PCA

May 23, 2022

[1]:
```
# lOAD IRIS DATASET
import pandas as pd
df = pd.read_csv("https://archive.ics.uci.edu/ml/machine-learning-databases/
 ↪iris/iris.data",
                 names=['sepal length','sepal width','petal length','petal␣
 ↪width','target'])
```

[2]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 150 entries, 0 to 149
Data columns (total 5 columns):
 #   Column        Non-Null Count  Dtype
---  ------        --------------  -----
 0   sepal length  150 non-null    float64
 1   sepal width   150 non-null    float64
 2   petal length  150 non-null    float64
 3   petal width   150 non-null    float64
 4   target        150 non-null    object
dtypes: float64(4), object(1)
memory usage: 6.0+ KB
```

[3]:
```
df.describe()
```

[3]:

	sepal length	sepal width	petal length	petal width
count	150.000000	150.000000	150.000000	150.000000
mean	5.843333	3.054000	3.758667	1.198667
std	0.828066	0.433594	1.764420	0.763161
min	4.300000	2.000000	1.000000	0.100000
25%	5.100000	2.800000	1.600000	0.300000
50%	5.800000	3.000000	4.350000	1.300000
75%	6.400000	3.300000	5.100000	1.800000
max	7.900000	4.400000	6.900000	2.500000

[4]:
```
from sklearn.preprocessing import StandardScaler
```

[5]:
```
sc = StandardScaler()
X = df[['sepal length','sepal width','petal length','petal width']]
y = df["target"]
X = sc.fit_transform(X)
```

[6]:
```
X
```

[6]:
```
array([[-9.00681170e-01,  1.03205722e+00, -1.34127240e+00,
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```

[7]:
```
from sklearn.decomposition import PCA
pca = PCA(n_components=2)
```

[8]:
```
import matplotlib.pyplot as plt
```

[9]:
```
X_reduced_components = pca.fit_transform(X)
```

[10]:
```
principalDf = pd.DataFrame(data = X_reduced_components
             , columns = ['principal component 1', 'principal component 2'])
```

[11]:
```
principalDf
```

[11]:

	principal component 1	principal component 2
0	-2.264542	0.505704
1	-2.086426	-0.655405
2	-2.367950	-0.318477
3	-2.304197	-0.575368
4	-2.388777	0.674767
..	…	…
145	1.870522	0.382822
146	1.558492	-0.905314

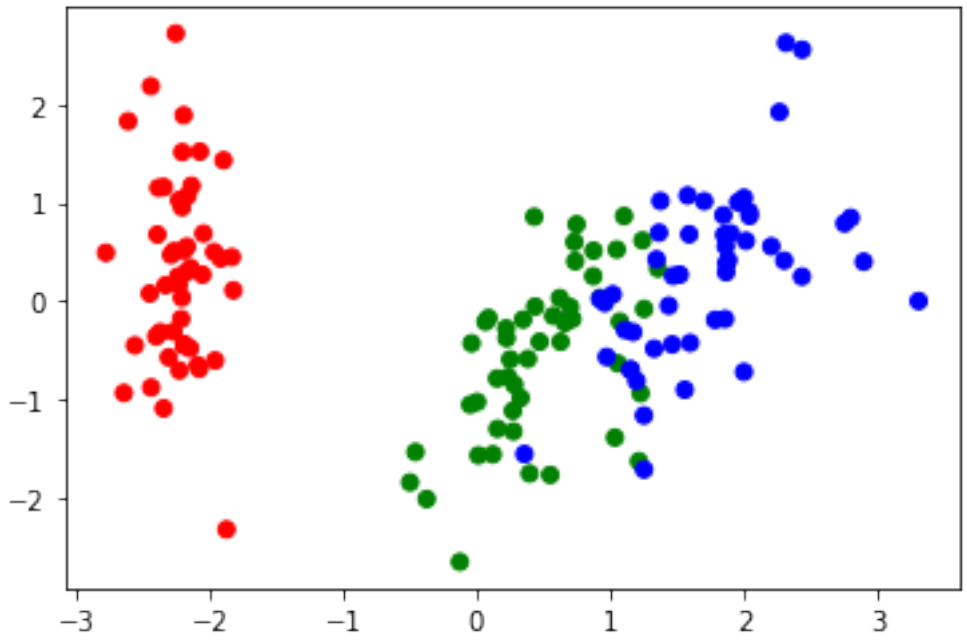
```
147              1.520845              0.266795
148              1.376391              1.016362
149              0.959299             -0.022284

[150 rows x 2 columns]
```

[12]:
```
targets = ['Iris-setosa', 'Iris-versicolor', 'Iris-virginica']
colors = ['r', 'g', 'b']
map_colors = dict(zip(targets, colors)) # {'Iris-setosa': 'r',␣
 ↪'Iris-versicolor': 'g', 'Iris-virginica': 'b'}
map_colors = y.apply(lambda x: map_colors[x])
```

[13]:
```
plt.scatter(principalDf['principal component 1'], principalDf['principal␣
 ↪component 2'], c=map_colors)
```

[13]:
```
<matplotlib.collections.PathCollection at 0x7ff8ab96f4c0>
```



[14]:
```
pca.explained_variance_ratio_
```

[14]:
```
array([0.72770452, 0.23030523])
```

[15]:
```
pca.components_
```

[15]:
```
array([[ 0.52237162, -0.26335492,  0.58125401,  0.56561105],
       [ 0.37231836,  0.92555649,  0.02109478,  0.06541577]])
```

[16]:
```
import numpy as np
np.cumsum(pca.explained_variance_ratio_)
# Both PC explain 95% of the variance. This match the goods results we can see␣
 ↪in the plot
```

[16]:
```
array([0.72770452, 0.95800975])
```

[ ]:
```

```