CSE575 - HomeWork 5

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hw5_scikit

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```python
[31]: import numpy as np
      import pandas as pd
      from sklearn.preprocessing import StandardScaler
      from sklearn.decomposition import PCA
      import matplotlib.pyplot as plt
      SEED = 0
```

```python
[32]: data = np.load("pca_data.npz")["data"]
      scaler = StandardScaler()
      data = scaler.fit_transform(data)
      print(data.shape)
```

```
(300, 2)
```

```python
[33]: pca_sklearn = PCA()
      pca_sklearn.fit(data)
      print('\nPrincipal Components with scaled data:\n', pca_sklearn.components_)
      print("\nPrincipal Component Explained variance ( eigen values ):")
      print(pca_sklearn.explained_variance_)
```

```
Principal Components with scaled data:
 [[-0.70710678 -0.70710678]
 [-0.70710678  0.70710678]]

Principal Component Explained variance ( eigen values ):
[1.69446527 0.31222369]
```

```python
[34]: def PCA_custom(X,n_components):
          X_center = np.subtract(X, np.mean(X, axis=0))
          covariance_matrix = np.cov(X_center.T)
          eigenvalue,eigenvector = np.linalg.eig(covariance_matrix)
          #print(eigenvalue)
          sorted_indices = np.argsort(eigenvalue)[::-1][:n_components]
          pca_components = eigenvector[:,sorted_indices]
          return pca_components,eigenvalue


      pca,explained_var = PCA_custom(data,2)
      print("Principal Components with scaled data:")
```

```
print(pca)
print("Principal Component Explained variance ( eigen values ) :")
print(explained_var)
```

```
Principal Components with scaled data:
[[ 0.70710678 -0.70710678]
 [ 0.70710678  0.70710678]]
Principal Component Explained variance ( eigen values ) :
[1.69446527 0.31222369]
```
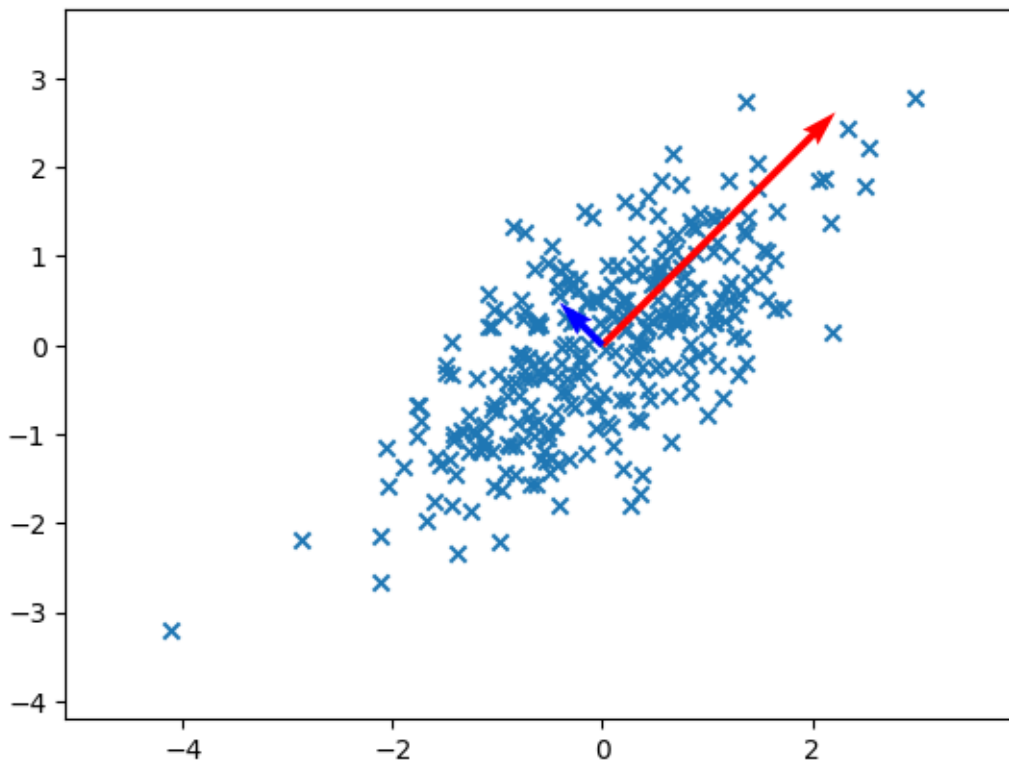
[35]:
```
plt.scatter(data[:,0], data[:,1],marker = "x")
#plt.quiver(np.mean(data[:,0]), np.mean(data[:,1]), pca_sklearn.
 ↪components_[0,0], pca_sklearn.components_[1,0], scale=0.5/pca_sklearn.
 ↪explained_variance_[0],scale_units='xy', color='r')
#plt.quiver(np.mean(data[:,0]), np.mean(data[:,1]), pca_sklearn.
 ↪components_[0,1], pca_sklearn.components_[1,1], scale=0.5/pca_sklearn.
 ↪explained_variance_[1],scale_units='xy', color='b')
plt.quiver(np.mean(data[:,0]), np.mean(data[:,1]), pca[0,0], pca[1,0], scale=0.
 ↪5/explained_var[0],scale_units='xy', color='r')
plt.quiver(np.mean(data[:,0]), np.mean(data[:,1]), pca[0,1], pca[1,1], scale=0.
 ↪5/explained_var[1],scale_units='xy', color='b')
plt.xlim(min(data[:, 0])-1, max(data[:, 0])+1)
plt.ylim(min(data[:, 1])-1, max(data[:, 1])+1)
plt.show()
```

[ ]: