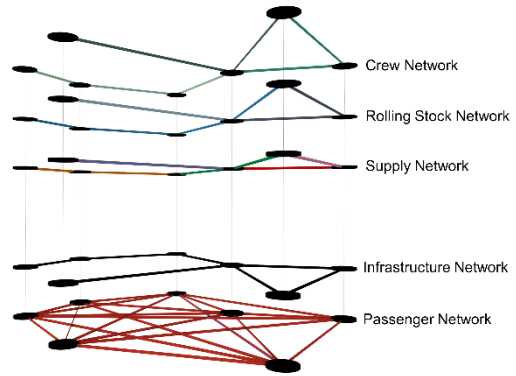


Scientific head:	Prof. Dr. F. Corman
Project title:	Graph Analysis and Graph Comparison Methods to analyse railway operation
Supervision:	Jan Lordieck

Background

Graphs are a natural data structure in describing railway systems. They are most commonly used for representing the infrastructure which are networks of nodes and links by nature. In addition, so called Event-Activity-Graphs or Diachronic Graphs got the standard way of representing the timetable of railways. A currently running research project at IVT aims on expanding the usage of such graphs from planning to analysing and managing railway systems.



Problem description

Graph analysis methods are commonly used to assess infrastructure or public transport supply (line) networks. Established examples include the calculation of centralities, degrees, connectivities etc. Graph comparison methods were not applied in the context of railway infrastructure yet. Both types of studying graphs (analysis and comparison) were not applied on studying realised operation or control of railway systems yet, although research and practice rely strongly on the data structure in the planning stage.

Research question

This proposal intends an exploratory study on graph analysis and comparison methods and its application to railway operation. The question is “What graph analysis and comparison methods can be applied to railway timetable and operation data stored as event-activity graphs?” and “What insights do they provide and how can they improve our understanding of operational dynamics in railway systems?”

Expected results

The student taking this challenge is expected to deliver a thorough literature review on current method to analyse railway operation and on graph analysis and comparison methods in general. Afterwards currently used and promising graph methods from the literature should be applied on a case study. The results are expected to be compared qualitatively assessing the significance of information gain from graph methods compared to traditional operation analysis techniques.

Credits:	20-30 (Master thesis)
Requirements:	<ul style="list-style-type: none"> • Motivation to carry out an extensive literature review • Some experience with graph theory • Experience with coding in python for implementation of analysis methods