Course Code: MCAS2140 Course Name: Algorithm Analysis and Design

# ANALYSIS OF PRIMS ALGORITHM GALGORITAS UNIVERSITY

Name of the Faculty: Unnikrishnan

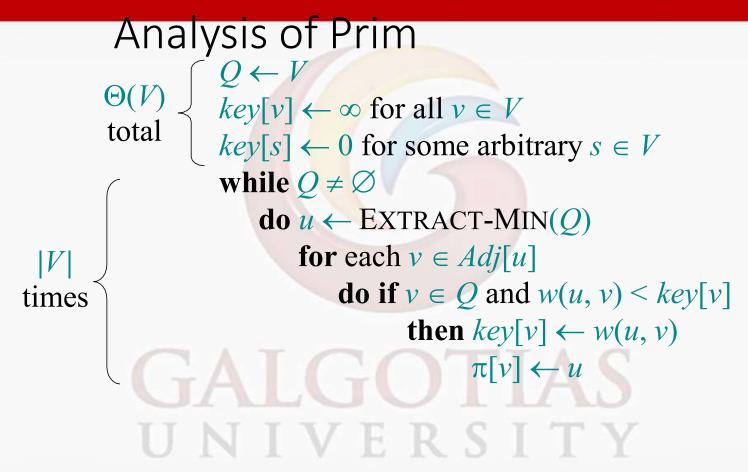
Course Code: MCAS2140 Course Name: Algorithm Analysis and Design

```
Analysis of Prim
         Q \leftarrow V
         key[v] \leftarrow \infty for all v \in V
         key[s] \leftarrow 0 for some arbitrary s \in V
         while Q \neq \emptyset
             do u \leftarrow \text{EXTRACT-MIN}(Q)
                for each v \in Adj[u]
                    do if v \in Q and w(u, v) < key[v]
                          then key[v] \leftarrow w(u, v)
                  \pi[v] \leftarrow u
  UNIVERSITY
```

Course Code: MCAS2140 Course Name: Algorithm Analysis and Design

```
Analysis of Prim
\Theta(V) \begin{cases} Q \leftarrow V \\ key[v] \leftarrow \infty \text{ for all } v \in V \\ key[s] \leftarrow 0 \text{ for some arbitrary } s \in V \end{cases}
             while Q \neq \emptyset
                  do u \leftarrow \text{EXTRACT-MIN}(Q)
                      for each v \in Adj[u]
                           do if v \in Q and w(u, v) < key[v]
                                  then key[v] \leftarrow w(u, v)
                 \pi[v] \leftarrow u
    UNIVERSITY
```

Course Code: MCAS2140 Course Name: Algorithm Analysis and Design



Course Code: MCAS2140 Course Name: Algorithm Analysis and Design

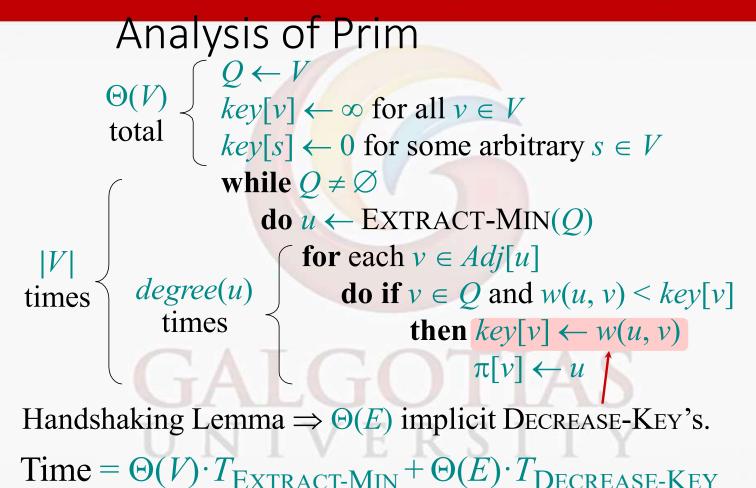
# Analysis of Prim $\begin{cases} Q \leftarrow V \\ key[v] \leftarrow \infty \text{ for all } v \in V \\ key[s] \leftarrow 0 \text{ for some arbitrary } s \in V \end{cases}$ while $Q \neq \emptyset$ **do** $u \leftarrow \text{EXTRACT-MIN}(Q)$ for each $v \in Adj[u]$ degree(u)**do if** $v \in Q$ and w(u, v) < key[v]times times then $key[v] \leftarrow w(u, v)$ $\pi[v] \leftarrow u$

