K Means Clustering in Big Mart Sale

- Data set are from here (https://drive.google.com/file/d/1ZzEouo7lRJvajxK6jLM2K_p9xAwGw1tS/view).
- More info about the data here (https://datahack.analyticsvidhya.com/contest/practice-problem-big-mart-sales-iii/?utm_source=blog&utm_medium=comprehensive-guide-k-means-clustering).

In [ ]:

```
### Import Libs
```

In [2]:

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
```

In [3]:

```
### Load Data set
```

In [4]:

```
Data_org = pd.read_csv('data/clustering.csv')
```

In [5]:

```
print(Data_org.shape)
Data_org.head(4)
```

```
(381, 13)
```

Out[5]:

	Loan_ID	Gender	Married	Dependents	Education	Self_Employed	ApplicantIncome	Coappl
0	LP001003	Male	Yes	1	Graduate	No	4583	
1	LP001005	Male	Yes	0	Graduate	Yes	3000	
2	LP001006	Male	Yes	0	Not Graduate	No	2583	
3	LP001008	Male	No	0	Graduate	No	6000	

Here we only take two variables from the data – “LoanAmount” and “ApplicantIncome”. This will make it easy to visualize the steps as well. Let’s pick these two variables and visualize the data points:

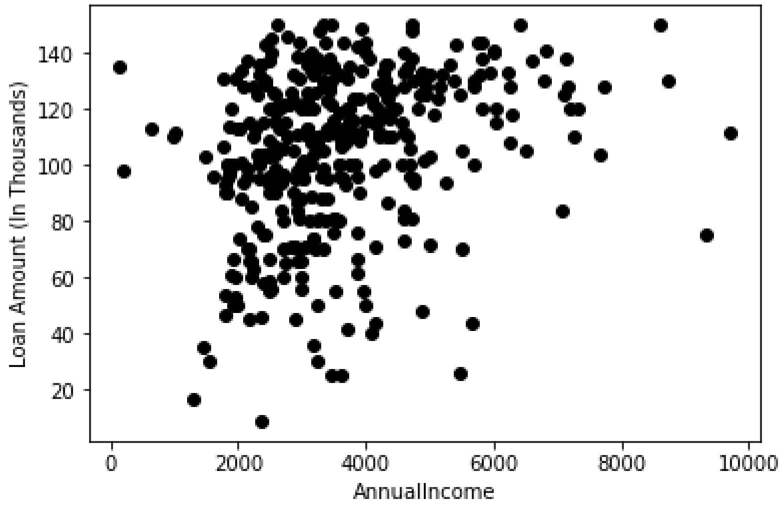
In [6]:

```
X = Data_org[["LoanAmount","ApplicantIncome"]]
```

Visualise data points

```
In [7]: plt.scatter(X["ApplicantIncome"],X["LoanAmount"],c='black')
        plt.xlabel('AnnualIncome')
        plt.ylabel('Loan Amount (In Thousands)')
```

```
Out[7]: Text(0, 0.5, 'Loan Amount (In Thousands)')
```



```
In [8]: X.head(5)
```

Out[8]:

	LoanAmount	ApplicantIncome
0	128.0	4583
1	66.0	3000
2	120.0	2583
3	141.0	6000
4	95.0	2333

Scale the data

```
In [9]: from sklearn.preprocessing import StandardScaler
        scale = StandardScaler()
        scale.fit(X)
        scaled_arr = scale.transform(X)
```

