Naman Jain Vimal Kumar
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Homework 9

1. *Generate Three Gaussian distributions, each with 100 data points in 2 dimensions, with centers at (5,5), (-5, 5), and (-5,-5) and standard deviation sigma = 2. Draw them in a Figure. Set K=3, do K-means clustering. Show the results in the same Figure. Repeat this 5 times. Submit the 5 figures, each represent the results of each K-means clustering.*
2. *Everything are same as (A), but with sigma=4. Submit the 5 figures.*

Solution

1. Sigma = 2

For Each Iteration (Until 5th Iteration):

```
Centroid: [-4.89923636  5.02724667]
Points Count: 100
Class: 2.0
------------------
Centroid: [5.22862662 4.7935583 ]
Points Count: 99
Class: 1.0
------------------
Centroid: [-5.08038499 -4.91071949]
Points Count: 101
Class: 3.0
------------------
```

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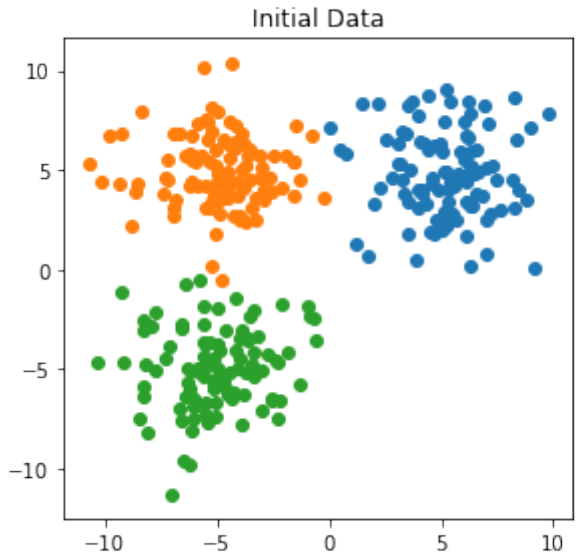

