Anomaly detection of wireless channel with autoencoders

Master's Thesis

Project

In the era of 6G and Industry 4.0, the landscape of wireless communication is rapidly evolving. 6G technology promises unprecedented data rates, ultra-low latency, and massive connectivity, which are essential for the seamless operation of Industry 4.0 applications such as smart factories, autonomous vehicles, and the Internet of Things (IoT). However, these advancements also bring new challenges,
particularly in maintaining the reliability and efficiency of wireless communication channels. Anomaly detection in the wireless channel becomes crucial in this context. By leveraging autoencoders, a type of neural network used for unsupervised learning, we can enable early prediction of disruptions. Autoencoders can learn the normal patterns of the wireless channel and identify deviations that may indicate potential issues. This early detection allows for timely adjustments in scheduling and routing, ensuring that communication remains reliable and efficient, thereby supporting the critical operations of Industry 4.0.
In this project, you will design an autoencoder using machine learning to predict anomalies in the wireless channel. The autoencoder will be trained using already gathered data from a smart factory hall of SEW Eurodrive.

Tasks

1. Introduction to the theory of autoencoders.
2. Training an autoencoder with empirical measurement data.
3. Conducting experiments to validate the autoencoder.
4. Evaluating the results.

Requirements

✔ Programming skills in Python.

✔ Machine Learning and Optimization in Communication.

✔ Knowledge of real-time communication and machine learning is an advantage.

✔ Knowledge of automation technology is an advantage.

Institute

Communications Engineering Lab

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

Contact

Prof. Dr.-Ing. Peter Rost

Room 103
peter.rost@kit.edu