```
C:\Users\FirouzehPC\Anaconda3\lib\site-packages\sklearn\preprocessing\data.p
y:625: DataConversionWarning: Data with input dtype int64, float64 were all c
onverted to float64 by StandardScaler.
  return self.partial_fit(X, y)
C:\Users\FirouzehPC\Anaconda3\lib\site-packages\ipykernel_launcher.py:4: Data
ConversionWarning: Data with input dtype int64, float64 were all converted to
float64 by StandardScaler.
  after removing the cwd from sys.path.
```

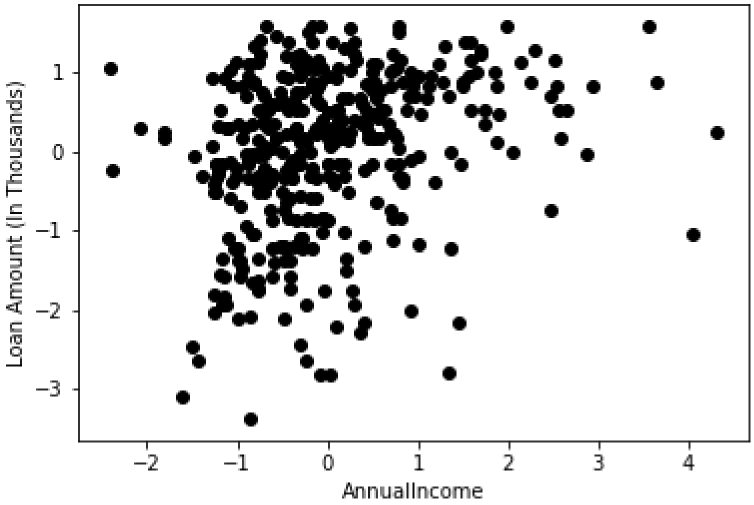
In [10]:
```
Xscaled = pd.DataFrame(data=scaled_arr, columns= X.columns)
Xscaled.head(4)
```

Out[10]:

	LoanAmount	ApplicantIncome
0	0.812575	0.707469
1	-1.376596	-0.408932
2	0.530102	-0.703019
3	1.271595	1.706799

In [11]:
```
plt.scatter(Xscaled["ApplicantIncome"],Xscaled["LoanAmount"],c='black')
plt.xlabel('AnnualIncome')
plt.ylabel('Loan Amount (In Thousands)')
```

Out[11]:
```
Text(0, 0.5, 'Loan Amount (In Thousands)')
```



In [ ]:
```
```

In [113]:
```
from sklearn.cluster import KMeans
```

In [154]:
```
k = 3
```

In [171]:
```
model = KMeans(n_clusters=k)
model.fit(Xscaled)
```

Out[171]:
```
KMeans(algorithm='auto', copy_x=True, init='k-means++', max_iter=300,
    n_clusters=3, n_init=10, n_jobs=None, precompute_distances='auto',
    random_state=None, tol=0.0001, verbose=0)
```

In [172]:
```
labels = model.labels_
centroids = model.cluster_centers_
```

In [173]:
```
centroids.shape
```

Out[173]:
```
(3, 2)
```

In [174]:

```
centroids
```

Out[174]:

```
array([[ 0.40863783, -0.41159803],
       [-1.39880054, -0.38169671],
       [ 0.64233436,  1.42076412]])
```

In [175]:

```
model.inertia_
```

Out[175]:

```
286.5761231062562
```

In [176]:

```
from sklearn.metrics import silhouette_score, silhouette_samples
silhouette_score(X,model.labels_)
```

Out[176]:

```
0.11977875631561362
```

In [177]:

```
silh0 = silh_samples[labels==0]
print(silh0.shape)
silh0[silh0>0.5].shape
```

```
(200,)
```

Out[177]:

```
(151,)
```

In [178]:

```
silh1 = silh_samples[labels==1]
print(silh1.shape)
silh1[silh1>0.5].shape
```

