TW9: Clustering

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Submit Assignment

- **Due** Sunday by 11:59pm
- **Points** 10
- **Submitting** a text entry box or a file upload
- **File Types** doc, docx, txt, jpeg, png, py, and zip

Learning objectives:

- Be able to understand clustering models: k-Means, DBSCAN and Gaussian Mixture models
- Be able to understand clustering problems and select an appropriate clustering algorithms.

Part 0: Basic applications of clustering models.

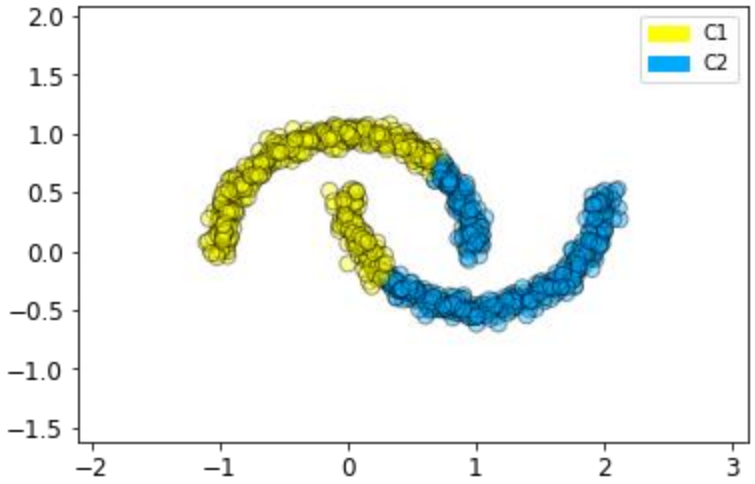
We will work together on basic applications of common clustering models.

- K-means and DBSCAN
- Download the starter notebook: TW9-clustering.zip
    - Use the following notebook (Part 0 is completed). Save it in TW9 folder.
        - clustering_basic_part0_completed.ipynb

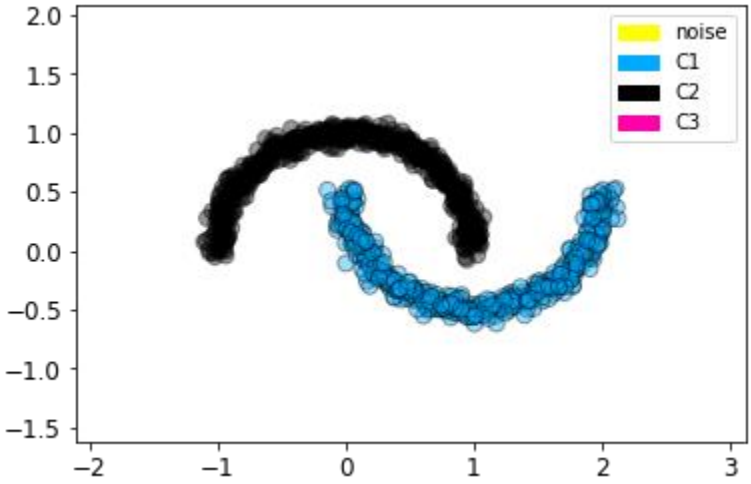
Part 1: K-means vs. DBSCAN

(1) Apply the following clustering models on the generated data above. (Links to an external site.)

- K-mean
    - Apply k-means model
    - use k = 2



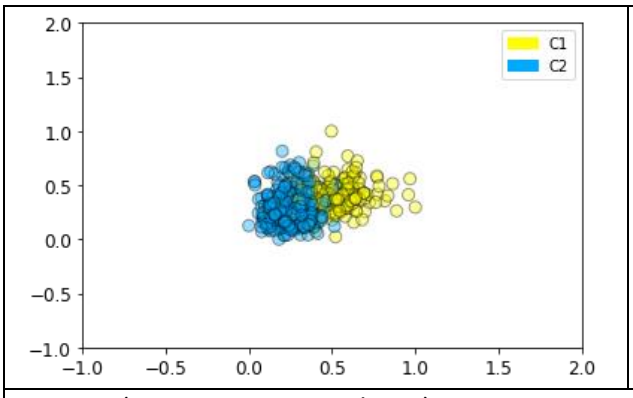
- DBSCAN
    - Apply DBSCAN model: eps=0.2, min_samples=5

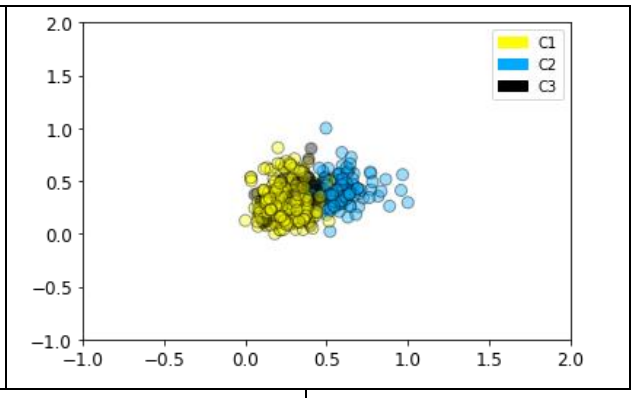


(2) Apply k-means model on breast cancer dataset and check the model performance

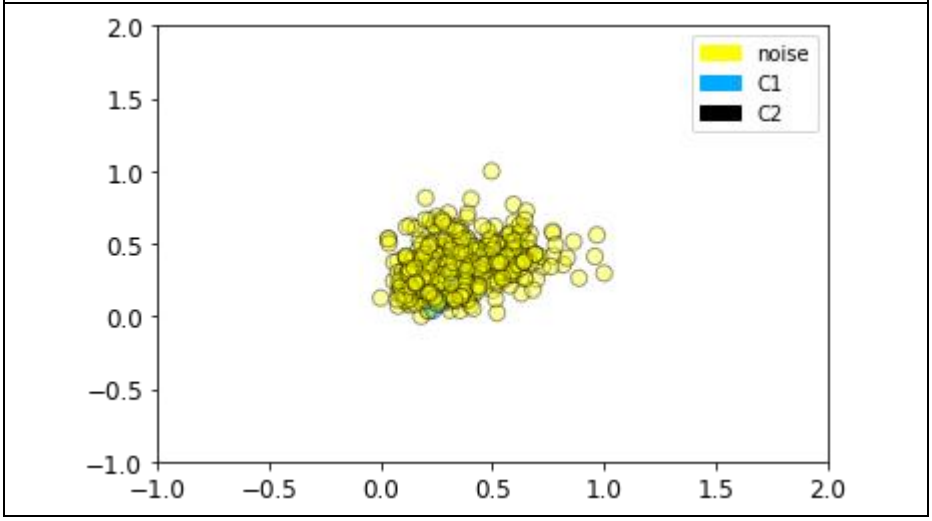
- check also notebook, clustering_Kmeans.ipynb for implementation details of k-means model

KMeans(n_clusters=2)	KMeans(n_clusters=3)



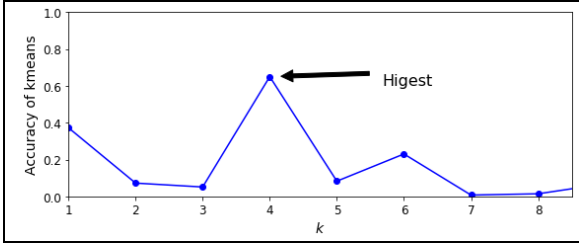
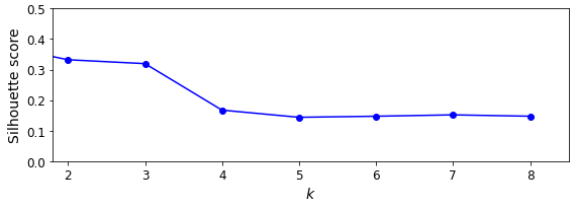


DBSCAN(eps=0.2, min_samples=5)



(3) Evaluate cluster models

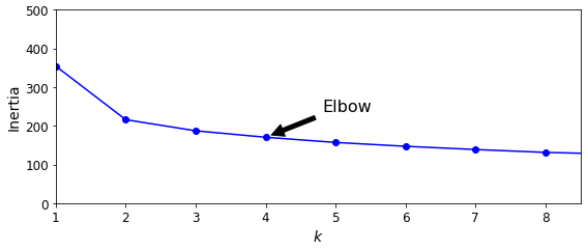
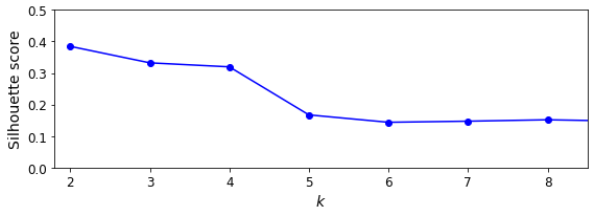
- evaluation methods are described in the starter notebook.

