

More Lives Saved



More Life Lived



MicroVision: Camera-based security systems for micromobility

Da Wang

da.wang@autoliv.com

Innovation Engineer

Project Background

■ Background

- With the rise of the micromobility transportation the last years, concerns about safety and traffic integration of the different types of vehicles still need to be addressed. The current camera-based road safety method is based on car collected data and focus on prevent risk for cars.

■ Purpose and scope

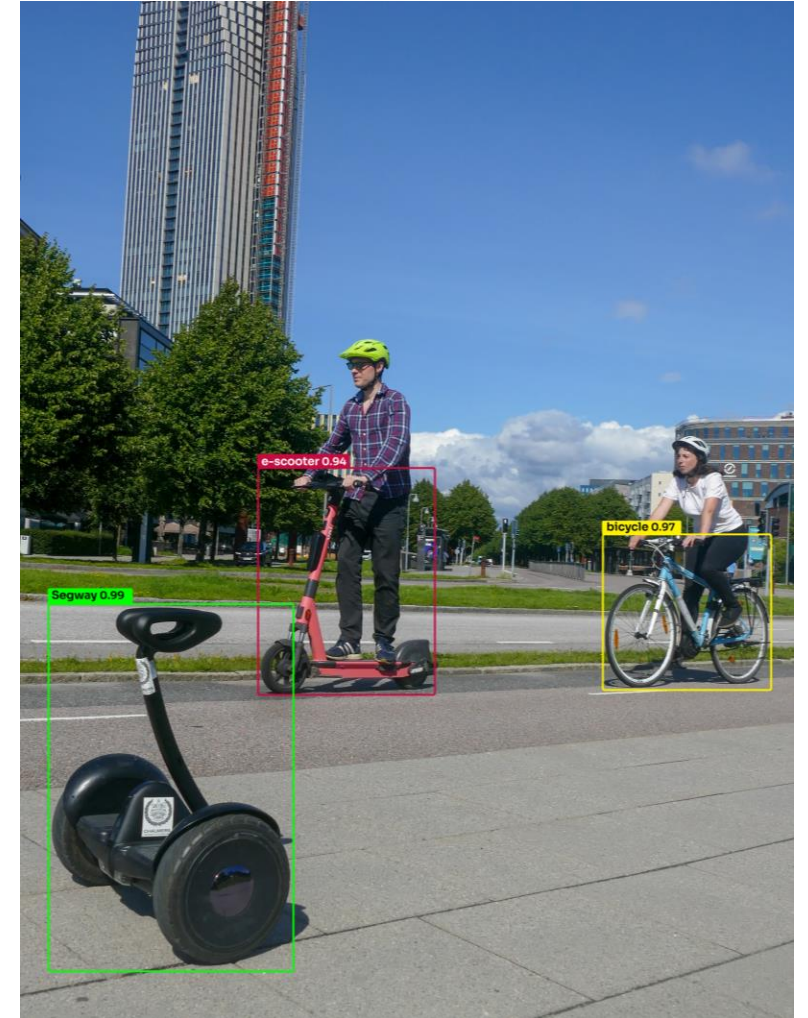
- The project leverages the latest image processing technology to develop a proof-of-concept of an embedded camera-based safety system for micromobilities

■ Project team

- WP1: Chalmers University (Vehicle Safety division)
- WP2/3: Autoliv Development AB

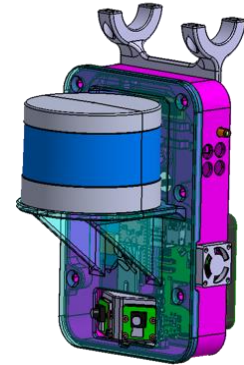
■ Time:

- 2023 Sept – 2025 Dec



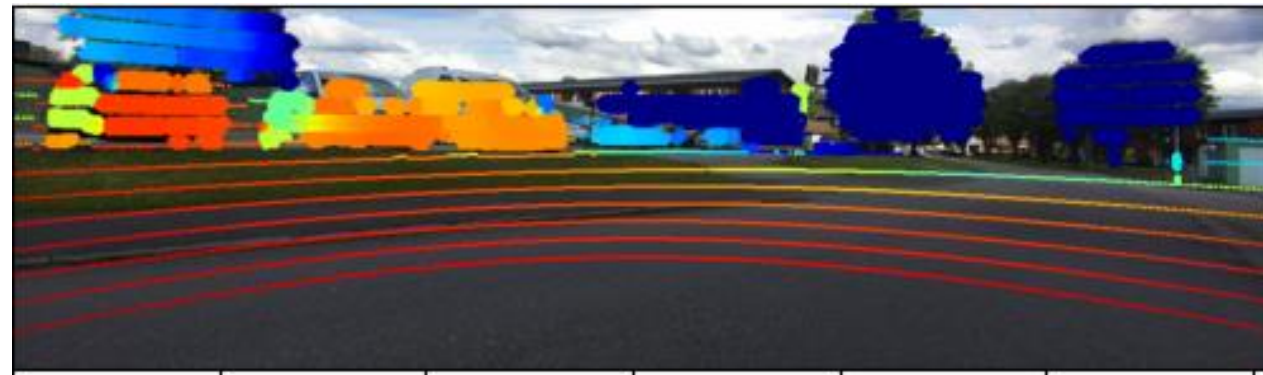
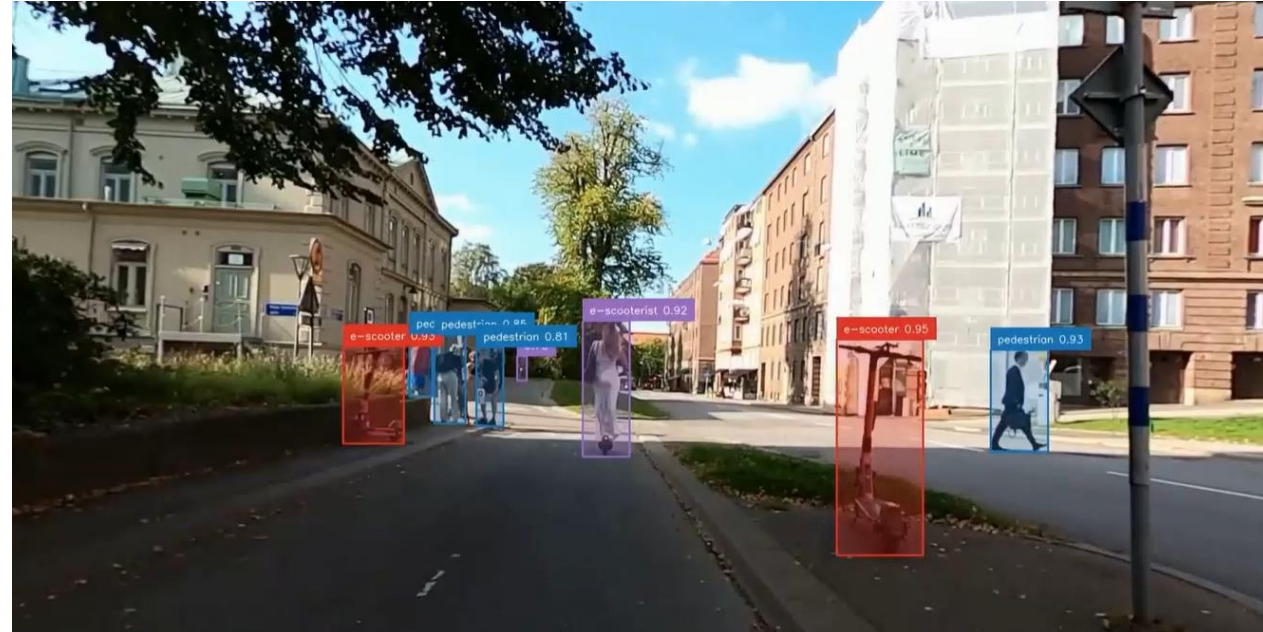
Data Collection

- Existing camera-based road safety data is car-centric and does not adequately address micromobility risks
- E-scooter
 - Sensor: GoPro camera
 - Location: Göteborg
- E-bike with data collection unit
 - Sensors: LiDAR, monocular camera, IMU
 - Location: Vårgårda
 - Outputs: RGB images and dense depth maps
- AI computer: Jetson Agx Orin
 - NVIDIA Ampere architecture
 - 2048 NVIDIA CUDA cores and 64 tensor cores