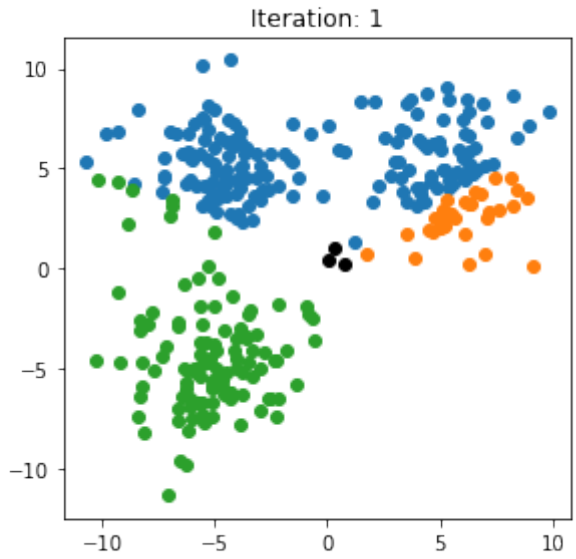

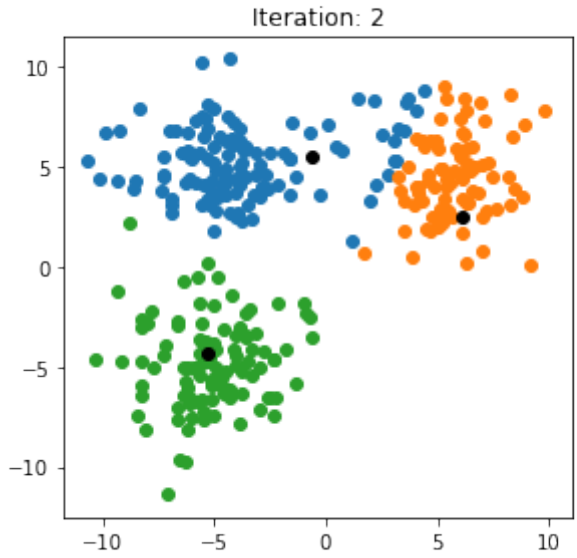

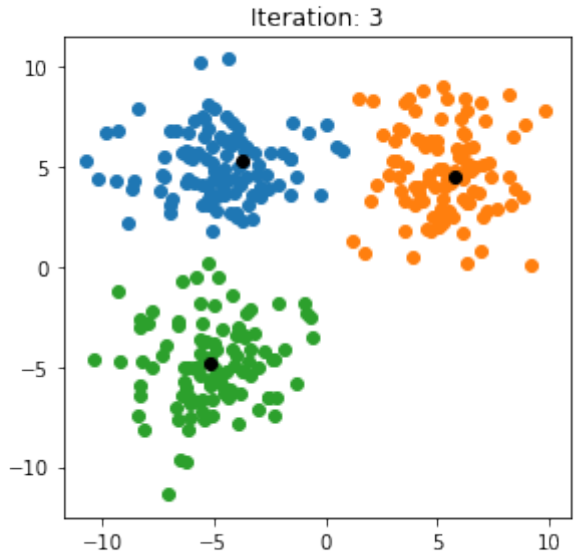

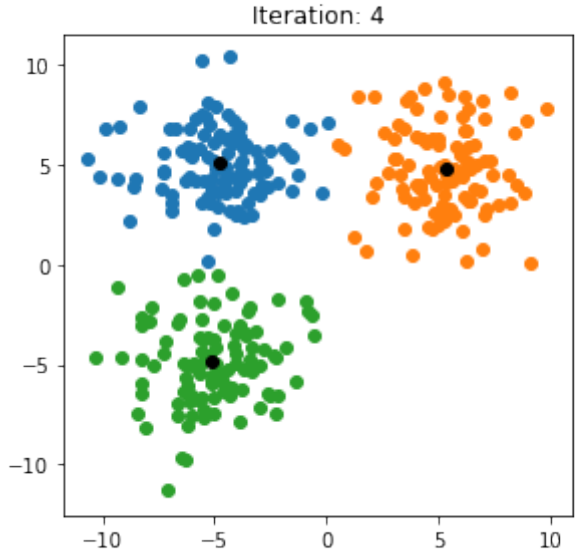

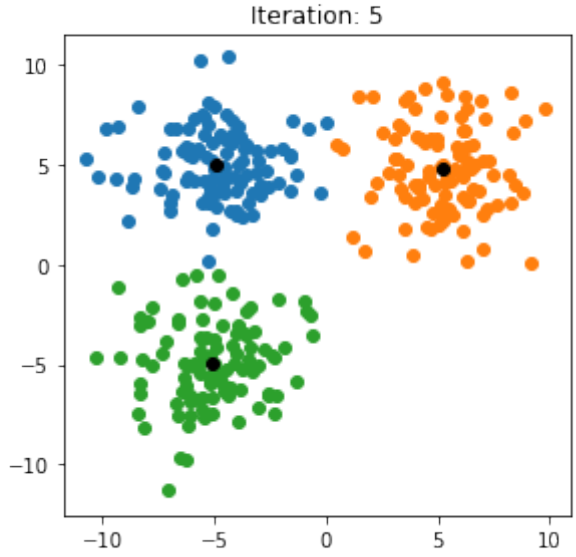

For 5 times K-means

```
K-means n Time: 1
```

```
Centroid: [4.95511215 5.13987634]
Points Count: 100
Class: 1.0
-------------------
Centroid: [-5.13821245  4.99446563]
Points Count: 101
Class: 2.0
-------------------
Centroid: [-4.66696211 -5.00293743]
Points Count: 99
Class: 3.0
-------------------
********************
K-means n Time: 2
Centroid: [4.95511215 5.13987634]
Points Count: 100
Class: 1.0
-------------------
Centroid: [-4.66696211 -5.00293743]
Points Count: 99
Class: 3.0
-------------------
Centroid: [-5.13821245  4.99446563]
Points Count: 101
Class: 2.0
-------------------
********************
K-means n Time: 3
Centroid: [5.00201746 5.14410785]
Points Count: 100
Class: 1.0
-------------------
Centroid: [-5.07103376  5.03951078]
Points Count: 101
Class: 2.0
-------------------
Centroid: [-4.6850281  -4.95119409]
Points Count: 99
Class: 3.0
-------------------
********************
K-means n Time: 4
Centroid: [4.95511215 5.13987634]
Points Count: 100
Class: 1.0
-------------------
Centroid: [-5.13821245  4.99446563]
Points Count: 101
Class: 2.0
-------------------
Centroid: [-4.66696211 -5.00293743]
Points Count: 99
Class: 3.0
-------------------
********************
K-means n Time: 5
Centroid: [4.95511215 5.13987634]
Points Count: 100
```

