Project 2: k-means

CS 4373: Data Mining Fall 2023

Instructor: Dr. Mohammad Imran Chowdhury

Total Points: 65

Due: 09/28/2023 11:59 PM

In this project, I invite you to do the following:

1. Import and prepare the `iris.csv` dataset.
2. Conduct a k-means cluster analysis.
3. Visualize the clusters.

Task 1: Import and prepare the `iris.csv` dataset **(15 points)**

This has two steps. In the first step, you read the iris data from **'data/iris.csv'** in the data folder then, save it in dataFrame **``df"**, and display the first 5 rows of **``df"**. The output should be as follows:

Out[2]:

	sepal_length	sepal_width	petal_length	petal_width	species
0	5.1	3.5	1.4	0.2	setosa
1	4.9	3.0	1.4	0.2	setosa
2	4.7	3.2	1.3	0.2	setosa
3	4.6	3.1	1.5	0.2	setosa
4	5.0	3.6	1.4	0.2	setosa

In the second step, separates the class variable in ``y", removes the ``y" column from dataFrame ``df", standardizes ``df", and display the first 5 rows. Note that to standardize call the StandardScaler().fit_transform() method. The output should be as follows:

Out[3]:

	sepal_length	sepal_width	petal_length	petal_width
0	-0.900681	1.032057	-1.341272	-1.312977
1	-1.143017	-0.124958	-1.341272	-1.312977
2	-1.385353	0.337848	-1.398138	-1.312977
3	-1.506521	0.106445	-1.284407	-1.312977
4	-1.021849	1.263460	-1.341272	-1.312977

Task 2: Conduct a k-means cluster analysis. **(25 points)**

You've to set up a `KMeans` object with the following parameters:

- `n_clusters`: Total number of clusters to make; set to three (03).
- `random_state`: Set to one (01) to reproduce these results.
- `init`: How to initialize the k-means centers; use `k-means++`.
- `n_init`: Number of times k-means would be run; set to ten (10).

Fits the model to the data and displays the parameters of the fitted model. The output should be as follows:

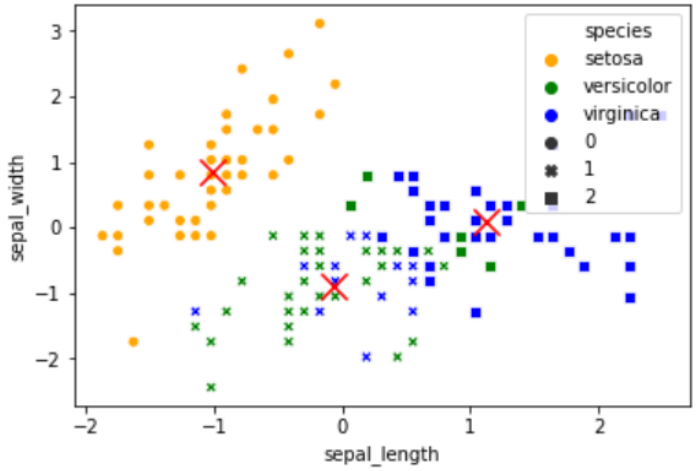
```
Out[4]: {'algorithm': 'auto',
         'copy_x': True,
         'init': 'k-means++',
         'max_iter': 300,
         'n_clusters': 3,
         'n_init': 10,
         'n_jobs': None,
         'precompute_distances': 'auto',
         'random_state': 1,
         'tol': 0.0001,
         'verbose': 0}
```

Task 3: Visualize the clusters. **(25 points)**

Your code should create a scatterplot of the first two features. Each point is colored according to its actual label. For comparison, each instance should be drawn with a marker according to the label found by the clustering algorithm.

The output should be as follows:

```
Out[5]: <matplotlib.collections.PathCollection at 0x28c33b5ba20>
```



The submission grading rubric is as follows (points out of 65 total):

Project element	**Points**
Task 1	15
Task 2	25
Task 3	25

Submission Instructions: Create a compressed file (.zip or .tar.gz files are accepted) with your all source files such as .ipynb files and data files. Generally speaking, to complete Task 1 through Task 3, you just need one .ipynb file. But it's better to submit everything as a compressed file. Submit the compressed file to Canvas.

Late submission policy: As described in the syllabus, any late submission will the penalized with 10% off after each 24 hours late. For example, an assignment worth 100 points turned in 2 days late will receive a 20-point penalty. Assignments turned in 5 or more days after the due date will receive a grade of 0.