Investigation of Semantic Communications in 6G Mobile Communications

Master's Thesis

Project

The upcoming 6G mobile communication standard will offer a multitude of operating modes, realizing connectivity between humans, between machines and enabling a vast amount of applications, ranging from industrial communication to video streaming. The different applications have differing requirements in terms of latency, quality-of-service, robustness and coding/decoding complexity. In this project, your tsask is to investigate so-called semantic communication schemes, i.e., communication schemes that are driven by the content of the message to be transmitted (the message semantics). This entails many a radically new design of the physical layer of the communication system, breaking traditional barriers, e.g., the separation of source and channel coding and non-adaptive digital modulation and radically redesigning next generation communication systems. Using semantic information can also be used to boost the performance of receivers in traditional communication systems, by exploiting the fact that, e.g,. transmission errors cause noticeable glitches in multimedia signals and correcting subsequently for these errors.

In this project, your tasks will be to investigate the potential of a redesigned physical layer for semantic communications in the 6G network.

Tasks

1. Identification of novel transceiver concepts
2. Development of ML-based transmitters and receivers
3. Flexible adaptation of the thesis' goals
4. Demonstration of the concept

Requirements

- ✔ Basics of digital communications (Communication Engineering I & II)
- ✔ Machine Learning and Optimization in Communications (MLOC)
- ✔ Interest in applying machine learning to communication systems
- ✔ Interest in source coding and decoding techniques
- ✔ Implementing algorithms in Python & PyTorch

Institute

Communications Engineering Lab

Hertzstr. 16
Gebäude 06.45
76187 Karlsruhe
www.cel.kit.edu

Contact

Prof. Dr.-Ing. Laurent Schmalen

Room 106
laurent.schmalen@kit.edu