# 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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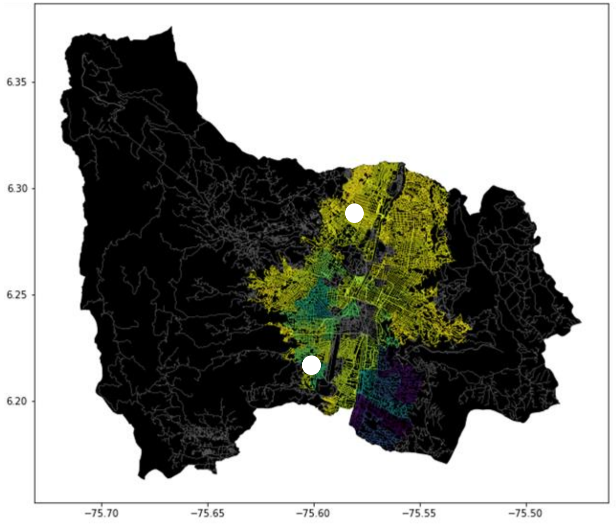
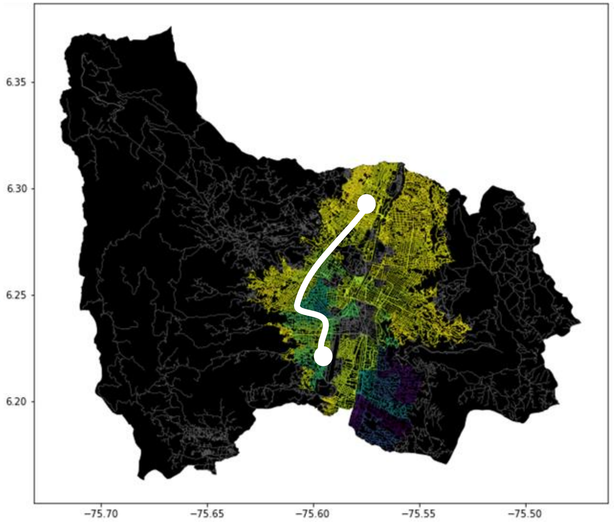
# Problem Statement



