In [219…

```
from sklearn.datasets import make_blobs
import matplotlib.pyplot as plt
import pandas as pd
import numpy as np
import random
```

In [220…

```
#epsilon = 7.5, MinPts = 3
df = pd.read_csv('dbscan.csv')
df.head()
```

Out[220]:

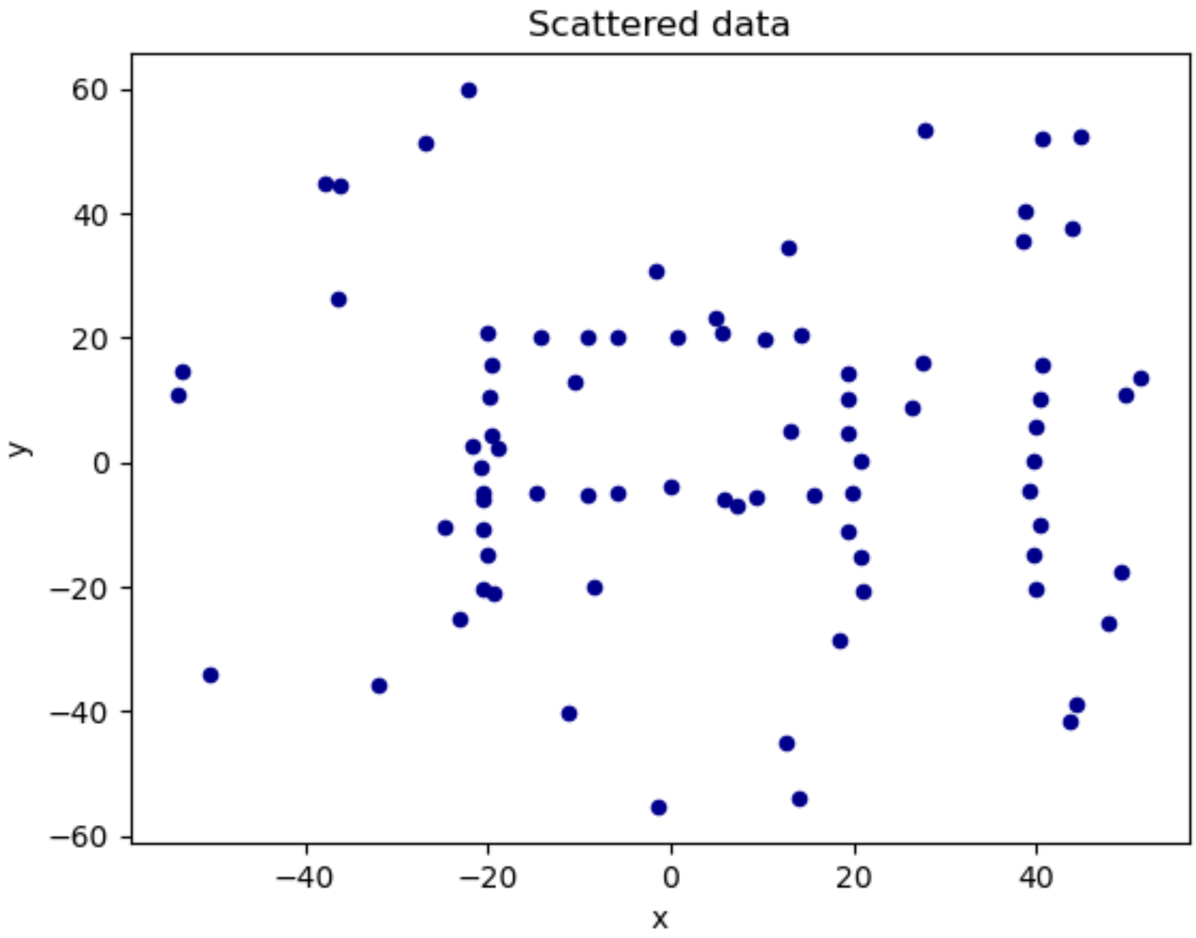
	cluster	pt	x	y	num_neighbors	neighbors
0	NaN	0	51.418089	13.593610	2	0,27
1	NaN	1	39.132318	-4.419204	3	1,40,75
2	NaN	2	47.807515	-25.822561	1	2
3	NaN	3	27.699703	53.434193	1	3
4	NaN	4	39.860995	5.676871	3	4,56,75

In [221…

```
df.plot.scatter(x='x', y='y', c='DarkBlue')
plt.title("Scattered data")
```

