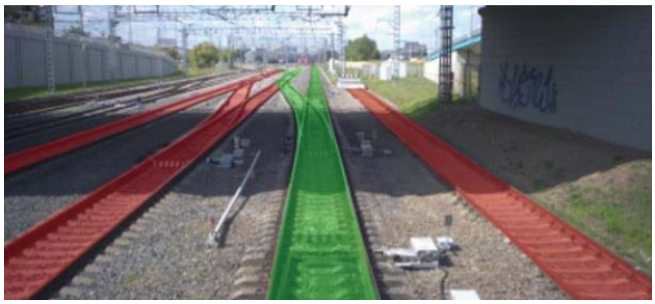
TECHNISCHE UNIVERSITÄT WIEN

Institut für Computertechnik
Institute of Computer Technology

Christian Doppler Forschungsgesellschaft

Master Thesis: Evaluation of Lane Detection CNNs for Rail Tracks

The Embedded Machine Learning (EML) team is part of the Christian Doppler Laboratory and does research on Deep Neural Networks (DNNs) in resource-constrained embedded devices. It studies how energy consumption and resource usage can be minimized while keeping high accuracy. The solution space is characterized by architecture parameters, DNN optimization and transformations, implementation platform configurations, and mapping options. This design space is huge, poorly understood, and rapidly evolving.



A Convolutional Neural Network (CNN) for lane detection generally consists of two parts: (1) a feature extractor, also called an encoder, compressing the original image and providing a low dimensional representation of the original image. (2) A decoder, converting back the compressed representation into pixel-level segmentation of lanes. In the state-of-the-art (SOTA), multiple CNNs have been proposed for lane detection of roads. However, the application of such CNNs for rail-tracks detection is missing.

This thesis project aims to evaluate SOTA CNNs for rail-track detection. This thesis project consists of the following steps:

- Select one of the state-of-the-art datasets, e.g., RailSem19
- Train/test at least three CNNs models, e.g., DeepLabV3, PiNet, CLRNet, to segment rail-tracks
- Evaluate the relative performance of these CNNs
- Optimize these networks for hardware acceleration

This thesis offers you an excellent opportunity to get into the hot topic of deep learning. It allows you to become an expert in configuring neural networks. Moreover, you acquire critical skills in using neural networks in embedded systems and resource constraints.

Some of the M.Sc. projects may be combined with a part-time position.

For details, please consult the following:

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