ML based GPR data analysis for damage detection, classification or localization

(Bachelor-, Master-, Diplom-, Studien- oder Projekt-Arbeit)

Prerequisites
Machine learning
Computer vision
Linear algebra

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Language
Englisch/ Deutsch

Description
One of the research project of our chair (RADSPOT) focuses on the development of innovative AI-based autonomous driving systems to detect damages in the road substructure, as well as marking deep infra-substructure as fingerprints for robust and high-precision localization. For this purpose, a fully equipped autonomous test-vehicle is used, extending the conventional sensor set of highly automated vehicles (front radar, short range radar, LiDAR and cameras), by a bi-frequency range ground penetrating radar (GPR). The design and implementation of adaptive algorithms, focusing on high precision localization and early recognition of emerging road damages via machine learning in the car and in the cloud, are ongoing tasks in the scope of the project. As well as the integration of the GPR sensor with our test-vehicle and the recording of measurement data.

Possible topics
In the area of machine learning based GPR data processing and analysis we can offer i.a. the following topics:

- Development of a 2D localization algorithm for bi-frequency GPR data.
- ML based aggregation algorithms for the combination of multi trace GPR data.
- 2D detection and classification of underground damages in the road substructure.