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Programming Project I : An Analysis Tool for Railway Network Management

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Summary:

- Created Classes
- Graphical Interface
- Graph Structure
- Implemented Functionalities
- Working Method

Graphical Interface

- Main menu with three primary options for user selection
- Each option has respective functionalities
- Options redirect users to a new menu with relevant algorithms
- Tailored to user's specific information needs

```
+-----+  
|      | Railway Network Management  
|      | Main Menu  
+-----+
```

- ```
|
| Option 1: Basic Service Metrics
| Option 2: Operation Cost Optimization
| Option 3: Reliability and Sensitivity to Line Failures
|
```

# Basic Service Metrics Menu

- Option 1 in main menu for multiple algorithm features
- Four sub-options available for user selection
- Each option uses different algorithms with shared functionalities
- All options incorporate elements of Edmonds-Karps algorithm to obtain desired output

## Basic Service Metrics Menu

| Option 1: Maximum number of trains between two stations

| Option 2: Stations which requires the most trains

| Option 3: Top-k municipalities and districts

# Operation cost optimization

- Option 3 in main menu for a single algorithm feature
- Automatically displays the result
- Utilizes both Edmond-Karps and Dijkstra algorithms for computation

|                             |  |
|-----------------------------|--|
| Railway Network Management  |  |
| Operation Cost Optimization |  |

Maximum amount of trains that can simultaneously travel between two specific stations with minimum cost for the company.

# Reliability and sensitivity to line failures Menu

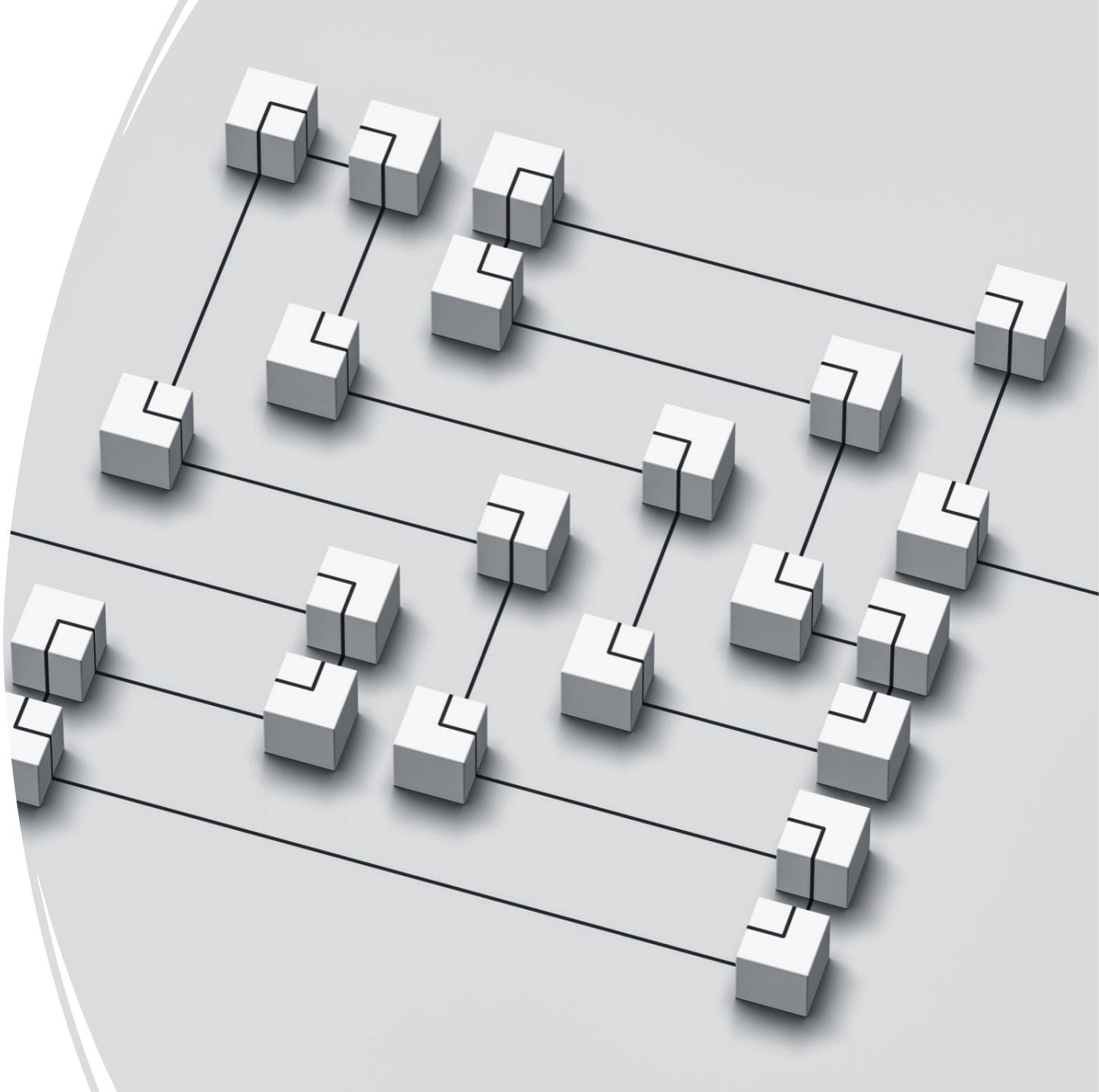
- Option 2 in main menu for advanced features
- Two sub-options available for user selection
- Algorithms inspired by Dijkstra and Edmond-Karps
- Displays expected information based on user choice