```
(97,)
```

Out[178]:

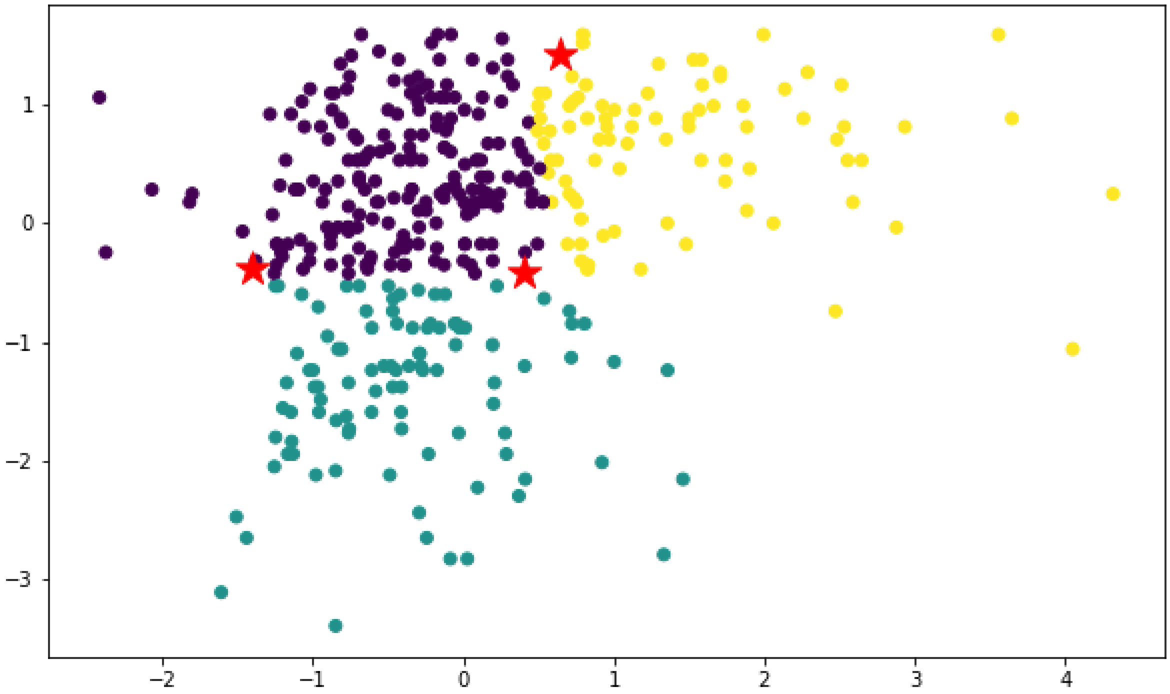
```
(83,)
```

In [179]:

```
fig, ax = plt.subplots(figsize=(10, 6))
plt.scatter(Xscaled["ApplicantIncome"], Xscaled["LoanAmount"], c=labels)
plt.scatter(centroids[:,0], centroids[:,1], marker='*', s=300, c='r', label='c
entroid')
```

Out[179]:

```
<matplotlib.collections.PathCollection at 0x1efec582fd0>
```

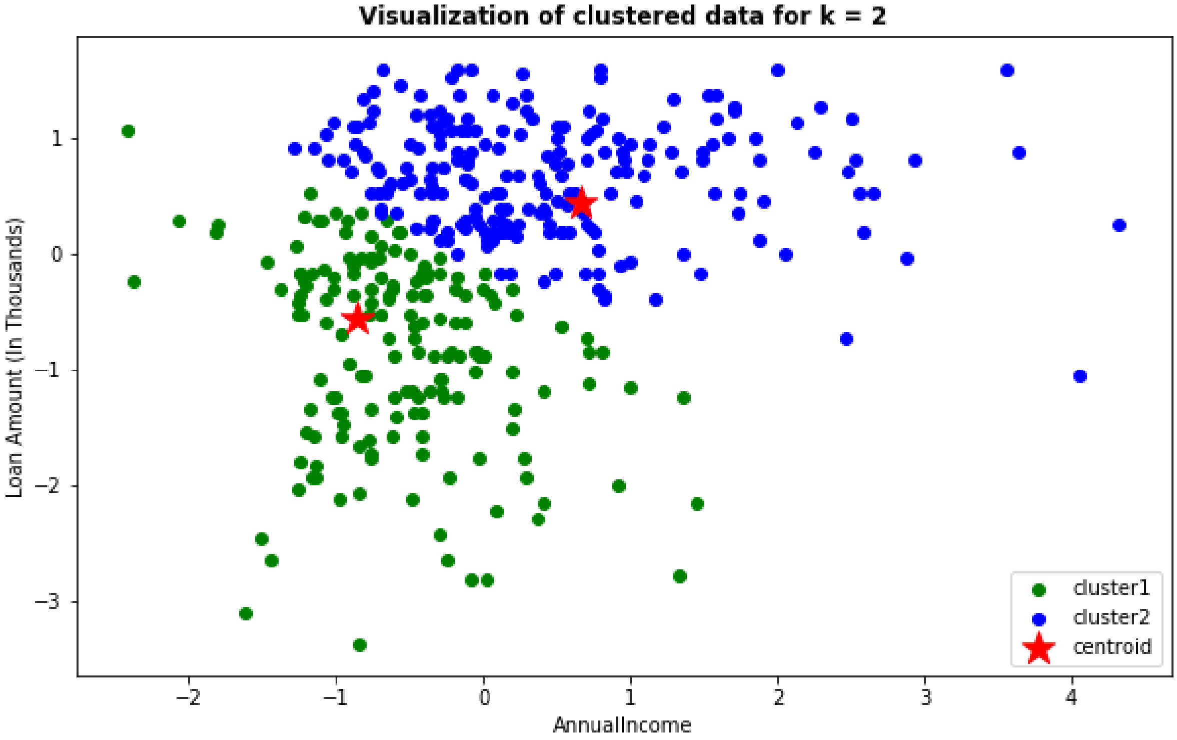


In [21]:

