Types of Graphs

This lesson showcases the two main categories of graphs.

We'll cover the following

- Types of Graphs
  - Undirected Graph
  - Directed Graph

Types of Graphs

There are two common types of graphs:

1. Undirected
2. Directed

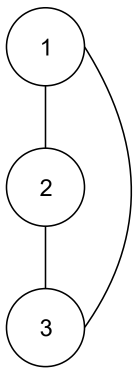
Undirected Graph

In an undirected graph, the edges are **bi-directional**. For e.g., an ordered **pair (2, 3)** shows that there exists an edge between vertex **2** and **3** without any specific direction. You can go from vertex **2** to **3** or from **3** to **2**.

Let's calculate the maximum number of edges for an undirected graph. We are denoting an edge between vertex **a** and **b** as **(a, b)**. So, the maximum possible edges of a graph with **n** vertices will be all possible pairs of vertices of that graph, assuming that there are no self-loops.

If a graph has **n** vertices, then there are **C (n,2)** possible pairs of vertices according to Combinatorics. Solving **C (n,2)** by binomial coefficients gives us $\frac{n(n-1)}{2}$. Hence, there are $\frac{n(n-1)}{2}$ maximum possible edges in an undirected graph.

You can see an example of an undirected graph below:



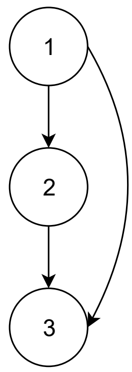
Directed Graph

In a directed graph, the edges are **unidirectional**. For a **pair (2, 3)**, there exists an edge from vertex **2** towards vertex **3** and the only way to traverse is to go from **2** to **3**, not the other way around.

This changes the maximum number of edges that can exist in the graph. For a directed graph with **n** vertices, the minimum number of edges that can connect a vertex with every other vertex is **n-1**. This excludes self-loops.

If you have **n** vertices, then all the possible edges become **n*(n-1)**.

Here's an example of a directed graph:



The choice between the two types depends on the nature of your program. We will use both of them later on in the chapter.

In the next lesson, we're going to learn ways to represent a graph data structure which will help us in implementing it.

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