Thomas Kreutz

M. Sc.

Robert-Bosch-Str. 24
64293 Darmstadt
+4915161414764
kreutz.thomas@outlook.com

Research Interests

- Computer Vision, LiDAR Point Cloud Videos, Multivariate Time Series
- Disentangled Representation Learning, Self-Supervised Representation Learning
- Deep Generative Models, Imitation Learning, Crowd Simulation, Smart Cities

Employment History

02/2022–today **Research Associate/PhD Student**, *Telecooperation Lab*, Technical University of Darmstadt

PhD in the field of Machine Learning for Smart Cities that mainly deals with the research of (unsupervised) machine learning methods for 4D LiDAR point clouds (3D LiDAR videos), which includes scene understanding tasks, such as motion segmentation, semantic segmentation, or object detection. Finally, the goal is to leverage the information from these scene understanding tasks for an interactive and controllable scene representation of public places that can serve for anonymous visualization, analysis, the generation of novel scenarios, and understanding of what-if scenarios.

11/2021–01/2022 **Machine Learning Engineer**, *COMPREDICT GmbH*, Darmstadt

Collaboration on a research project for a well-known French automobile manufacturer

- Deep learning-based anomaly detection on the measurement time series data of a high-voltage battery for electric vehicles.
- Anomaly detection in diagnostic trouble codes for the charging mechanism of an electric vehicle.

04/2021–11/2021 **External Master's Thesis**, *COMPREDICT GmbH*, Darmstadt

Working on my master's thesis *Driving Event Discovery based on Vehicle CAN-data* on site for the company, including:

- Development of an unsupervised machine learning approach to discover driving events in vehicle CAN-data from a Tesla Model 3 vehicle without any supervision.
- Collection and annotation of vehicle CAN-data of a Tesla Model 3 vehicle.

05/2019–06/2020 **Student Research Assistant**, *MAIS*, Technical Unversity of Darmstadt

Research and implementation of measures against a DDoS attack on the Floodlight SDN Controller with the help of Dynamic Enforcement

- Implementation of a virtual network and DDoS attack in Mininet.
- Research into countermeasures and their implementation in a Dynamic Enforcement Framework named CliSeAu.
- Program code inspection of the Floodlight SDN controller.

Education

10/2019–11/2021 **Computer Science, Master of Science (1,57)** , *Technical University of Darmstadt*

- Master's Thesis: Driving Event Discovery based on Vehicle CAN-data (Grade 1.0)
- Focus of study: Machine Learning, IT Security
- Secondary field of study: Human Sciences

10/2013–09/2019 **Computer Science, Bachelor of Science (2,12)**, *Technical University of Darmstadt*

- Bachelor's Thesis: Towards Enforcing Dynamic Security Policies in Java Programs (Grade 1.0)

Publications (accepted and published)

2024 **LiOn-XA: Unsupervised Domain Adaptation via LiDAR-Only Cross-Modal Adversarial Training**, *Thomas Kreutz, Jens Lemke, Max Mühlhäuser, Alejandro Sanchez Guinea*, In: 2024 IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)

2024 **Implicit Neural Clustering**, *Thomas Kreutz, Max Mühlhäuser, Alejandro Sanchez Guinea*, In: Synthetic Data for Computer Vision Workshop@ CVPR 2024, 2024, Seattle, USA

2024 **Common Sense Initialization of Mixture Density Networks for Motion Planning with Overestimated Number of Components**, *Thomas Kreutz, Max Mühlhäuser, Alejandro Sanchez Guinea*, In: The Second Tiny Papers Track at ICLR 2024, 2024, Wien, Germany

2023 **Unsupervised 4D LiDAR Moving Object Segmentation in Stationary Settings with Multivariate Occupancy Time Series**, *Thomas Kreutz, Max Mühlhäuser, Alejandro Sanchez Guinea*, In: Proceedings of the IEEE/CVF Winter Conference on Applications of Computer Vision (WACV'23), pp. 1644-1653, IEEE, 2023 IEEE/CVF Winter Conference on Applications of Computer Vision, Hawaii, USA

