Basics of Cluster Analysis

We explore the very basics of cluster analysis with k-means.

Import the Relevant Libraries

In [1]:

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

# Set the Styles to Seaborn
sns.set()

# Import the KMeans Module so We Can Perform k-Means Clustering With sklearn
from sklearn.cluster import KMeans
```

Load the Data

In [2]:

```
# Load the Country Clusters Data
data = pd.read_csv('Countries.csv')
```

In [3]:

```
# Check Out the Data Manually
data
```

Out[3]:

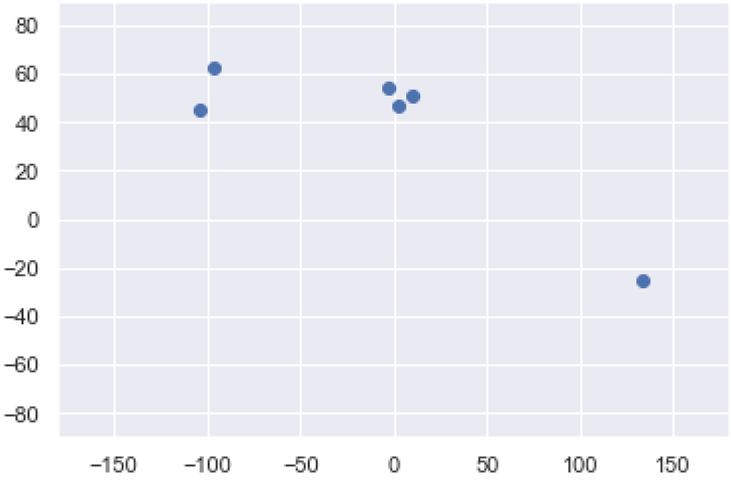
	Country	Latitude	Longitude	Language
0	USA	44.97	-103.77	English
1	Canada	62.40	-96.80	English
2	France	46.75	2.40	French
3	UK	54.01	-2.53	English
4	Germany	51.15	10.40	German
5	Australia	-25.45	133.11	English

Plot the Data

In [4]:

```
# Use the Simplest Code Possible to Create a Scatterplot Using the Longitude and Latitu
# Note: In Order to Reach a Result Resembling the World Map, We Must Use the Longitude
plt.scatter(data['Longitude'], data['Latitude'])

# Set Limits of the Axes, Again to Resemble the World Map
plt.xlim(-180, 180)
plt.ylim(-90, 90)
plt.show
```

Out[4]:
```
<function matplotlib.pyplot.show(close=None, block=None)>
```



Select the Features

In [5]:
```
# iloc is a Method Used to 'Slice' Data
# 'slice' is Not Technically Correct as There Are Methods 'slice' Which Are a Bit Differ
# The Term Used by pandas Is 'Selection by Position'
# The First Argument Identifies the Rows to Keep
# The First Argument Identifies the Columns to Keep
# When Choosing the Columns (e.g. a:b, We Will Keep Columns a, a + 1, a + 2,..., b - 1
x = data.iloc[:, 1:3]
# For This Particular Case, We Are Choosing Columns 1 and 2
```

In [6]:
```
# Check If It Worked Correctly
x
```

Out[6]:

	Latitude	Longitude
0	44.97	-103.77
1	62.40	-96.80
2	46.75	2.40
3	54.01	-2.53
4	51.15	10.40
5	-25.45	133.11

Clustering

This is the part of the sheet which deals with the actual clustering.

In [7]:
```
# Create an Object Called kmeans
# The Number In the Brackets Is K, or the Number of Clusters We Are Aiming For
kmeans = KMeans(3)
```

```
In [8]:
# Fit the Input Data (i.e. Cluster the Data In X In K Clusters)
kmeans.fit(x)
```

```
Out[8]: KMeans(n_clusters=3)
```

Clustering Results

There are many ways to do this part. This is the most illustrative one.

```
In [9]:
# Create a Variable Which Will Contain the Predicted Clusters For Each Observation
identified_clusters = kmeans.fit_predict(x)

# Check the Result
identified_clusters
```

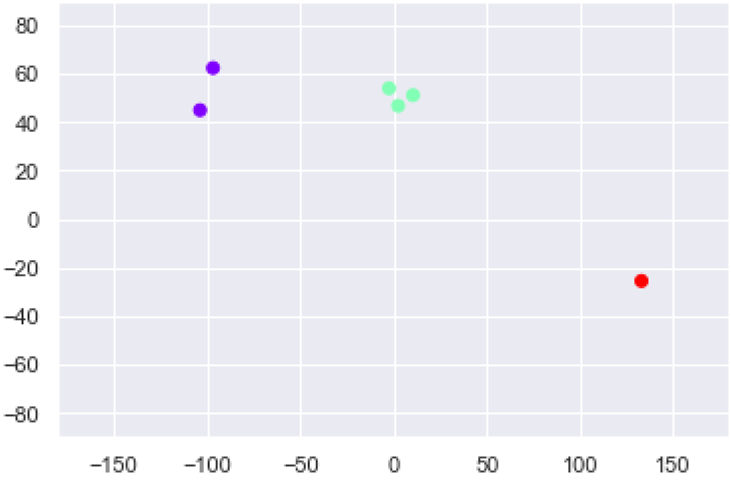
```
Out[9]: array([0, 0, 1, 1, 1, 2])
```

```
In [10]:
# Create a Copy of the Data
data_with_clusters = data.copy()

# Create a New Series Containing the Identified Cluster For Each Observation
data_with_clusters['Cluster'] = identified_clusters

# Check the Result
data_with_clusters
```

Out[10]:

	Country	Latitude	Longitude	Language	Cluster
0	USA	44.97	-103.77	English	0
1	Canada	62.40	-96.80	English	0
2	France	46.75	2.40	French	1
3	UK	54.01	-2.53	English	1
4	Germany	51.15	10.40	German	1
5	Australia	-25.45	133.11	English	2

```
In [11]:
# Plot the Data Using the Longitude and the Latitude
# c (Color) Is an Argument Which Could be Coded With a Variable
# The Variable In This Case Has Values 0, 1, and 2, Indicating to plt.scatter That Ther
# All Points In Cluster 0 Will be the Same Color, All Points In Cluster 1 Another, etc.
# cmap is the Color Map. Rainbow Is a Nice One, but You Can Check Others Here: https://
plt.scatter(data_with_clusters['Longitude'], data_with_clusters['Latitude'], c = data_w
plt.xlim(-180, 180)
plt.ylim(-90, 90)
plt.show()
```


80
60
40
20
0
−20
−40
−60
−80
−150
−100
−50
0
50
100
150