ECE 421 Homework 7

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Question 1,

$K = 2$

$D = \{ 0, 0.5, 0.5 + \triangle, 1.5 + \triangle \}$

$\triangle \geq 0$ is a problem parameter

Part A,

Let $\triangle = 0.5$

$M_1[0] = 1$

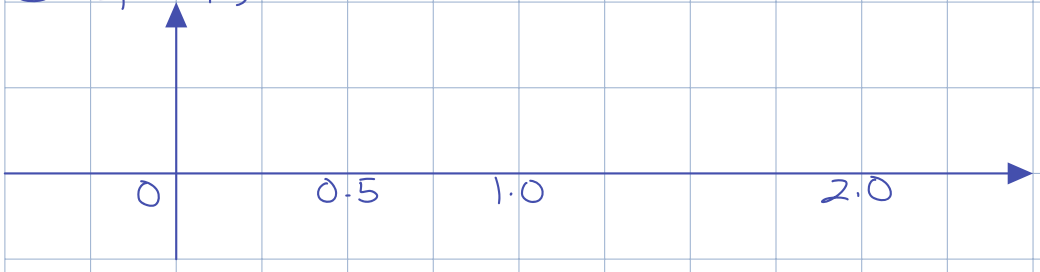
$M_2[0] = 2$

$D = \{ 0, 0.5, 1.0, 2.0 \}$

$\{ B_1[l], B_2[l] \}$

$\{ M_1[l], M_2[l] \}$

Step 1,



$M_1[0] = 1$ $\quad B_1[1] = \{ 0, 0.5, 1.0 \}$

$M_2[0] = 2$ $\quad B_2[1] = \{ 2.0 \}$

Step 2

$B_1[1] = \{0, 0.5, 1.0\}$

$B_2[1] = \{2.0\}$

$$\mu_1[1] = \frac{1}{3}(0 + 0.5 + 1.0)$$

$$= \frac{1}{3}(1.5) = 0.5$$

$$\mu_2[1] = \frac{1}{1}(2.0) = 2.0$$

Converged

$B_1[1] = \{0, 0.5, 1.0\}$

$B_2[1] = \{2.0\}$

$\mu_1[1] = 0.5$

$\mu_2[1] = 2.0$

Part B,

(i)

Observation:

Cluster did not change in (a) because data skewed towards left

So moving the data point pass boundary point 1.5 seems to be smart

Pick $\triangle = 1 + \varepsilon$, $\varepsilon > 0$ then our dataset is

$D = \{0, 0.5, 1.5 + \varepsilon, 2.5 + \varepsilon\}$

The clusters became

$B_1[1] = \{0, 0.5\}$

$B_2[1] = \{1.5 + \varepsilon, 2.5 + \varepsilon\}$

$$\mu_1[1] = \frac{1}{2}(0 + 0.5) = \frac{1}{4}$$

$$\mu_2[1] = \frac{1}{2}(1.5 + \varepsilon + 2.5 + \varepsilon) = 2 + \varepsilon$$

If $\triangle < 1$, we cannot have a new center