In [1]:

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
import sklearn
from sklearn.decomposition import PCA
df = pd.read_csv("/Users/parth/Desktop/FeynnLabs/PROJECT_RESEARCH_2/mcdonalds.csv")
```

In [2]:

```
df.head()
```

Out[2]:

	yummy	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive	healthy	disgus
0	No	Yes	No	Yes	No	Yes	Yes	No	Yes	No	
1	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	
2	No	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	
3	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	
4	No	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	

In [3]:

```
df.tail()
```

Out[3]:

	yummy	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive	healthy	dis
1448	No	Yes	No	Yes	Yes	No	No	No	Yes	No	
1449	Yes	Yes	No	Yes	No	No	Yes	Yes	No	Yes	
1450	Yes	Yes	No	Yes	No	Yes	No	Yes	Yes	No	
1451	Yes	Yes	No	No	No	Yes	Yes	Yes	No	Yes	
1452	No	Yes	No	Yes	Yes	No	No	No	Yes	No	

In [4]:

```
df.describe()
```

Out[4]:

	Age
count	1453.000000
mean	44.604955
std	14.221178
min	18.000000
25%	33.000000
50%	45.000000
75%	57.000000
max	71.000000

In [5]:

```
df.isnull().sum()
```

Out[5]:

```
yummy             0
convenient        0
spicy             0
fattening         0
greasy            0
fast              0
cheap             0
tasty             0
expensive         0
healthy           0
disgusting        0
Like              0
Age               0
VisitFrequency    0
Gender            0
dtype: int64
```

In [6]:

```
df.info()
```

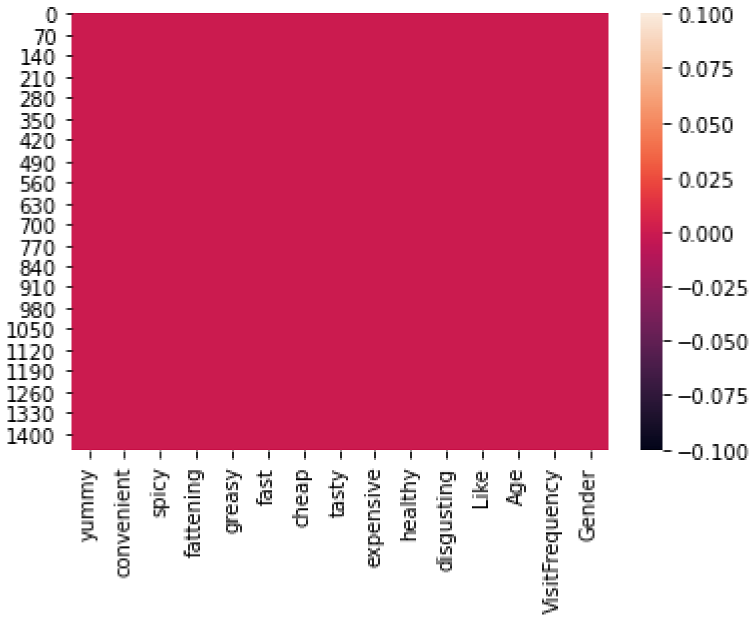
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 1453 entries, 0 to 1452
Data columns (total 15 columns):
 #   Column          Non-Null Count  Dtype 
---  ------          --------------  ----- 
 0   yummy           1453 non-null   object
 1   convenient      1453 non-null   object
 2   spicy           1453 non-null   object
 3   fattening       1453 non-null   object
 4   greasy          1453 non-null   object
 5   fast            1453 non-null   object
 6   cheap           1453 non-null   object
 7   tasty           1453 non-null   object
 8   expensive       1453 non-null   object
 9   healthy         1453 non-null   object
 10  disgusting      1453 non-null   object
 11  Like            1453 non-null   object
 12  Age             1453 non-null   int64 
 13  VisitFrequency  1453 non-null   object
 14  Gender          1453 non-null   object
dtypes: int64(1), object(14)
memory usage: 170.4+ KB
```

In [7]:

```
sns.heatmap(df.isnull()) # checking for null values in our dataset
```

