

# Graph Algorithms



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[based on slides by Prof. Welch]

## Directed Graphs

Let  $V$  be a finite set and  $E$  a binary relation on  $V$ , that is,  $E \subseteq V \times V$ . Then the pair  $G=(V,E)$  is called a **directed graph**.

- The elements in  $V$  are called **vertices**.
- The elements in  $E$  are called **edges**.
- Self-loops are allowed, i.e.,  $E$  may contain  $(v,v)$ .

## Undirected Graphs

Let  $V$  be a finite set and  $E$  a subset of  $\{ e \mid e \subseteq V, |e|=2 \}$ . Then the pair  $G=(V,E)$  is called an **undirected graph**.

- The elements in  $V$  are called **vertices**.
- The elements in  $E$  are called **edges**,  $e=\{u,v\}$ .
- Self-loops are not allowed,  $e=\{u,u\}=\{u\}$ .