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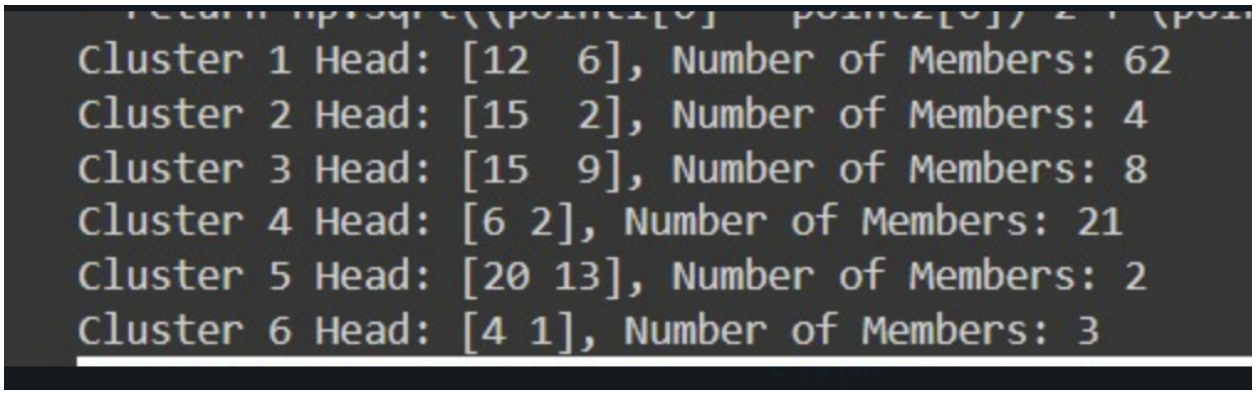
1)

```
import csv
import random
with open('data.csv', 'w', newline='') as file:
    writer = csv.writer(file)
    field = ["x", "y"]

    writer.writerow(field)
    for i in range(100):
      x=random.randint(1,20)
      y=random.randint(1,20)
      writer.writerow([x,y])
```

OUTPUT:

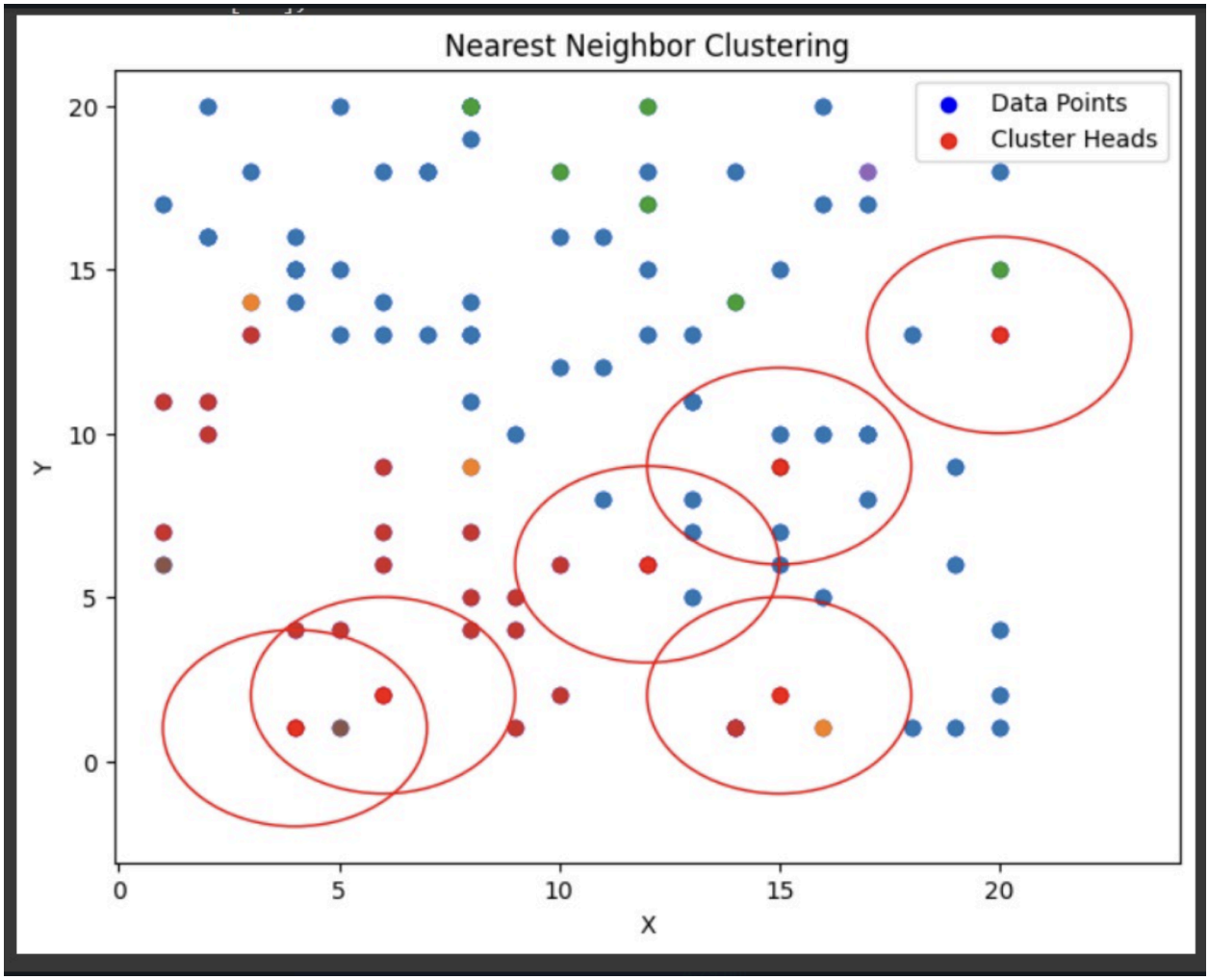


2)

```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt

def distance(point1, point2):
    return np.sqrt((point1[0] - point2[0])*2 + (point1[1] - point2[1])*2)

def nearest_neighbor_clustering(data, threshold):
    clusters = []
    cluster_heads = []

    for point in data:
        assigned = False
        for cluster in clusters:
            if any(distance(point, member) <= threshold for member in cluster):
                cluster.append(point)
```

```
                assigned = True
                break
        if not assigned:
            clusters.append([point])
            cluster_heads.append(point)

    return clusters, cluster_heads

def plot_clusters(data, clusters, cluster_heads, threshold):
    plt.figure(figsize=(8, 6))
    plt.scatter(data[:,0], data[:,1], color='blue', label='Data Points')
    for cluster in clusters:
        cluster = np.array(cluster)
        plt.scatter(cluster[:,0], cluster[:,1])
    for head in cluster_heads:
        circle = plt.Circle((head[0], head[1]), threshold, color='red', fill=False)
        plt.gca().add_patch(circle)
    plt.scatter(np.array(cluster_heads)[:,0], np.array(cluster_heads)[:,1], color='red', label='Cluster
Heads')
    plt.xlabel('X')
    plt.ylabel('Y')
    plt.title('Nearest Neighbor Clustering')
    plt.legend()
    plt.show()


data_df = pd.read_csv("data.csv")
data = data_df.iloc[:, :2].values


threshold = 3


clusters, cluster_heads = nearest_neighbor_clustering(data, threshold)


for i, cluster in enumerate(clusters):
    print(f"Cluster {i+1} Head: {cluster_heads[i]}, Number of Members: {len(cluster)}")


plot_clusters(data, clusters, cluster_heads, threshold)
```

OUTPUT:


Nearest Neighbor Clustering
Data Points
Cluster Heads
20
15
10
5
0
Y
0
5
10
15
20
X