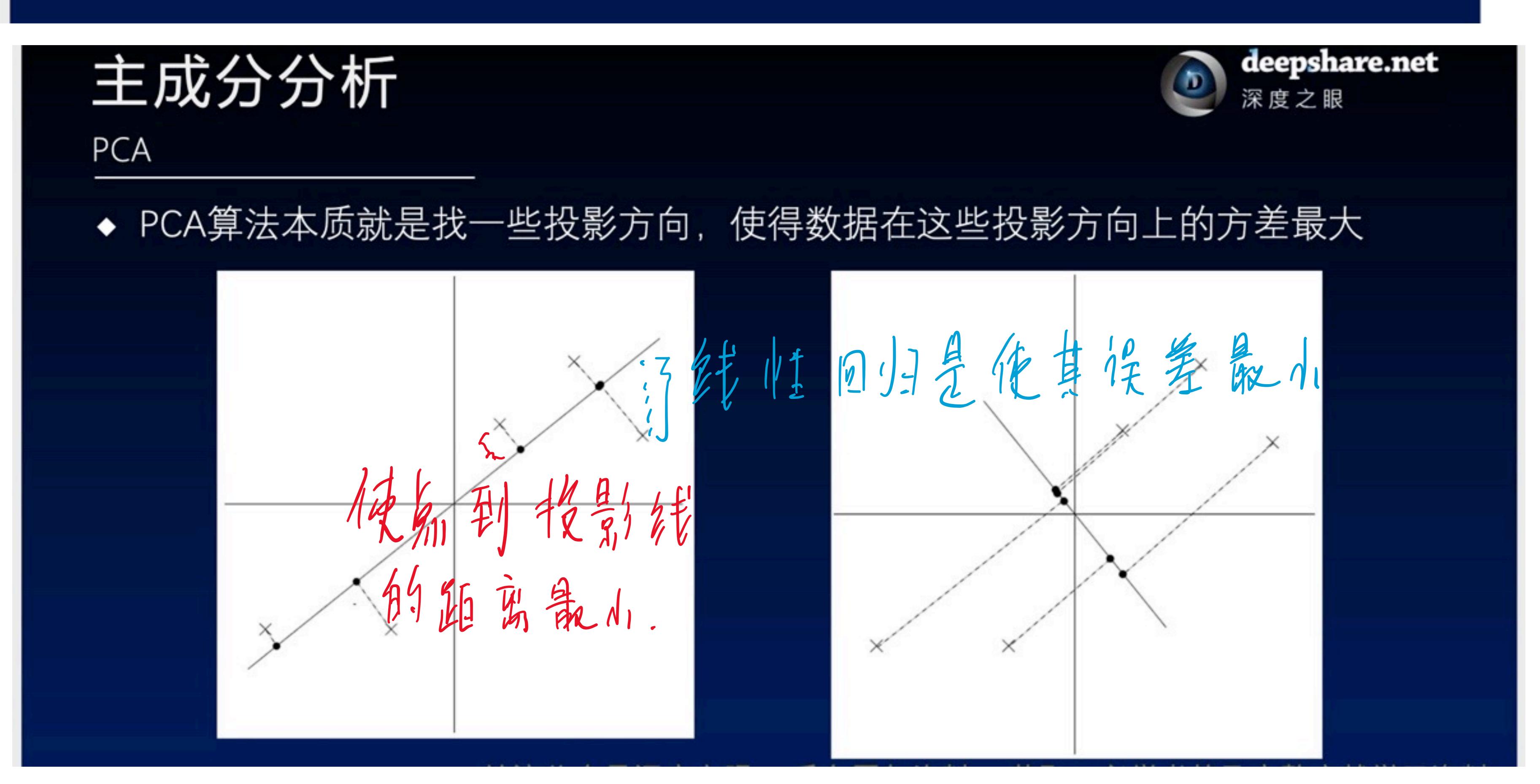


村他路线注流:

- D Heat map 5
- 2) t SNE Plots
- 3) multi-dimensional scalling



1. 基于协方差矩阵的特征值分解算法

```
特征归一化
def featureNormalize(X):
    mu = np.mean(X,axis=0).reshape(1,-1)
    sigma = np.std(X,axis=0,ddof=1).reshape(1,-1)
    X = (X-mu)/sigma
    return X, mu, sigma
def pca(X,K):
    m = len(X)
    sigma = np.dot(np.transpose(X),X)/(m-1)
    #返回的特征向量要是排序后的
    eigenvalues, eigenvectors = np.linalg.eig(sigma)
    index = np.argsort(-eigenvalues) # 依照featValue进行从大到小排序
    eigenvectors = eigenvectors[:,index]
    u_reduce = eigenvectors[:, 0:K]
    return np.dot(X, u_reduce), eigenvectors
X, mu, sigma = featureNormalize(X)
Z, eigenvectors = pca(X,1)
def recoverData(Z, U, K):
    U_reduce = U[:,0:K]
    X_rec = np.dot(Z,np.transpose(U_reduce))
    return X_rec
def plotData(X_orgin,X_rec):
    plt.scatter(X_orgin[:,0],X_orgin[:,1])
    plt.scatter(X_rec[:, 0], X_rec[:, 1],c='red')
    plt.show()
X_rec = recoverData(Z,eigenvectors,1)
plotData(X,X_rec)
```