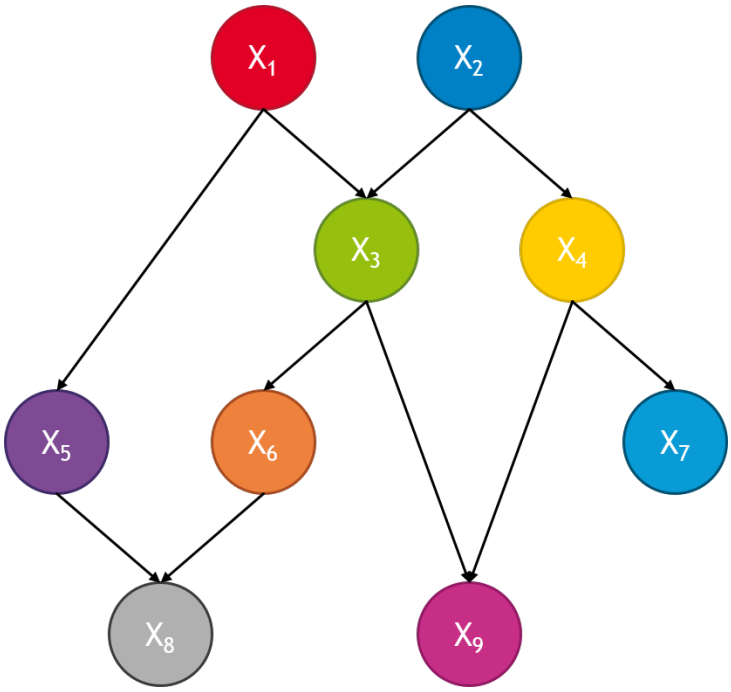

Train delay predictions based on Bayesian networks including inter-train conflict dependencies

Thomas Spanninger

Francesco Corman

STRC conference paper 2022 **May 11, 2022**

STRC | **22nd Swiss Transport Research Conference**
Monte Verità / Ascona, May 18-20, 2022

Train delay predictions based on Bayesian networks including inter-train conflict dependencies

Thomas Spanninger
IVT
ETH Zürich
CH-8093 Zurich
tspanninger@ethz.ch

Francesco Corman
IVT
ETH Zürich

May 11, 2022

Abstract

Train delays are inconvenient for passengers. Due to numerous influencing factors, delays are unavoidable in railways and to minimize their cascading consequences, traffic control managers aim to avoid their spreading. As of the limited track infrastructure, this task is difficult with often very restricted options. Therefore, it is important to provide real-time predictions of train delays that estimate the consequences of actual delays and potential traffic control actions. Recently, Bayesian networks (BN) have become a popular model to predict train delays in real-time as combination of data-driven models and operation modelling approaches. One important step of BN models consists of assuming a dependency structure of train events (arrival, departure and through) on a station level for the prediction horizon in form of a directed acyclic graph (DAG). This DAG is most widely modelled on the Markov property assumption for stochastic processes (1^{st} and 2^{nd}-order) of delays along train journeys. In this study, we analyze the benefits of including inter-train dependencies in a test-case setting within a corridor of the Swiss railway network and can show an increase of the prediction accuracy of 19.8% in terms of mean absolute error and 30.6% of root mean squared error.

Keywords

railways, train delay, prediction, Bayesian networks, dependency structure

Suggested Citation