



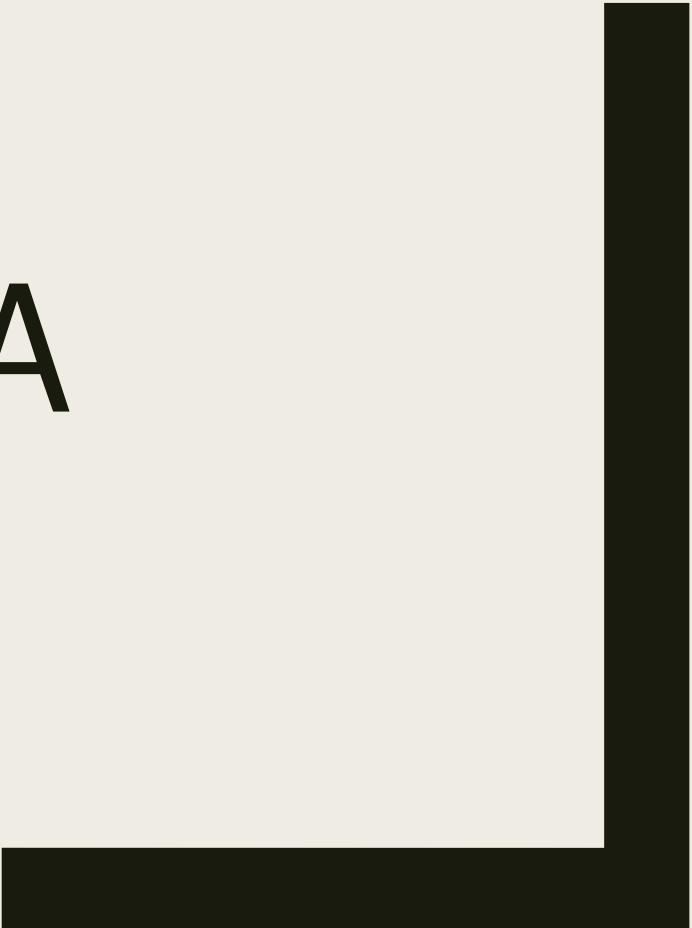
PROJETO DA

Grupo 2 – Turma 1 (G01_3)