Out[221]:

```
Text(0.5, 1.0, 'Scattered data')
```



In [222…

```
num_neighbor_list = dict()
for index,rows in df.iterrows():
    if rows.num_neighbors in num_neighbor_list:
        num_neighbor_list[rows['num_neighbors']].append(rows['pt'])
    else:
        temp_list = []
        temp_list.append(rows['pt'])
        num_neighbor_list[rows['num_neighbors']] = temp_list
```

In [223…

```
num_neighbor_list
```

Out[223]:

```
{2: [0, 12, 13, 21, 27, 31, 35, 43, 47, 48, 51, 55, 59, 62, 64, 66, 67, 77]
,
 3: [1, 4, 5, 6, 9, 11, 14, 17, 19, 22, 26, 28, 33, 40, 53, 56, 75, 76, 78]
,
 1: [2, 3, 7, 15, 18, 23, 24, 36, 41, 44, 57, 58, 61, 65, 73, 79],
 5: [8, 32, 38, 39, 50, 68, 70],
 4: [10, 16, 20, 25, 29, 30, 34, 37, 42, 45, 46, 49, 52, 54, 69, 71, 74],
 6: [60],
 7: [63, 72]}
```

In [224…

```
neighbors_list = [[int(item) for item in each.split(",")]
                          for each in df["neighbors"].tolist()]
dbscan_dict = dict(zip(df["pt"], neighbors_list))
dbscan_dict
```

Out[224]:

```
{0: [0, 27],
 1: [1, 40, 75],
 2: [2],
 3: [3],
 4: [4, 56, 75],
 5: [5, 70, 74],
 6: [6, 14, 42],
 7: [7],
 8: [8, 11, 60, 63, 72],
 9: [9, 33, 78],
 10: [10, 22, 39, 71],
 11: [8, 11, 14],
 12: [12, 28],
 13: [13, 51],
 14: [6, 11, 14],
 15: [15],
 16: [16, 29, 46, 48],
 17: [17, 20, 42],
 18: [18],
 19: [19, 54, 74],
 20: [17, 20, 38, 42],
 21: [21, 76],
 22: [10, 22, 71],
 23: [23],
 24: [24],
 25: [25, 26, 54, 67],
 26: [25, 26, 34],
 27: [0, 27],
 28: [12, 28, 40],
 29: [16, 29, 34, 46],
 30: [30, 38, 45, 52],
 31: [31, 49],
 32: [32, 63, 69, 70, 72],
 33: [9, 33, 78],
 34: [26, 29, 34, 46],
 35: [35, 62],
 36: [36],
 37: [37, 38, 45, 53],
 38: [20, 30, 37, 38, 45],
 39: [10, 39, 50, 68, 71],
 40: [1, 28, 40],
 41: [41],
 42: [6, 17, 20, 42],
 43: [43, 59],
 44: [44],
 45: [30, 37, 38, 45],
 46: [16, 29, 34, 46],
 47: [47, 53],
 48: [16, 48],
 49: [31, 49, 52, 76],
 50: [39, 50, 60, 63, 68],
 51: [13, 51],
 52: [30, 49, 52, 64],
 53: [37, 47, 53],
 54: [19, 25, 54, 74],
 55: [55, 77],
 56: [4, 56, 66],
 57: [57],
 58: [58],
 59: [43, 59],
 60: [8, 50, 60, 63, 68, 72],
 61: [61],
 62: [35, 62],
 63: [8, 32, 50, 60, 63, 68, 72],
 64: [52, 64],
 65: [65],
 66: [56, 66],
 67: [25, 67],
 68: [39, 50, 60, 63, 68],
 69: [32, 69, 70, 72],
 70: [5, 32, 69, 70, 72],
 71: [10, 22, 39, 71],
 72: [8, 32, 60, 63, 69, 70, 72],
 73: [73],
 74: [5, 19, 54, 74],
 75: [1, 4, 75],
 76: [21, 49, 76],
 77: [55, 77],
 78: [9, 33, 78],
 79: [79]}
```

In [225…

```
def defining_points(MinPts,num_neighbor_list):
    cores, non_cores, outliers = list(), list(), list()

    [cores.extend(num_neighbor_list[i])
     for i in num_neighbor_list if i >= MinPts]

    [non_cores.extend(num_neighbor_list[i])
     for i in num_neighbor_list if i < MinPts and i > 1]

    [outliers.extend(num_neighbor_list[i])
     for i in num_neighbor_list if i == 1]

    return cores,non_cores,outliers
```

In [226…

```
cores,non_cores,outliers = defining_points(3,num_neighbor_list)
```

In [227…

```
print(cores)
```

```
[1, 4, 5, 6, 9, 11, 14, 17, 19, 22, 26, 28, 33, 40, 53, 56, 75, 76, 78, 8, 3
2, 38, 39, 50, 68, 70, 10, 16, 20, 25, 29, 30, 34, 37, 42, 45, 46, 49, 52, 5
4, 69, 71, 74, 60, 63, 72]
```

In [228…

```
print(non_cores)
```

```
[0, 12, 13, 21, 27, 31, 35, 43, 47, 48, 51, 55, 59, 62, 64, 66, 67, 77]
```

In [229…

```
print(outliers)
```

```
[2, 3, 7, 15, 18, 23, 24, 36, 41, 44, 57, 58, 61, 65, 73, 79]
```

In [230…

```
def cluster_with_stack(eps, minPts, df):

    #initiating cluster number
    C = 1
    #initiating stacks to maintain
    current_stack = set()
    unvisited = list(df.index)
    clusters = []


    while (len(unvisited) != 0): #run until all points have been visited

        #identifier for first point of a cluster
        first_point = True

        #choose a random unvisited point
        current_stack.add(random.choice(unvisited))

        while len(current_stack) != 0: #run until a cluster is complete

            #pop current point from stack
            curr_idx = current_stack.pop()

            #check if point iscore, neighbour or border
            if curr_idx in cores:
                iscore = True
                isborder = False
                isnoise = False

            if curr_idx in non_cores:
                iscore = False
                isborder = True
                isnoise = False

            if curr_idx in outliers:
                iscore = False
                isborder = False
                isnoise = True

            neigh_indexes = dbscan_dict[curr_idx]
            #dealing with an edge case
            if (isborder & first_point):
                #for first border point, we label it aand its neighbours as
                clusters.append((curr_idx, 0))
                clusters.extend(list(zip(neigh_indexes,[0 for _ in range(len

                #label as visited
                unvisited.remove(curr_idx)
                unvisited = [e for e in unvisited if e not in neigh_indexes]

                continue

            unvisited.remove(curr_idx) #remove point from unvisited list


            neigh_indexes = set(neigh_indexes) & set(unvisited) #look at onl

            if iscore: #if current point is a core
                first_point = False

                clusters.append((curr_idx,C)) #assign to a cluster
                current_stack.update(neigh_indexes) #add neighbours to a sta

            elif isborder: #if current point is a border point
                clusters.append((curr_idx,C))

                continue

            elif isnoise: #if current point is noise
                clusters.append((curr_idx, 0))

                continue

        if not first_point:
            #increment cluster number
            C+=1

    return clusters
```

In [231…

```
eps = 7.5
#minimum neighbouring points set to 3
minPts = 3

data = pd.read_csv("dbscan.csv", usecols = ['x','y'] )
#data
clustered = cluster_with_stack(eps, minPts, data)

idx , cluster = list(zip(*clustered))
cluster_df = pd.DataFrame(clustered, columns = ["pt", "cluster"])

cluster_df
```

Out[231]:

	pt	cluster
0	64	0
1	52	0
2	64	0
3	26	1
4	34	1
...	...	...
83	61	0
84	7	0
85	77	0
86	55	0
87	77	0

88 rows × 2 columns

In [232…

```
merged_df = pd.merge(df, cluster_df, on ='pt')
```

In [233…

```
merged_df
```

Out[233]:

