Ex4: PCA

- Cho tập tin Iris.xls. Đọc dữ liệu vào dataframe
- Tìm correlation matrix, trực quan hóa
- Áp dụng PCA: giảm chiều dữ liệu còn 2 chiều (gốc là 4 chiều, không tính cột loại iris)
- Trực quan hóa dữ liệu sau khi giảm chiều

In [1]:

```
import pandas as pd
from sklearn.decomposition import PCA
```

In [2]:

```
data = pd.read_excel("Iris.xls")
data.head()
```

Out[2]:

	sepallength	sepalwidth	petallength	petalwidth	iris
0	5.1	3.5	1.4	0.2	Iris-setosa
1	4.9	3.0	1.4	0.2	Iris-setosa
2	4.7	3.2	1.3	0.2	Iris-setosa
3	4.6	3.1	1.5	0.2	Iris-setosa
4	5.0	3.6	1.4	0.2	Iris-setosa

In [3]:

```
data.corr()
```

Out[3]:

	sepallength	sepalwidth	petallength	petalwidth
sepallength	1.000000	-0.109369	0.871754	0.817954
sepalwidth	-0.109369	1.000000	-0.420516	-0.356544
petallength	0.871754	-0.420516	1.000000	0.962757
petalwidth	0.817954	-0.356544	0.962757	1.000000

In [4]:

```
corr = data.corr()
corr
```

Out[4]:

	sepallength	sepalwidth	petallength	petalwidth
sepallength	1.000000	-0.109369	0.871754	0.817954
sepalwidth	-0.109369	1.000000	-0.420516	-0.356544
petallength	0.871754	-0.420516	1.000000	0.962757
petalwidth	0.817954	-0.356544	0.962757	1.000000

In [5]:

```
import seaborn as sns
sns.heatmap(corr,
            xticklabels=corr.columns.values,
            yticklabels=corr.columns.values)
```

Out[5]:

```
<matplotlib.axes._subplots.AxesSubplot at 0x13a70534390>
```

In [6]:

```
A = data[['sepallength','sepalwidth','petallength','petalwidth']].values
A[0:5]
```

Out[6]:

```
array([[5.1, 3.5, 1.4, 0.2],
       [4.9, 3. , 1.4, 0.2],
       [4.7, 3.2, 1.3, 0.2],
       [4.6, 3.1, 1.5, 0.2],
       [5. , 3.6, 1.4, 0.2]])
```

In [7]:

```
# create the transform
pca = PCA(2)
# fit transform
pca.fit(A)
```

Out[7]:

```
PCA(copy=True, iterated_power='auto', n_components=2, random_state=None,
  svd_solver='auto', tol=0.0, whiten=False)
```

In [8]:

```
# access values and vectors
print(pca.components_)
print(pca.explained_variance_)
```

```
[[ 0.36158968 -0.08226889  0.85657211  0.35884393]
 [ 0.65653988  0.72971237 -0.1757674  -0.07470647]]
[4.22484077 0.24224357]
```

In [9]:

```
# transform data
B = pca.transform(A)
print(B[0:5])
```

```
[[-2.68420713  0.32660731]
 [-2.71539062 -0.16955685]
 [-2.88981954 -0.13734561]
 [-2.7464372  -0.31112432]
 [-2.72859298  0.33392456]]
```

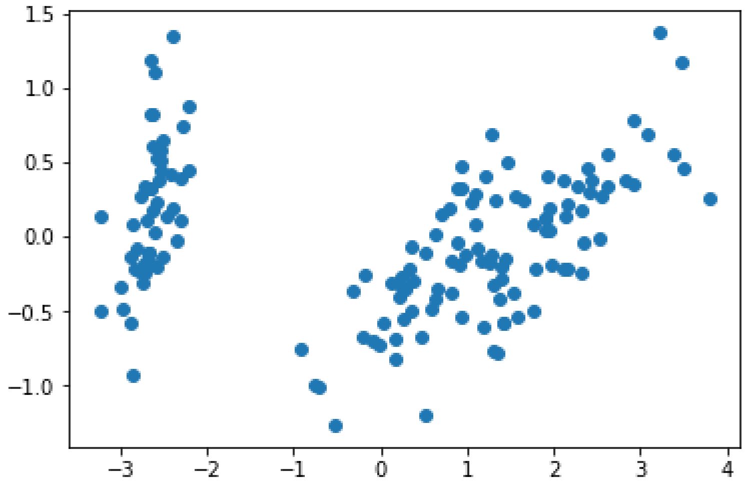
In [17]:

```
pca.explained_variance_ratio_
```

Out[17]:

```
array([0.92461621, 0.05301557])
```

In [11]:
```
plt.scatter(B[:,0], B[:,1])
plt.show()
```



In [12]:
```
principalDf = pd.DataFrame(data = B
             , columns = ['principal component 1', 'principal component 2'])
principalDf.head()
```

Out[12]:

	principal component 1	principal component 2
0	-2.684207	0.326607
1	-2.715391	-0.169557
2	-2.889820	-0.137346
3	-2.746437	-0.311124
4	-2.728593	0.333925

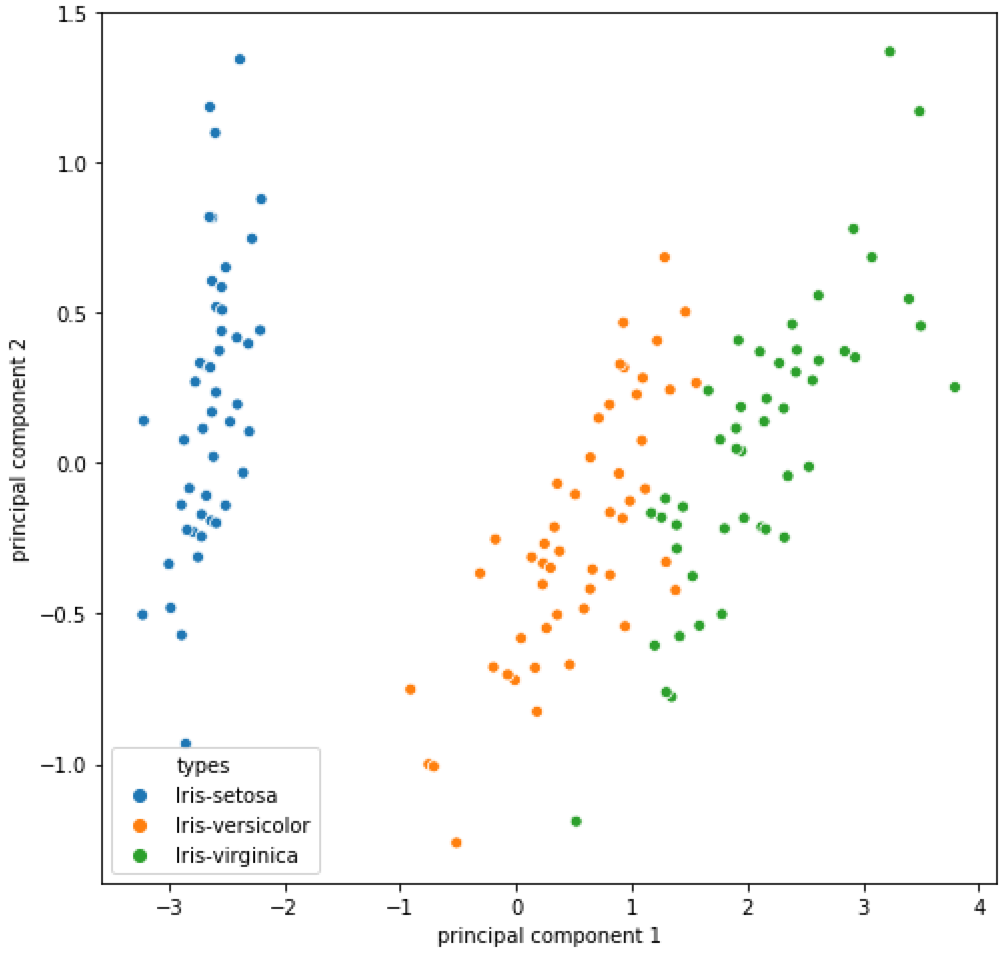
In [13]:
```
import numpy as np
```

In [14]:
```
y = np.array(data.iris)
y = pd.DataFrame(data = y, columns = ['types'])
finalDf = pd.concat([principalDf, y], axis = 1)
finalDf.head(5)
```

Out[14]:

	principal component 1	principal component 2	types
0	-2.684207	0.326607	Iris-setosa
1	-2.715391	-0.169557	Iris-setosa
2	-2.889820	-0.137346	Iris-setosa
3	-2.746437	-0.311124	Iris-setosa
4	-2.728593	0.333925	Iris-setosa

In [15]:
```
plt.figure(figsize=(8,8))
sns.scatterplot(x="principal component 1", y="principal component 2", data = final
plt.show()
```



In [ ]: