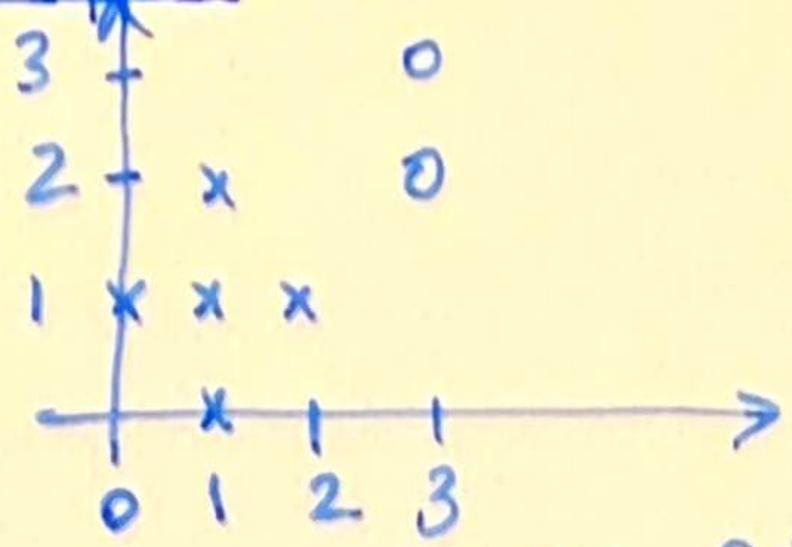
Given the data



There are two classes but we don't know their labels.

We only know $x = \left\{ \begin{bmatrix}1\\1\end{bmatrix}, \begin{bmatrix}0\\1\end{bmatrix}, \begin{bmatrix}1\\0\end{bmatrix}, \begin{bmatrix}2\\1\end{bmatrix}, \begin{bmatrix}1\\2\end{bmatrix}, \begin{bmatrix}3\\2\end{bmatrix}, \begin{bmatrix}3\\3\end{bmatrix} \right\}$

Let $K=2$: # of classes.

Let $\mu_1 = \begin{bmatrix}2\\1\end{bmatrix}$ and $\mu_2 = \begin{bmatrix}3\\2\end{bmatrix}$ (Initial center of mass vectors)

- Vectors $\begin{bmatrix}1\\1\end{bmatrix}, \begin{bmatrix}0\\1\end{bmatrix}, \begin{bmatrix}1\\0\end{bmatrix}, \begin{bmatrix}2\\1\end{bmatrix}$ and $\begin{bmatrix}1\\2\end{bmatrix}$ are close to μ_1 compared to μ_2. Therefore the new μ_1 will be $\mu_1 = \frac{1}{5}\left(\begin{bmatrix}1\\1\end{bmatrix} + \begin{bmatrix}0\\1\end{bmatrix} + \begin{bmatrix}1\\0\end{bmatrix} + \begin{bmatrix}2\\1\end{bmatrix} + \begin{bmatrix}1\\2\end{bmatrix}\right) = \begin{bmatrix}1\\1\end{bmatrix}$.
- Vectors $\begin{bmatrix}3\\2\end{bmatrix}, \begin{bmatrix}3\\3\end{bmatrix}$ are close to $\mu_2 = \begin{bmatrix}3\\2\end{bmatrix}$. So the new vector $\mu_2 = \frac{1}{2}\left(\begin{bmatrix}3\\2\end{bmatrix} + \begin{bmatrix}3\\3\end{bmatrix}\right) = \begin{bmatrix}3\\3/2\end{bmatrix}$
- Vectors $\begin{bmatrix}1\\1\end{bmatrix}, \begin{bmatrix}0\\1\end{bmatrix}, \cdots \begin{bmatrix}1\\2\end{bmatrix}$ are close to $\mu_1 = [1\ 1]^T$
  " $\begin{bmatrix}3\\2\end{bmatrix}, \begin{bmatrix}3\\3\end{bmatrix}$ " " " $\mu_2 = [3\ \ 3/2]^T$

So, we stop the iterative process.

Test Given $x = \begin{bmatrix}0\\0\end{bmatrix}$ will it be in class 1 or 2?

distance $d\left(\begin{bmatrix}0\\0\end{bmatrix}, \begin{bmatrix}1\\1\end{bmatrix}\right) = \sqrt{1^2+1^2} = \sqrt{2} < \text{dist}\left(\begin{bmatrix}0\\0\end{bmatrix}, \begin{bmatrix}3\\3/2\end{bmatrix}\right) = \sqrt{3^2 + (\quad)^2}$

Therefore $\begin{bmatrix}0\\0\end{bmatrix}$ is in class 1.