DRL Based GNN for 6G Cellular Access Network Schedular

Abstract

As the demand for mobile high bandwidth – low latency is increasing, the access network must become smarter and automatically adapt to rapid changes. A scheduler is a module that observes the network, receive traffic requests from all users and allocates a bandwidth and a specific route to each requested connection.

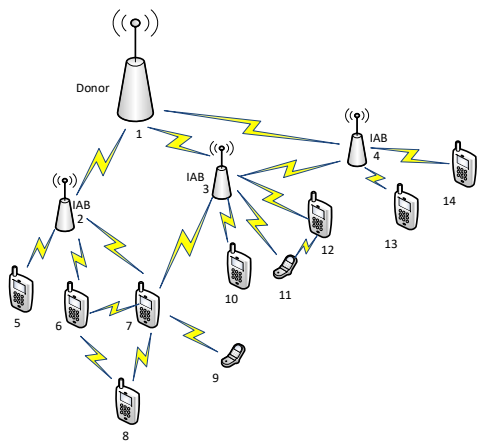

Fig. 1: 6G Example Access Network

In order to accomplish the scheduling task quickly and efficiently, you will further develop a Deep Reinforcement Learning (DRL) based scheduler that observes the network (the environment), receives traffic requests and allocates route and bandwidth to each traffic request. The focus of this semester's project is to replace the neural network of the DRL algorithm with a graph neural network (GNN) type of "brain". The GNN will be tailored for a dynamic topology.

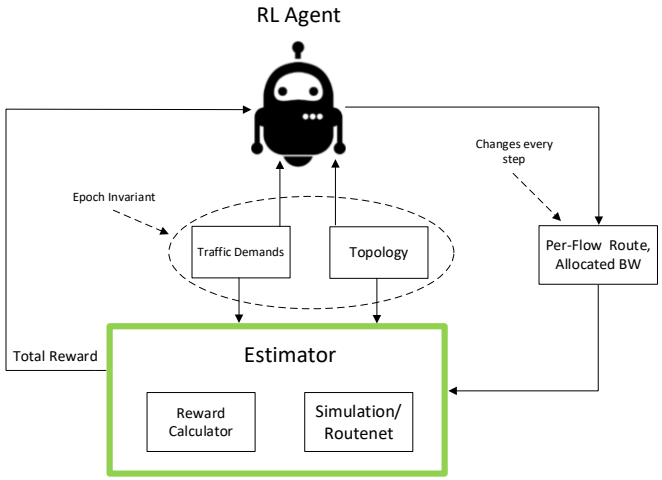

Fig. 2: Reinforcement based Learning Scheduler

Project objective

Deepening last semester project by using the benefit of a GNN architecture and tailor it for a dynamic topologies.

Project overview

1. Ramp-up last semester project [1].
2. Understand and study GNN concepts.
3. Develop a GNN architecture for dynamic topologies.
4. Replace the MLP of the DRL algorithm with the proposed GNN.
5. Compare the performance of the RL scheduler with MLP policy, GNN policy and OSPF.

Notes

- The above list is an estimate. Goals and tasks may be modified during the first few weeks of the projects before the CDR (Critical Design Review) at week 4 of the semester.

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. Reinforcement Learning background (for at least one of the team members)
3. Deep Learning background.

Instructors: Barak Gahtan (barakgahtan@cs.technion.ac.il)

Eran Tavor (tavran@cs.technion.ac.il)

References:

[1] https://gitlab.cs.technion.ac.il/lccn/sp2022_routenet_scheduler

[2] https://gitlab.cs.technion.ac.il/lccn/w2021-2022_omet_sim_for_routenet

[3] https://omnetpp.org/