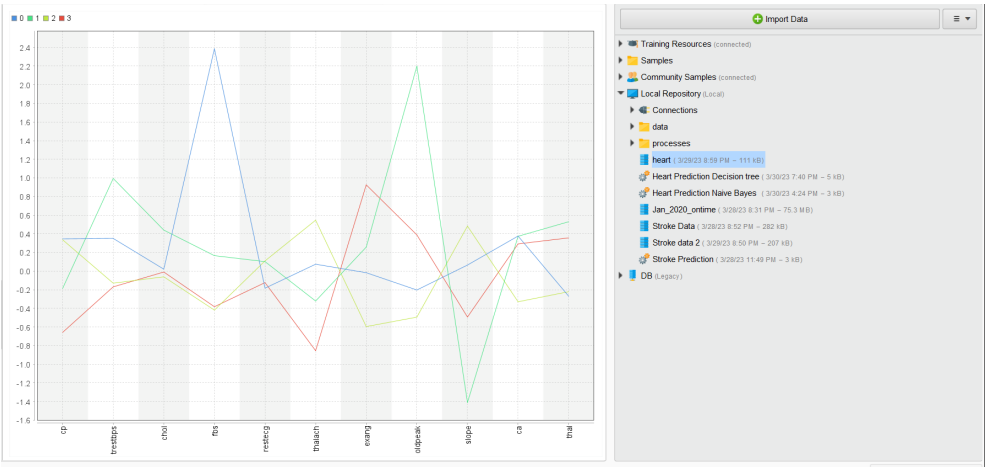
Cluster Model

```
Cluster 0: 134 items
Cluster 1: 72 items
Cluster 2: 509 items
Cluster 3: 310 items
Total number of items: 1025
```

