AI Network Challenge

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Overview

- Pad: https://pad.inria.fr/p/g.D1sMHS8qEcwsc2iq$np_TuYkekVkbtLyVZYr_netaichallenge

- Work items
  - WI1: use case definition
  - WI2: identification of the datasets and/or experimental platforms
  - WI3: challenge publication

Use Case Definition

- 3 propositions
  - Routing
    - Not only prediction but also actions to perform
    - Global routing vs local forwarding (decide output port of packets in switches)
    - Input data to learn on: historical traffic in different conditions.
    - The question behind would be to know if he AI approach can automatically learn what the best routes are based on traffic analysis and so without knowing the failures/anomalies (that are usually reported)
  - Intent (interpretation)
    - In the scope of IBN roadmap, rely on NLP
    - Input data to learn and validate: some text-base intent + their technical realization
    - Issue: how to get a representative number of intents + operations (manually defined as the goal is not to "learn an algorithm")
    - Extend to other stages of the IBN pipeline
  - Traffic prediction
    - Common use case
    - Goal: predict the traffic flows that will occur in a future or the traffic distribution over time
    - Input data: some historical traffic
    - Advantage: easy to understand, datasets could be found
- Any other proposition? In relation with an IETF WG?

Routing / Forwarding / TE use case

- Objective
  - Take local routing decisions at each node
  - Replace or learn the routing table without any routing algorithm
  - Make it easy even for non experts (no management plane, no SDN…)
- Inputs
  - Minimal input: destination of the ingoing packets to be routed
  - Extra inputs: source, states of other nodes, delay observed for each forwarded packets…
- SotA
  - Rich literature in the area of multi-agent systems for routing
  - A lot of approaches using (Deep) Reinforcement Learning (A. Cabellos's presentation @ IETF100)
  - Widely investigated use case
    - could attract a substantial number of participants
    - check genericity of proposed solutions

Routing / Forwarding / TE use case

- Scientific and technical originality
  - Most of approaches suppose the ability to compute a reward (high overhead if computed for each decision)
  - Still questionable in terms of adaptability regarding dynamic traffic changes
  - Can we take good decisions only past observations (forwarded packets)?
    - Very challenging as it embeds very few of information
    - Maintain “rewards” during a limited period of time → alternating between (re)learning and just forwarding (learn good strategies in advances)
    - Combine different types of learning algorithms, learning must be done over a representative sets of situation

Orchestration of AI

- Evaluation
  - Simulator-based evaluations
  - Provide a topology description to participants
  - Participants provide a single program for each node to take routing decisions
  - Scores depending on E2E delay, complexity, overhead…

Other items

- Platforms
  - Use an existing platform: https://openml.org/ , https://www.kaggle.com/, https://www.aicrowd.com
  - Setup a dedicated platform Acumos: https://www.acumos.org
  - Evaluation purely based on valued prediction outputs (compare prediction to “real labels”)
  - Evaluation based on experimental validation, e.g. simulation
    - Examples on aicrowd https://www.aicrowd.com/
    - Need more effort to develop and maintain the challenge
    - Need also an “infrastructure” to run the challenge (target something lightweight)
- Support from other groups
  - ITU FG-ML5G (can provide use case), also in discussion with aicrowd
  - IEEE Network Intelligence ETI
  - + search for sponsors
- Open questions / comments:
  - Duration of challenge: on-site event only (eventually repeated), multiple-stages (will allows people to warm-up on easir problem and then team-up)
  - What would be the benefit for NMRG?
    - Mapping/assessing types of algorithms regarding the network problem to solve
    - Help in identifying remaining challenge in the area and so a potential roadmap
    - … ?