



## QUIC RTT estimation using ML techniques

### Abstract

QUIC is a secure, encrypted, multiplexed, and low-latency transport protocol (RFC 9000) designed together with HTTP3 (RFC 9114) to improve the performance of HTTPS traffic. QUIC is expected to become the dominant transport protocol on the internet, replacing TCP. Most of the packets in QUIC are encrypted, all of the payload and even most of the header, which makes it difficult for internet service providers (ISPs) and other middleboxes to monitor the network. An important metric that ISPs use to gauge the health of the network is round-trip time (RTT) estimation. If the RTT of many connections becomes very high, it can indicate that queues in routers are building up and the network is at risk of collapsing. In such cases, ISPs may limit the bandwidth of heavy users to prevent network failure.

The purpose of this project is to estimate RTT in case those bits are not available. We believe that various ML techniques can be used to estimate the RTT (as an observer observes the spin bit). One possible direction would be to embed a sliding window of consecutive frames (or properties of frames as (Time of Arrival, Size and Direction) into a picture and then try to extract insights from the picture. Another approach could be to use CNN to exploit session characteristics.

Data set. In this project you will use an Infrastructure that was developed in a past project, that infrastructure can be utilized for generating a tagged pcaps (In which we know everything about the packets' content, the RTT as the client and server estimate it, and the 'wire latency'.

### Problem Formulation

The purpose of this project is to develop a Machine Learning tool that accurately estimates QUIC connection RTT.

### Project overview

1. Read related ML materials.
2. Generate synthetic data of QUIC sessions.
3. Build an ML model to try to predict the RTT of a QUIC session.

### Notes

- The above project's aim is to produce in the long run an academic paper. The project can also be a good way to start a research proposal for an MSc.
- The above list is an estimate. Goals and tasks might be modified during the first few weeks of the projects before the finalization of High Level Design Document.

General requirements for all LCCN Projects are specified at the lab website:

<https://lccn.cs.technion.ac.il/lab-courses/>



### Prerequisites:

1. Introduction to computer networks (236334) - Mandatory
2. Machine Learning background – Mandatory (contact Barak Gahtan for approval).

### Instructors

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