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```
Class: 1.0
-------------------
Centroid: [-5.13821245  4.99446563]
Points Count: 101
Class: 2.0
-------------------
Centroid: [-4.66696211 -5.00293743]
Points Count: 99
Class: 3.0
-------------------
```

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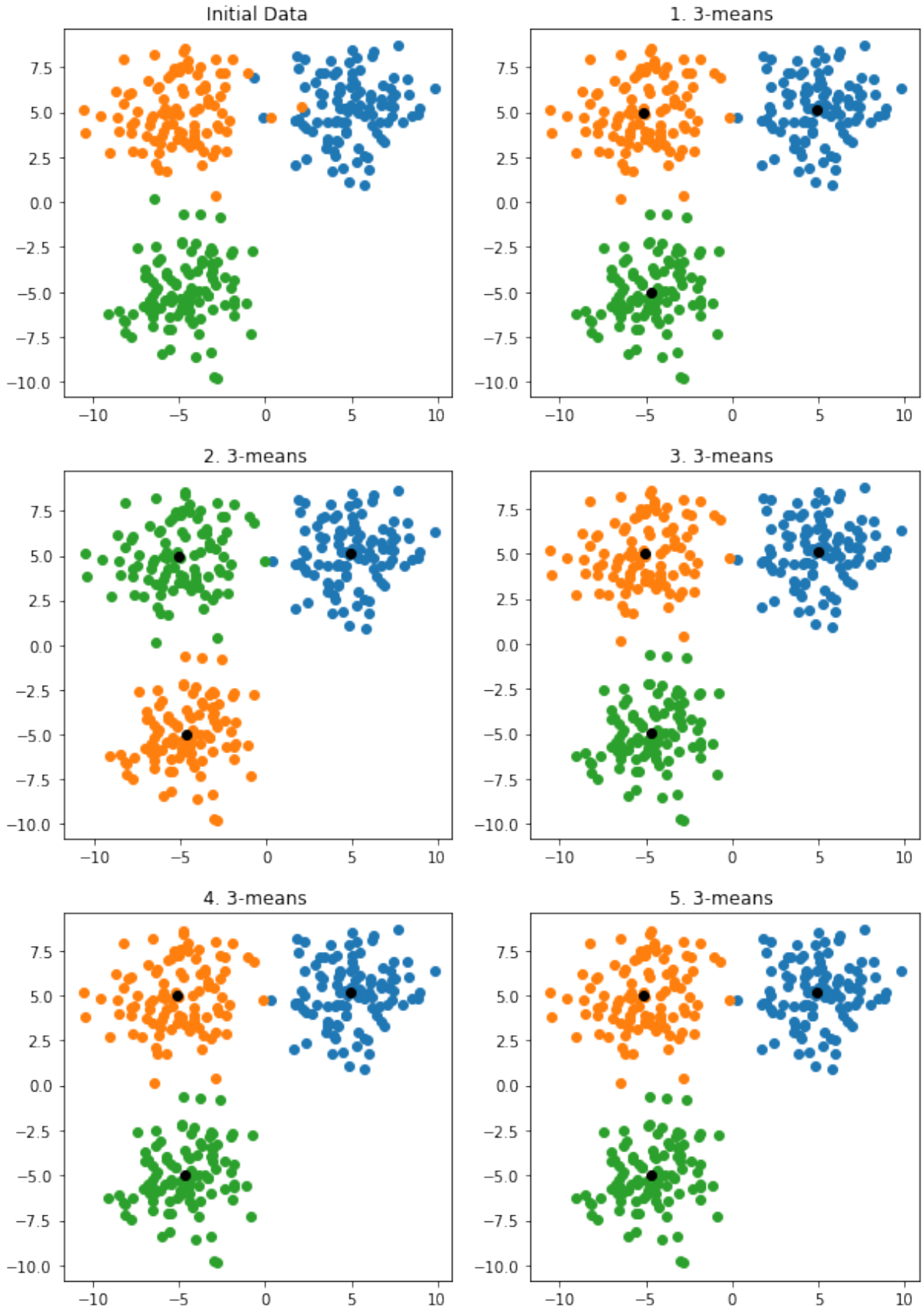

2. Sigma = 4

For Each Iteration (Until 5th Iteration)

