KMeans EDA on Telecom Churn Data

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Research Question:

"To what extent can you accurately group customers into clusters based on customer cost, usage, internet service, contract type, and income and explore how many clusters are best?"

Show Python Version

In [1]:
```
import sys
sys.version_info
```

Out[1]:
```
sys.version_info(major=3, minor=8, micro=8, releaselevel='final', serial=0)
```

Import necessary libraries

In [2]:
```
import pandas as pd
from scipy.cluster.vq import kmeans, kmeans2
import seaborn as sns
from sklearn.preprocessing import MinMaxScaler
from numpy import random
```

Set the random seed to get the same results every run

In [3]:
```
random.seed(1234)
```

Import the original dataset

In [4]:
```
url = "C:/Users/tedda/Desktop/Data Science Portfolio/Machine Learning/Unsupervised Lear
churn_data = pd.read_csv(url)
churn_data.head()
```

Out[4]:

	CaseOrder	Customer_id	Interaction	UID	City	State	County
0	1	K409198	aa90260b-4141-4a24-8e36-b04ce1f4f77b	e885b299883d4f9fb18e39c75155d990	Point Baker	AK	Prince o Wales Hyde
1	2	S120509	fb76459f-c047-4a9d-8af9-e0f7d4ac2524	f2de8bef964785f41a2959829830fb8a	West Branch	MI	Ogemav
2	3	K191035	344d114c-3736-4be5-98f7-c72c281e2d35	f1784cfa9f6d92ae816197eb175d3c71	Yamhill	OR	Yamhi

	CaseOrder	Customer_id	Interaction	UID	City	State	County
3	4	D90850	abfa2b40-2d43-4994-b15a-989b8c79e311	dc8a365077241bb5cd5ccd305136b05e	Del Mar	CA	San Diego
4	5	K662701	68a861fd-0d20-4e51-a587-8a90407ee574	aabb64a116e83fdc4befc1fbab1663f9	Needville	TX	Fort Bend

5 rows × 50 columns

Index the dataset to remove unnecessary columns and split out the Churn column for future analysis

In [5]:
```
churn_indexed = churn_data[['Churn','MonthlyCharge','Bandwidth_GB_Year','Contract','Int
churn_yes = churn_indexed['Churn'] # split out the Churn column for future analysis
my_cols = set(churn_indexed.columns)
my_cols.remove('Churn')
churn_indexed = churn_indexed[my_cols] # removed all unnecessary columns
```

Create dummy columns for Categorical Variables by using .get_dummies() from pandas

In [6]:
```
churn_dummy = pd.get_dummies(data = churn_indexed)
```

Normalize the dataset and create the final dataframe to use for analysis

In [7]:
```
new_cols = set(churn_dummy.columns) # extract the column names
scaler = MinMaxScaler() # instantiate the MinMaxScaler() function
scaler.fit(churn_dummy) # fit the MinMaxScaler to our data
churn_normed = scaler.transform(churn_dummy) # transform our data
churn_df = pd.DataFrame(churn_normed, columns = new_cols) # create usable dataframe and
```

Describe the output dataset

In [8]:
```
churn_df.describe()
```

Out[8]:

	InternetService_None	MonthlyCharge	Income	Contract_Month-to-month	Bandwidth_GB_Year	Contr
count	10000.000000	10000.000000	10000.000000	10000.000000	10000.000000	1000
mean	0.440790	0.152612	0.462176	0.545600	0.210200	
std	0.204314	0.109069	0.312030	0.497941	0.407471	
min	0.000000	0.000000	0.000000	0.000000	0.000000	

	InternetService_None	MonthlyCharge	Income	Contract_Month-to-month	Bandwidth_GB_Year	Contr
25%	0.285469	0.073007	0.154347	0.000000	0.000000	
50%	0.416335	0.126945	0.446069	1.000000	0.000000	
75%	0.574531	0.204591	0.775420	1.000000	0.000000	
max	1.000000	1.000000	1.000000	1.000000	1.000000	

Export the cleaned, usable dataset

In [9]:
```
churn_df.to_csv("C:/Users/tedda/Desktop/Data Science Portfolio/Machine Learning/Unsuper
```

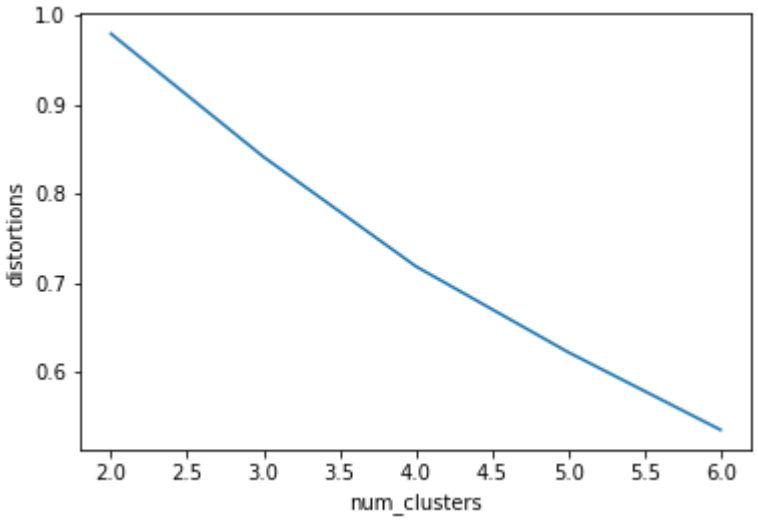
Create a For Loop to test different numbers of clusters in the data

In [10]:
```
num_clusters = range(2,7)
distortions = []
for i in num_clusters:
    cluster_centers,distortion = kmeans(churn_df, i)
    distortions.append(distortion)
```

Create a new dataframe to plot the distortion of each number of clusters

In [11]:
```
elbow_plot = pd.DataFrame({'num_clusters':num_clusters,'distortions':distortions})
sns.lineplot(x='num_clusters',y='distortions',data = elbow_plot)
```

Out[11]: <AxesSubplot:xlabel='num_clusters', ylabel='distortions'>



Decided to use k = 4 as there is a VERY slightly, visible elbow there. Use kmeans2 to plot the new cluster and get the labels

In [12]:
```
centroids, labels = kmeans2(churn_df, 4, minit='points')
```

Add our Churn column and the new labels into our dataframe for further analysis

In [13]:
```
churn_df['Churn']=churn_yes
churn_df['labels']=labels
```

Count the amount in each of our 4 clusters

In [14]:
```
churn_df['labels'].value_counts()
```

Out[14]:
```
1    3316
2    3037
3    2442
0    1205
Name: labels, dtype: int64
```

Export the final dataset for further analysis

In [15]:
```
churn_df.to_csv("C:/Users/tedda/Desktop/Data Science Portfolio/Machine Learning/Unsuper
```