Robust Route Planner

Final Project

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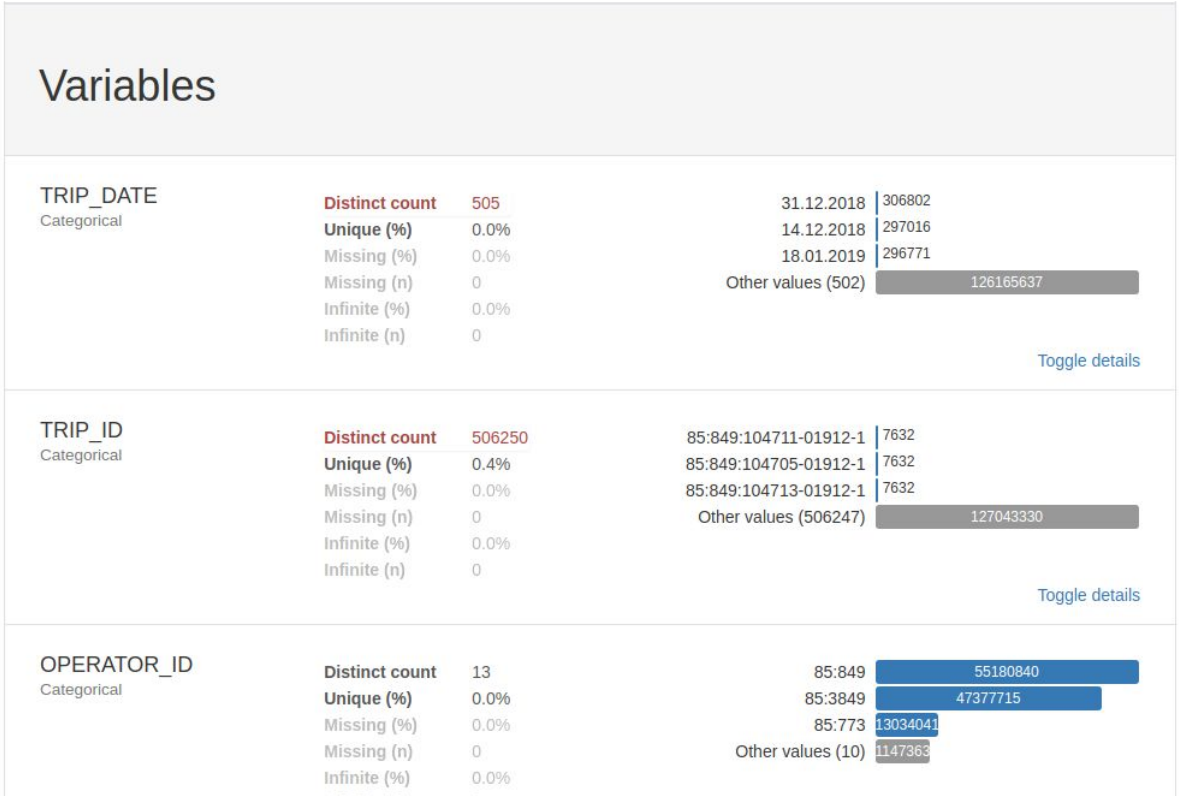
Content

- Data Cleaning and Analysis
- Connection Graph
- Timetable
- Confidence Calculation
- Robust Route Calculation
- Visualization

Data Analysis



Can be seen in the notebook:

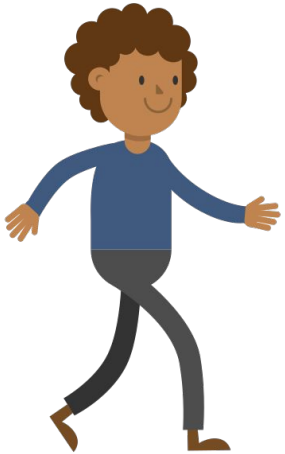
SBB_Data_Analysis.ipynb

Data Cleaning

- **ADDITIONAL_TRIPS** where trip is additional
- **FAILED** if trip failed
- **PASSES_BY** if trip passes by the station
- **SCHEDULE/ACTIVE ARRIVE/DEPART TIME**S if any of the times is null
- Etc.

Connection Graph

- Distances between stations and Zurich (using coordinates)
- Stations around Zurich (≤10 km)
- Distances between stations
- Form a matrix with the connections
- Walking matrix: with the connections feasible during the *max_walking_time*
- Then: merge connection and walk matrices into a one single adjacency matrix of all possible paths



Timetable

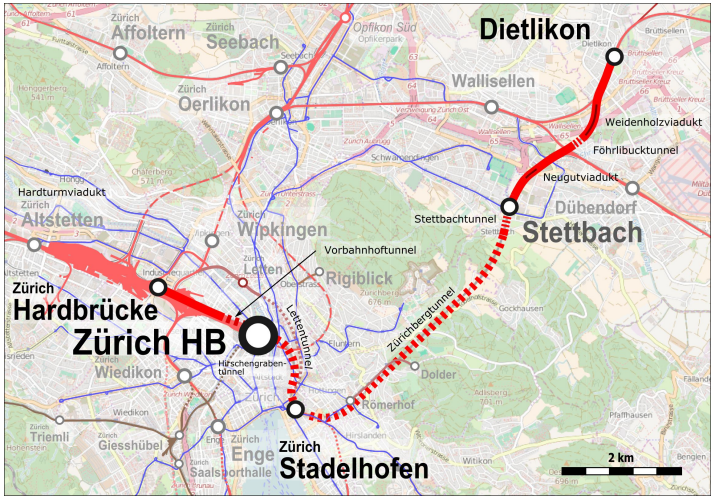
- Using the available data, we can now form a timetable that links between two stations at specific times when connections exist
- Using a self join

Confidence Calculation

- We created clusters using the data and several different attributes each time to find relationships between the attributes and the delays:
  - ACTUAL_ARRIVE_TIME
  - ACTUAL_DEPART_TIME
  - OPERATOR_ID
  - SERVICE_TYPE
  - STATION_ID
- Probability of delay computed using number of times delayed
- P(successful trip) = $\prod_i$P(segment$_i$ delayed)

Robust Route Calculation

- Find best routes for given start and end destinations (reuse all previous methods)
  - by eliminating duplicate paths that involve only walking
  - by considering the probabilities of the arrival of each transportation on time
- Provide to user the best 3 options




```
route: 2
---------------
departure:  8503000 arrival:  8503307 departure_time:  2018-06-26 21:49:00 arrival_time:  2018-06-26 22:09:00 transport_type:  Zug
departure:  8503307 arrival:  8503016 departure_time:  2018-06-26 22:26:00 arrival_time:  2018-06-26 22:31:00 transport_type:  Zug
confidence = 0.9998768818457573
---------------
```

Visualization

DEMO