```
import numpy as np
from sklearn.datasets import load_iris
import matplotlib.pyplot as plt
iris = load_iris()
X = iris.data
y = iris.target
def standardize_data(X):
    mean = np.mean(X, axis=0)
    std = np.std(X, axis=0)
    X_standardized = (X - mean) / std
    return X_standardized

X_standardized = standardize_data(X)
covariance_matrix = np.cov(X_standardized, rowvar=False)
eigenvalues, eigenvectors = np.linalg.eig(covariance_matrix)
print(eigenvalues)
sorted_indices = np.argsort(eigenvalues)[::-1]
sorted_eigenvectors = eigenvectors[:, sorted_indices]
sorted_eigenvalues = eigenvalues[sorted_indices]

k=2
top_k_eigenvectors = sorted_eigenvectors[:, :k]

projection_matrix = top_k_eigenvectors


X_pca = X_standardized.dot(projection_matrix)

plt.figure()
for i in range(len(np.unique(y))):
    plt.scatter(X_pca[y == i, 0], X_pca[y == i, 1], label=f'Class {i}')

plt.title('PCA for Iris Dataset')
plt.xlabel('Principal Component 1')
plt.ylabel('Principal Component 2')
plt.legend()
plt.show()
```

```
[2.93808505 0.9201649  0.14774182 0.02085386]
```