Out[7]:

```
<AxesSubplot:>
```



In [8]:

```
df.columns
```

Out[8]:

```
Index(['yummy', 'convenient', 'spicy', 'fattening', 'greasy', 'fast', 'chea
p',
       'tasty', 'expensive', 'healthy', 'disgusting', 'Like', 'Age',
       'VisitFrequency', 'Gender'],
      dtype='object')
```

In [9]:

```
data=df.iloc[:,1:11]
data.head()
```

Out[9]:

	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive	healthy	disgusting
0	Yes	No	Yes	No	Yes	Yes	No	Yes	No	No
1	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	No	No
2	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No
3	Yes	No	Yes	Yes	Yes	Yes	Yes	No	No	Yes
4	Yes	No	Yes	Yes	Yes	Yes	No	No	Yes	No

In [10]:

```
# printing max and min age of the customer
print(df['Age'].max())
print(df['Age'].min())
```

```
71
18
```

In [11]:

```
# checking the number of male and female who visits the shop
print(df['Gender'].value_counts())
arr = df['Gender'].value_counts()
```

```
Female    788
Male      665
Name: Gender, dtype: int64
```

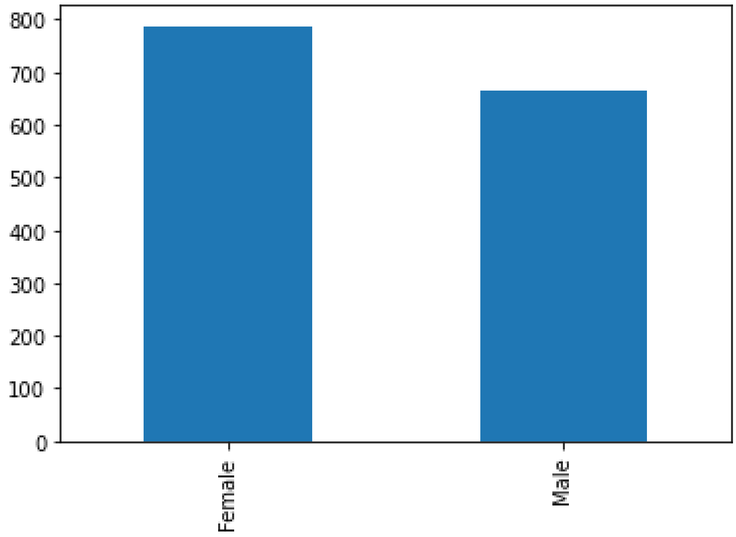
In [ ]:

In [12]:

```
df['Gender'].value_counts().plot(kind='bar')   # here female count is more than male count
```

Out[12]:

```
<AxesSubplot:>
```



In [13]:

```
# checking the count of healthy and non healthy food   ( here yes represents healthy foood)
healthy_nonhealthy=df['healthy'].value_counts()
healthy_nonhealthy
```

Out[13]:

```
No     1164
Yes     289
Name: healthy, dtype: int64
```

In [14]:

```
# Encoding technique
# we had only one numerical feature in our dataset
df.replace({'tasty':{'Yes':1,'No':0}},inplace=True)
df.replace({'expensive':{'Yes':1,'No':0}},inplace=True)
df.replace({'healthy':{'Yes':1,'No':0}},inplace=True)
df.replace({'disgusting':{'Yes':1,'No':0}},inplace=True)
df.replace({'Like':{'I love it!+5':1,'I hate it!-5':2}},inplace=True)
df.replace({'Gender':{'Male':1,'Female':0}},inplace=True)
df.replace({'yummy':{'Yes':1,'No':0}},inplace=True)
df.replace({'convenient':{'Yes':1,'No':0}},inplace=True)
df.replace({'spicy':{'Yes':1,'No':0}},inplace=True)
df.replace({'fattening':{'Yes':1,'No':0}},inplace=True)
df.replace({'greasy':{'Yes':1,'No':0}},inplace=True)
df.replace({'fast':{'Yes':1,'No':0}},inplace=True)
df.replace({'cheap':{'Yes':1,'No':0}},inplace=True)
df.replace({'VisitFrequency':{'Every three months':1,'Never':0,'Once a month':2,'Once a yea
```

In [15]:

```
#lets print our dataset again
df.head()  # returns the top 5 rows of the datset
```

Out[15]:

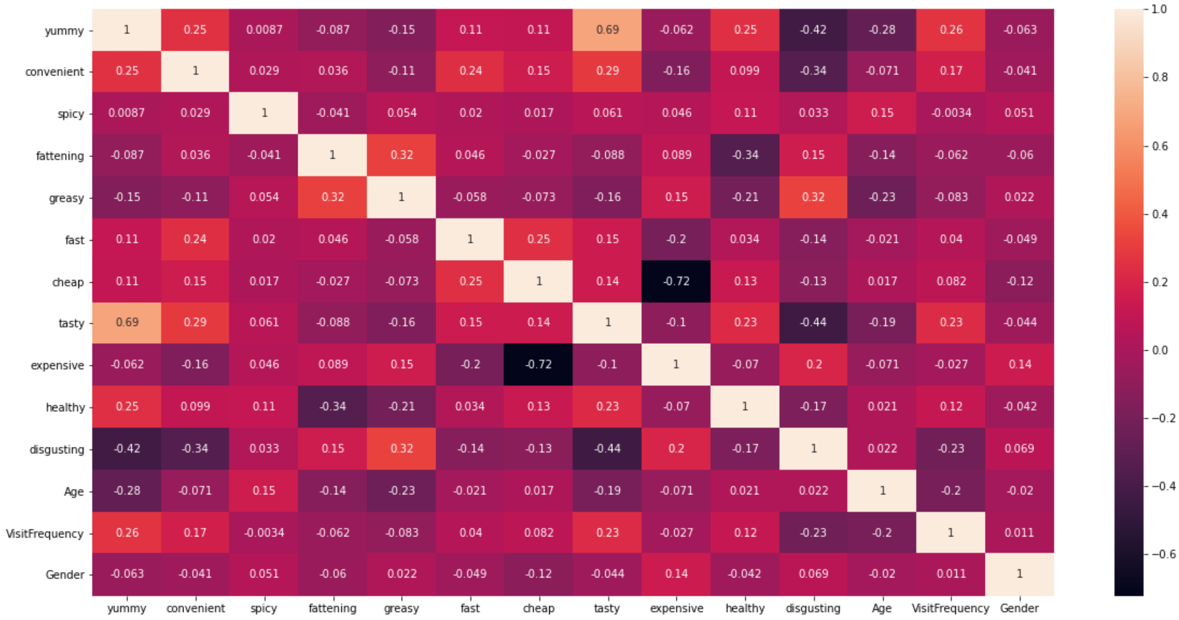
	yummy	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive	healthy	disgus
0	0	1	0	1	0	1	1	0	1	0	
1	1	1	0	1	1	1	1	1	1	0	
2	0	1	1	1	1	1	0	1	1	1	
3	1	1	0	1	1	1	1	1	0	0	
4	0	1	0	1	1	1	1	0	0	1	

In [16]:

```
# Checking the correlation of the dataset
correlation=df.corr()
f,ax=plt.subplots(figsize=(20,10))
sns.heatmap(correlation,annot=True)
```

Out[16]:

```
<AxesSubplot:>
```



K-Means

In [17]:

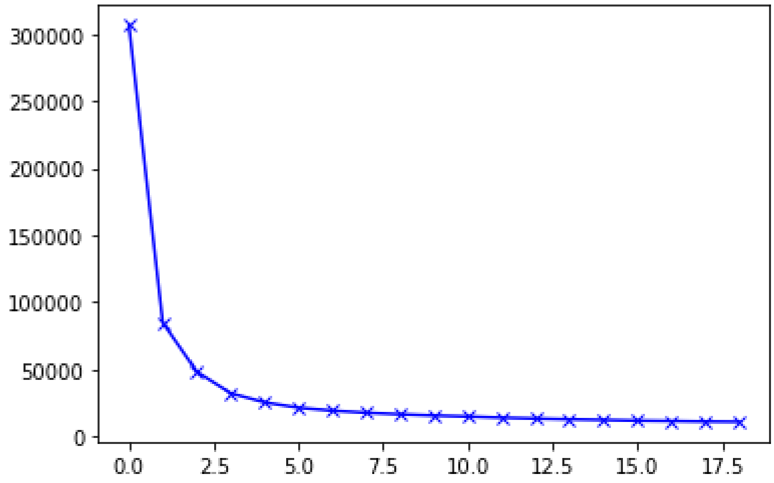
```
# kmeans algorithm
# elbow method (how many clusters u should have)
# elbow method graph ( for selecting the no of clusters )
from sklearn.cluster import KMeans
scores=[]
range_values=range(1,20)
for i in range_values:
  kmean = KMeans(n_clusters=i)
  kmean.fit(df)
  scores.append(kmean.inertia_)

plt.plot(scores,'bx-')
```

```
C:\Users\HP\anaconda3\lib\site-packages\sklearn\cluster\_kmeans.py:881: User
Warning: KMeans is known to have a memory leak on Windows with MKL, when the
re are less chunks than available threads. You can avoid it by setting the e
nvironment variable OMP_NUM_THREADS=6.
  warnings.warn(
```

Out[17]:

```
[<matplotlib.lines.Line2D at 0x1771f7787c0>]
```



In [18]:

```
from sklearn.cluster import KMeans
kmeans = KMeans(3)
kmeans.fit(df)
label=kmeans.labels_
```

In [19]:

```
kmeans.cluster_centers_.shape
```

Out[19]:

```
(3, 15)
```

In [20]:

```
cluster_centers=pd.DataFrame(data=kmeans.cluster_centers_,columns=[df.columns])    # creati
cluster_centers
```

Out[20]:

	yummy	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive
0	0.424132	0.890311	0.140768	0.819013	0.425960	0.914077	0.628885	0.561243	0.29433
1	0.751121	0.926009	0.051570	0.914798	0.692825	0.912556	0.625561	0.771300	0.36547
2	0.513043	0.910870	0.078261	0.878261	0.484783	0.871739	0.536957	0.619565	0.42608

In [21]:

```
# so now we have 3 group of customer
label.shape  # label will be assigned to our dataset(0-3)
(1453,)
# how the labels are assigned
L=kmeans.fit_predict(df) # use scaled data here
L
```

Out[21]:

```
array([1, 2, 1, ..., 1, 2, 0])
```

In [22]:

```
# here we are going to add the label to the original data(that is grouping(0-7))
final_data=pd.concat([df,pd.DataFrame({"cluster":label})],axis=1)
final_data
```

Out[22]:

	yummy	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive	healthy	dis
0	0	1	0	1	0	1	1	0	1	0	
1	1	1	0	1	1	1	1	1	1	0	
2	0	1	1	1	1	1	0	1	1	1	
3	1	1	0	1	1	1	1	1	0	0	
4	0	1	0	1	1	1	1	0	0	1	
...	...	...	...	...	...	...	...	...	...	...	
1448	0	1	0	1	1	0	0	0	1	0	
1449	1	1	0	1	0	0	1	1	0	1	
1450	1	1	0	1	0	1	0	1	1	0	
1451	1	1	0	0	0	1	1	1	0	1	
1452	0	1	0	1	1	0	0	0	1	0	

1453 rows × 16 columns

In [23]:

```
# checkig the count of customer in each cluster
final_data['cluster'].value_counts()
```

Out[23]:

```
0    547
2    460
1    446
Name: cluster, dtype: int64
```

In [24]:

```
# principal component analysis  ( this is used to reduce the dimentionality)
# dimentionality reduction
pca=PCA(n_components=2)
principal_comp=pca.fit_transform(final_data)
pca_dataframe=pd.DataFrame(data=principal_comp,columns=['pca1','pca2'])
pca_dataframe
```

Out[24]:

	pca1	pca2
0	-16.536175	3.872855
1	-6.352080	-0.866155
2	-17.435612	-0.085852
3	-24.268771	-3.902616
4	-4.351941	-0.817373
...	...	...
1448	-2.330602	-0.791649
1449	8.704878	-1.256194
1450	-7.375731	-2.066779
1451	3.667746	-2.667732
1452	14.470179	4.832753

