Universität Stuttgart

**INSTITUT FÜR
KOMMUNIKATIONSNETZE
UND RECHNERSYSTEME**
Prof. Dr.-Ing. Andreas Kirstädter

Master thesis No. 1030
## Network Pathfinding with Reinforcement Learning

Methods
Programming
Simulation
Reinforcement Learning

Topics
Communication networks
Network control

Background

During the last decade, there have been tremendous advancements in Machine Learning (ML), triggering extraordinary success stories in numerous applications. Modern research shows that the integration of ML methods in network control can be very beneficial in solving complicated problems fast. A specific category of ML, Reinforcement Learning (RL), became exceptionally popular for achieving superhuman skills in complex games like Chess and Go. RL can be used to solve general-purpose problems where a machine needs to interact with any environment. In this work, you will take advantage of popular RL techniques to solve the network routing problem.
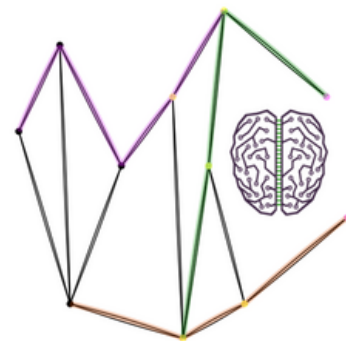
Problem Description

Within this thesis, you are called to substitute traditional methodologies of pathfinding like Dijkstra or Bellman-Ford with an RL approach. RL will enable dynamic behavior and the possibility of fast solving highly complex computer network problems. More specifically, the thesis consists of the following steps:

- Literature research on RL and RL pathfinding techniques.

- Getting familiar with Julia and ReinforcementLearning.jl

- Constructing the simulated environment.

- Development of RL approaches for pathfinding

- Evaluation of the different RL approaches

Acquired Knowledge and Skills

This work will deepen your knowledge of pathfinding algorithms and RL techniques. You will also dive into programming with Julia, a high-level, high-performance, dynamic programming language established in the scientific community. Finally, you will learn how to evaluate and benchmark your algorithms.

Requirements
Programming Experience

Desirable knowledge
Kommunikationsnetze I
Communication Networks Architecture and Design

Contact

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