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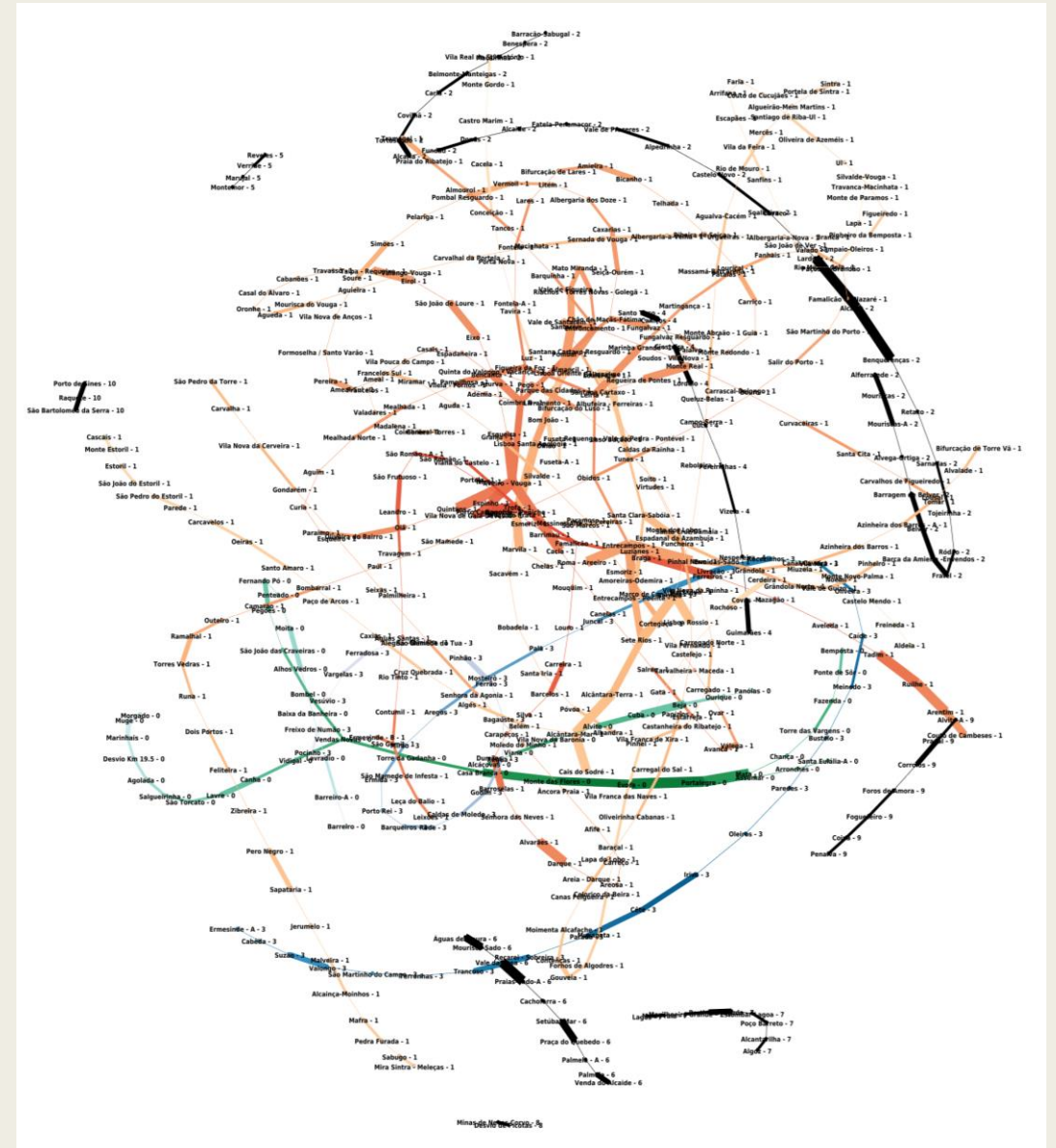


Reading Dataset

- Read from default dataset in the beginning of the program;
- The user can, however, choose to create graphs from custom datasets by placing them on the data folder;
- Can reload the dataset at any given time during execution;
- The data is organized in a main graph, created right after the dataset is read.

Graph Used

- The graph used in this project represents the stations as vertices and the edges represent any trip you can take from one station to another.
- Each edge has its own capacity, which is the number of trains that can circulate at the same time on that part of the network.



User Interface:

- Here are the various menus that compose the user interface.

```
#####
#      MAIN MENU      #
#####
1.Basic Service Metrics
2.Operation Cost Optimization
3.Reliability and Sensitivity to Line Failures
4.Load Dataset
Enter q to terminate the program or to return to a previous menu
Enter the respective number:
```

```
#####
#   Basic Service Metrics   #
#####
1.Max number of trains between two specific stations
2.Stations that require the most amount of trains
3.Top-k municipalities and districts that are assigned large budgets
4.Maximum number of trains that can simultaneously arrive at a given station
Enter the respective number:
```

```
#####
#Operation Cost Optimization#
#####
Source: |
```

```
#####
# Reliability and Sensitivity to Line Failures#
#####
1.Maximum number of trains that can simultaneously travel between two specific stations in a network of reduced connectivity
2.Stations that are most affected by each segment fail
Enter the respective number or q to return to the main menu: |
```

```
#####
#      Load Dataset      #
#####
1.Load Data from preset
2.Load Data from my own dataset
Enter the respective number or q to return to the main menu:
```

Main Algorithms

- Max-Flow (Edmonds-Karp Algorithm) and a few variants appropriate to the project – complexity of $O(VE^2)$;
- Min-Cost (Bellman-Ford & Dijkstra's approach) – complexity of $O(E \log V)$;
- BFS (Breath-First Search) – complexity of $O(V+E)$;
- Algorithm used to determine the maximum number of trains between two stations – Brute Force – complexity of $O(V^3 E^2)$.

Tasks Implemented:

- T1.1;
- T1.2;
- T1.3;

- T2.1;
- T2.2 (Slow Execution Time – not optimal :/);

- T3.1;
- T4.1;
- T5.1.