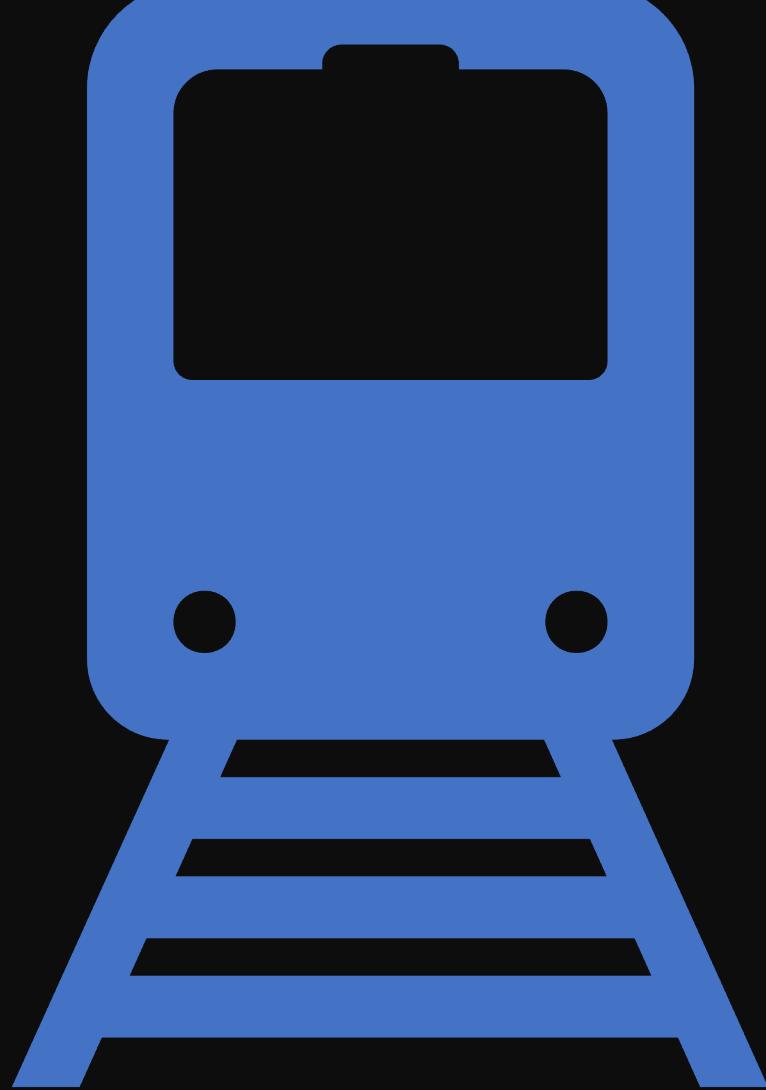
```
+-----+
| Railway Network Management |
| Reliability and Sensitivity to Line Failures |
+-----+
|
| Option 1: Maximum number of trains that can simultaneously travel between
| two specific stations in a network of reduced connectivity.
|
| Option 2: Report on the stations that are the most affected by each segment failure.
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+-----+
```

# Graph Structure:

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- Bidirected graph structure for train network representation
- Vertex attributes: station name, district, municipality, township, line
- Edge attributes: number of trains, service type
- Basic graph extended with additional features to address project tasks



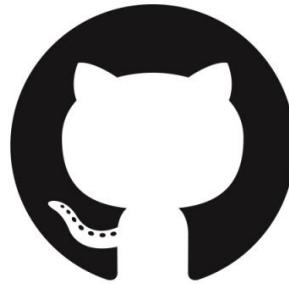


## Implemented features

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- Creation of a simple interface that exposes all implemented functionality
  - Basic functionality to read and analyze supplied data files
  - Maximum flow of trains between two stations
  - Analysis of the maximum number of trains in each station
  - Analysis of locations where larger budgets must be allocated
  - Maximum flow of trains from one station
  - Analysis of minimum operating cost between two stations
  - Number of trains between two stations Reduced connections on the railway line
  - Analysis of the impact of network failures on stations
-

# Working Method:



# GitHub



Whenever necessary, we turned to each other to overcome challenges



We try to divide the work between the 3 members as effectively as possible



We use tools like GitHub, so we can work asynchronously



# Thanks!

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- <https://github.com/DA1>