import libraries

In [4]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
sns.set()
from sklearn.cluster import KMeans
```

import dataset

In [5]:
```
data = pd.read_csv("H:\Level 4 Information Systems\Plastikat\Plastikat Data\K_means_companies_clustring.csv")
data
```

Out[5]:

	name	longitude	latitude	governorate
0	Schmitt - Jacobi	244	94	Cairo
1	Haley Group	361	111	Cairo
2	Wilkinson - Fahey	145	20	Cairo
3	Marks - Rice	180	83	Cairo
4	Ruecker Group	451	162	Cairo
...	...	...	...	...
151	Joyce Abshire	1225	1067	Alexandria
152	Leola Buckridge	1270	1414	Alexandria
153	Marcel Bins	1392	1241	Alexandria
154	Willis Hagenes	1083	1415	Alexandria
155	Ms. Edmond Gottlieb	1004	1005	Alexandria

156 rows × 4 columns

data encoding

In [6]:
```
df = data.copy()

df['governorate'] = df['governorate'].map({'Cairo':0,'Giza':1,'Alexandria':2})
df.head(23)
```

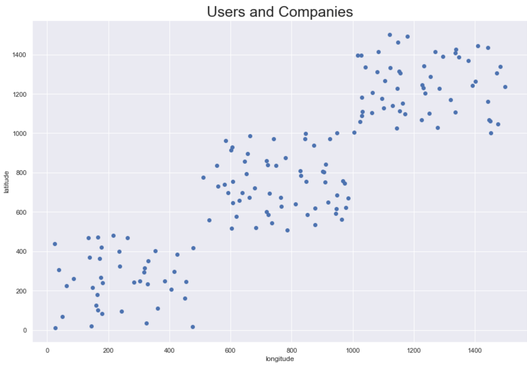
Out[6]:

	name	longitude	latitude	governorate
0	Schmitt - Jacobi	244	94	0
1	Haley Group	361	111	0
2	Wilkinson - Fahey	145	20	0
3	Marks - Rice	180	83	0
4	Ruecker Group	451	162	0
5	Hauck - Strosin	405	207	0
6	Emmerich, Kerluke and Adams	166	100	0
7	Gerlach - Berge	87	261	0
8	Walter and Sons	319	314	0
9	Marks, O'Hara and Schroeder	415	297	0
10	Beahan and Sons	63	224	0
11	Larson, Jast and Wiegand	303	250	0
12	Hauck, Adams and Durgan	49	69	0
13	Yundt, Goldner and Renner	475	18	0
14	Witting Group	316	295	0
15	Corwin, Wiegand and Mertz	149	214	0
16	Schultz, O'Connell and Koelpin	25	438	0
17	Ella Robel	182	240	0
18	Randal Olson	139	368	0
19	Chet Boehm	175	267	0
20	Maurice Macejkovic MD	216	481	0
21	Reanna Vandervort MD	263	469	0
22	Miss Dorothy Jacobi	171	363	0

plot data

In [7]:
```
plt.figure(figsize = (15,10))
plt.scatter(df.longitude, df['latitude'])
plt.xlabel('longitude')
plt.ylabel('latitude')
plt.title('Users and Companies',size=25)
```

Out[7]:
```
Text(0.5, 1.0, 'Users and Companies')
```



Kmeans Clustering

In [9]:
```
km = KMeans(n_clusters=3)
y_predicted = km.fit_predict(df[['longitude','latitude']])
y_predicted
```

Out[9]:
```
array([1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1, 1,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2, 2,
       2, 2])
```

In [10]:
```
df['cluster'] = y_predicted
df.sample(23)
```

Out[10]:

	name	longitude	latitude	governorate	cluster
96	Gillian Heidenreich	912	841	1	0
40	Eunice Schiller	284	241	0	1
45	Skiles - Heller	606	929	1	0
147	Shemar Volkman	1278	1028	2	2
29	Elyssa Tremblay III	238	323	0	1
16	Schultz, O'Connell and Koelpin	25	438	0	1
3	Marks - Rice	180	83	0	1
5	Hauck - Strosin	405	207	0	1
85	Sigurd Nicolas	510	776	1	0
123	Georgianna Schmeler	1029	1183	2	2
124	Gianni Hansen IV	1227	1245	2	2
108	Corwin, Huels and Harris	1378	1368	2	2
115	Rice - O'Hara	1145	1228	2	2
41	Braun LLC	949	685	1	0
129	Brandon Grady	1023	1057	2	2
26	Alvera Kirlin	426	384	0	1
95	Martina Hane	846	997	1	0
117	Waelchi - Koepp	1410	1444	2	2
55	Reichel - Farrell	663	985	1	0
0	Schmitt - Jacobi	244	94	0	1
54	Bahringer - Schmidt	580	740	1	0
146	Monica Adams	1122	1332	2	2
60	Aylin Metz	717	859	1	0

In [11]:
```
km.cluster_centers_
```

Out[11]:
```
array([[ 762.77966102,  741.50847458],
       [ 243.90243902,  258.65853659],
       [1228.28571429, 1238.19642857]])
```

In [12]:
```
df1 = df[df.cluster==0]
df2 = df[df.cluster==1]
df3 = df[df.cluster==2]
plt.figure(figsize = (15,10))
plt.scatter(df1.longitude, df1['latitude'],color='green',label='Cairo')
plt.scatter(df2.longitude, df2['latitude'],color='red',label='Giza')
plt.scatter(df3.longitude, df3['latitude'],color='blue',label='Alexandria')
plt.scatter(km.cluster_centers_[:,0],km.cluster_centers_[:,1], color='black',marker='+',label='centroid')
plt.xlabel('longitude')
plt.ylabel('latitude')
plt.title('Clustering Users and Companies per 3 Governorates',size=25)
plt.legend()
```

Out[12]:
```
<matplotlib.legend.Legend at 0x1aa95839d60>
```