STATISTICAL STUDY WITH PLANNING ROUTES TO AVOID SEXUAL HARASSMENT IN MEDELLÍN.

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Team

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Data preparation

http://github.com/LauZar12/proyecto/

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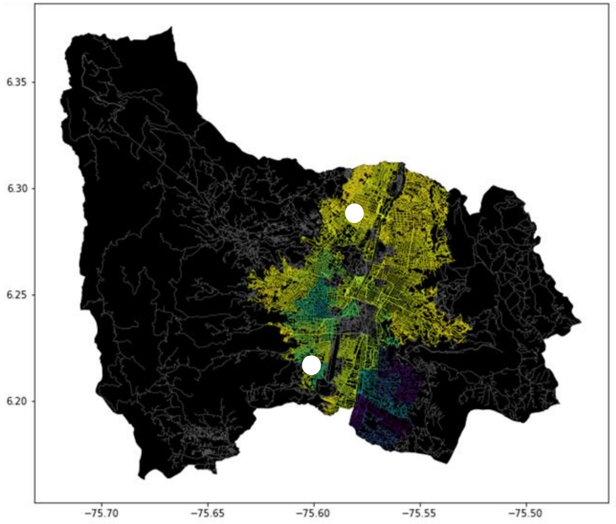
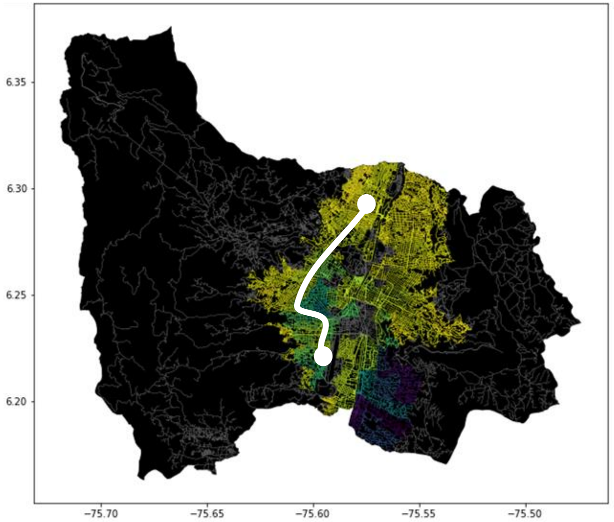
Problem Statement



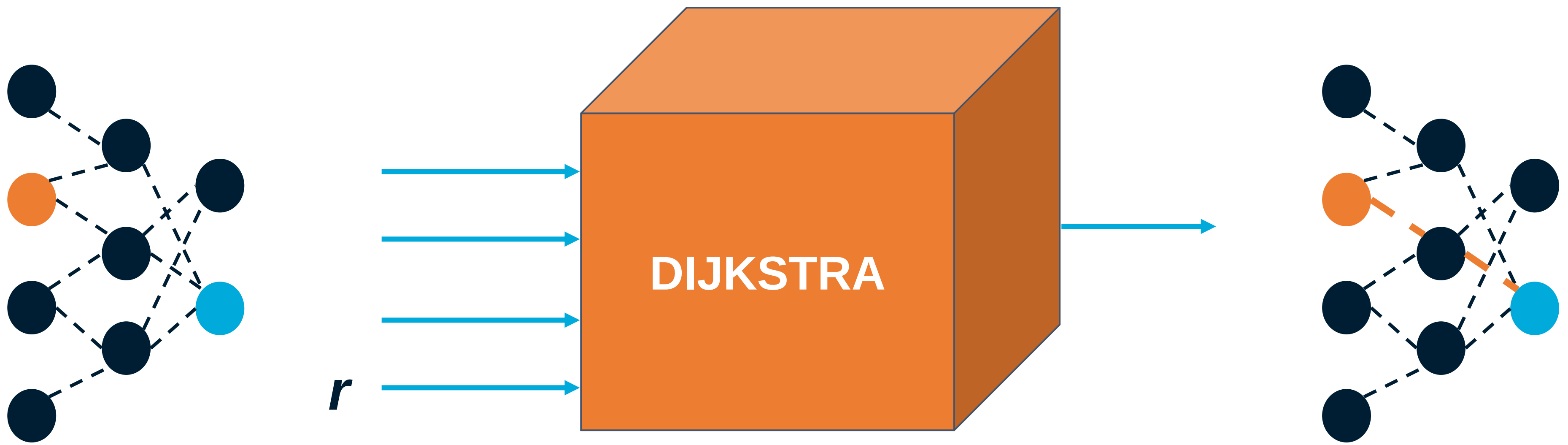
Streets of Medellín, Origin and Destination