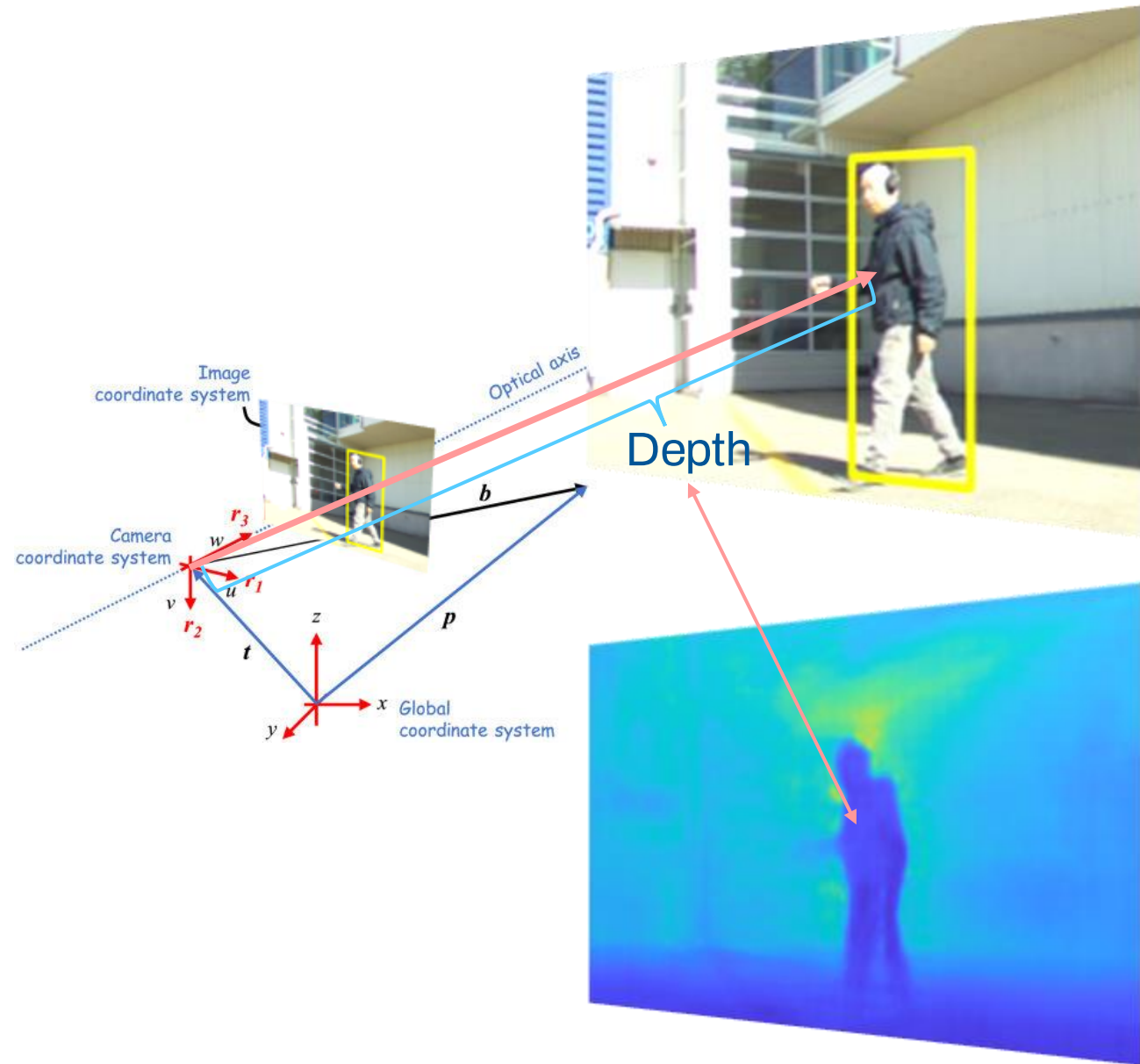
Data Processing and Model Training

- Feature extraction
 - E-scooter data:
 - Semi-automated annotation
 - E-bike data:
 - Pair and align images and depth maps
- Model:
 - Detection model: YOLO11
 - Depth estimation: DepthAnything
 - Both fine tuned by in-house datasets



Object Positioning

- Detect objects in RGB images (e.g. pedestrians, cyclists).
- Convert image coordinates to the camera coordinate system
- Track objects over time in the camera frame
- Estimate risk based on object trajectories
- HMI provides rider warnings seconds before a potential collision



System Demo – Pedestrian Cross Street



Data and Privacy Protection

- Anonymization
 - Faces are blurred
 - License plates are blurred
 - GPS signal is removed
 - Trim video of starting and ending of trips
 - Only anonymized data is kept for no more than 10 years
- E-scooter data is published
 - <https://researchdata.se/en/catalogue/dataset/2025-74>



Future Data Utilization

- Enable vehicle state estimation
 - Trajectory, lean angle, steering behavior
- Support infrastructure monitoring
 - Detection of road surface irregularities



Saving More Lives
