Spatio-Temporal Graph Embedding Workflows for Transportation Modelling

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# Abstract

Traffic infrastructure forms networks and a wide array of approaches have been developed to predict future behaviour within these networks. In recent years, Graph Convolutional Networks (GCNs) have emerged as a promising method for modelling such behaviour within the network based on historical data. However, a gap exists between the way infrastructure is present in the real world and how GCNs currently process graphs representing it and the derived information. Traffic networks, embedded in geographic space, often span large areas, and their spatial complexity presents a significant challenge. Beyond geography, temporal factors further complicate the problem. Traffic is inherently time-dependent, as it reflects the movement of vehicles through both space and time. This time-varying behaviour introduces additional challenges when attempting to predict future traffic patterns. The goal of this project is to develop a graph embedding approach for modelling such complex spatio-temporal networks. This will enable the use of GCNs to predict future network behaviour by effectively capturing both spatial and temporal dynamics within traffic infrastructure. In literature, different graph models have been proposed, differing in their complexity and level of reduction. In this project, different graphs will be considered and checked for their usefulness to model a transportation network. A workflow for building a graph from data will be realized. Data regarding cargo train transportation in Austria will be used for modelling and testing on a real-world problem.

# Keywords

traffic modelling, spatio-temporal networks, graph convolutional network (CGN)