

VORTRAG

“Train timetabling and scheduling under uncertainty“

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Abstract:

In this study, we analyse the current utilisation of the rail network and the reliability of the offered train services. Utilisation is measured by the number of trains that travel through the network in a given time period; the more trains, the higher the utilisation. Reliability is measured by the deviations from the current train timetable that are caused, for example, by bad weather conditions and technical malfunctions. Our aim is to improve both, reliability and utilisation. Yet, the two goals are often conflicting. We apply different optimisation techniques to iteratively generate timetables with more and more trains while complying with safety regulations. By examining the reliability of these timetables when executed under uncertainty, we can gain insights into the trade-off between network utilisation and timetable reliability. The problem is challenging as it combines combinatorial optimisation under uncertainty and decision making with multiple objectives. We propose a new mathematical model based on an event-activity graph. Solutions to small instances are generated by a commercial optimisation software. Large instances are solved by a heuristic algorithm that generates close-to-optimal solutions in a short amount of time. A case study is conducted on the rail network around Peterborough station. Delay scenarios are based on historical records.