

4. Dimensionality reduction method using PCA algorithm.

```
import numpy as np

x1 = np.array([4, 8, 13, 7])
x2 = np.array([11, 4, 5, 14])
X = np.column_stack((x1, x2))
print("Original Data:\n", X)

mean_vec = np.mean(X, axis=0)
X_centered = X - mean_vec

print("\nMean of Features:\n", mean_vec)
print("\nMean-Centered Data:\n", X_centered)

cov_matrix = np.cov(X_centered, rowvar=False)
print("\nCovariance Matrix:\n", cov_matrix)

eig_vals, eig_vecs = np.linalg.eig(cov_matrix)

print("\nEigenvalues:\n", eig_vals)
print("\nEigenvectors:\n", eig_vecs)

sorted_idx = np.argsort(eig_vals)[::-1]
eig_vals_sorted = eig_vals[sorted_idx]
eig_vecs_sorted = eig_vecs[:, sorted_idx]

print("\nSorted Eigenvalues:\n", eig_vals_sorted)
print("\nSorted Eigenvectors (Principal Components):\n", eig_vecs_sorted)

X_pca = X_centered @ eig_vecs_sorted
print("\nPCA-Transformed Data:\n", X_pca)
```