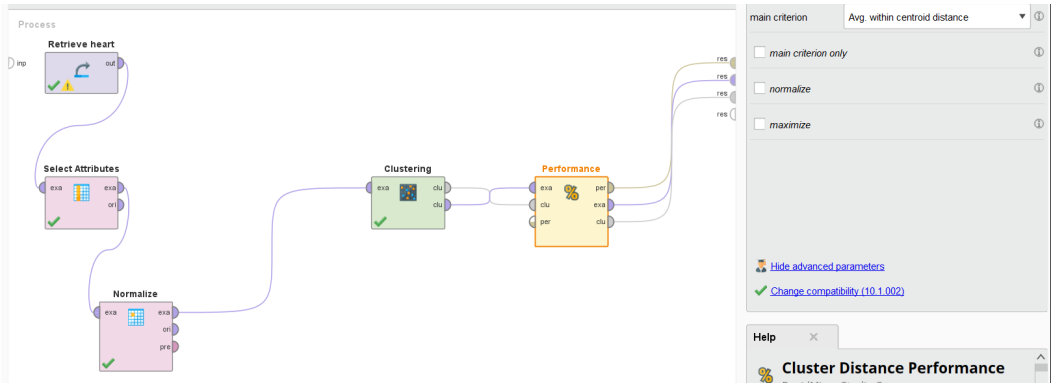
This the folder view of Clusters

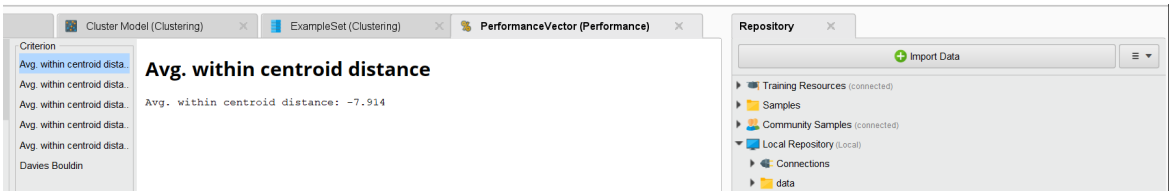


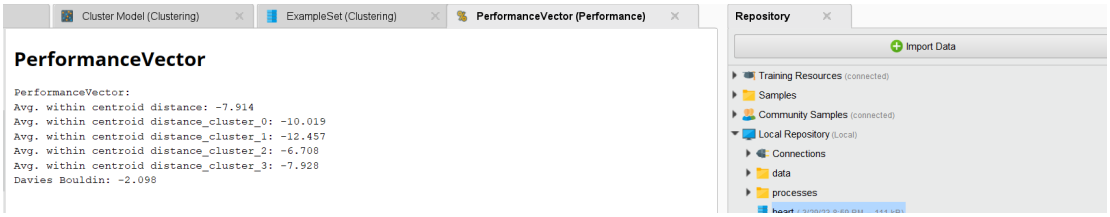


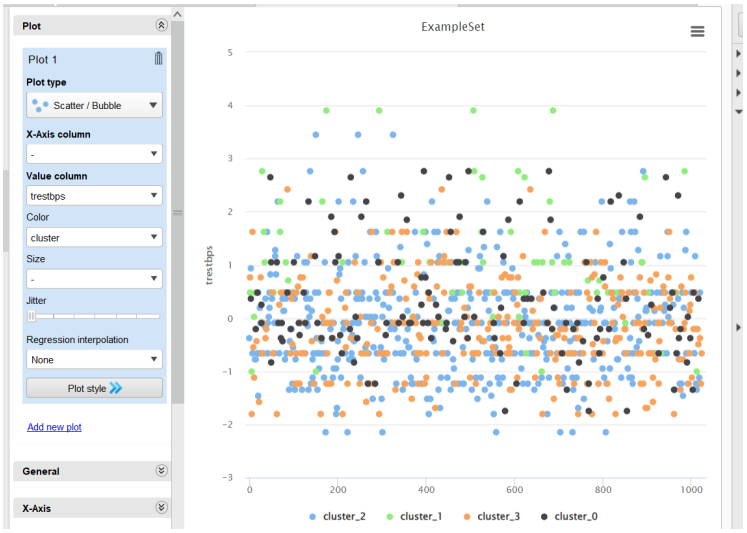


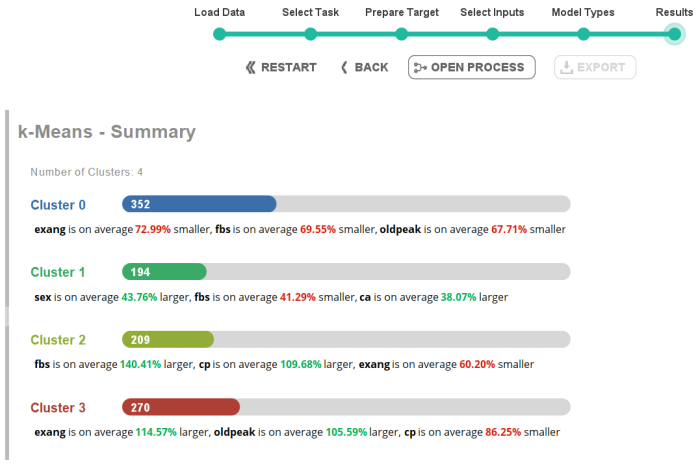
Step 7:Search performance distance and then arrange as shown in below











K Means Clustering using Python

- Importing dataset

```
import numpy as np # to handle numeric data
import matplotlib.pyplot as plt # for visualization
import pandas as pd # for handling dataframe
#Import the libraries
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sb
```

```
[2] ourData = pd.read_csv('heart.csv') # read the data
    ourData.head() # print the
```

	age	sex	cp	trestbps	chol	fbs	restecg	thalach	exang	oldpeak	slope	ca	thal	target
0	52	1	0	125	212	0	1	168	0	1.0	2	2	3	0
1	53	1	0	140	203	1	0	155	1	3.1	0	0	3	0
2	70	1	0	145	174	0	1	125	1	2.6	0	0	3	0
3	61	1	0	148	203	0	1	161	0	0.0	2	1	3	0
4	62	0	0	138	294	1	1	106	0	1.9	1	3	2	0

- Importing K means from sklearn

```
[3] from sklearn.cluster import KMeans
```

```
X = ourData[['cp','trestbps','chol','fbs','restecg','thalach','exang','oldpeak','slope','ca','thal']].copy()
```

```
[5] for i in range(1, 11):
        kmeans = KMeans(n_clusters=i, random_state=0)
        kmeans.fit(X)
```

```
wcss= []
for i in range(1, 11):
    kmeans = KMeans(n_clusters=i, init='k-means++',random_state=42)
    kmeans.fit(X)
    wcss.append(kmeans.inertia_)
```

