```python
import pandas as pd
import numpy as np
from sklearn.decomposition import PCA
from sklearn.preprocessing import StandardScaler
import seaborn as sns
from pandas import DataFrame
df=pd.read_csv('recipes_muffins_cupcakes_scones.csv')
features=df.keys()
features=features.drop('Type')
x=np.array(df.loc[:,'Flour':'Salt'])
y=np.array(df['Type'])
fig, ax=plt.subplots(nrows=1,ncols=2)
x=StandardScaler().fit_transform(x)
pca=PCA(n_components=2)
principalComponents=pca.fit_transform(x)
explained_variance=pca.explained_variance_ratio_
print(f'variance ratio: {explained_variance}')
for i in range(len(df)):
    if i<=9:
        ax[0].scatter(principalComponents[0:i,0],principalComponents[0:i,1],c='y')
    elif i>9 and i<=19:
        ax[0].scatter(principalComponents[10:i,0],principalComponents[10:i,1],c='g')
    else:
        ax[0].scatter(principalComponents[20:i,0],principalComponents[20:i,1],c='b')
ax[1].plot(np.cumsum(explained_variance))
plt.show()
df_comp=pd.DataFrame(pca.components_)
sns.heatmap(df_comp,cmap='plasma')
plt.show()
pca1=abs(df_comp.iloc[0])
pca2=abs(df_comp.iloc[1])
max1=pca1.idxmax()
min1=pca1.idxmin()
max2=pca2.idxmax()
min2=pca2.idxmin()
print(f'max var pca1: {features[max1]} min var pca1: {features[min1]}\nmax var pca2: {features[max2]} min var pca2: {features[min2]}')
cov_mat=np.cov(x.T)
sns.heatmap(cov_mat)
plt.show()
```

