Predicting IBM Employee Attrition Python Jupyter Notebook

Part 5 - Use k-Means Clustering to Group Employees into Clusters

Import numpy and pandas.

In [1]:

```
import numpy as np
import pandas as pd
```

Import data visualization libraries and set %matplotlib inline.

In [2]:

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

Import churn modeling pickle file into a Pandas dataframe called churn_model2.

In [3]:

```
churn_model2 = pd.read_pickle('../data/churn_modeling_data.pickle')
```

Drop Churn target variable and include only predictor features in churn_model2 dataframe for k-means clustering.

In [4]:

```
churn_pred_feat = churn_model2.drop(['Churn'], axis=1)
```

Center and scale all predictor features.

In [5]:

```
from sklearn.preprocessing import StandardScaler
```

In [6]:

```
scaler = StandardScaler()
churn_pred_feat_scaled = scaler.fit_transform(churn_pred_feat)
```

Using scaled predictor features, determine how many clusters will yield the highest silhouette score combined with the lowest possible inertia.

In [7]:

```
from sklearn.cluster import KMeans
from sklearn import metrics
```

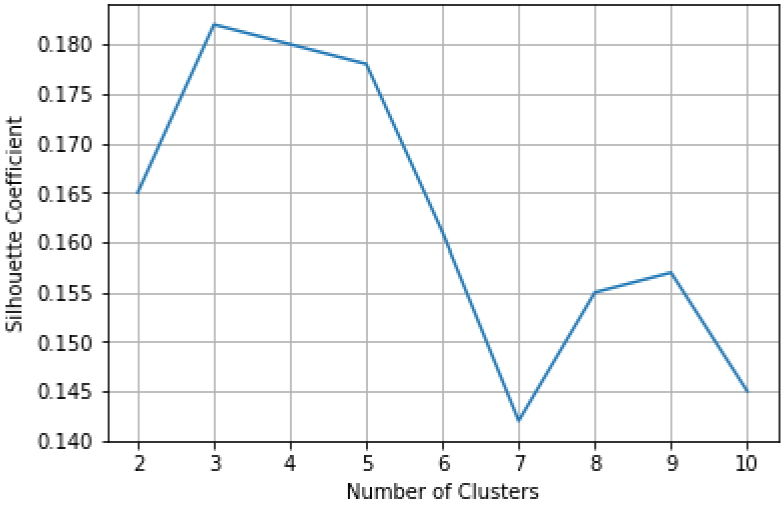
In [8]:

```
k_range2 = range(2, 11)

sil_scores1 = []
clus_inertia1 = []

for k in k_range2:
    km = KMeans(n_clusters=k, random_state=123)
    km.fit(churn_pred_feat_scaled)
    sil_scores1.append(metrics.silhouette_score(churn_pred_feat_scaled, km.labels_
    clus_inertia1.append(km.inertia_.round(3))

print(sil_scores1)
print(clus_inertia1)
```

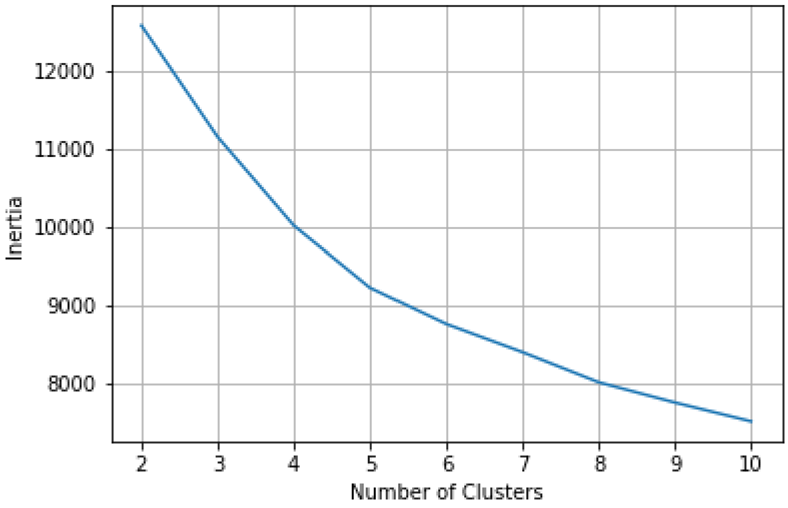
```
[0.165, 0.182, 0.18, 0.178, 0.161, 0.142, 0.155, 0.157, 0.145]
[12584.437, 11155.616, 10019.114, 9222.795, 8757.186, 8395.91, 8009.325, 7749.4
54, 7508.134]
```

In [9]:

```
plt.plot(k_range2, sil_scores1)
plt.xlabel('Number of Clusters')
plt.ylabel('Silhouette Coefficient')
plt.grid(True)
```



In [10]:
```
plt.plot(k_range2, clus_inertia1)
plt.xlabel('Number of Clusters')
plt.ylabel('Inertia')
plt.grid(True)
```



- The employees in the churn dataframe can be grouped into 3 clusters using k-means clustering and features for predicting churn.

Group employees in churn_model2 dataframe into 3 clusters.

In [11]:
```
kmeans_3s = KMeans(n_clusters=3, random_state=1)
kmeans_3s.fit(churn_pred_feat_scaled)
churn_pred_feat['cluster'] = kmeans_3s.labels_
churn_pred_feat.sort_values('cluster').head()
```

Out[11]:

	Age	BusTravLevel	DistanceFromHome	EnvironmentSatisfaction	JobInvolvement	MonthlyInc
1087	34	1	7	1	2	2
1308	38	1	2	1	0	5
1391	38	1	1	0	1	2
697	29	2	20	2	2	2
238	32	1	4	2	2	3

Inspect cluster traits by calculating cluster centers as mean of features for predicting churn.

In [12]:

```
churn_pred_feat.sort_values('cluster')
churn_pred_feat.groupby('cluster').mean()
```

Out[12]:

	Age	BusTravLevel	DistanceFromHome	EnvironmentSatisfaction	JobInvolvement	Mo
cluster						
0	30.361446	1.216867	8.662651	1.734940	1.650602	
1	37.899476	1.072251	9.356021	1.716230	1.752880	
2	36.027778	1.092593	8.932870	1.731481	1.694444	

Obtain number of employees for each cluster.

In [13]:

```
churn_pred_feat.cluster.value_counts()
```

Out[13]:

```
1    955
2    432
0     83
Name: cluster, dtype: int64
```