Universität Stuttgart

INSTITUT FÜR
KOMMUNIKATIONSNETZE
UND RECHNERSYSTEME
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Master thesis No. 974

Transport Network Reconfiguration using Contextual Bandits and Neural Networks

Methods

Machine Learning
Performance Evaluation

Topics

Network control
Multi-layer networks

Background

Novel and higher-quality Internet services fuel an exponential growth of traffic in Internet service providers' transport networks. This leads to a significant increase in resource demand with large variations over time thus requiring more efficient and dynamic operation of future networks. The Software-Defined Networking (SDN) paradigm enables an efficient and dynamic (re)configuration of multi-layer transport networks. While optimal configurations can be obtained by various methods, a current research topic at the IKR explores the potential of machine learning for this task. Projects like Google's AlphaGo and Facebook's face recognition show the huge promise machine learning has to offer.

Task

In this project you will design, implement and evaluate a self-learning optimization algorithm for the dynamic reconfiguration of multi-layer communication networks. The algorithm will be based on the contextual bandits approach. The project involves the following tasks

- Literature study on contextual multi-armed bandits using neural networks
- Design and implementation of the learning algorithm
- Simulative evaluation of both parameterization and performance

Acquired Knowledge and Skills

You will learn to identify a solution approach for a specific problem in the literature, to adapt and to implement it. You will acquire knowledge in the field of contextual bandits and neural networks as well as transport network reconfiguration. Furthermore, you will learn how to evaluate a complex system through simulation.

Requirements

Programming Experience in Python
Communication Networks II

Desirable knowledge

Experience in Machine Learning

Contact

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