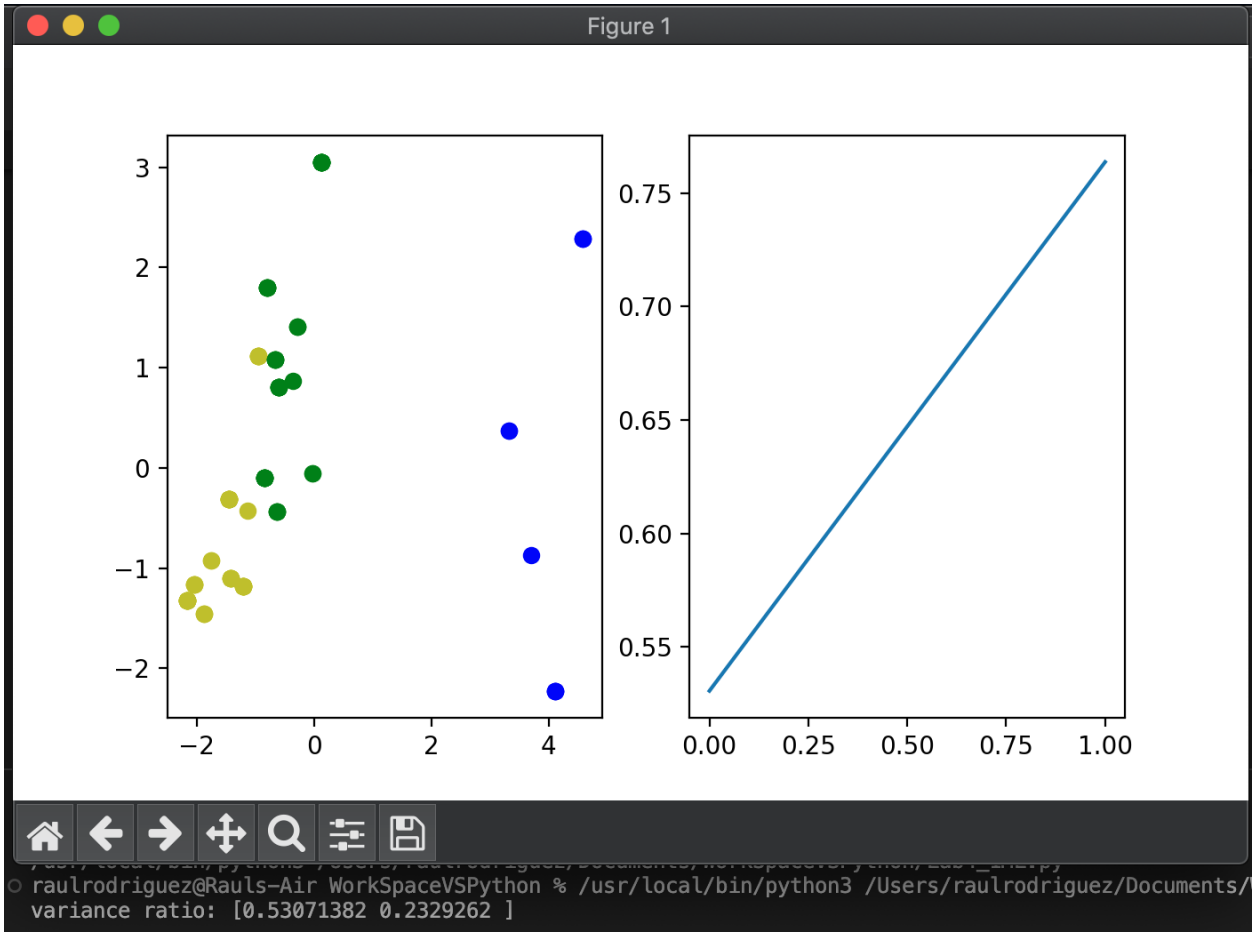


Figure 1
3
2
1
0
−1
−2
−2
0
2
4
0.75
0.70
0.65
0.60
0.55
0.00
0.25
0.50
0.75
1.00
raulrodriguez@Rauls-Air WorkSpaceVSPython % /usr/local/bin/python3 /Users/raulrodriguez/Documents/
variance ratio: [0.53071382 0.2329262]

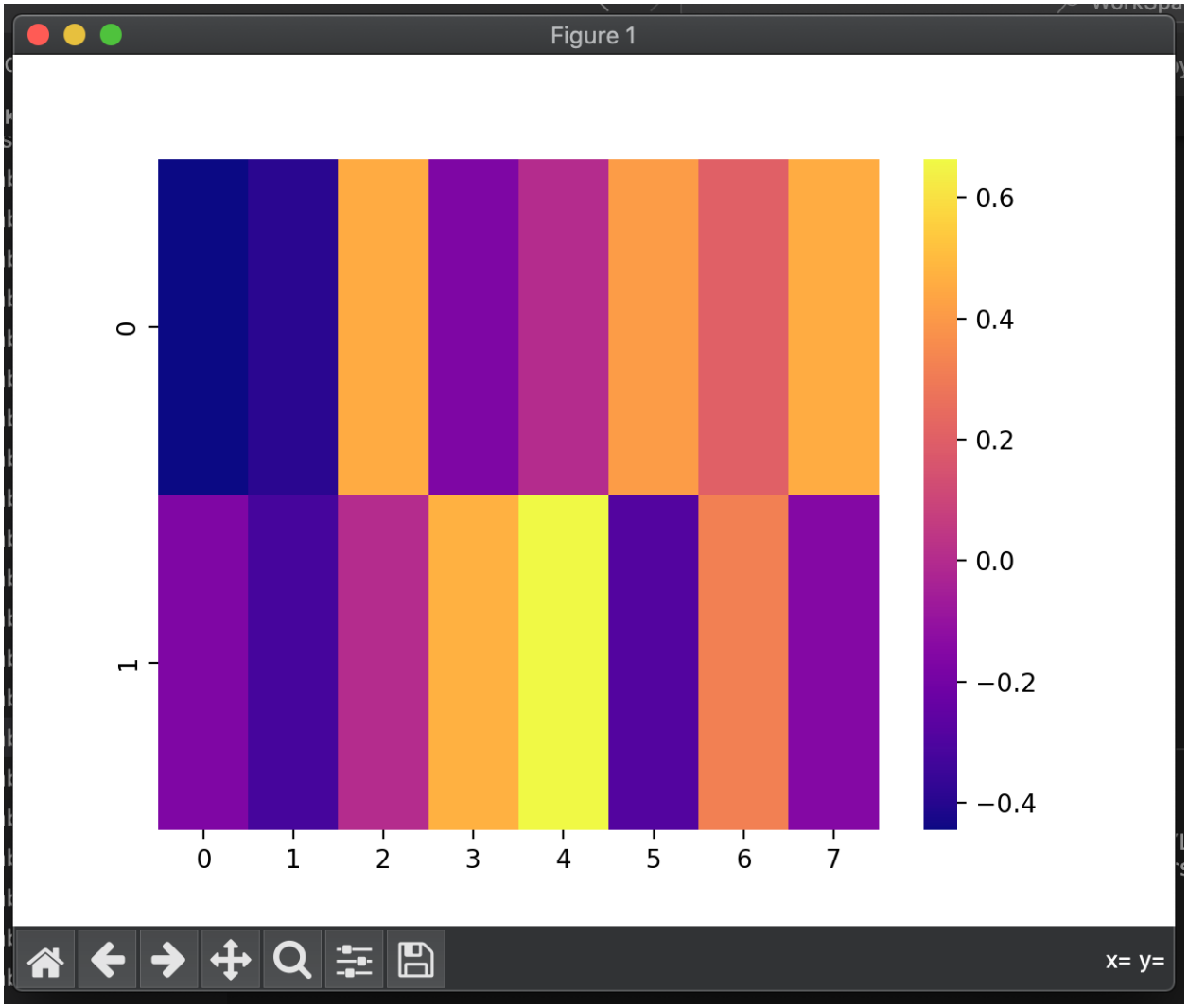
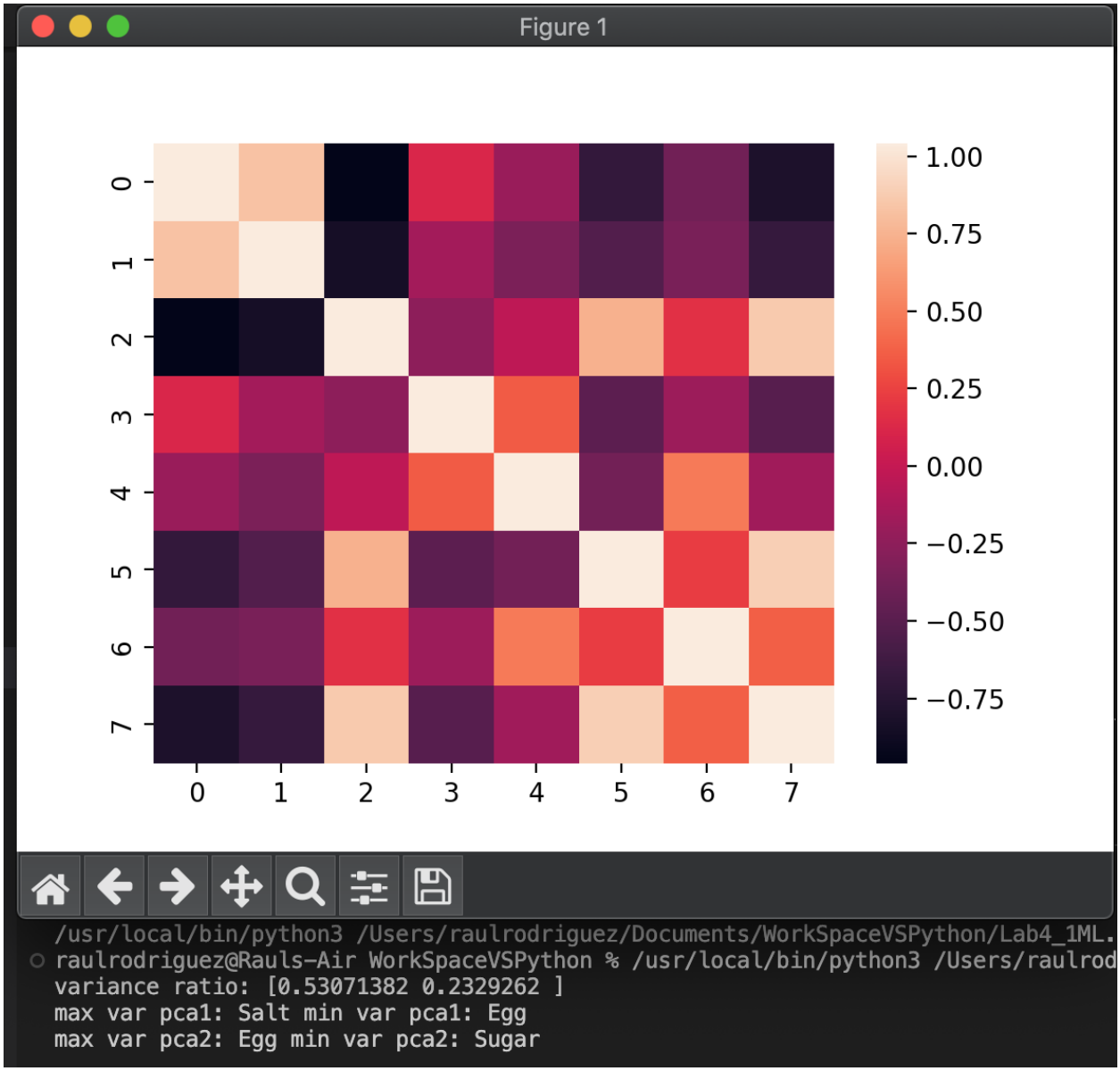


Figure 1
0
1
0
1
2
3
4
5
6
7
0.6
0.4
0.2
0.0
−0.2
−0.4
x= y=




```
/usr/local/bin/python3 /Users/raulrodriguez/Documents/WorkSpaceVSPython/Lab4_1ML.
raulrodriguez@Rauls-Air WorkSpaceVSPython % /usr/local/bin/python3 /Users/raulrod
variance ratio: [0.53071382 0.2329262 ]
max var pca1: Salt min var pca1: Egg
max var pca2: Egg min var pca2: Sugar
```