Chair of Network Architectures and Services
TUM School of Computation, Information, and Technology
Technical University of Munich

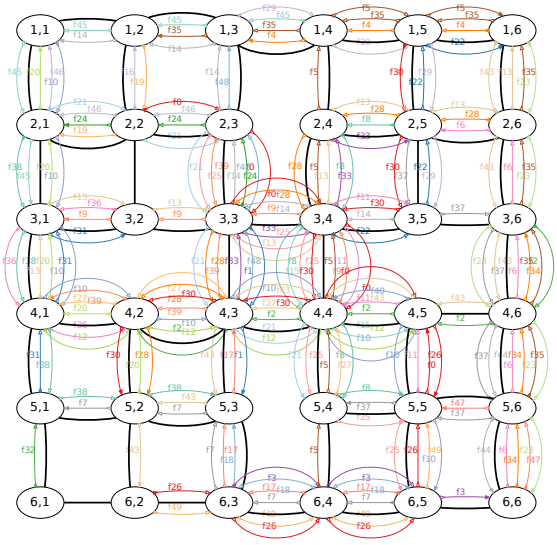
Thesis B.Sc.

IDP

Efficient Routing in TSN-ATS using GNNs

Motivation

Time Sensitive Networking (TSN) is a set of standards for deterministic service over Ethernet [1]. Asynchronous Traffic Shaping (ATS) is one such standard that does, in contrast to other standards, not rely on time synchronization [2]. Current approaches to routing in TSN-ATS rely on worst-case delay bounds of flows. The aim of this thesis is to extend such an approach by including mean and percentile values of flow delays. These values can be obtained using a machine learning approach that relies on Graph Neural Networks (GNNs) [3].



[1] https://en.wikipedia.org/wiki/Time-Sensitive_Networking
[2] https://en.wikipedia.org/wiki/Time-Sensitive_Networking#IEEE_802.1Qcr_Asynchronous_Traffic_Shaping
[3] https://distill.pub/2021/gnn-intro

Your Task

- Familiarize yourself with TSN-ATS, routing algorithms for TSN-ATS, and GNNs
- Create a dataset using a network simulator
- Apply a GNN approach to predict mean and percentile delay values
- Evaluate the quality of the approach by looking at improvements over TSN-ATS routing based on worst-case delays

Requirements

- Hands-on experience with machine learning, preferably PyTorch
- Basic knowledge of computer networks and communication
- Experience in Python
- Self motivated work approach

Contact

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