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

Thesis B.Sc.

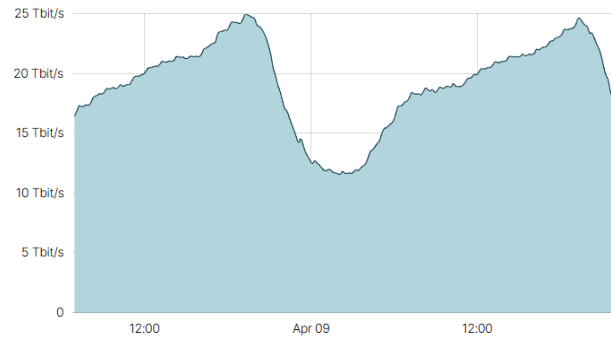# Early Detection of Traffic Shifts in ISP Networks

In modern ISP networks, understanding and managing inter-domain traffic is crucial for maintaining performance and reliability. Traffic shifts can occur unexpectedly due to various reasons, including human-induced events such as large-scale content distribution (e.g., game updates on platforms like Steam), or issues such as distributed denial-of-service (DDoS) attacks, router or link failures, and routing misconfigurations. Detecting these shifts early is essential to give network operators time to react

Typical daily traffic pattern observed at the DE-CIX [3].

before problems escalate. However, the highly dynamic nature of traffic volume – with regular fluctuations throughout the day – presents a significant challenge, as normal variations must not trigger false alarms. This thesis should explore leveraging Time Series Foundation Models (TSFMs) [1] to model traffic behavior and detect abnormal shifts, similar to an approach proposed by Wehner et al. [2] for video streaming QoE.

Your Task

- Familiarize with TSFMs and the approach used by Wehner et al. [2]
- Familiarize with traffic patterns and typical scenarios
- Apply TSFMs to the problem of traffic shift detection
- Analyze the capabilities of your approach using a synthetical dataset provided by us

Requirements

- Machine learning background
- Computer networking knowledge
- Pyton programming skills

References

[1] Yuxuan Liang et al., Foundation models for time series analysis: A tutorial and survey, Proceedings of the 30th ACM SIGKDD Conference on Knowledge Discovery and Data Mining, 2024, pp. 6555–6565.
[2] Nikolas Wehner et al., Exploring the application of Time Series Foundation Models to network monitoring tasks, Computer Networks, Volume 269, 2025, 111395.
[3] https://www.de-cix.net/en/about-de-cix/news/new-global-traffic-record-at-de-cix-25-tbps-across-all-ixs

Contact

Johannes Späth   spaethj@net.in.tum.de
Patrick Sattler   sattler@net.in.tum.de