PROBLEM 1 - LINKAGE CRITERIA (10/10 points)

In this problem, you will implement three different linkage criteria: `singleLinkageDist`, `maxLinkageDist`, and `averageLinkageDist`. For our purposes, distances between elements will be calculated using the `Point` class `distance` method, which calculates the Euclidean distance.

- The `singleLinkageDist` between two clusters is the shortest distance between an element in one cluster to an element in the other cluster. In other words, the distance will be that between the points that are closest to each other, where one point is from one cluster and the other is from the other cluster.
- The `maxLinkageDist` between two clusters is the largest distance between an element in one cluster to an element in the other cluster. In other words, the distance will be that between the points that are farthest from each other, where one point is from one cluster and the other is from the other cluster.
- The `averageLinkageDist` between two clusters uses the mean to find the average distance between all possible pais of elements (p1, p2) where p1 is from one cluster and p2 is from the other cluster.

Enter all code for the `Cluster` class below, including the functions in this class that were already defined for you.

```
# Enter code for the Cluster class in this box
class Cluster(object):
    """ A Cluster is defines as a set of elements, all having
    a particular type """
    def __init__(self, points, pointType):
        """ Elements of a cluster are saved in self.points
        and the pointType is also saved """
        self.points = points
        self.pointType = pointType
    def singleLinkageDist(self, other):
        """ Returns the float distance between the points that
        are closest to each other, where one point is from
        self and the other point is from other. Uses the
        Euclidean dist between 2 points, defined in Point."""
        # TO DO
        dist = float('inf')
```

Correct

Test results

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CORRECT

Test: links1

Testing simple datafile with singleLinkageDist and no scaling

Output:

```
singleLinkageDist with data ['a,2','b,2','c,1','d,4'] is  1.0
Test completed
```

Help

Test: links2

Testing complex datafile with singleLinkageDist and no scaling

Output:

```
singleLinkageDist with data
['a,2,10,5,3,4,6','b,2,3,8,5,7,3','c,1,4,5,1,5,5','d,4,3,8,5,5,5'] is  3.46410161514
Test completed
```

Test: links3

Testing simple datafile with maxLinkageDist and no scaling

Output:

```
maxLinkageDist with data ['a,2','b,2','c,1','d,4'] is  2.0
Test completed
```

Test: links4

Testing complex datafile with maxLinkageDist and no scaling

Output:

```
maxLinkageDist with data ['a,2,10,5,3,4,6','b,2,3,8,5,7,3','c,1,4,5,1,5,5','d,4,3,8,5,5,5']
is  8.24621125124
Test completed
```

Test: links5

Testing simple datafile with averageLinkageDist and no scaling

Output:

```
averageLinkageDist with data ['a,2','b,2','c,1','d,4'] is  1.5
Test completed
```

Test: links6

Testing complex datafile with averageLinkageDist and no scaling

Output:

```
averageLinkageDist with data
['a,2,10,5,3,4,6','b,2,3,8,5,7,3','c,1,4,5,1,5,5','d,4,3,8,5,5,5'] is  6.04595779344
Test completed
```

Hide output

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