Course Code: MCAS2140 Course Name: Algorithm Analysis and Design

# Analysis of Prim $\begin{array}{c} Q \leftarrow V \\ key[v] \leftarrow \infty \text{ for all } v \in V \\ key[s] \leftarrow 0 \text{ for some arbitrary } s \in V \end{array}$ $\begin{array}{c} \text{while } Q \neq \emptyset \\ \text{do } u \leftarrow \text{EXTRACT-MIN}(Q) \\ \text{for each } v \in Adj[u] \\ \text{do if } v \in Q \text{ and } w(u, v) < key[v] \\ \text{then } key[v] \leftarrow w(u, v) \\ \pi[v] \leftarrow u \end{array}$

Handshaking Lemma  $\Rightarrow \Theta(E)$  implicit Decrease-Key's.

Course Code: MCAS2140 Course Name: Algorithm Analysis and Design



Name of the Faculty: Unnikrishnan

Course Code: MCAS2140 Course Name: Algorithm Analysis and Design

# Analysis of Prim (continued)

Time = 
$$\Theta(V) \cdot T_{\text{EXTRACT-MIN}} + \Theta(E) \cdot T_{\text{DECREASE-KEY}}$$

# GALGOTIAS UNIVERSITY

Name of the Faculty: Unnikrishnan

Course Code: MCAS2140 Course Name: Algorithm Analysis and Design

# Analysis of Prim (continued)

Time = 
$$\Theta(V) \cdot T_{\text{EXTRACT-MIN}} + \Theta(E) \cdot T_{\text{DECREASE-KEY}}$$

Q  $T_{\text{EXTRACT-MIN}}$   $T_{\text{DECREASE-KEY}}$  Total

# GALGOTIAS UNIVERSITY

Name of the Faculty: Unnikrishnan

Course Code: MCAS2140 Course Name: Algorithm Analysis and Design

# Analysis of Prim (continued)

$$Time = \Theta(V) \cdot T_{\text{EXTRACT-MIN}} + \Theta(E) \cdot T_{\text{DECREASE-KEY}}$$

Q  $T_{\text{EXTRACT-MIN}}$   $T_{\text{DECREASE-KEY}}$  Total

array

O(V)

O(1)

 $O(V^2)$ 

GALGOTIAS UNIVERSITY

Name of the Faculty: Unnikrishnan

Course Code: MCAS2140 Course Name: Algorithm Analysis and Design

# Analysis of Prim (continued)

$$Time = \Theta(V) \cdot T_{\text{EXTRACT-MIN}} + \Theta(E) \cdot T_{\text{DECREASE-KEY}}$$

Q	T <sub>EXTRACT-MIN</sub>	T <sub>DECREASE-KEY</sub>	Total
array	O(V)	<i>O</i> (1)	$O(V^2)$
binary heap	$O(\lg V)$	$O(\lg V)$	$O(E \lg V)$
	UALC	E R S I T	Y

Name of the Faculty: Unnikrishnan

Course Code: MCAS2140 Course Name: Algorithm Analysis and Design

# Analysis of Prim (continued)

$$Time = \Theta(V) \cdot T_{\text{EXTRACT-MIN}} + \Theta(E) \cdot T_{\text{DECREASE-KEY}}$$

Q	T <sub>EXTRACT-MIN</sub>	T <sub>DECREASE-KEY</sub>	Total
array	O(V)	<i>O</i> (1)	$O(V^2)$
binary heap	$O(\lg V)$	$O(\lg V)$	$O(E \lg V)$
Fibonacci heap	O(lg V) amortized	O(1) amortized	$O(E + V \lg V)$ worst case

Name of the Faculty: Unnikrishnan