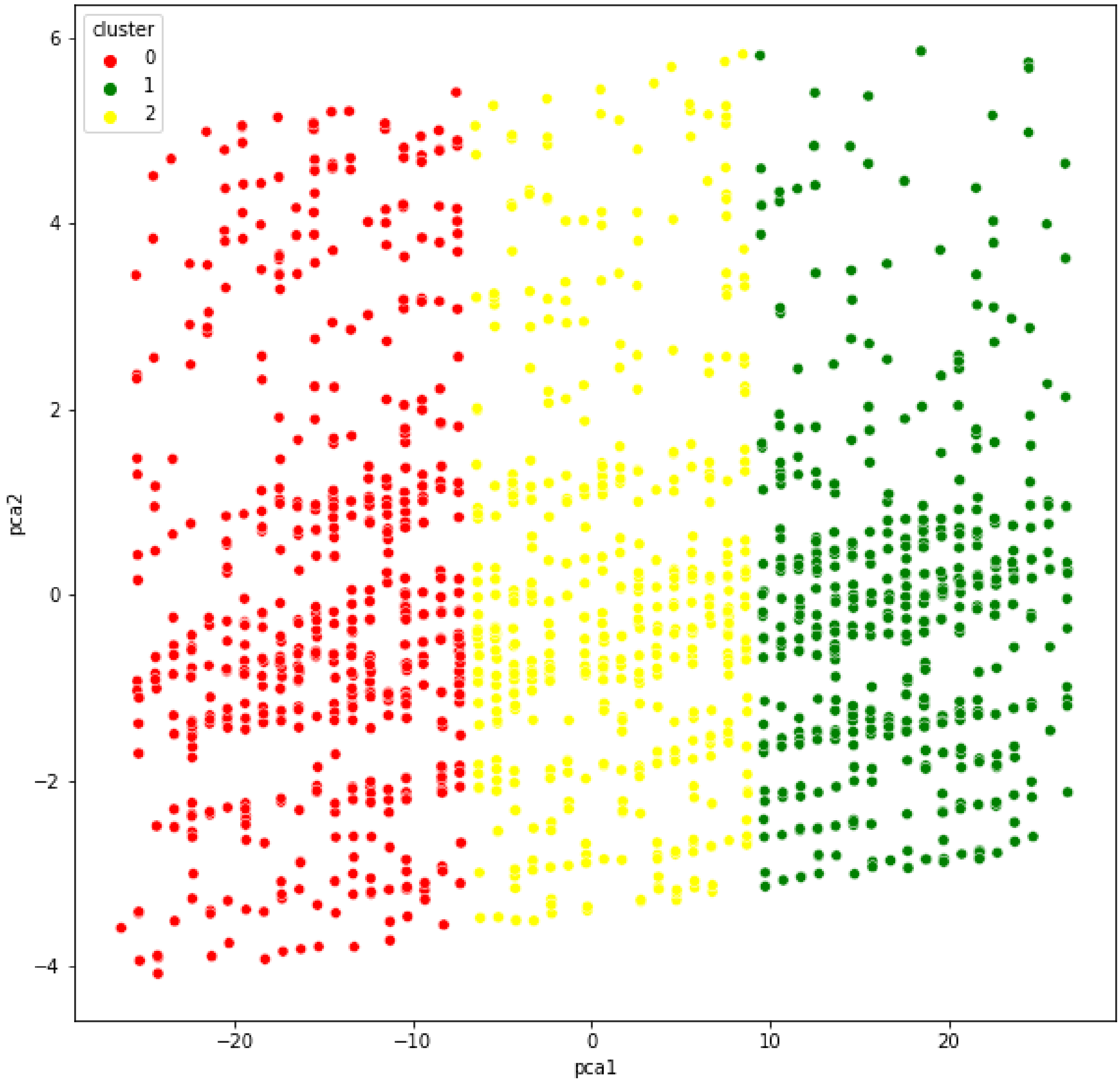
1453 rows × 2 columns

In [25]:

```
pca_df=pd.concat([pca_dataframe,pd.DataFrame({'cluster':label})],axis=1)
pca_df

#ploting the scatterplot for the pca_df data(3 different clusters)

plt.figure(figsize=(10,10))
pca_df_plot=sns.scatterplot(x='pca1',y='pca2',hue="cluster",data=pca_df,palette=['red','gre
plt.show()
```



