Machine learning – Ex3

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## Problem 1

*Dataset:*

A6

*Center*

**a)**

A screenshot of a computer

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This is the the result for the process for the first epoch:

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Datapoint | Ditance to:   |  |  |  | | --- | --- | --- | | (2, 3) | (4, -0.5) | (10, 2.5) | | Cluster |
|  | |  |  |  | | --- | --- | --- | | 0.0 | 4.03 | 8.02 | | C1 |
|  | |  |  |  | | --- | --- | --- | | 5.59 | 3.16 | 3.61 | | C2 |
|  | |  |  |  | | --- | --- | --- | | 9.22 | 7.16 | 1.8 | | C3 |
|  | |  |  |  | | --- | --- | --- | | 4.03 | 0.0 | 6.71 | | C2 |
|  | |  |  |  | | --- | --- | --- | | 8.02 | 6.71 | 0.0 | | C3 |
| A6 | |  |  |  | | --- | --- | --- | | 1.41 | 2.69 | 7.02 | | C1 |
|  | |  |  |  | | --- | --- | --- | | 5.83 | 3.04 | 3.91 | | C2 |
|  | |  |  |  | | --- | --- | --- | | 7.16 | 5.39 | 1.41 | | C3 |
|  | |  |  |  | | --- | --- | --- | | 2.06 | 3.0 | 6.0 | | C1 |
|  | |  |  |  | | --- | --- | --- | | 8.25 | 6.18 | 1.5 | | C3 |

With the formula :

Exemple use :

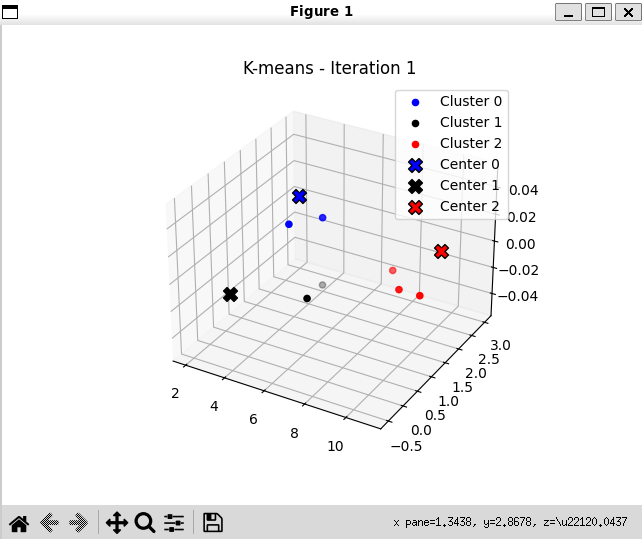
**Epoch 1 :**

* **Cluster 1** : A1, A6, A9
* **Cluster 2** : A2, A4, A7
* **Cluster 3** : A3, A5, A8, A10

**Epoch 2 :**

* **Cluster 1** : A1, A6, A9
* **Cluster 2** : A2, A4, A7
* **Cluster 3** : A3, A5, A8, A10

**b)**

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how to calculate the cluster center:

**Epoch 1 :**

* **Cluster center 1**: (2, 3)
* **Cluster center 2** : (4, -0.5)
* **Cluster center 3** : (10, 2.5)

**Epoch 2 :**

* **Cluster center 1** : (3.0, 2.5)
* **Cluster center 2** : (6.0, 0.0)
* **Cluster center 3** : (10.0, 1.5)

**c)**

it converge after 1 epoch.

## Problem 2

a)



*Rules :*

Results:

Derivative of log-vraisemblance:

**b)**

Derivative of log-vraisemblance

Make a cross product:

Lettres translate:

Results:

A number and number equation

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## Problem 3

a)

Joint density of independent variables:

Rules:

We want to find :

So, the result is:

**b)**

Criteria of the smallest squares

maximizing the natural logarithm of J

*Rules:*

Don’t need .

So, the result is:

c)

maximizing the natural logarithm of J:

*Rules:*

(we know a and b)

​​

The result is: