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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

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|                                     |
|      Railway Network Management    |
|      Operation Cost Optimization   |
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|                                     |
|      Maximum amount of trains that can simultaneously travel between      |
|      two specific stations with minimum cost for the company.              |
|                                     |
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```

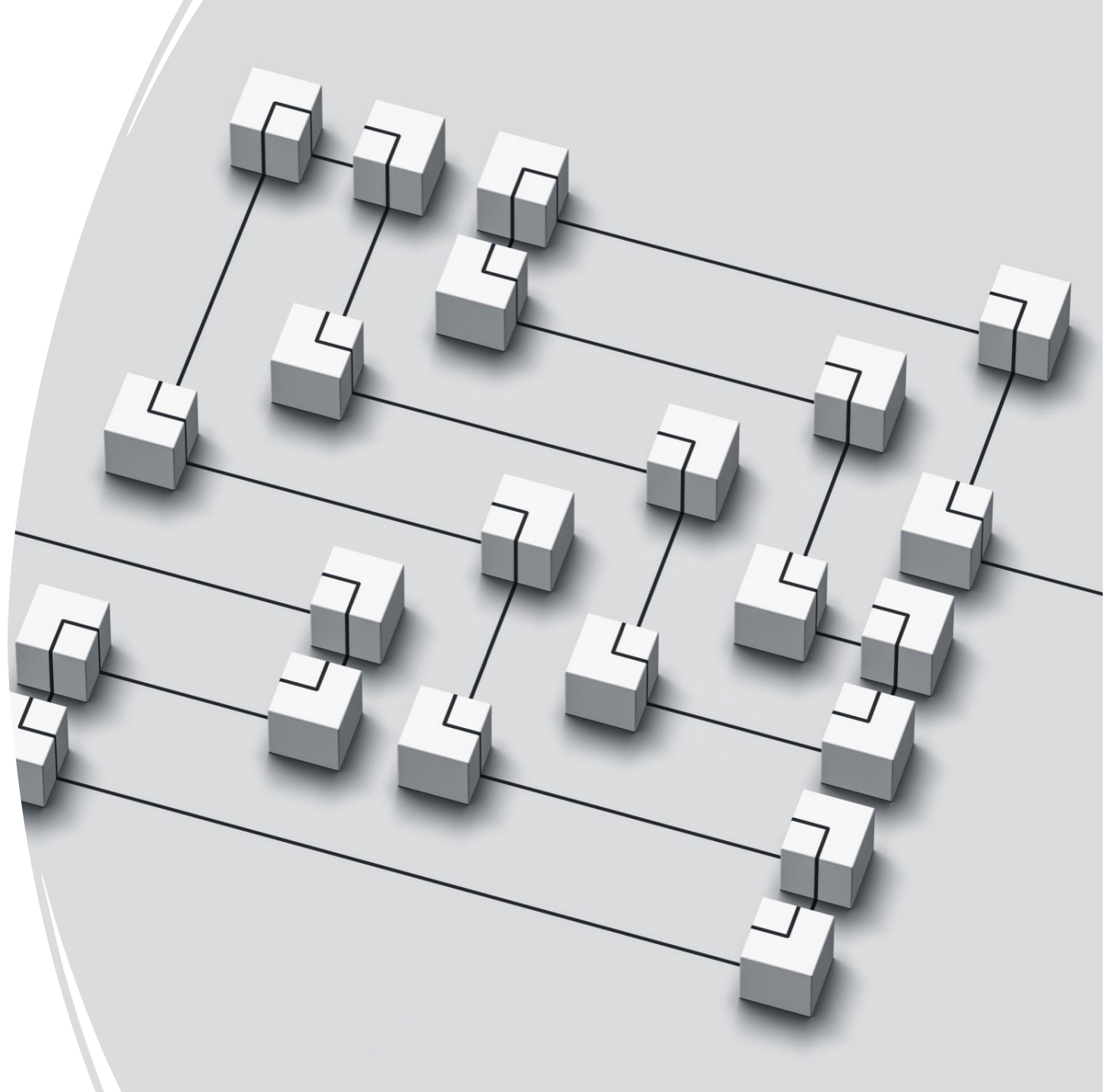
Reliability and sensitivity to line failures Menu

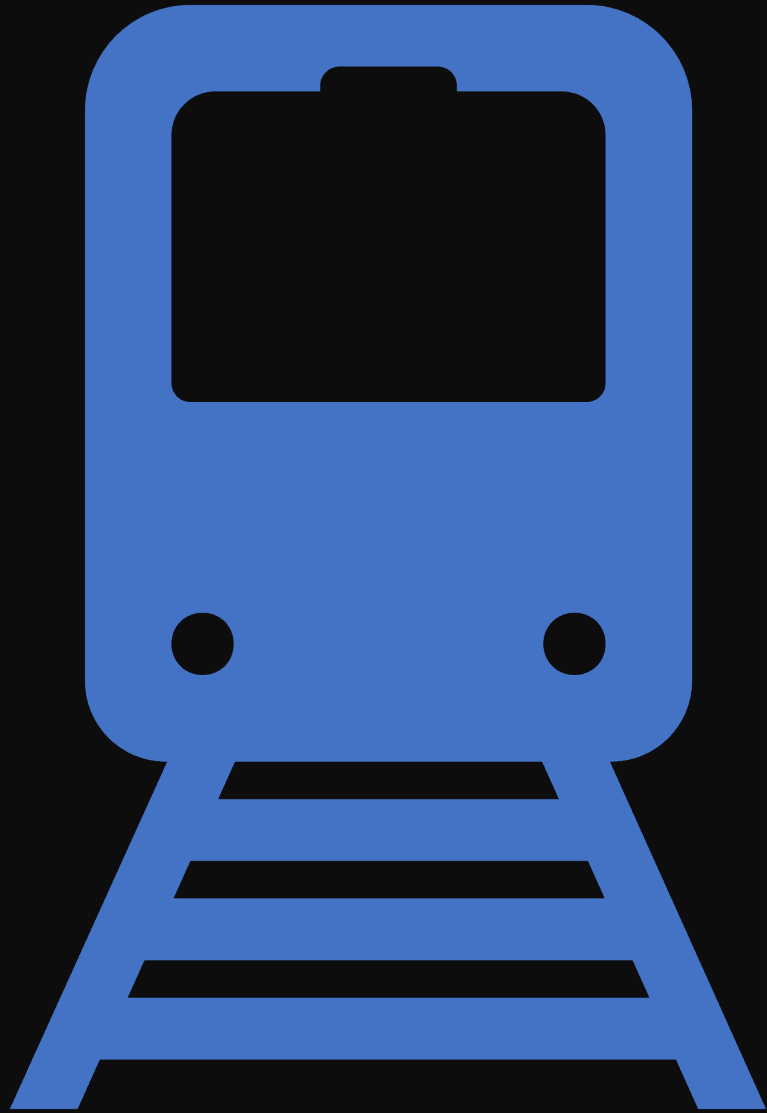
- Option 2 in main menu for advanced features
- Two sub-options available for user selection
- Algorithms inspired by Dijkstra and Edmond-Karps
- Displays expected information based on user choice

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|                                     |
|               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:

- 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

- 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:



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>