Weekly Assignment 1

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Algorithm Design and Analysis

September 11, 2024

Solution 1:

An undirected graph $G = \langle V, E \rangle$ is called connected, if there is a path between every pair of distinct vertices. It is called disconnected otherwise. Given, for vertices $n \geq 2$ there exists a graph G where $|V| = n$ and $|E| = \frac{(n-1)(n-2)}{2}$. We will prove G is not connected by construction.

- For $n = 2$: $|E| = 0$, i.e., we have isolated vertices, hence G is not connected.

- For $n > 2$, let's construct components G_1 with vertices $v_1, v_2, ..., v_{n-1}$ and G_2 with a vertex v_n.

- G_1 component of the graph has exactly $|E| = \frac{(n-1)(n-2)}{2}$ edges because each pair of the n1 vertices can be connected by an edge.

- G_2 component with the isolated vertex has no additional edges connected to the rest of G.

Thus, by construction we show that the undirected graph $G\langle V, E \rangle$ has $|V| = n$ and exactly $|E| = \frac{(n-1)(n-2)}{2}$ and because of an isolated vertex it is not connected.