SETLabs Research is a Munich-based research center founded in 2021 as a subsidiary of Virtual Vehicle Research GmbH in Graz, Austria. SETLabs partners with academia and industry for joint projects to enable knowledge transfer from basic and applied research into real-world applications. The center has domain-open expertise in modeling and simulation, hardware/software integration, systems engineering, machine learning, and artificial intelligence. The main research fields are healthcare technologies and mobility.

Master Thesis
"Semi-Supervised Learning for AI-driven Automated Labelling of Sensor Data in Railway Domain"

Building your own dataset for training and evaluating the performance of a neural network for object detection is a challenging task when considering the perspective of annotation cost, i.e., time and mouse clicks by hand required to draw 2d or 3d bounding boxes per camera image or LiDAR point cloud respectively. Therefore, the goal of this thesis is to make use of an AI-based approach to accelerate the generation of object class annotations for a pool of unlabeled raw sensor data from railway scene recordings. The final result should be a more efficient process that can save a huge amount of human manual workload and effort.

Your Tasks

- Perform State-of-the-Art research about Semi-Supervised Learning for 3D Object Detection and Sensor Fusion with Deep Learning techniques for Autonomous Driving.
- Explore a railway dataset like OSDaR23 (Open Sensor Data for Rail 2023) from Digitale Schiene Deutschland, i.e., become familiar with their sequences of point clouds and images.
- Become familiar with open-source software like 3D BAT (3D Box Annotation Tool) or Xtreme1 that support the annotation of labels in both LiDAR point clouds and Camera images.
- Implement a "Human-in-the-Loop Object Detector Training" scheme: A neural network for 3d object detection should be integrated as intelligence engine operating in the backend of the annotation tool to deliver pre-annotations, i.e., out-of-the-box labels for the recognized objects. These labels may not be accurate enough, so they still may need some corrections by the human annotator. Afterward these new approved labels are fed again to the neural network to continue with the next rounds of training in order to achieve a better prediction performance over time the more labeled data becomes available.
- Evaluate quantitatively and qualitatively the results of the implementation, analyzing in detail the benefits of AI-driven vs. manual labelling of sensor data in terms of annotation cost.
- Provide documentation of all your work from theoretical concept to implementation

Your Profile

- Student currently enrolled in BSc. or MSc. Informatics / Robotics / Electrical Engineering or similar with some experience and background at student level in Computer Vision and Deep Learning.
- Ideally basic knowledge in perception for Autonomous Driving. Previous work with automotive datasets like KITTI, Waymo, etc., or experience with 3D / LiDAR perception would be highly beneficial.
- Enthusiasm to do research in the area of Object Detection with Deep Learning methods.
- Required: Solid Python and PyTorch programming skills. Good to know: ROS and Docker.

Our Offer

- Paid Master Thesis
- Possibility for a student employment/Internship
- Collaboration and contribution in an engaged, dynamic team
- Challenging activities in a renowned international network
- Contractually secured home office models and flexible time management
- Mentoring program for new employees
- Personal and professional development opportunities on any career level
- Flat hierarchies and freedom for taking responsibility and own ideas
- Regular participation in scientific conferences
- Team building and company events

Contact for Application

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Virtual Vehicle Research GmbH, the 100% parent company of SETLabs Research GmbH, processes your application on behalf of SETLabs Research GmbH. For further information please see our [Data Protection Notice](#).

If you consent that your submitted data is also stored in our talent pool for up to one year after the last contact with you, please let us know by e-mail. You may withdraw your consent at any time.