# Ferramenta de Análise da Rede de Comboios

Trabalho Prático 1 – Desenho de Algoritmos

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# Objetivo

Este projeto, tem como objetivo conceber uma ferramenta para analisar uma rede de comboios, de forma a encontrar os problemas e assim melhorá-la;

# Dados

| Name | District | Municipality | Township | Line |
|---|---|---|---|---|
| Porto Campanhã | PORTO | PORTO | Porto | Linha do Norte |
| Viana do Castelo | VIANA DO CASTELO | VIANA DO CASTELO | Viana do Castelo | Linha do Minho |
| Ermidas-Sado | SETÚBAL | SANTIAGO DO CACÉM | Ermidas-Sado | Linha do Sul |
| Faro | FARO | FARO | Faro | Linha do Algarve |
| Funcheira | BEJA | OURIQUE | Funcheira | Linha do Sul |
| Lisboa Oriente | LISBOA | LISBOA | Parque das Nações | Linha do Norte |
| Nine | BRAGA | FAMALICÃO | Nine | Linha do Minho |
| Pinhal Novo | SETÚBAL | PALMELA | Pinhal Novo | Linha do Sul |
| Pombal | LEIRIA | POMBAL | Pombal | Linha do Norte |
| Tunes | FARO | SILVES | Tunes | Linha do Sul |
| Vila Nova de Gaia-Devesas | PORTO | VILA NOVA DE GAIA | Vila Nova de Gaia | Linha do Norte |
| Silva | BRAGA | BARCELOS | Silva | Linha do Minho |
| São Pedro da Torre | VIANA DO CASTELO | VALENÇA | São Pedro da Torre | Linha do Minho |
| Vila Nova da Rainha | LISBOA | AZAMBUJA | Vila Nova da Rainha | Linha do Norte |
| Estarreja | AVEIRO | ESTARREJA | Beduído e Veiros | Linha do Norte |
| Branca | AVEIRO | ALBERGARIA-A-VELHA | Branca | Linha do Vouga |
| Valongo-Vouga | AVEIRO | ÁGUEDA | Valongo do Vouga | Linha do Vouga |
| Mirão | PORTO | BAIÃO | Santa Cruz do Douro e São Tomé de Covelas | Linha do Douro |
| Oliveira | PORTO | AMARANTE | Vila Meã | Linha do Douro |

| Station_A | Station_B | Capacity | Service |
|---|---|---|---|
| Casa Branca | Monte das Flores | 8 | STANDARD |
| Monte das Flores | Évora | 8 | STANDARD |
| Évora | Portalegre | 10 | STANDARD |
| Funcheira | Santa Clara-Sabóia | 4 | ALFA PENDULAR |
| Alferrarede | Mouriscas | 6 | STANDARD |
| Mouriscas | Mouriscas-A | 6 | STANDARD |
| Mouriscas-A | Alvega-Ortiga | 2 | STANDARD |
| Alvega-Ortiga | Barragem de Belver | 2 | STANDARD |
| Barragem de Belver | Belver | 6 | STANDARD |
| Belver | Barca da Amieira -Envendos | 6 | STANDARD |
| Barca da Amieira -Envendos | Fratel | 6 | STANDARD |
| Fratel | Ródão | 4 | STANDARD |
| Ródão | Tojeirinha | 2 | STANDARD |
| Tojeirinha | Sarnadas | 4 | STANDARD |
| Sarnadas | Retaxo | 2 | STANDARD |
| Retaxo | Benquerenças | 2 | STANDARD |
| Benquerenças | Alcains | 10 | STANDARD |
| Alcains | Lardosa | 10 | STANDARD |
| Lardosa | Soalheira | 2 | STANDARD |

# Interface

- Menu;

- Inputs do utilizador;

- Algoritmos relevante;

# Classes



- Menu;
- Graph;
- Station;
- Trip;
- ReadData;

# Funcionamento

```
-------------------------------> MENU <------------------------------------
1. Specific Station Information
2. Maximum number of trains that can simultaneously travel between two stations
3. Shortest path between two stations
4. Display the pair of stations that needs trains
5. Top-k municipalities/districts with highest budget needs
6. Max number of trains that can arrive at a train simultaneously
7. Maximum concurrent trains with minimal cost for the company between two stations
Station: Viana do Castelo
District: VIANA DO CASTELO
Municipality: VIANA DO CASTELO
Township: Viana do Castelo
Line: Linha do Minho
  ==> Connects to: Nine
      Capacity: 4
      Service: STANDARD
```