2022 **Unsupervised Driving Event Discovery Based on Vehicle CAN-data**, *Thomas Kreutz, Ousama Esbel, Max Mühlhäuser, Alejandro Sanchez Guinea*, In: 2022 IEEE 25th International Conference on Intelligent Transportation Systems (ITSC), pp. 4169-4174, IEEE, 25th International Conference on Intelligent Transportation Systems, Macau, Peoples Republik of China

Publications Under Review

2024 **The Sky Is The Limit When Clustering Is Equated With Disentanglement**, *Thomas Kreutz, Max Mühlhäuser, Alejandro Sanchez Guinea*, Under Review at ICLR'25.

2024 **Whenever, Wherever: Towards Orchestrating Crowd Simulations with Spatio-Temporal Spawn Dynamics**, *Thomas Kreutz, Max Mühlhäuser, Alejandro Sanchez Guinea*, Under Review at ICRA'25.

Research Projects

04/2023 – today **Software Campus**, *UnErObVe: Unüberwachte Erkennung von Objekten und deren Verhalten Mithilfe von LiDAR- und Zeitseriendaten (Unsupervised Object and Behavior Recognition based on LiDAR and Multivariate Time Series Data)*, Management of an IT/ML research project, funded by the Federal Ministry of Education and Research (BMBF), with the support of TU Darmstadt as research partner and Software AG as industry partner.

- Funding Amount: 100.000€
- The project includes the collection of a multi-modal LiDAR (2x Velodyne VLP-16) and time series (5x IMU XSens Movella Dot) dataset, the development of an unsupervised human activity recognition approach, the development of an unsupervised object recognition approach, the development of an automatic matching approach from time series to detected objects, and a combination of all three approaches into a prototype for visualizing public places with their objects and activities in a virtual environment.
- As part of the Software Campus program, six different workshop trainings regarding social-, personal-, and leadership skills and methodologies have been completed in-person at the following companies: Zeiss, Trumpf, Volkswagen, Huawei, and DATEV.

Teaching Experience

10/2023 – 02/2024 **Teaching Assistant**, *Internet Practical Course Telecooperation*, Supervision of Android app development projects on the topic of remote collaboration. (4-6 members per group, 12 groups in total)

02/2022 – today **Student Supervision**, *Supervision of 3 bachelor's thesis and 6 master's theses*, Direct supervision of students in their final year thesis, including the teaching of a systematic literature review methodology, research skills, and academic writing skills.

Reviewer Experience

Conference *IEEE International Conference on Learning Representations 2025 (ICLR 2025)*

Conference *IEEE International Conference on Robotics and Automation 2025 (ICRA 2025)*

Conference *IEEE/RSJ International Conference on Intelligent Robots and Systems 2024 (IROS 2024)*

Conference *IEEE/CVF Conference on Computer Vision and Pattern Recognition 2024 (CVPR 2024)*

Conference *The 34th IEEE Intelligent Vehicles Symposium (IV 2022)*

Skills und Knowledge

Programming Languages Python, C#, Java

Machine Learning	Unsupervised Learning, Supervised Learning, Deep Learning, Deep Generative Models, Self-supervised Representation Learning, (Unsupervised) Domain Adaptation, (LiDAR) Object Detection, (LiDAR) Semantic Segmentation, (LiDAR) Panoptic Segmentation, (LiDAR) Motion Segmentation, Clustering, LiDAR, Time Series, Point Clouds, Trajectory Prediction (uni or multi-modal, short- and longterm), Crowd Simulation (Microscopic), Imitation Learning (BC, GAIL, RL), (Neural) Cellular Automata, NLP, Pytorch, Tensorflow, Scikit-Learn, Numpy, Pandas, Pyplot, StableBaselines3
Other Skills	Unity, Software-defined Networking (SDN), Dynamic Enforcement, Aspect-oriented programming (AOP), AspectJ, Spring AOP, Isabelle/HOL, Mininet, LaTeX, Git, Docker