Universität Stuttgart

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

Master thesis No. 1064

Designing and Implementing an Automated Hyperparameter Optimization Framework for Network ML Models

Methods	**Topics**
Optimization Algorithms	Hyperparameter Tuning
Simulation	Neural Architecture Search

Background

Machine learning models in networking applications require careful tuning of numerous hyperparameters to achieve optimal performance. Manual hyperparameter optimization is time-consuming, resource-intensive, and often leads to suboptimal results. Automated hyperparameter optimization frameworks can systematically explore the parameter space and identify optimal configurations, significantly improving model performance and reducing development time. Recent advances in automated optimization techniques have shown promising results in various domains, making them particularly relevant for network-related ML applications.

Problem Description

This thesis focuses on developing an efficient hyperparameter optimization framework for network ML models. The project consists of the following steps:

- Survey existing hyperparameter optimization methods and frameworks
- Design and implement a flexible framework for hyperparameter tuning in Julia
- Develop optimization algorithms (e.g., Bayesian Optimization, Random Search, Evolution Strategies)
- Create benchmarking suite for different network ML models
- Evaluate and compare optimization strategies

Acquired Knowledge and Skills

Through this thesis, you will gain deep understanding of hyperparameter optimization techniques, machine learning model architectures, and performance optimization. You will develop expertise in designing scalable optimization frameworks and implementing various search strategies.

Requirements	**Desirable knowledge**
Strong Programming Skills	Programming Experience in Julia
Understanding of Machine Learning Fundamentals	Computer Networks

Contact

M.Sc. Nicolas Hornek
room 1.402 (ETI II), phone 685-67992, E-Mail nicolas.hornek@ikr.uni-stuttgart.de

Dipl.-Ing. Filippos Christou
room 1.319 (ETI II), phone 685-67968, E-Mail filippos.christou@ikr.uni-stuttgart.de