

# COMP 251 Assign 5

260515648  
Chelsea Ma

## 1. Divide-and-Conquer - minimum spanning tree

$$G = (V, E)$$

$$V = \begin{matrix} V_1 \\ V_2 \end{matrix} \left. \vphantom{\begin{matrix} V_1 \\ V_2 \end{matrix}} \right\} \text{ s.t. } |V_1| - |V_2| = 1$$

- $E$  -  $E_1$  = set of edges incident only on vertices in  $V_1$   
 -  $E_2$  = set of edges incident only on vertices in  $V_2$

Minimum-spanning tree on

①  $G_1 = (V_1, E_1)$

②  $G_2 = (V_2, E_2)$

Minimum-weight edge that crosses  $(V_1, V_2)$

Use minimum-weight edge to unite two minimum spanning trees

Result ① Algorithm is correct

② Algorithm fails  $\Rightarrow$  true

Given  $G$

$$\begin{array}{ccccccc} & A & \overset{10}{-} & B & \overset{1}{-} & C & \overset{10}{-} & D \\ \overset{10}{|} & & & \overset{10}{|} & & \overset{10}{|} & & \overset{10}{|} \\ E & - & F & - & G & - & H \\ & \overset{10}{|} & & \overset{2}{|} & & \overset{10}{|} & & \end{array}$$

Divide  $G$  into  $G_1$  and  $G_2$  where  $G_1 = \{A, B, E, F\}$

$$G_2 = \{C, D, G, H\}$$

$$G_1 \quad \begin{array}{ccc} A & \overset{10}{-} & B \\ \overset{10}{|} & & \overset{10}{|} \\ E & - & F \\ & \overset{10}{|} & \end{array}$$

$$G_2 \quad \begin{array}{ccc} C & \overset{10}{-} & D \\ \overset{10}{|} & & \overset{10}{|} \\ G & - & H \\ & \overset{10}{|} & \end{array}$$

Minimum Spanning Tree of  $G_1$  is  $A - B$  Cost = 30

$$\begin{array}{c} | \\ E - F \end{array}$$

Minimum Spanning Tree of  $G_2$  is  $C - D$  Cost = 30

$$\begin{array}{c} | \\ G - H \end{array}$$