```
Centroid: [-6.33049379  5.45126905]
```

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```
Points Count: 96
Class: 2.0
-------------------
Centroid: [4.63456072 5.51334715]
Points Count: 106
Class: 1.0
-------------------
Centroid: [-5.23788698 -5.79037373]
Points Count: 98
Class: 3.0
-------------------
```

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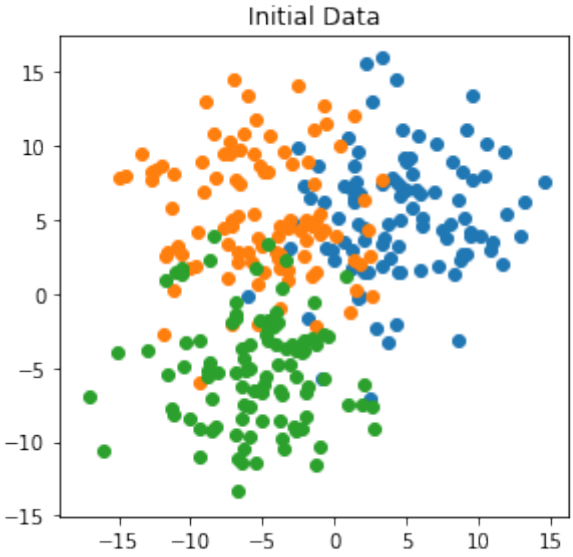

