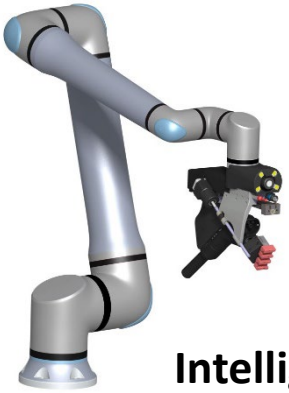
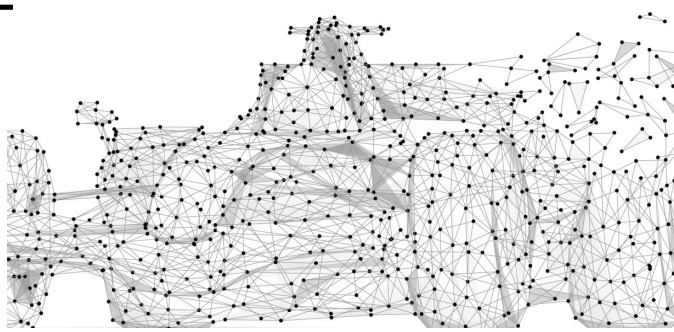
Graz University of Technology
Erzherzog-Johann-University

Institute of Automotive Engineering

Master thesis





Intelligent EV Charging: Leveraging AI and Computer Vision

Current EV charging systems face significant challenges that hinder their broader adoption and operational effectiveness. Inefficiencies in vehicle detection and identification often lead to operational delays, while suboptimal identification of charging points compromises safety and accessibility. To address these limitations, the research aims to develop an intelligent EV charging system leveraging advanced AI and computer vision technologies. The system will enable real-time scanning and identification of vehicles' make, model, and charging flap position. Additionally, guided navigation mechanisms will ensure precise vehicle positioning within the charging zone, improving usability, efficiency, and throughput at EV charging stations. This comprehensive approach seeks to revolutionize EV charging infrastructure, making it smarter, safer, and more user-friendly.

Working tasks

- Collect images and videos of incoming vehicles from multiple angles.
- Apply normalization techniques to standardize lighting conditions and angles.
- Use filtering and edge detection methods to enhance image clarity.
- Implement edge computing hardware to handle image recognition tasks on-site.
- Process images in real-time to minimize latency and improve responsiveness.
- Utilize deep learning models to extract key features such as vehicle make, model, colour, and license plate.
- Apply machine learning algorithms to classify vehicles based on the extracted features.
- Train and update the models to improve classification accuracy over time.
- Use object detection algorithms to pinpoint the location of the vehicle’s charging flap and lid.
- Develop a feedback system that provides real-time guidance to drivers for accurate vehicle positioning within the charging zone.

Project Context

Building on TU Graz’s robotic EV charging system with 130+ test runs, featuring automated charging lid/plug handling, CCS Type 2 connection, and HPC (500kW) safety validation.

Duration:	ca. 6 months
Remuneration:	€ 3.000,-
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