Karlsruhe Institute of Technology

**Communications Engineering Lab (CEL)**
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# Developement of a ML-based multi-static JCAS System

**Master's Thesis**

## Project

Joint Communication and Sensing will be a key element of future mobile communication standards such as 6G. The upcoming cellular networks are expected to work on additional frequency bands like millimeter-wave (mmWave) and sub-THz bands, leading to significantly enhanced available bandwidths. This fact offers a great opportunity to implement high-performing JCAS systems, since it enables a high-range resolution and makes it feasible to implement large antenna arrays leading, to high angular resolution.

To exploit the full potential of JCAS in novel cellular networks, the channel state information of the base stations can be combined in order to estimate the position of mobile users. Classical approaches for the joint estimation of time of arrival (ToA) and angle of arrival (AoA) such as the use of a Kalman filter have been studied in the past. Nevertheless, the use machine machine-learning approaches might enhance the system's performance and efficiency by combining large amounts of data from several base stations.

The goal of this work is to implement and evaluate a JCAS system that exploits these advantages in the context of the development of the novel 6G cellular network.

## Tasks

1. Implement MIMO simulations with a realistic channel for a JCAS system
2. Reproduce results of state-of-the-art approaches to multi-static JCAS
3. Design and evaluate ML-based approaches

## Requirements

- ✔ Programming experience or interest
- ✔ Interest in Machine Learning
- ✔ Communications Engineering I/II

## Institute

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