Dr. Thomas Kreutz

kreutz.thomas@outlook.com • thkreutz.github.io
https://scholar.google.de/citations?user=BGk0i0wAAAAJ

Research Interests: Representation learning (self-supervised; multimodal contrastive & joint-embedding spaces; disentangled representations), Scene understanding (vision & time series; spatio-temporal modeling)

Education

Computer Science, Ph.D. (magna cum laude), *Technical University of Darmstadt*, Telecooperation Lab. **02/2022 – 07/2025**

- Ph.D. Thesis: "Towards LiDAR and IMU-Based Human-Centric Scene Understanding in the Context of Urban Environments" (available at https://tuprints.ulb.tu-darmstadt.de/id/eprint/31055)
- Advisors: Prof. Dr. Max Mühlhäuser, Dr. Alejandro Sanchez Guinea

Computer Science, M.Sc., *Technical University of Darmstadt*, Computer Science Department. **2019 – 2021**

- Master's Thesis: "Driving Event Discovery based on Vehicle CAN-data", graded 1.0 (scale 1.0-5.0, 1.0 best)
- Major: Machine Learning, IT Security, Secondary field of study: Human Sciences

Computer Science, B.Sc., *Technical University of Darmstadt*, Computer Science Department. **2013 – 2019**

- Bachelor's Thesis: "Towards Enforcing Dynamic Security Policies in Java Programs", graded 1.0 (scale 1.0-5.0, 1.0 best)

Selected Peer-Reviewed Academic Publications

DeSPITE: Exploring Contrastive Deep Skeleton-Pointcloud-IMU-Text Embeddings for Advanced Point Cloud Human Activity Understanding, ***Thomas Kreutz***, *Max Mühlhäuser, Alejandro Sanchez Guinea*. **ICCV 2025**

Whenever, Wherever: Towards Orchestrating Crowd Simulations with Spatio-Temporal Spawn Dynamics, ***Thomas Kreutz***, *Max Mühlhäuser, Alejandro Sanchez Guinea*. **ICRA 2025**

LiOn-XA: Unsupervised Domain Adaptation via LiDAR-Only Cross-Modal Adversarial Training, ***Thomas Kreutz***, *Jens Lemke, Max Mühlhäuser, Alejandro Sanchez Guinea*, [Oral]. **IROS 2024**

Unsupervised 4D LiDAR Moving Object Segmentation in Stationary Settings with Multivariate Occupancy Time Series, ***Thomas Kreutz***, *Max Mühlhäuser, Alejandro Sanchez Guinea*. **WACV 2023**

Unsupervised Driving Event Discovery Based on Vehicle CAN-data, ***Thomas Kreutz***, *Ousama Esbel, Max Mühlhäuser, Alejandro Sanchez Guinea*. **ITSC 2022**

Research & Work Experience

Research Associate/PhD Student, *Telecooperation Lab*, Technical University of Darmstadt. **02/2022 – 07/2025**

- Proposed new unsupervised ML approaches for LiDAR moving object segmentation and domain adaptation for LiDAR semantic segmentation (WACV 2023, IROS 2024)
- Proposed a novel approach for spatio-temporal spawn dynamics for crowd simulations using neural temporal point processes (nTPP-GMM) (ICRA 2025)
- Proposed a new multi-modal contrastive learning approach (DeSPITE) to jointly embed LiDAR, IMU, skeleton and text for human activity understanding tasks such as cross-modal person re-identification, cross-modal retrieval, and human activity recognition (ICCV 2025)
- Secured €100,000 research grant (BMBF) as a participant in the Software Campus Program

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

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.

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

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.

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

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

Grants

Software Campus Program, *German Federal Ministry of Education and Research* (*BMBF*). **04/2023 – 04/2025**

- €100,000 research grant
- Led my own research project, "Unsupervised Object and Behavior Recognition with LiDAR and Time Series Data."
- Led a multi-modal data collection initiative (LiDAR, IMU, video) to develop self-supervised object recognition systems, using 2x LiDAR Velodyne VLP16 + 1xGoPro Hero 8 + 10xMovella Xsens Dot IMU
- Completed six intensive 1-2 day training sessions focused on leadership and personal competencies at Zeiss, Merck, Trumpf, Volkswagen, Huawei, and DATEV.

Teaching & Mentorship

Teaching Assistant, Internet Practical Course Telecooperation. **10/2023 – 02/2024**

Supervising Android app development projects on the topic of remote collaboration. (12 groups with 4-6 members each)

Academic Supervision. **02/2022 – present**

Supervised 5 x Master's and 3 x Bachelor's Theses

- Zixhuan Chen: From 1.04.2022 till 11.10.2022. "4D Object Recognition in LiDAR Data"
- Yifan Wang: From 15.03.2022 till 19.10.2022. "Evidence and Empirical-based Comparative Analysis of Techniques for Object Detection in Urban Environments"
- Jens Lemke: From 11.04.2022 till 14.12.2022. "Domain adaptation for LiDAR data in urban environments"
- Christian Schwenk: From 02.11.2022 till 16.05.2023. "Handwriting Recognition based on Wearable Inertial Sensors"
- Martin Christoph: From 23.10.2023 till 12.05.2024. "Towards Urban Scene Understanding based on Multi-Modal LiDAR and Multivariate Time Series Data"
- Eren Can: From 07.06.2024 till 04.02.2025. "Time Series-Based Activity Localization in LiDAR Point Cloud Videos"
- Julian Ripper: From 29.01.2024 till 15.07.2024. "High-Quality Sensor Data Synthesis with Diffusion Models"
- Ravi Kumar: From 17.06.2024 till 10.02.2025. "Towards Pseudo-Label Refinement for Unsupervised LiDAR Object Detection"

Supervised 1 x Working Student

- Working Student Elias Wendt: 1.09.2023 till 29.02.2024. Supervision of implementation work on deep learning-based unsupervised time series segmentation.

Technical Skills & Competences

Language: German (native), English (C1/C2 level), French (A1 level)

Programming Languages: Python, C#, Java

ML Tools and Libraries: PyTorch, TensorFlow, Scikit-Learn, SciPy, NumPy, Pandas, PyPlot, Seaborn, Open3D, MinkowskiEngine

Other Skills: Unity, LaTeX, Git, Docker, MS Powerpoint, VeloView, Carla, Wireshark, Software-defined Networking (SDN), Dynamic Enforcement, Aspect-oriented programming (AOP), AspectJ, Spring AOP, Isabelle/HOL, Mininet

Conference Reviewing

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*)