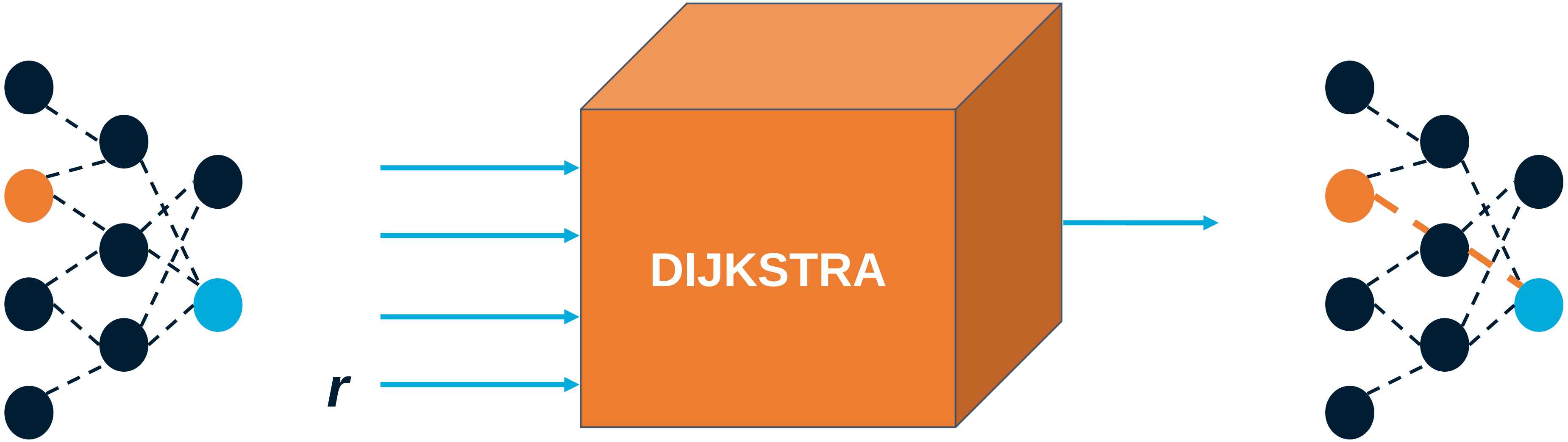

**Streets of Medellín, Origin and Destination**

**Constrained Shortest Path Algorithm**




**Constrained Shortest Paths**

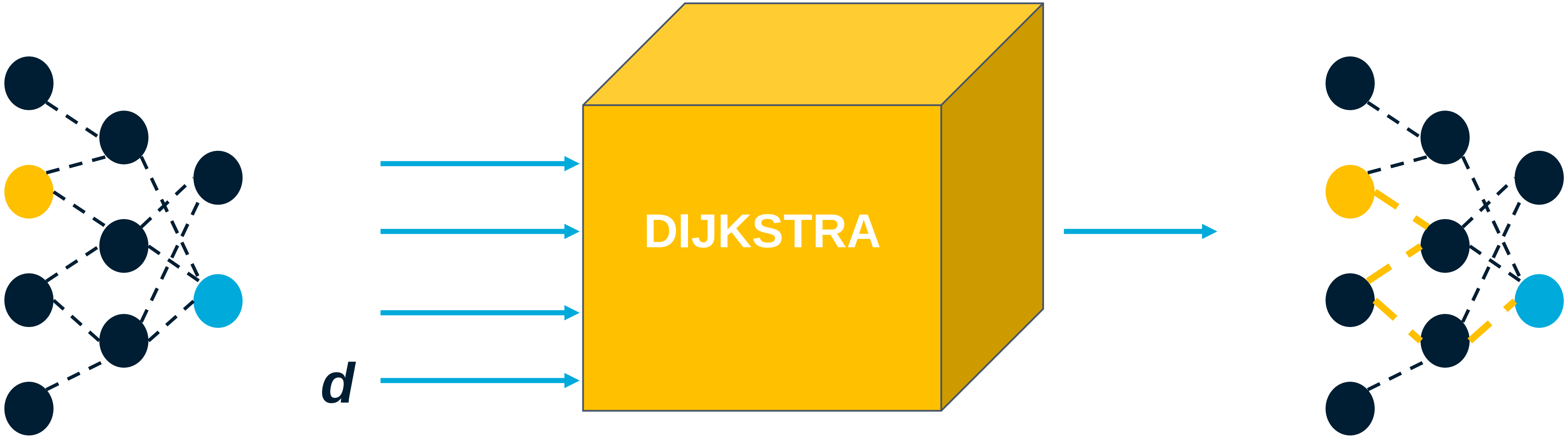
# First Algorithm




**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

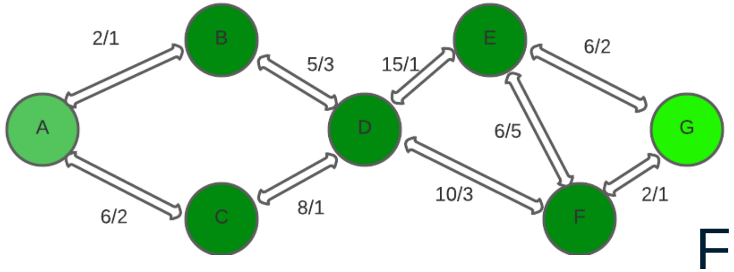



Fig 1

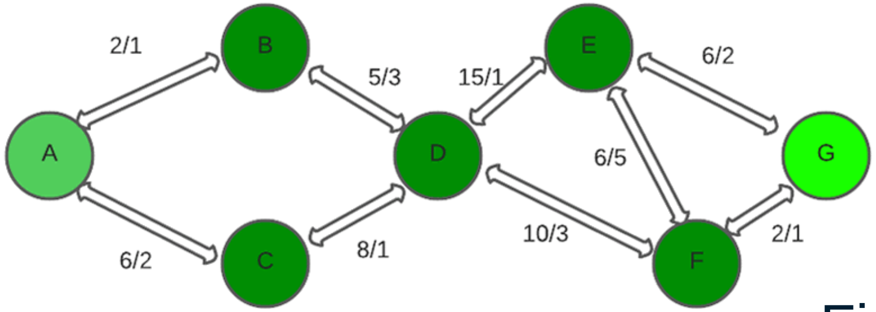



Fig 2

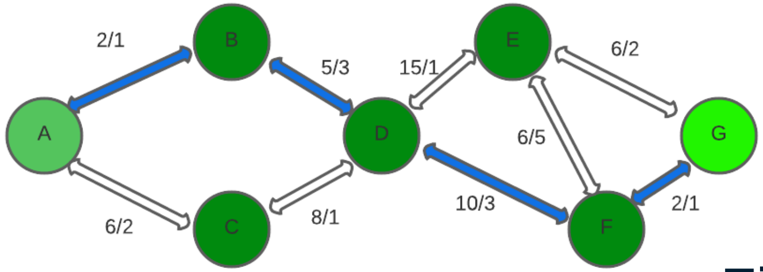



Fig 3

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 | 815 m |
| Universidad Nacional | Universidad Luis Amigó | 1469 m |

Shortest distance obtained.

*In what follows, we present the results obtained for the shortest path due to new directions given in class harassment is not taken into account. We compare with Google maps and we have the same short distance.*

# 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 .

*In what follows, we present the results obtained for the shortest path due to new directions given in class harassment is not taken into account. We compare with other partners and we have similar results but cause with have different csv we got interesting paths.*

# Algorithm Execution Times

## Execution Times

UNIVERSIDAD EAFIT → Universidad de Medellín (Ciencia y Libertad) → 13.5 seconds

UNIVERSIDAD DE ANTIOQUIA → UNIVERSIDAD NACIONAL DE COLOMBIA → 11.5 seconds

UNIVERSIDAD NACIONAL DE COLOMBIA → UNIVERSIDAD CATÓLICA LUIS AMIGÓ → 12.49 seconds

*The execution times for all the process with the algortihm are perfect for a real life situation , because complexity and the efiency of Dijkstra we can run the program faster and with no problems.*

# Future Work Directions

## Databases

- Add other variables
- Data managing

## Project 1

- A Web Application
- Interface design

## Software Eng.

- Multiplatform design
- Cloud functionality

## Project 2

- Web app development
- User management and market launch

# THANK YOU!

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