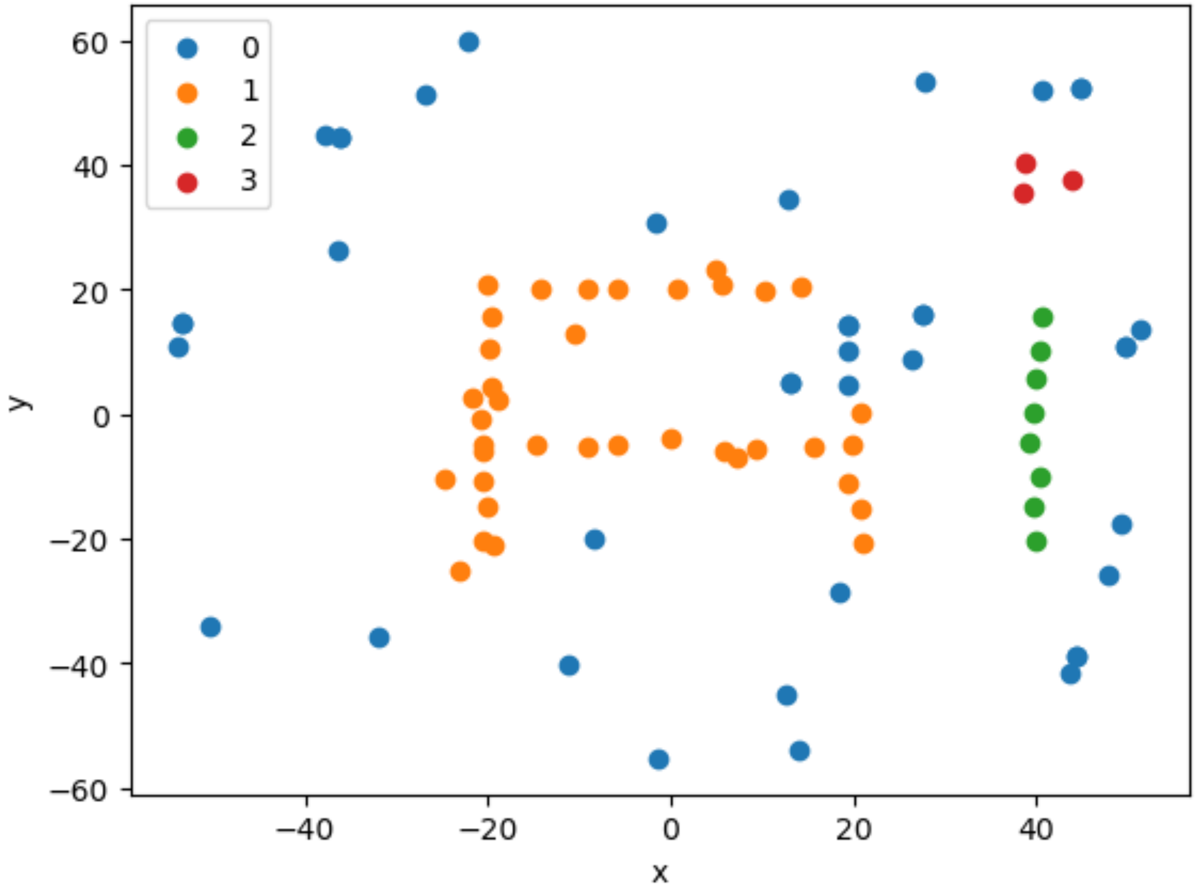
	cluster_x	pt	x	y	num_neighbors	neighbors	cluster_y
0	NaN	0	51.418089	13.593610	2	0,27	0
1	NaN	1	39.132318	-4.419204	3	1,40,75	2
2	NaN	2	47.807515	-25.822561	1	2	0
3	NaN	3	27.699703	53.434193	1	3	0
4	NaN	4	39.860995	5.676871	3	4,56,75	2
...	...	...	...	...	...	...	...
83	NaN	76	26.366491	8.798826	3	21,49,76	0
84	NaN	77	-36.184060	44.292045	2	55,77	0
85	NaN	77	-36.184060	44.292045	2	55,77	0
86	NaN	78	44.012085	37.729478	3	9,33,78	3
87	NaN	79	-1.393234	-55.293943	1	79	0

88 rows × 7 columns

In [234…

```
plt.figure(figsize=(10,7))

fig, ax = plt.subplots()

for cluster, df_cluster in merged_df.groupby('cluster_y'):
    ax.scatter(df_cluster['x'], df_cluster['y'], label=cluster)

ax.legend()
ax.set_xlabel('x')
ax.set_ylabel('y')

plt.show()
```

```
<Figure size 1000x700 with 0 Axes>
```



In [ ]:

```
```

In [ ]:

```
# t_p = []
# for key in dbscan_dict.keys():
#     print('key - ',key)
#     if key in t_p:
#         x = 1
#         print('already traversed')
#     else:
#         t_p.append(key)
#         neighbors = dbscan_dict[key]
#         print('neighbors - ')
#         for neighbor in neighbors:
#             if neighbor in t_p:
#                 continue
#             else:
#                 print(neighbor)
#                 t_p.append(neighbor)
```

In [ ]:

```
# clusters = []

# for i in dbscan_dict:
#     if i in cores:
#         flag = 0
#         for cls in clusters:
#             if i in cls:
#                 flag += 1
#             continue
#         if flag == 0:
#             clusters.append([i])
```