

IMLPR Homework #10 Solutions

1. Try by hands and compare your k-means results against the Matlab K-means.

2. PCA

(1) 2, 2, 4, 4, mean=3, variance=1

(2) 1, 4, 1, 3, mean=2.25, variance=2.25

(3) $\frac{3}{\sqrt{2}}, \frac{6}{\sqrt{2}}, \frac{5}{\sqrt{2}}, \frac{7}{\sqrt{2}}$, mean=3.7123, variance=1.0938

(4) $\text{Cov} = \begin{pmatrix} 1.0 & -0.25 \\ -0.25 & 1.688 \end{pmatrix}$,

$$\lambda_1 = 1.7688, \lambda_2 = 0.9187$$

$$u_1 = (-0.3092, 0.9510), u_2 = (-0.9510, -0.3092)$$

0.3326, 3.1856, -0.2858, 1.6162, mean=1.2122, variance=1.7688

(5) The projections in (1) and (2) reduce the original data to 2 and 3 points. Projection to the first principal component axis gives the best projection with a bigger variance: the variance of (4) is bigger than that of (3).