Accuracy of the model	Silhouette scores
	

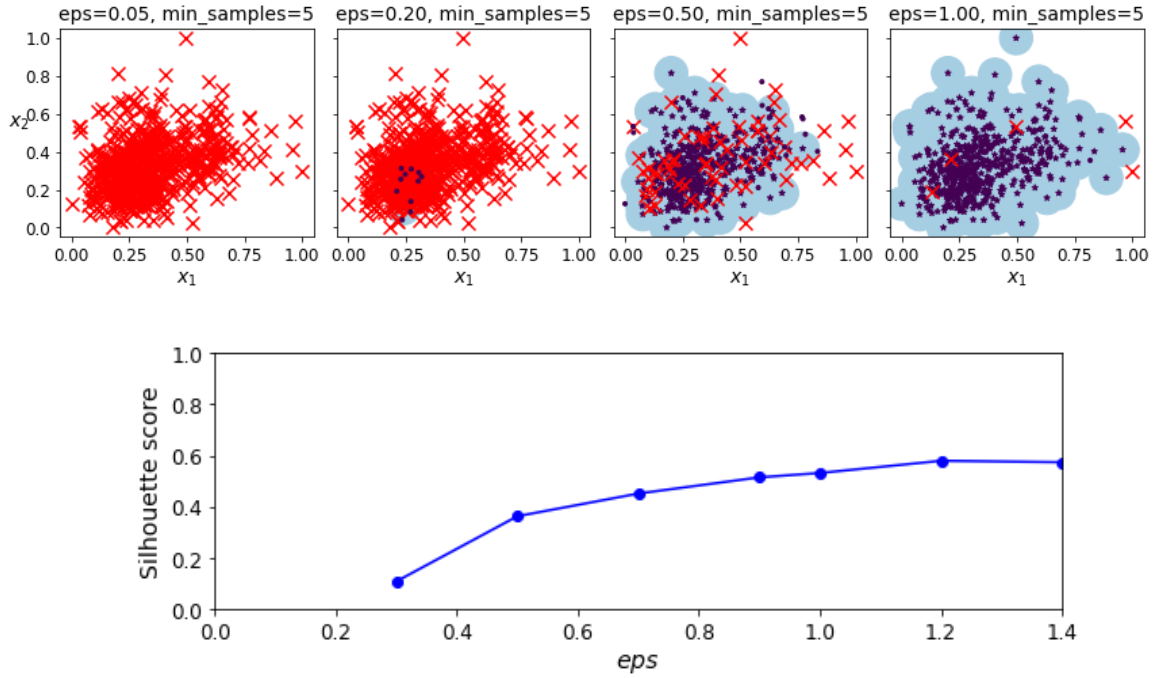
Part 2: Optimal parameters of clustering models:

The given notebooks of k-means and DBSCAN models includes examples of finding optimal parameters. Apply these techniques to find optimal parameters of K-means and DBSCAN models for the given dataset.

- K-means: clustering_Kmeans.ipynb
- DBSCAN: clustering_DBSCAN.ipynb

Optimal parameters of clustering models by Kmeans: `inertia_`	**Silhouette score vs kmeans**
	

Optimal parameters of clustering models by clustering_DBSCAN



We learn Basic applications of clustering models.

K-means and DBSCAN.

For the K-means: the parameter n_clusters value can affect the result of the model.

- The dataset need be scaled by using MinMaxScaler() for normalized values of X.
- Evaluate Model performance by checking Accuracy of the model, which is y_pred/ y_real * 100 %.
- Optimal parameters of clustering models by Kmeans: by increasing or decreasing the k value/n_clusters; or can use **Silhouette score**

For the DBSCAN: the parameter eps and min_samples value can affect the result of the model.

- The dataset need be scaled by using MinMaxScaler() for normalized values of X.
- Optimal parameters of clustering models by DBSCAN: by increasing or decreasing the eps value, or the min_samples ; or can use **Silhouette score**

Silhouette Score: The silhouette score is calculated utilizing the mean intra- cluster distance between points, AND the mean nearest-cluster distance. A silhouette score ranges from -1 to 1, with -1 being the worst score possible and 1 being the best score. Silhouette scores of 0 suggest overlapping clusters.

Submission(s)

Each student should make individual submissions.

- **Part 1**:
    - Push an updated notebook file to his/her/their Git repo.
        - **You do not need to submit any notebook files to Canvas**.
        - I will visit your Github to check the file.
- **Part 2**:
    - Submit a summary of your learning to Canvas. Your document should include:
        - Full names of your team members who work on the assignment.
        - URL links to the notebook of each student on GitHub repo.
        - A summary of what you learned from the teamwork assignment.