```
fig, ax = plt.subplots(figsize=(10, 6))
plt.scatter(Xscaled[labels==0]["ApplicantIncome"],Xscaled[labels==0]["LoanAmou
nt"],c='green', label= 'cluster1')
plt.scatter(Xscaled[labels==1]["ApplicantIncome"],Xscaled[labels==1]["LoanAmou
nt"],c='blue', label= 'cluster2')

plt.scatter(centroids[:,0], centroids[:,1], marker='*', s=300, c='r', label='c
entroid')

plt.xlabel('AnnualIncome')
plt.ylabel('Loan Amount (In Thousands)')
plt.title('Visualization of clustered data for k = {}'.format(k), fontweight=
'bold')

plt.legend(loc =4)
```

Out[21]:

```
<matplotlib.legend.Legend at 0x1efe1ff96d8>
```



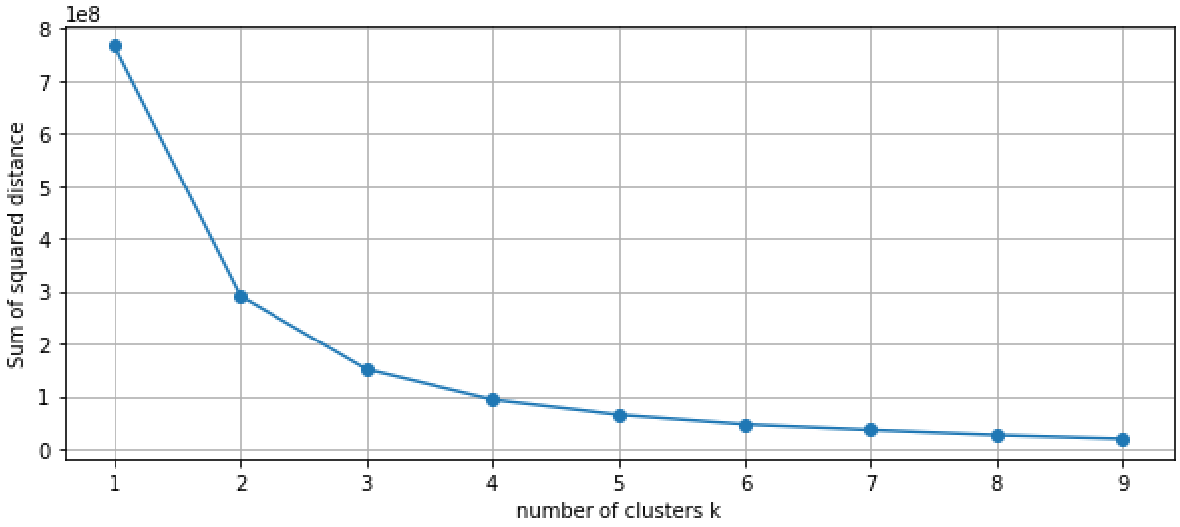
In [27]:

```
SSE =[]
list_k = list(range(1,10))
print(list_k)
for k in list_k:
    model = KMeans(n_clusters=k)
    model.fit(X)
    SSE.append(model.inertia_)
```

```
[1, 2, 3, 4, 5, 6, 7, 8, 9]
```

In [39]:

```
## plot SSE against K
plt.figure(figsize=(10,4))
plt.plot(list_k, SSE, marker ='o')
plt.xlabel('number of clusters k')
plt.ylabel('Sum of squared distance')
plt.grid(True)
```



In [43]: