DEVELOPMENT OF AN ALGORITHM FOR THE OPTIMIZATION OF PEDESTRIAN ROUTES BASED ON STREET HARASSMENT OF THE LGBTQ COMMUNITY

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Team

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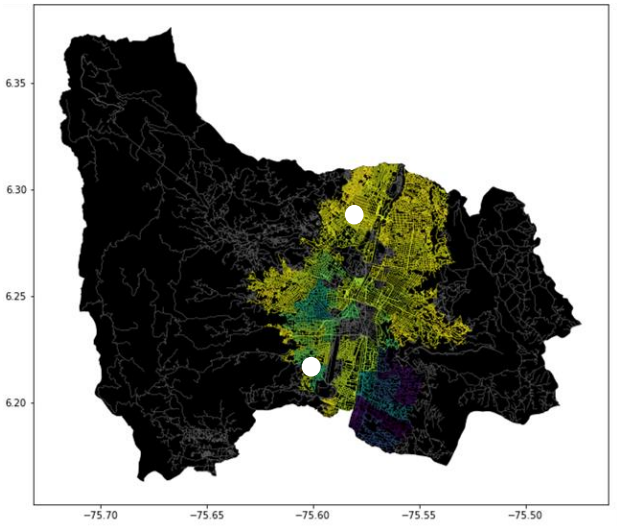
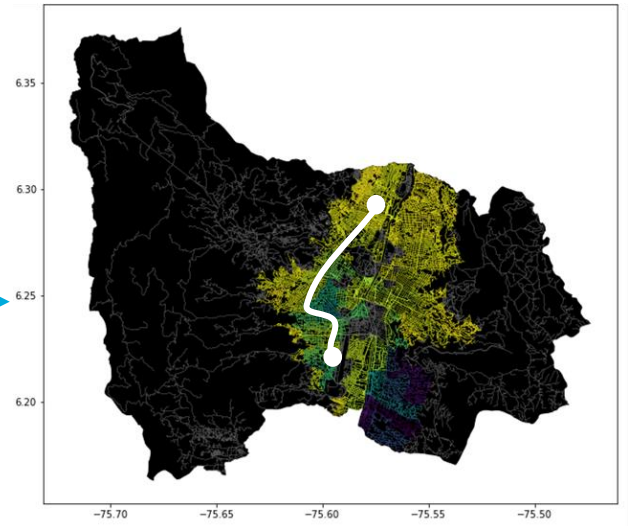
https://github.com/FelipeGilM/ST0245-002/tree/master/informe/entrega1

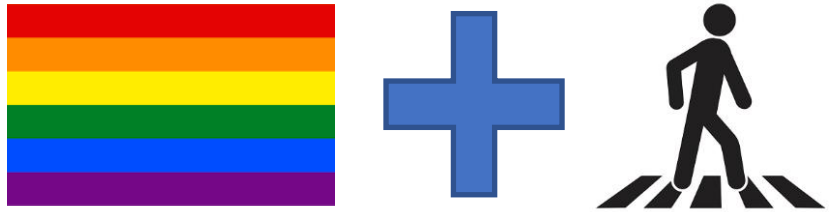
Problem Statement



Constrained Shortest Path Algorithm



Streets of Medellín, Origin and Destination



Constrained Shortest Paths

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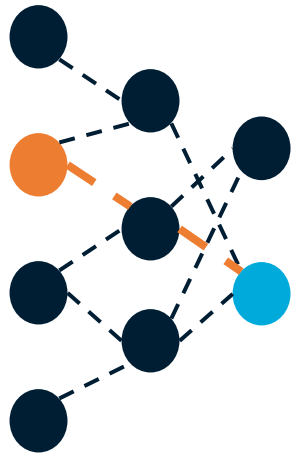
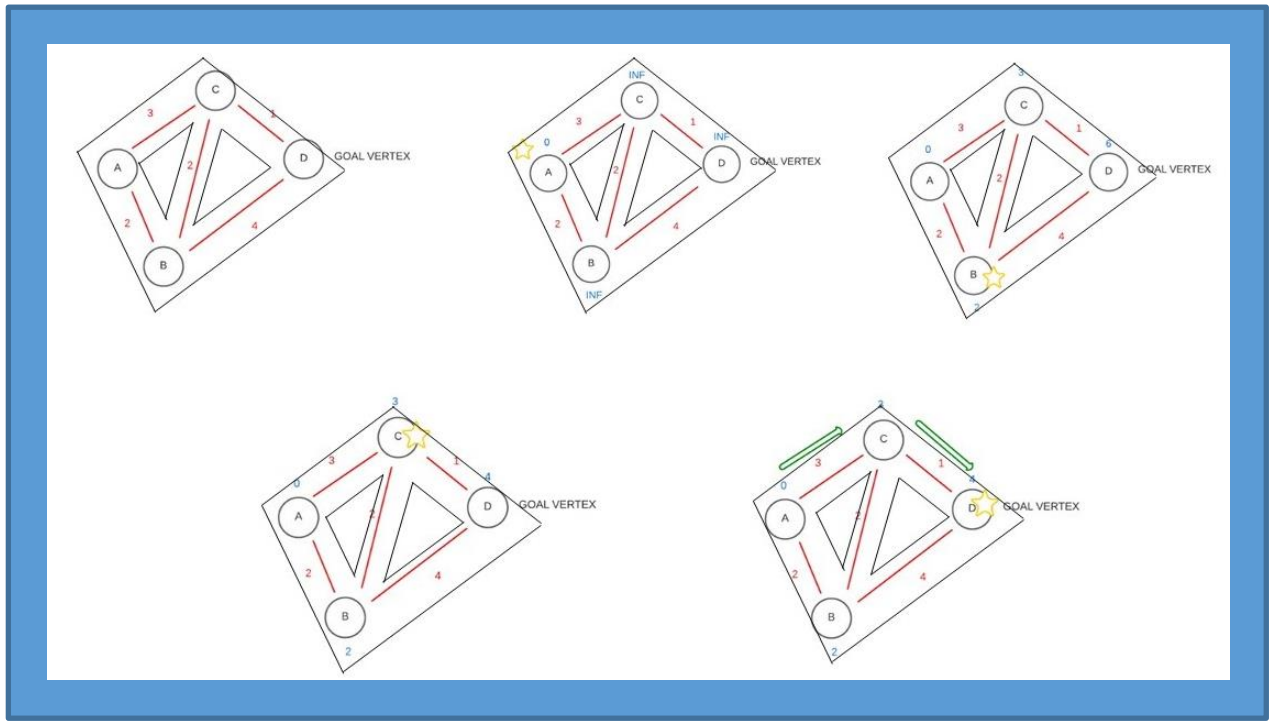
First Algorithm

Streets of Medellín, Origin and Destination



Shortest path or the lowest weighted-average risk of harassment path

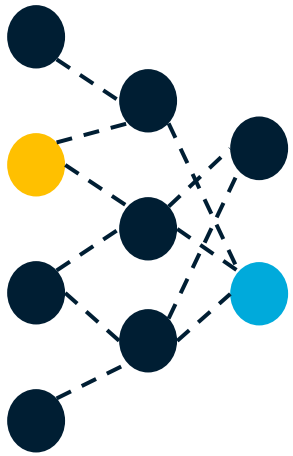
Algorithm Explanation



‘Dijkstra algorithm’ for the Constrained Shortest Path
In the figure there are 4 steps:

1. Set the values of the origin node and the uncertain nodes.
2. Calculate the cost of the neighbor nodes.
3. Find the shortest path between nodes.
4. Show the path of the shortest cost

Second Algorithm



Streets of Medellín, Origin and Destination

r

d

Dijkstra algorithm for one variable and with a condition

Path with the lowest weighted-average risk of harassment without exceeding a distance *d*
Or
The shortest path without exceeding a weighted-average risk of harassment r

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Algorithm Complexity

	Time Complexity	Memory Complexity
Dijkstra algorithm	O (V^2)	O(V)

Time and memory complexity of the algorithm name. V is the number of vertex of the graph and E is the number of edges of the graph.

As stated above this is the worst-case complexity for Dijkstra's algorithm with O(V^2) when implementing using an unsorted array and no priority queue. This is because for each vertex (V), we need to relax the connected edges in order to find the minimum cost edge that connects a vertex to V. We need to do V number of calculations and each operation takes O(V) times, therefore leaving us with the complexity of O(V^2)
V calculations
O(V) time
Total: O(V^2)

Shortest Path Results

Origin	Destination	Shortest distance (meters)	Without exceeding a weighted-average risk of harassment
Universidad EAFIT	Universidad de Medellín	490.864	0.84
Universidad de Antioquia	Universidad Nacional	815.437	0.83
Universidad Nacional	Universidad Luis Amigó	1231.125	0.85

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

Lowest Risk Results

Origin	Destination	Weighted-average risk of harassment	Without exceeding a distance (meters)
Universidad EAFIT	Universidad de Medellín	0,73	5000
Universidad de Antioquia	Universidad Nacional	0,87	7000
Universidad Nacional	Universidad Luis Amigó	0,86	6500

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

Algorithm Execution Times

Execution Times

1 minutes

2 minutes

3.5 minutes

Future Work Directions

S & M 4

- Traffic Estimation

Optimization 1

- Biobjective Optimization with linear variables

Optimization 2

- Biobjective Optimization with nonlinear variables

S & M 5

- Harassment Estimation

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THANK YOU!

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