



Intelligence Program 2017

Code Test (HCMC)

- 1> Generate 100 samples in class 0 (blue color) and 360 samples in class 1 (red color) as figure 1.

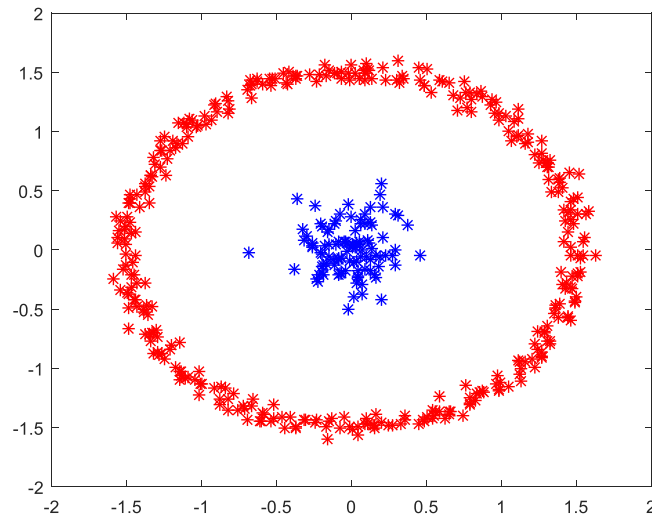


Figure 1: Simulation data

- 2> Denote x_i is the i^{th} sample that we have generated; compute the matrix W as:

$$W_{ij} = \exp\left(-\frac{\|x_i - x_j\|^2}{\sigma^2}\right), \sigma = 0.3$$

- 3> Compute a diagonal matrix D that $D_{ii} = \sum_j W_{ij}$
- 4> Compute matrix $L = D - W$;
- 5> Compute matrix $L_{rw} = D^{-1}L = I - D^{-1}W$ where I is identity matrix
- 6> Compute eigenvalue and eigenvector of L_{rw}
- 7> Sorts the elements of eigenvalue in ascending order
- 8> Create a matrix $Y_{460 \times 3}$ that :
- First column of Y is the eigenvector with the smallest eigenvalue
 - Second column of Y is the eigenvector with the second eigenvalue
 - Third column of Y is the eigenvector with the third eigenvalue

- 9> Display the second and the third column of Y on a 2D plane. Each row presents one point.
- 10> Explain the purpose of the code? In your opinion, how the code helps with machine learning problems?

Solution :

HCM test:

