

CS-430 Project Details

Team: NULL

Members: Aditya Dasgupta, Devyani Gauri

Seat numbers: 14, 25

This project consists of two parts:

1. **Minimum Spanning Tree:** For MST, we used Prim's algorithm

Prim's Algorithm:

```
MST-PRIM( $G, w, r$ )
1  for each  $u \in G.V$ 
2       $u.key = \infty$ 
3       $u.\pi = \text{NIL}$ 
4   $r.key = 0$ 
5   $Q = G.V$ 
6  while  $Q \neq \emptyset$ 
7       $u = \text{EXTRACT-MIN}(Q)$ 
8      for each  $v \in G.Adj[u]$ 
9          if  $v \in Q$  and  $w(u, v) < v.key$ 
10              $v.\pi = u$ 
11              $v.key = w(u, v)$ 
```

2. **Shortest Path:** We used Dijkstra's algorithm to find the shortest path between any 2 points in the graph

Dijkstra's Algorithm:

```
DIJKSTRA( $G, w, s$ )
1  INITIALIZE-SINGLE-SOURCE( $G, s$ )
2   $S = \emptyset$ 
3   $Q = G.V$ 
4  while  $Q \neq \emptyset$ 
5       $u = \text{EXTRACT-MIN}(Q)$ 
6       $S = S \cup \{u\}$ 
7      for each vertex  $v \in G.Adj[u]$ 
8          RELAX( $u, v, w$ )
```

We made our program pretty simple, so it takes user input to choose either Minimum Spanning Tree or Shortest Path, or they can choose to exit. The user just has to type 1, 2 or 3 for the following:

- 1: Minimum Spanning Tree
- 2: Shortest Path
- 3: Exit

To demonstrate our algorithms, we have 3 different graphs with different numbers of vertices that the user can choose between.