

OFDMA Resource Allocation using Deep Reinforcement Learning for a Non-Orthogonal Multiple Access Scenario

Master's Thesis

Project

To ensure stable communication between a base station and multiple users with mobile devices the base station needs to decide which resources, e.g. subcarriers in an Orthogonal Frequency-Division Multiple Access (OFDMA) scenario, get allocated to a user. Due to varying data rate requirements of the users, e.g. voice call, video call etc., and altering channel qualities of the moving users more flexible resource allocation approaches than existing ones need to be developed. In a former thesis the introduced problem was tackled by a reinforcement learning (RL) approach. On an experimental setup, which simulated different users that roamed around a base station, an RL agent was trained that allocated resources to the users and outperformed existing resource allocation agents and approaches.

A progression of the used experimental setup is the introduction of Non-Orthogonal Multiple Access (NOMA). Multiple users can be allocated to the same resource and a successive interference cancellation decodes the superimposed signals.

In this thesis an RL agent for the NOMA problem should be designed. Therefore the parameters of the NOMA problem need to be investigated and the RL agent needs to be enhanced in order to ensure required data rates for each user. Afterwards the developed agent should be benchmarked against existing agents.

Deliverables

1. Become acquainted with RL and the resource allocation problem
2. Study the NOMA environment and learn how to modify the reward and architecture of an RL agent in order to fulfill a certain task
3. Training and evaluation of the neural network

Requirements

- ✓ (optimally) working knowledge of Python
- ✓ (optimally) knowledge in RL or the MLOC lecture
- ✓ Interest in Neural Networks and RL
- ✓ Having fun at coding!

Institute

Communications Engineering Lab

Hertzstr. 16
Gebäude 06.45
76187 Karlsruhe
<https://cel.kit.edu>

Contact

Eike Bansbach, M.Sc.

Room 105
e.bansbach@kit.edu