# Funcionamento

```
1. Display station information within a given name
2. Display all stations in a specific district, municipality, or line
3. Back
4. Quit
Enter your choice: 2


Enter the letter corresponding to the category of stations you want to display: (d for district, m for municipality, or l for line): d

Enter the District: PORTO

All stations from District: PORTO
1:Travagem
2:Aregos
3:Bustelo
4:Francelos Norte
5:Miramar
6:Ca┤¦de
7:Valongo
8:Palmilheira
9:Francelos Sul
10:Trofa
11:Coimbr├Áes
```

```
1. Display station information within a given name
2. Display all stations in a specific district, municipality, or line
3. Back
4. Quit
Enter your choice: 2


Enter the letter corresponding to the category of stations you want to display: (d for district, m for municipality, or l for line): m

Enter the Municipality: PORTO

All stations from Municipality: PORTO
1:Porto Campanh├ú
2:Contumil
3:Porto S├úo Bento
```

```
1. Display station information within a given name
2. Display all stations in a specific district, municipality, or line
3. Back
4. Quit
Enter your choice: 2


Enter the letter corresponding to the category of stations you want to display: (d for district, m for municipality, or l for line): l

Enter the Line: Linha do Minho

All stations from Line: Linha do Minho
1:Caminha
2:Travagem
3:Louro
4:Esqueiro
5:Alvar├ües
6:Palmilheira
7:Barcelos
8:Trofa
9:Carreira
10:Moledo do Minho
11:├éncora Praia
12:Areia - Darque
```

# Funcionamento

```
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6. Max number of trains that can arrive at a train simultaneously
7. Maximum concurrent trains with minimal cost for the company between two stations
8. Quit
Enter your choice: 2


Insert Source Station Name:Lisboa Oriente
Insert Destination Station Name:Entroncamento
22 trains have the capacity to travel concurrently between Lisboa Oriente and Entroncamento.
```

```
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4. Display the pair of stations that needs trains
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6. Max number of trains that can arrive at a train simultaneously
7. Maximum concurrent trains with minimal cost for the company between two stations
8. Quit
Enter your choice: 3


Insert Source Station Name:Coimbra B
Insert Destination Station Name:Lisboa Oriente


Shortest path between Coimbra B and Lisboa Oriente:


Coimbra B ==> Pombal ==> Entroncamento ==> Lisboa Oriente


Total distance: 4
```

# Funcionamento



```
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6. Max number of trains that can arrive at a train simultaneously
7. Maximum concurrent trains with minimal cost for the company between two stations
8. Quit
Enter your choice: 4




Max: 22
Entroncamento - Santar├®m

Lisboa Oriente - Santar├®m

Santar├®m - Lisboa Oriente
```

# Funcionamento

```
-----------------------------> MENU <-----------------------------------
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7. Maximum concurrent trains with minimal cost for the company between two stations
8. Quit
Enter your choice: 5


District or Municipality? (d/m):
d
Amount to be displayed:
10
LISBOA requires 5414 trains.
AVEIRO requires 4866 trains.
LEIRIA requires 1674 trains.
PORTO requires 1526 trains.
SANTARëM requires 1298 trains.
COIMBRA requires 1082 trains.
FARO requires 650 trains.
CASTELO BRANCO requires 506 trains.
BRAGA requires 506 trains.
SETÜBAL requires 506 trains.
```

```
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4. Display the pair of stations that needs trains
5. Top-k municipalities/districts with highest budget needs
6. Max number of trains that can arrive at a train simultaneously
7. Maximum concurrent trains with minimal cost for the company between two stations
8. Quit
Enter your choice: 5


District or Municipality? (d/m):
m
Amount to be displayed:
5
LISBOA requires 678 trains.
POMBAL requires 156 trains.
AVEIRO requires 134 trains.
COIMBRA requires 126 trains.
SINTRA requires 118 trains.
```

# Funcionamento

# Dificuldades Encontradas



- Utilizar a pontuação portuguesa;
- Gestão do tempo;
- Esforço de cada elemento;