Dataspace for automated driving

Summary

This position aims to advance the field of automated driving through cutting-edge research in utilizing data-driven techniques with our custom automated shuttle, TalTech iseAuto. The focus is on leveraging knowledge coming from data and how to extend the concepts of dataset and dataspace for automated driving. Applied methodologies include perception, machine learning, and sensor fusion to enhance the reliability, robustness, and accuracy of perception modules in autonomous vehicles.

Research field:	Production and materials engineering, robotics, transport and logistics
Supervisors:	Prof. Dr. Raivo Sell
	Prof. Dr. Mauro Bellone
Availability:	This position is available.
Offered by:	School of Engineering
	Department of Mechanical and Industrial Engineering
Application deadline:	Applications are accepted between June 01, 2025 00:00 and June 30, 2025 23:59 (Europe/Zurich)

Description

Key areas of research include:

- Developing algorithms for environmental understanding using data from LiDAR, cameras, radar, and other sensors.
- Improving object detection, tracking, and semantic segmentation capabilities in diverse driving conditions.
- Addressing challenges related to sensor calibration, occlusion, and dynamic scene interpretation.
- Integrating perception outputs into broader decision-making pipelines for real-time autonomous driving applications.

The candidate will work collaboratively within an interdisciplinary team, contributing to experimental validation and large-scale data analysis while publishing findings in top-tier journals and conferences.

Previous research and study goals

Recent studies on intelligent transportation systems suggest that the coordination of vehicles in traffic constitutes an important aspect of urban planning, generating significant savings and improving safety in transportation systems. Among the countless open research problems, collective perception is a relevant topic involving artificial intelligence functionalities. The candidate for this position will contribute to the body of knowledge by enhancing the safety, reliability, and efficiency of automated vehicles by developing a collaborative multimodal perception system.

This system leverages data from multiple sources, such as cameras, LiDAR, radar, and V2X (Vehicle-to-Everything) communication, to create a more comprehensive understanding of the vehicle's surroundings. The candidate will work closely with the TelaTech iseAuto (https://iseauto.taltech.ee/) automated shuttle implementing research results on the real vehicle.

By integrating and fusing these diverse data streams, the project aims to improve the vehicle's ability to detect and interpret complex driving environments, including other vehicles, pedestrians, cyclists, and potential obstacles, even in challenging conditions like low light, fog, or heavy traffic.

Additionally, this project focuses on enabling vehicles to share and receive perception data with nearby vehicles and infrastructure, leading to a collective awareness of road situations that individual sensors alone might miss. This collaboration can help anticipate potential hazards, reduce accidents, optimize traffic flow, and enable more coordinated and intelligent decision-making for autonomous driving.

Ultimately, the project aims to advance the development of safer, smarter, and more efficient automated vehicles by creating a robust perception framework that leverages the full spectrum of available data sources.

The study goal is to carry out high-quality research in this domain involving both theoretical and practical aspects of perception systems, with the potential to generate publications in high-ranked journals and conferences using both simulations and robotic vehicles. To this end, the candidate is expected to have a good knowledge of programming tools and acquire knowledge about our custom systems during the initial stage of the doctoral studies.

Responsibilities and (foreseen) tasks

Support laboratory activities to integrate the onboard computing system and sensors on the bus itself, support in pilot preparation processes, and research under the following topics:

- Data-driven methodologies for perception for autonomous vehicles in the context of CCAM
- Self-driving vehicle behaviour in complex urban environments
- Co-operational behaviour based on V2V and V2X communication
- Autonomous driving algorithms and technologies (e.g. vehicle control, path planning, scheduling) and sensors (e.g. lidars, radars, cameras, and GNSS)
- High-level integration of autonomous driving techniques with open-source autonomous driving software (for simulation and testing)

Applicants should fulfil the following requirements:

- a degree in engineering sciences (preferably in computing, robotics, AI)
- a clear interest in the topic of the position
- excellent English communication skill
- computer science skill
- programming in C++ and Python
- strong and demonstrable writing and analytical skills
- capacity to work both as an independent researcher and as part of an international team
- capacity and willingness to provide aid in organisational tasks relevant to the project

The following experience is beneficial:

- Experience with ROS, Autoware is a plus
- Experience in designing software systems
- General overview and understanding of working principles of sensors and robotics

Applicants are invited to submit a research plan outlining their approach to the topic. This should include strategies for conducting research and collecting data. You're encouraged to build on the suggested research questions and tasks, as well as propose theoretical frameworks that could guide your work.

What do we offer?

- 4-year PhD position fully funded in one of the largest, most internationalized and leading technical research centers in Estonia with a large portfolio of ongoing pan-European and national research projects
- The chance to do high-level research connected to physical hardware, including the full-scale autonomous shuttle vehicle
- Opportunities for conference visits, research stays and networking with globally leading universities and research centers in the fields of engineering and ICT
- Competitive salary working in hybrid environment supporting remote work but leveraging laboratory hand-on experience
- Financial support for traveling and conferences

About the departments

The position is supervised in a combination of two units in TalTech.

FinEst Centre for Smart Cities is an independent organisation under the Tallinn University of Technology. FinEst Centre is an international research and development centre, fostering collaboration between researchers, cities and various other partners. https://finestcentre.eu/

Department of Mechanical and Industrial Engineering (EMI) is an engineering and research unit of Tallinn University of Technology, School of Engineering that focuses on mechanical, industrial and robotics engineering in an interdisciplinary way. The research group Autonomous Vehicles https://autolab.taltech.ee/ is a future-oriented research group with the main strengths and focus topics:

- Self-driving vehicles, driving algorithms and cyber-physical system
- Sensor fusion, perception and big data
- Cybersecurity, automotive networking
- Simulations, verifications and validations of autonomous vehicles
- Human-machine interfaces and interactions
- Self-driving shuttle bus deployment and experimentation

Additional information

For further information, please contact Prof. Raivo Sell (raivo.sell@taltech.ee) and Prof. Mauro Bellone (mauro.bellone@taltech.ee).

Visit for more information:
• https://taltech.ee/
• https://autolab.taltech.ee/
• https://finestcentre.eu/

See TalTech iseAuto demonstration videos:
• https://www.youtube.com/@iseauto7365
• https://www.youtube.com/watch?v=0URhTZ2L4F4&ab_channel=Iseauto
• https://www.youtube.com/watch?v=40eCa5eSEFA&t=4s&ab_channel=Iseauto

To get more information or to apply online, visit https://taltech.glowbase.com/positions/935 or scan the the code on the left with your smartphone.