In [26]:

```
final_data
```

Out[26]:

	yummy	convenient	spicy	fattening	greasy	fast	cheap	tasty	expensive	healthy	dis
0	0	1	0	1	0	1	1	0	1	0	
1	1	1	0	1	1	1	1	1	1	0	
2	0	1	1	1	1	1	0	1	1	1	
3	1	1	0	1	1	1	1	1	0	0	
4	0	1	0	1	1	1	1	0	0	1	
...	...	...	...	...	...	...	...	...	...	...	
1448	0	1	0	1	1	0	0	0	1	0	
1449	1	1	0	1	0	0	1	1	0	1	
1450	1	1	0	1	0	1	0	1	1	0	
1451	1	1	0	0	0	1	1	1	0	1	
1452	0	1	0	1	1	0	0	0	1	0	

1453 rows × 16 columns

In [27]:

```
km = KMeans(n_clusters=5).fit(final_data)

cluster_map = pd.DataFrame()
cluster_map['final_data_index'] = final_data.index.values
cluster_map['cluster'] = km.labels_

#Once the final_dataFrame is available is quite easy to filter, For example, to filter all
cluster_map[cluster_map.cluster == 3]
```

Out[27]:

	final_data_index	cluster
0	0	3
2	2	3
3	3	3
12	12	3
14	14	3
...	...	...
1397	1397	3
1409	1409	3
1418	1418	3
1437	1437	3
1439	1439	3

226 rows × 2 columns

In [28]:

```
df['categories'] = kmeans.labels_
```

In [29]:

```
df
```

Out[29]:

```
      yummy  convenient  spicy  fattening  greasy  fast  cheap  tasty  expensive  healthy  dis
   0      0           1      0          1       0     1      1      0          1        0
   1      1           1      0          1       1     1      1      1          1        0
   2      0           1      1          1       1     1      0      1          1        1
   3      1           1      0          1       1     1      1      1          0        0
   4      0           1      0          1       1     1      1      0          0        1
 ...    ...         ...    ...        ...     ...   ...    ...    ...        ...      ...
1448      0           1      0          1       1     0      0      0          1        0
1449      1           1      0          1       0     0      1      1          0        1
1450      1           1      0          1       0     1      0      1          1        0
1451      1           1      0          0       0     1      1      1          0        1
1452      0           1      0          1       1     0      0      0          1        0

1453 rows × 16 columns
```

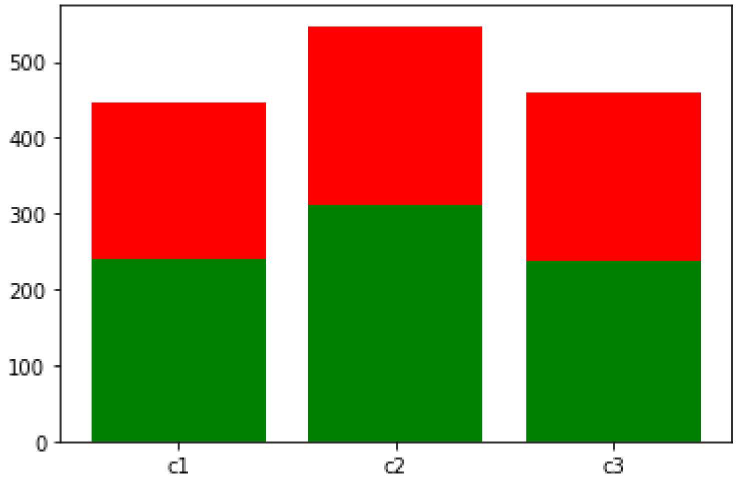
In [30]:

```
segmenter_list_females = [len(df[(df['Gender']==0) & (df['categories']==0)]),len(df[(df['Ge
# segmenter_list_females
segmenter_list_males = [len(df[(df['Gender']==1) & (df['categories']==0)]),len(df[(df['Gend
# segmenter_list_males

# cluster values
# cluster_values = [490,547,416]
categories = ['c1','c2','c3']
```

In [31]:

```
plt.bar(categories, segmenter_list_females, color='green')
plt.bar(categories, segmenter_list_males, bottom=segmenter_list_females, color='red')
plt.show()
```


500
400
300
200
100
0
c1
c2
c3