G H raisoni COLLEGE | Engineering and Management Pune

An Empowered Autonomous Institute, Affiliated to SPPU, Pune
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Department of CSE - Artificial Intelligence

Subject - Data Structures and Algorithms (23UAIPCL2301)

TAE - II Poster Presentation

TOPIC: MINIMUM SPANNING TREE (MST)

A spanning tree is defined as a tree-like subgraph of a connected, undirected graph that includes all the vertices of the graph.

Or, to say in Layman's words, it is a subset of the edges of the graph that forms a tree (acyclic) where every node of the graph is a part of the tree.

The minimum spanning tree has all the properties of a spanning tree with an added constraint of having the minimum possible weights among all possible spanning trees.

A minimum spanning tree (MST) is defined as a spanning tree that has the minimum weight among all the possible spanning trees

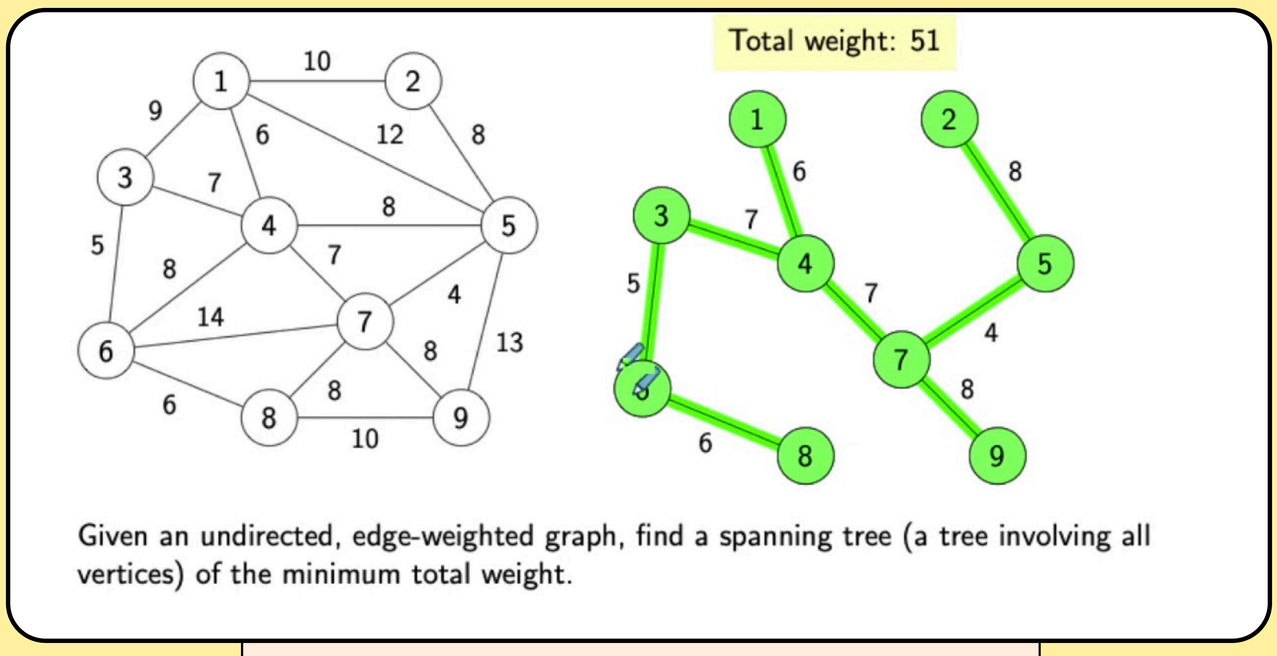

Fig.1) Visual Representation of MST

Kruskal's Minimum Spanning Tree Algorithm:

This is one of the popular algorithms for finding the minimum spanning tree from a connected, undirected graph. This is a greedy algorithm. The algorithm workflow is as below:
First, it sorts all the edges of the graph by their weights,
Then starts the iterations of finding the spanning tree.
At each iteration, the algorithm adds the next lowest-weight edge one by one, such that the edges picked until now does not form a cycle.

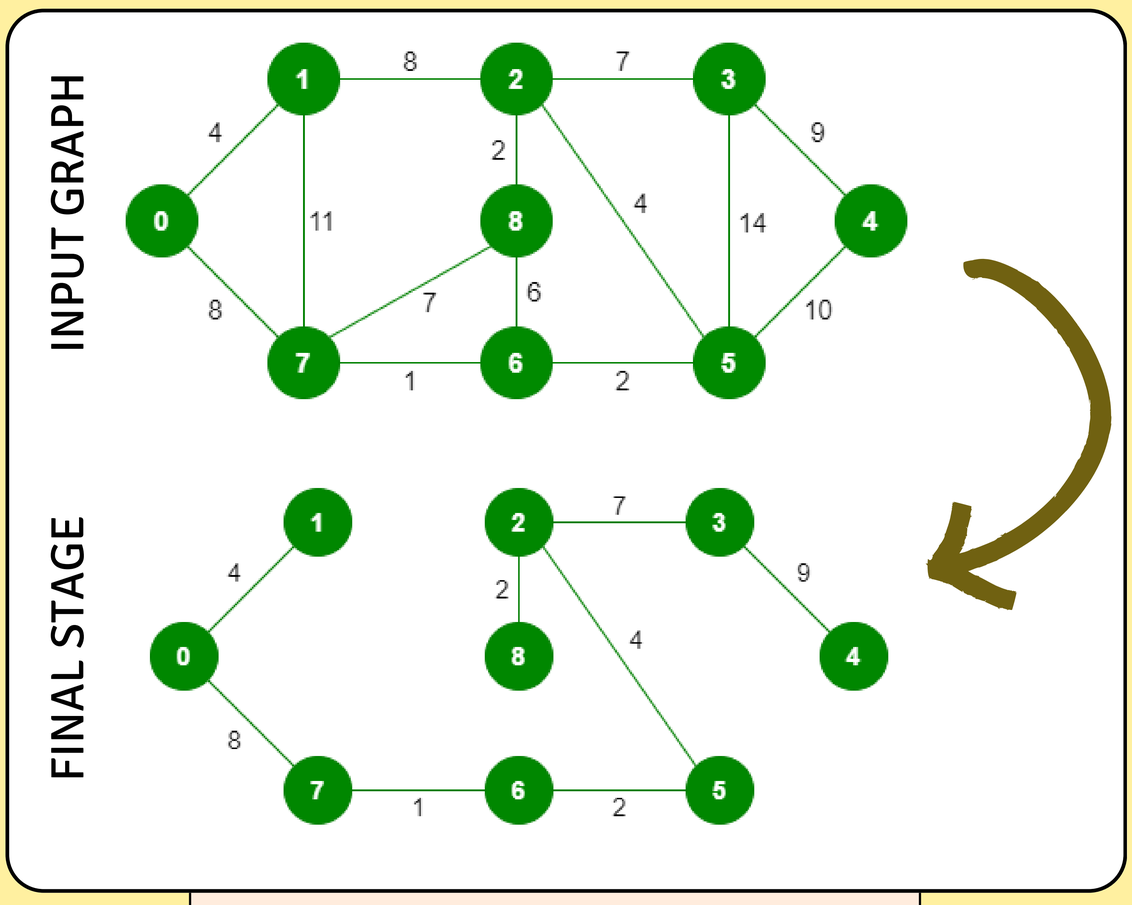

Fig.2) MST Using Kruskal's Algorithm

Applications of Minimum Spanning Trees:

Network design: Spanning trees can be used in network design to find the minimum number of connections required to connect all nodes. Minimum spanning trees, in particular, can help minimize the cost of the connections by selecting the cheapest edges.
Image processing: Spanning trees can be used in image processing to identify regions of similar intensity or color, which can be useful for segmentation and classification tasks.
Biology: Spanning trees and minimum spanning trees can be used in biology to construct phylogenetic trees to represent evolutionary relationships among species or genes.
Social network analysis: Spanning trees and minimum spanning trees can be used in social network analysis to identify important connections and relationships among individuals or groups.

Presented By: Atharva Mendole (A27)
Vighnesh Taware (A62)

Guided By: Dr Devidas Thosar