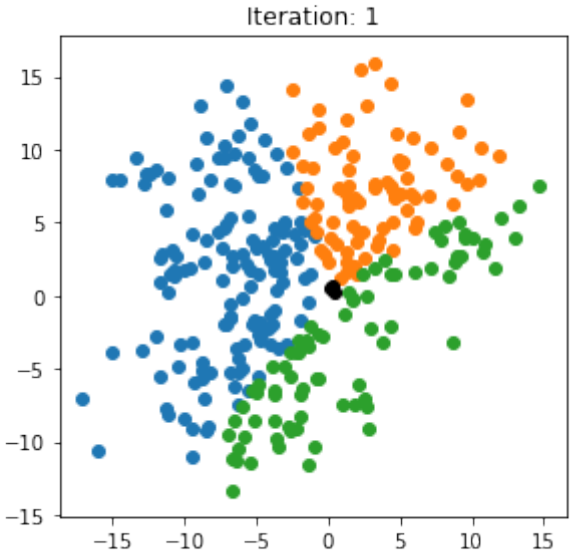

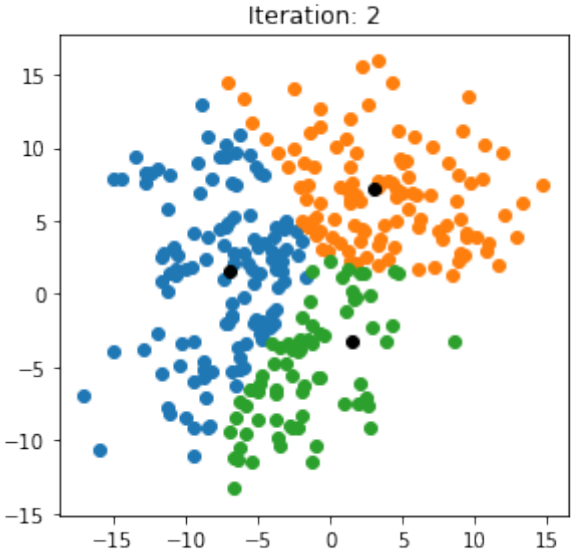

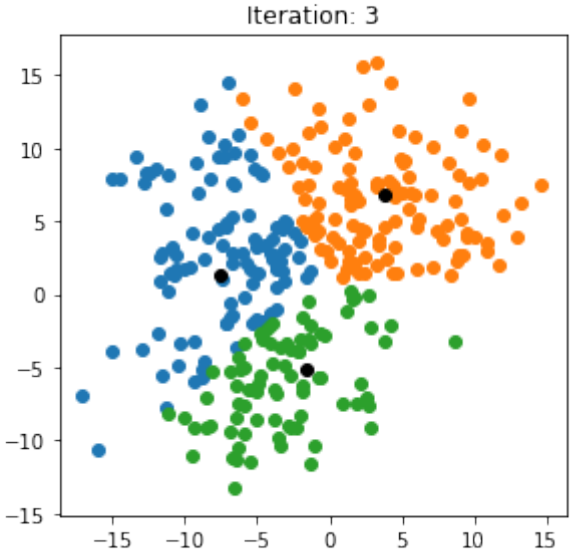

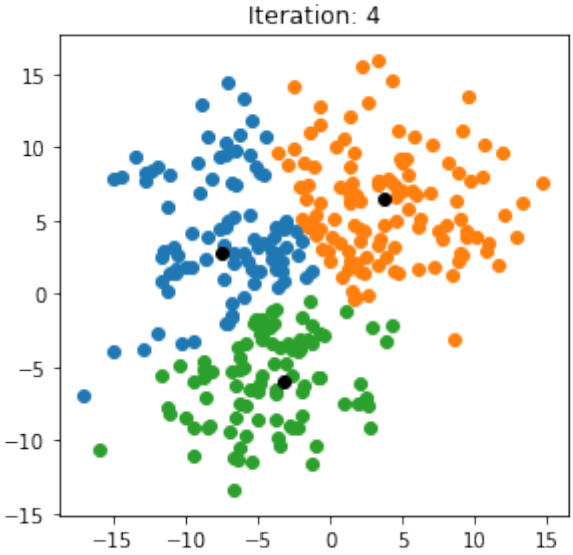

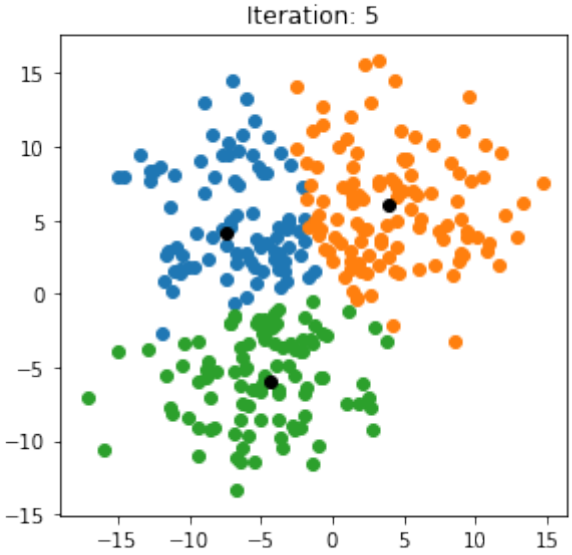

For
****

```
K-means n Time: 1
Centroid: [4.87907475 4.38626943]
Points Count: 103
Class: 1.0
--------------------
Centroid: [-4.6992557  -5.08885372]
Points Count: 106
Class: 3.0
--------------------
Centroid: [-5.24945892  6.45680425]
Points Count: 91
Class: 2.0
--------------------
********************
K-means n Time: 2
Centroid: [-5.31277799  6.42643647]
Points Count: 90
Class: 2.0
--------------------
Centroid: [-4.6992557  -5.08885372]
Points Count: 106
Class: 3.0
--------------------
Centroid: [4.83628297 4.43172912]
Points Count: 104
Class: 1.0
--------------------
********************
K-means n Time: 3
Centroid: [-5.03915982  6.62555216]
Points Count: 92
Class: 2.0
--------------------
Centroid: [4.98628054 4.16938665]
Points Count: 102
Class: 1.0
--------------------
Centroid: [-4.6992557  -5.08885372]
Points Count: 106
Class: 3.0
--------------------
********************
K-means n Time: 4
Centroid: [-5.19260162  5.03101244]
Points Count: 106
Class: 2.0
--------------------
Centroid: [4.82151767 4.72561233]
Points Count: 105
Class: 1.0
--------------------
Centroid: [-4.81606516 -6.09473086]
Points Count: 89
Class: 3.0
--------------------
********************
K-means n Time: 5
Centroid: [-5.48862848  6.42494725]
```

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```
Points Count: 88
Class: 2.0
-------------------
Centroid: [-4.6992557  -5.08885372]
Points Count: 106
Class: 3.0
-------------------
Centroid: [4.6943937  4.48832351]
Points Count: 106
Class: 1.0
-------------------
```

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