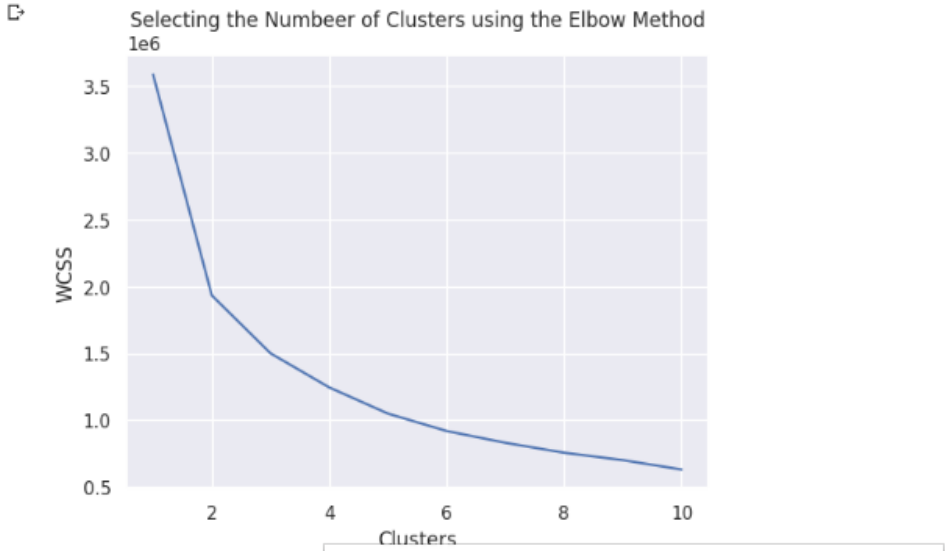
```
import matplotlib.pyplot as plt
import seaborn as sns
```

```
[8] sns.set()
```

- Selecting number of clusters using wcss

```
[8] sns.set()
```

```
plt.plot(range(1, 11), wcss)
plt.title('Selecting the Numbeer of Clusters using the Elbow Method')
plt.xlabel('Clusters')
plt.ylabel('WCSS')
plt.show()
```



- Using Gaussian Mixture to display the clusters

```
[10] from sklearn.mixture import GaussianMixture
```

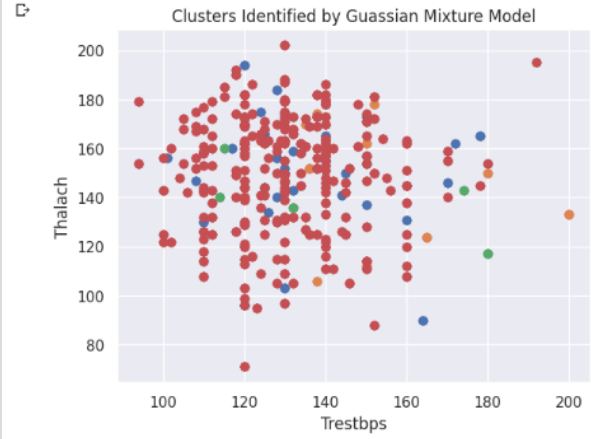
```
[15] from sklearn.mixture import GaussianMixture
n_clusters = 4
gmm_model = GaussianMixture(n_components=n_clusters)
gmm_model.fit(X)
```

```
GaussianMixture
GaussianMixture(n_components=4)
```

```
cluster_labels = gmm_model.predict(X)
X = pd.DataFrame(X)
X['cluster'] = cluster_labels
```

```
for k in range(0,n_clusters):
    data = X[X["cluster"]==k]
    plt.scatter(data["trestbps"],data["thalach"])

plt.title("Clusters Identified by Guassian Mixture Model")
plt.ylabel("Thalach")
plt.xlabel("Trestbps")
plt.show()
```



Conclusion: We have successfully implemented K Means clustering algorithm using Rapid Miner and Python and compared their results.