

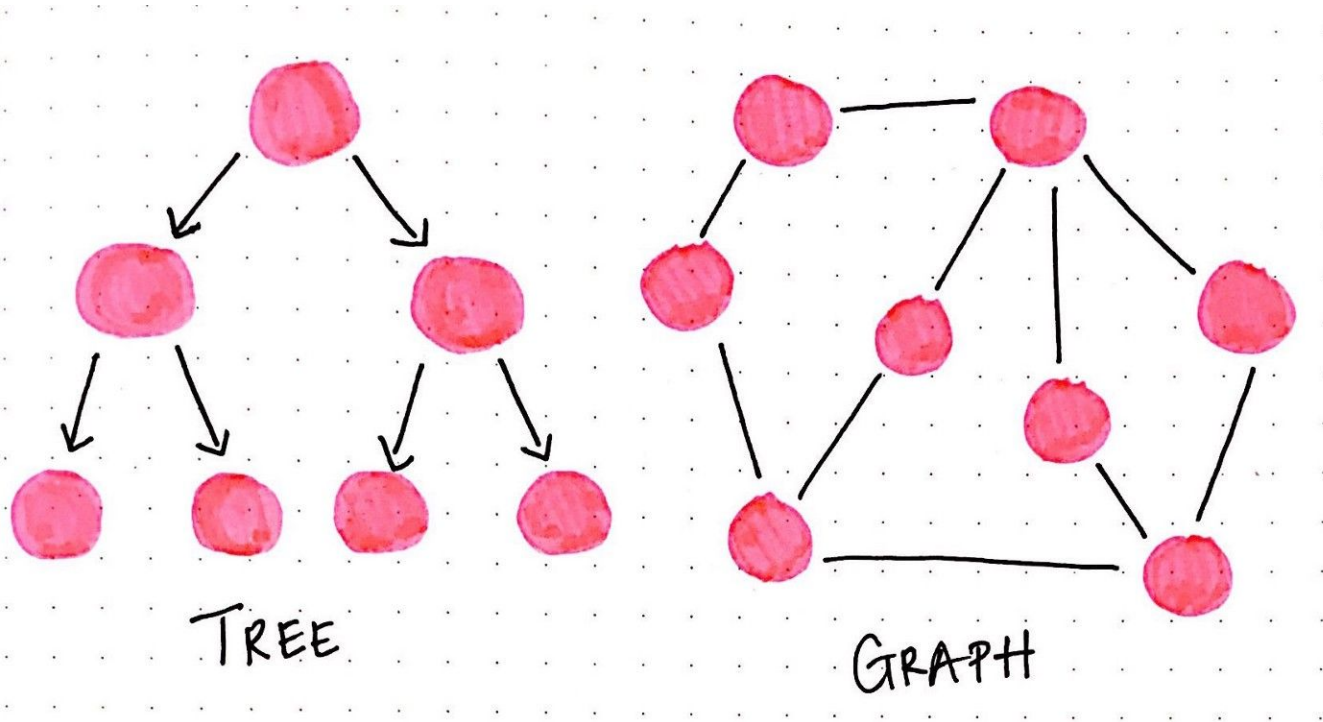
# Graphs



# What we're going to learn

- What is a graph
- Some common graph terminology
- Types of problems you can solve with graphs

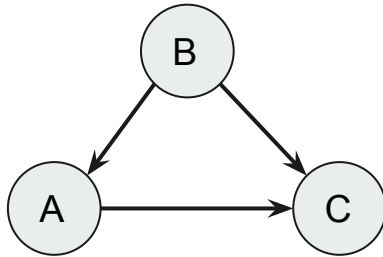
Images from A Gentle Introduction to Graph Theory by Vaidehi Joshi



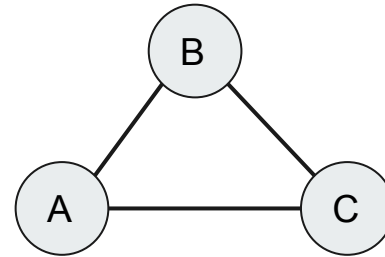
A **vertex** (also called a **node**) is the fundamental unit of a graph. It can represent a place, a person, etc.

- Plural: **vertices**

An **edge** is a connection between two vertices. It can be **directed** (goes only one way) or **undirected** (goes both ways).

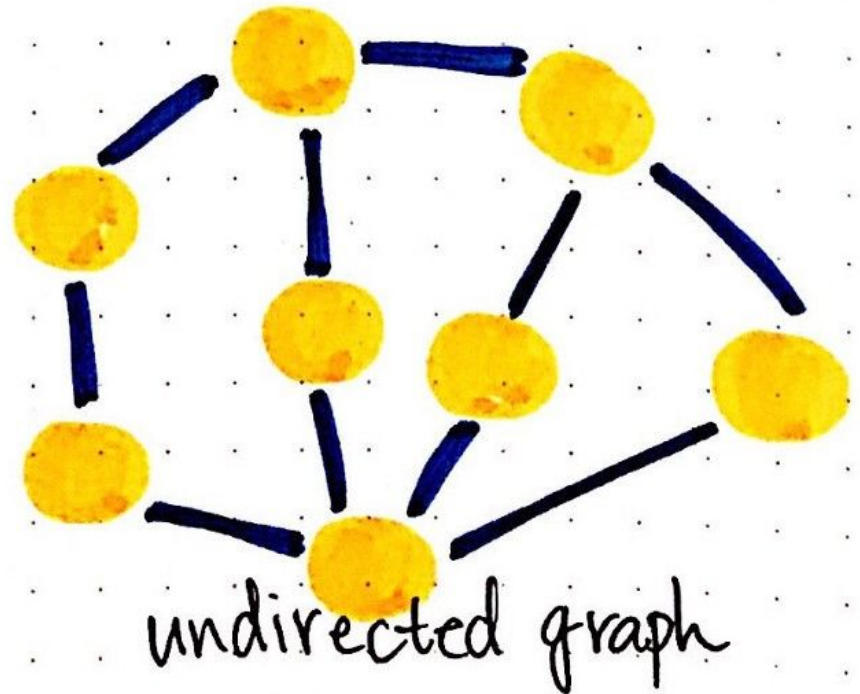
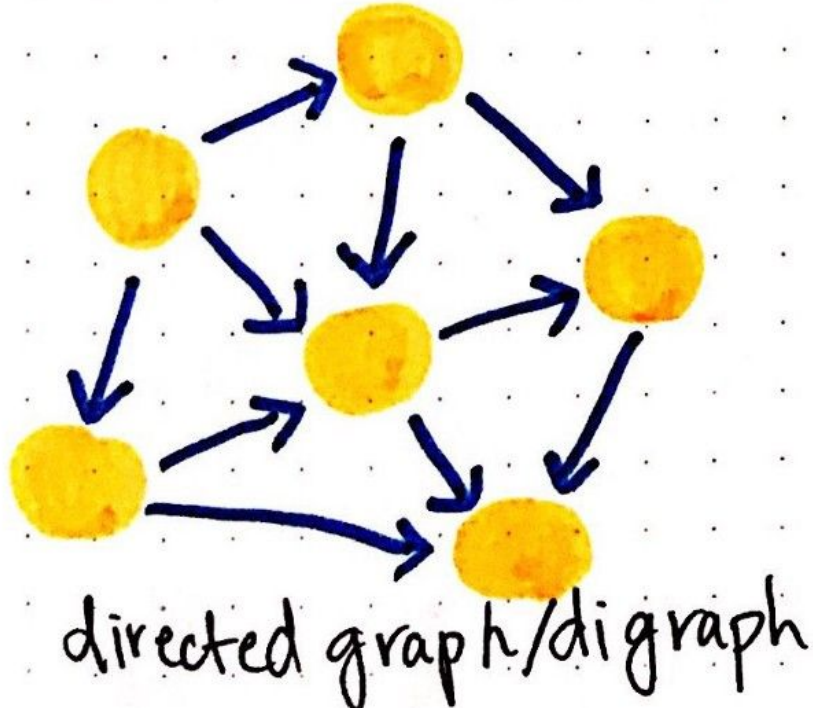


-OR-



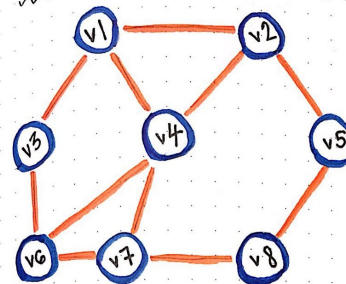
# Digraph vs Graph

[Images from A Gentle Introduction to Graph Theory by Vaidehi Joshi](#)



## Images from A Gentle Introduction to Graph Theory by Vaidehi Joshi

### (Formally) Defining a Graph



8 vertices/nodes  
11 edges/links

$$G = (V, E)$$

$$V = \{v1, v2, v3, v4, v5, v6, v7, v8\}$$

$$E = \{ \{v1, v2\}, \\ \{v1, v3\}, \\ \{v1, v4\}, \\ \{v2, v4\}, \\ \{v2, v5\}, \\ \{v3, v6\}, \\ \{v4, v6\}, \\ \{v4, v7\}, \\ \{v5, v8\}, \\ \{v6, v7\}, \\ \{v7, v8\} \}$$

these edge definitions are unordered pairs!

→  $G = (V, E)$  is the formal mathematical notation for defining graphs.

→ A graph  $G$  is an ordered pair of a set  $V$  vertices and  $E$ , a set of edges.

→ An ordered pair is a pair of mathematical objects in which the order of objects in the pair matters.

# Let's start building a Graph in Python!

# Shout Outs