

Homework 4

B1141065

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(1) 請使用 complete linkage 方法 對該資料庫進行分群

(2) 分群數量為 2 (Number of clusters = 2)

* 資料庫	Object	X	Y
	1	22	60
	2	40	25
	3	60	30
	4	64	66
	5	80	30
	6	82	55

解: <key> 每次合併距離佳最近的 2 個點(集合), 直到完成分群

1° 以全域計算距離佳

$$d(1,2) = \sqrt{(22-40)^2 + (60-25)^2} = 39.357 \quad d(1,3) = \sqrt{(22-60)^2 + (60-30)^2} = 48.614 \quad d(1,4) = \sqrt{(22-64)^2 + (60-66)^2} = 42.4264$$

$$d(1,5) = \sqrt{(22-80)^2 + (60-30)^2} = 65.299 \quad d(1,6) = \sqrt{(22-82)^2 + (60-55)^2} = 60.2079 \quad d(2,3) = \sqrt{(40-60)^2 + (25-30)^2} = 20.615$$

$$d(2,4) = \sqrt{(40-64)^2 + (25-66)^2} = 47.5078 \quad d(2,5) = \sqrt{(40-80)^2 + (25-30)^2} = 40.31 \quad d(2,6) = \sqrt{(40-82)^2 + (25-55)^2} = 51.6139$$

$$d(3,4) = \sqrt{(60-64)^2 + (30-66)^2} = 36.2215 \quad d(3,5) = \sqrt{(60-80)^2 + (30-30)^2} = 20 \quad d(3,6) = \sqrt{(60-82)^2 + (30-55)^2} = 33.3016$$

$$d(4,5) = \sqrt{(64-80)^2 + (66-30)^2} = 39.395 \quad d(4,6) = \sqrt{(64-82)^2 + (66-55)^2} = 21.095 \quad d(5,6) = \sqrt{(80-82)^2 + (30-55)^2} = 25.079$$

2° 第 1 輪分群

4° 第 3 輪分群

∴ $d(3,5) = 20$ 為目前最小 \Rightarrow 距離佳最近

$\therefore d(\{1,4,6\}) = \max\{d(1,4), d(1,6)\} = 60.2079$

\Rightarrow 將 $\{3\}, \{5\}$ 合併 $\Rightarrow \{1\}, \{2\}, \{3,5\}, \{4\}, \{6\}$

$d(\{2\}, \{4,6\}) = \max\{d(2,4), d(2,6)\} = 51.6139$

3° 第 2 輪分群

$d(\{3,5\}, \{4,6\}) = \max\{d(3,4), d(5,4), d(3,6), d(5,6)\} = 39.395$

$$\textcircled{1} d(\{1,3,5\}) = \max\{d(1,3), d(1,5)\} = 65.299$$

\Rightarrow 其中 $d(\{3,5\}, \{4,6\})$ 為目前最小 \Rightarrow 將兩者合併

$$\textcircled{2} d(\{2,3,5\}) = \max\{d(2,3), d(2,5)\} = 40.31$$

$\Rightarrow \{1\}, \{2\}, \{3,4,5,6\}$ 3群

$$\textcircled{3} d(\{4,3,5\}) = \max\{d(4,3), d(4,5)\} = 39.395$$

5° 第 4 輪分群

$$\textcircled{4} d(\{6,3,5\}) = \max\{d(6,3), d(6,5)\} = 33.3016$$

$d(\{1,3,5,4,6\}) = \max\{d(1,3), d(1,5), d(1,4), d(1,6)\} = 65.299$

\Rightarrow 其中 $d(4,6) = 21.095$ 為目前最小

$d(\{2,3,5,4,6\}) = \max\{d(2,3), d(2,5), d(2,4), d(2,6)\} = 51.6139$

\Rightarrow 將 $\{4\}, \{6\}$ 合併

\Rightarrow 其中 $d(1,2)$ 為目前最小 \Rightarrow 將 $\{1\}, \{2\}$ 合併 $\Rightarrow \{1,2\}, \{3,4,5,6\}$

$\Rightarrow \{1\}, \{2\}, \{3,5\}, \{4,6\}$

A: 以 complete linkage 來將資料庫分成 2 群

chryculture

完成分群

4群

結果如右: $\begin{cases} C_1 : \{1, 2\} \\ C_2 : \{3, 5, 4, 6\} \end{cases}$