

# Thomas Kreutz | Dr. rer. nat.

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📄 <https://scholar.google.de/citations?user=BGk0i0wAAAAJ>

**Professional Summary:** I am a passionate computer scientist specialized in **scene understanding** and **spatio-temporal ML** that thrives in fast-paced, applied environments with the ability to learn new domains quickly (**Ph.D. in 3.5 years w/ 7 first-author publications** at top venues like ICCV, ICRA, IROS, WACV).

## Education

**Computer Science, Ph.D. (magna cum laude)**, *Technical University of Darmstadt*, Telecoop-eration 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>)

**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)

**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)

## Research & Work Experience

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

- **PhD completion:** Individual doctorate finished in **3.5 years (cumulative thesis)**, ahead of German average (~5–6 years).
- **Research scope:** **Scene understanding with spatio-temporal data** (e.g., LiDAR point clouds, IMU time series, vehicle CAN-data, 2D trajectories, RGB, human skeleton poses, natural language). Main topics: **Representation Learning, LiDAR Moving Object Segmentation, Unsupervised Domain Adaptation for LiDAR Semantic Segmentation, Crowd Simulation, Multimodal Contrastive Learning, HAR, Cross-modal Person Re-ID, Cross-modal Temporal Moment Retrieval, Unsupervised Time-series Segmentation.**
- **Publications & talks:** **7 first-author publications** (ICCV, ICRA, IROS, WACV, ITSC, CVPRW, ICLR Tiny papers track). **6** in-person conference participations (USA×4, Austria×1, UAE×1); given **4** technical talks (at WACV23, IROS24, ICRA25, ITSC22). All my publications can be found on my Google Scholar profile (<https://scholar.google.de/citations?user=BGk0i0wAAAAJ>) or my personal webpage (<https://thkreutz.github.io>)
- **Programming:** Built **reproducible end-to-end ML pipelines** (data collection/ingestion → preprocessing → DL models → training → evaluation → visualization) in **Python** with libraries such as **PyTorch/TensorFlow, Weights & Biases (wandb), NumPy, Pandas, Open3D, Pyplot/Seaborn**. Datasets: *autonomous driving* (e.g., KITTI, SemanticKITTI, Argoverse, nuScenes), *crowds/trajectories* (Grand Central Station, ETH/UCY, SDD, ATC, Edinburgh Forum), *human activity/pose* (MSR-Action3D, HMPEAR, LIPD, NTU-RGB+D, AMASS, BABEL).
- **Project leadership & management:** Alumni of the **Software Campus Program** (funded by the German Federal Ministry of Education and Research - BMBF), where I conceptualized, planned, led, and carried out a **2-year** research project with **€100,000** budget (<https://softwarecampus.de/en/>). Planned and wrote the full research project proposal (research, work packages, milestones, budget) and completed leadership/PM trainings (see “Personal Development”).
- **Dataset collection:** As part of my Software Campus Project, I planned and led the collection of a multimodal dataset for HAR and cross-modal re-ID (**2× Velodyne VLP-16, 1× GoPro Hero 8, 10× Xsens DOT IMUs; 2 subjects, 4 scenes, 20 sequences of 10 min** each). As part of supervising an M.Sc. Thesis, I conveyed the idea and supervised the collection of a handwriting recognition dataset using **IMU data from Apple Smartwatches (15 subjects)**.
- **Supervision & teaching:** Supervised **8 final year theses** (5 M.Sc., 3 B.Sc.). Topics: LiDAR object detection/panoptic segmentation, domain adaptation, smartwatch-IMU handwriting recognition, LiDAR+IMU HAR collection, diffusion models for time series; Taught a **practical course on Android app development (Internet Practical Course Telecooperation, WiSe 2025)**, where I and 3 other colleagues supervised **12 groups with 4-6 members** each.

**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 using **supervised contrastive learning**, including data pre-processing, visualization, and evaluation
- Anomaly detection in **diagnostic trouble codes** during high-voltage battery charging with **association rule mining**.

**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; Manual collection and annotation of around 1 hour of vehicle CAN-data.

**Student Research Assistant, MAIS, Technical University of Darmstadt.** 05/2019 – 06/2020  
○ Implementation of a **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.

## Awards & Achievements

**1st Place Winner – Hafnia Hackathon 2025, Milestone Systems and NVIDIA.** 13/10/2025 – 11/11/2025  
○ **Project: AskTheCity** – A social-network-style web app that uses a **VLM** via API to turn live city cameras (YouTube livestreams) into sources for instant, privacy-aware answers to user questions about the scene a camera records.  
○ **Tech stack:** Hafnia VLM-aaS, Python (Flask, requests, ollama, folium, yt-dlp), SQLite, JavaScript, CSS, HTML.  
○ **Press release:** <https://www.milestonesys.com/company/news/press-releases/developers-innovate-safer-vid-eo-intelligence/>

**Software Campus Program, German Federal Ministry of Education and Research (BMBF).** 04/2023 – 04/2025  
○ Competitive leadership and research program combining **industry collaboration**, **project management**, and **technical leadership** with a €100,000 funded research project.

## Personal Development

**Agility in Practice (SCRUM) — DATEV Agile Camp, Datev AG, Nürnberg.** 12/2023  
**Successful Negotiation in the Business Context, Trumpf SE + Co. KG, Ditzingen.** 09/2023  
**Innovation Management, Huawei Technologies Düsseldorf GmbH, München.** 11/2023  
**Diversity - Leading Diverse Teams and Fostering Potential, Volkswagen AG, Wolfsburg.** 10/2023  
**Understand Yourself and Others Better - Insights Discovery Workshop, Merck KGaA, Darmstadt.** 09/2023  
**Effective Leadership Communication, Carl Zeiss AG, Oberkochen.** 06/2023

## 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

**ML Models and Deep Learning:** Hidden Markov Model (HMM), k-means, DBSCAN, HDBSCAN, TICC, single-linkage hierarchical clustering, Multilayer Perceptron (MLP), Long Short-Term Memory (LSTM), Gated Recurrent Unit (GRU), Convolutional Neural Network (CNN), Transformer, Vision Transformer (ViT), Set Transformer, Autoencoder (AE), Variational Autoencoder (VAE),  $\beta$ -VAE, Generative Adversarial Network (GAN), Graph Neural Network (GNN), Neural Cellular Automata (NCA), Cellular Automata (CA)

**Other Skills:** Unity, LaTeX, Git, MS Powerpoint, VeloView, Carla, Wireshark, Software-defined Networking (SDN), Dynamic Enforcement, Aspect-oriented programming (AOP), Mininet

## Selected Peer-Reviewed 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, M. Mühlhäuser, A. S. Guinea. ICRA 2025

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

**Unsupervised 4D LiDAR Moving Object Segmentation in Stationary Settings with Multi-variate Occupancy Time Series,** Thomas Kreutz, M. Mühlhäuser, A. S. Guinea. WACV 2023

Full list of publications: <https://scholar.google.de/citations?user=BGk0i0wAAAAJ>