Thomas Kreutz | Dr. rer. nat.

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▣ https://scholar.google.de/citations?user=BGkOiOwAAAAJ

Professional Summary: I am a passionate computer scientist, specialized in **scene understanding** and **spatio-temporal ML**. I thrive in fast-paced, applied environments and can 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-   **02/2022 – 07/2025**
eration Lab.

○ 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=BGkOiOwAAAAJ`) 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-video-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), β-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 Multivariate Occupancy Time Series, *Thomas Kreutz, M. Mühlhäuser, A. S. Guinea*.   WACV 2023

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