Constrained Shortest Path Algorithm



Constrained Shortest Paths

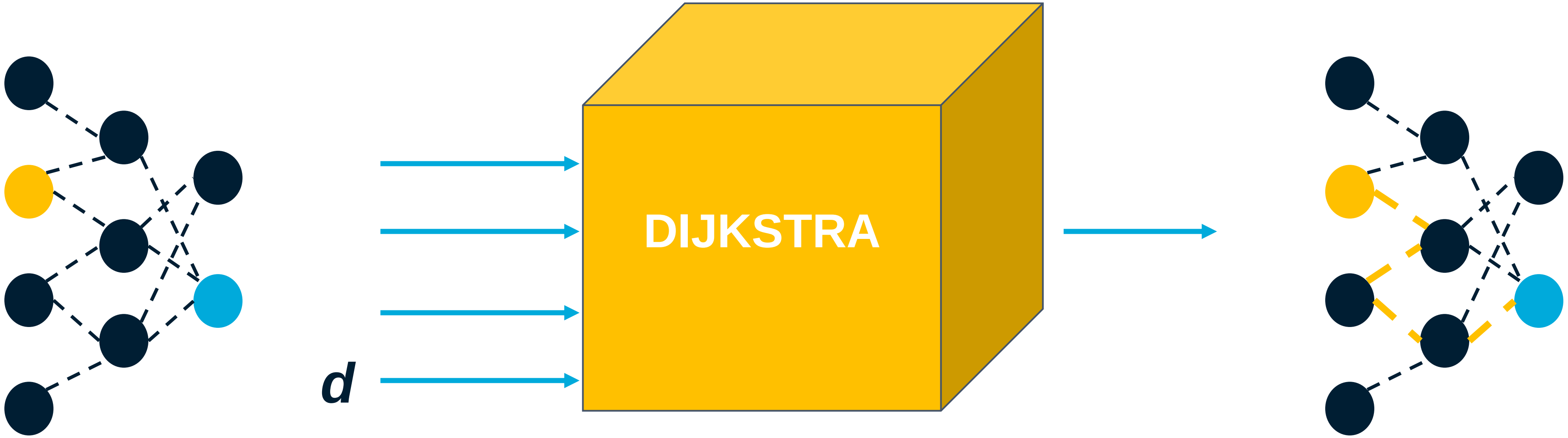
First Algorithm



Streets of Medellín, Origin and Destination

Shortest path without exceeding a weighted-average risk of harassment *r*

Second Algorithm



Streets of Medellín, Origin and Destination

Path with the lowest weighted-average risk of harassment without exceeding a distance *d*

Algorithm Explanation

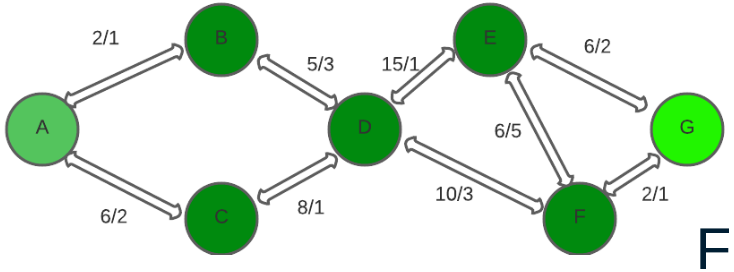


Fig 1

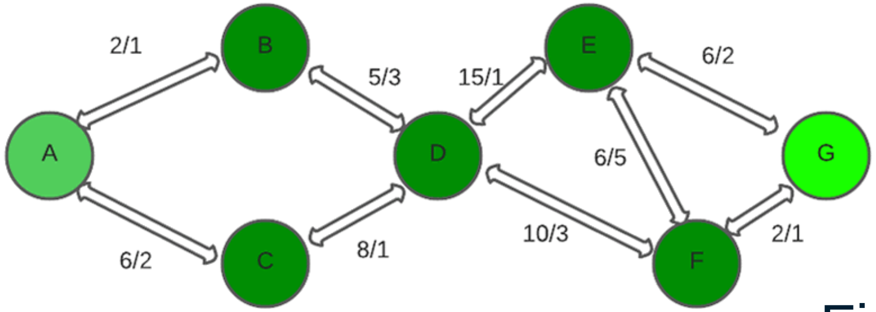


Fig 2

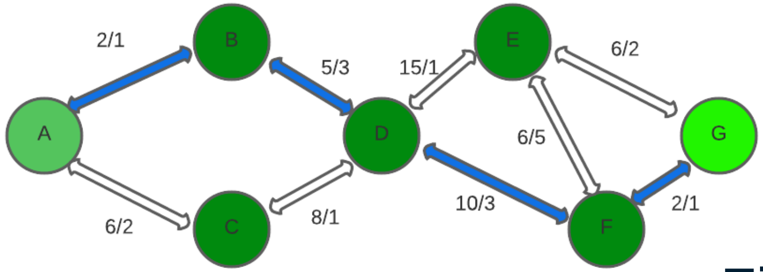


Fig 3

DIJKSTRA

```
FOR EACH node n in graph
    SET dist[n] TO infinity
    SET prev[n] TO unknown
    ADD n TO Q
ENDFOR
dist[source] = 0

WHILE Q is not empty:
    SET u TO node from Q with minimal dist[u]
    REMOVE u FROM Q
    FOR EACH neighbor node n of u
        IF n in Q THEN
            temp = dist[u] + length between u and n
            IF temp < dist[v] THEN
                dist[v] = temp
                prev[v] = unknown
            ENDIF
        ENDIF
    ENDFOR
ENDWHILE
```

We can observe a graph in fig1 containing two values for each path from one node to another, that of the distance and that of the harassment. In fig2 we observe the operation of the Dijkstra algorithm, we can see how the algorithm search for each node the shortest path in its adjacent nodes and when it finds it, it adds them to the final path. This action is repeated until reaching the goal node. In fig 3 we can see the shortest path defined by the algorithm

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Algorithm Complexity

	Time Complexity	Memory Complexity
DIJKSTRA WITH MODIFIED WEIGHTS	O((|V|+|E|) log |V|)	$O(V^2)$

On the table are the time and memory complexity of the algorithms where V is the number of nodes, E is the number of edges And the memory complexity it is the one showed there because we used it for every single street (we don´t use a binary monticule or a balanced binary tree).

Shortest Path Results

Origin	Destination	Shortest distance (meters)
Universidad EAFIT	Universidad de Medellín	6142m
Universidad de Antioquia	Universidad Nacional	???
Universidad Nacional	Universidad Luis Amigó	??

Shortest distance obtained without exceeding a weighted average risk of harassment *r.*

We can observe a graph in fig1 containing two values for each path from one node to another, that of the distance and that of the harassment. In fig2 we observe the operation of the Dijkstra algorithm, we can see how the algorithm search for each node the shortest path in its adjacent nodes and when it finds it, it adds them to the final path. This action is repeated until reaching the goal node. In fig 3 we can see the shortest path defined by the algorithm

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Lowest Risk Results

Origin	Destination	Weighted-average risk of harassment
Universidad EAFIT	Universidad de Medellín	0.642
Universidad de Antioquia	Universidad Nacional	0.605
Universidad Nacional	Universidad Luis Amigó	0.599

Lowest weighted-average risk of harassment obtained without exceeding a distance *d.*

We can observe a graph in fig1 containing two values for each path from one node to another, that of the distance and that of the harassment. In fig2 we observe the operation of the Dijkstra algorithm, we can see how the algorithm search for each node the shortest path in its adjacent nodes and when it finds it, it adds them to the final path. This action is repeated until reaching the goal node. In fig 3 we can see the shortest path defined by the algorithm

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Algorithm Execution Times

Execution Times

Universidad EAFIT →	Universidad de Medellín →	13.5 seconds
Universidad de Antioquia →	Universidad Nacional de Colombia →	11.5 seconds
Universidad Nacional de Colombia →	Universidad Católica Luis Amigó →	12.49 seconds

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Future Work Directions

Databases

Add other variables

Project 1

A Web Application

Software Eng.

A Web Application

Project 2

Include ML or VR

THANK YOU!

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