# Karsten Roth

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**Languages**

German (native), English (fluent), Mandarin (fluent), French (elementary)

## Education

**PhD Machine Learning** — Tübingen, Germany
University of Tübingen, ELLIS & IMPRS-IS — *since 2021*

**Supervisors:** Prof. Zeynep Akata (University of Tübingen), Prof. Oriol Vinyals (Google Deepmind, UCL).

**Topics:** Representation Learning under Distribution Shifts — Continual Learning — Multimodal and explainable representation learning — Contrastive and metric representation learning.

**B.SC, M.Sc Physics** — Heidelberg, Germany
Heidelberg University - ML/CV, Medical/Solid State Physics. Grade: 1.1/4.0 (Best: 1.0) — *2014 – 2021*

## Research Experience

**Research Scientist Intern** — May 2022 – Oct 2022
Meta AI — *Paris, France*

Research Scientist intern at Meta AI supervised by Diane Bouchacourt, Pascal Vincent and Mark Ibrahim working disentangled representation learning under correlation shifts. Published at ICLR 2023.

**Research Intern** — Oct 2020 – Mar 2021
Amazon, AWS — *Tübingen, Germany*

Research intern at the Amazon AWS Research Lablet supervised by Peter Gehler, Thomas Brox and Bernhard Schölkopf working on weakly supervised (*cold-start*) industrial anomaly detection. Published at CVPR 2022, and now widely utilized.

**Research Intern** — May 2020 – Sep 2020
Vector Institute — *Toronto, Canada*

Research intern at the Vector Institute supervised by Marzyeh Ghassemi. Worked on (incremental) few-shot and zero-shot learning, both fundamentally and applied to medical computer vision. One first author publication at ICML 2021. Follow-up work to be published at NeurIPS 2021.

**Research Intern** — Sep 2019 – Mar 2020
Montreal Institute for Learning Algorithms (MILA) — *Montreal, Canada*

Research intern at MILA under supervision of Joseph Paul Cohen and Yoshua Bengio. Worked on unsupervised representation learning and transfer learning for 3D CT data as well as
fundamental Deep Metric Learning, with two publications at ICML 2020 and ECCV 2020.

**Student Researcher** — Feb 2017 – Sep 2019
Center for Integrative Infectious Diseases Research (CIID) — *Heidelberg, Germany*

Collaboration between the Center for Integrative Infectious Disease Research and the Heidelberg Collaboratory for Image Processing (HCI), supervised by PD Alessia Ruggieri and Prof. Fred Hamprecht. Research on tracking and data colocalization for Hepatitis-C infected cells to investigate oscillatory stress behaviour. Published in Science Advances 2022.

## Extracurricular Activities & Awards

**Qualcomm Innovation Fellowship 2023** Recipient of the Qualcomm Innovation PhD Fellowship (Europe) for my work on continual adaptation in vision-language foundation models, alongside 40.000$ research funding.

**Outstanding Reviewer** Received outstanding reviewer awards for CVPR 2022, ECCV 2022 and CVPR 2023.

**EMVA Young Professional Award** Endowed by the European Machine Vision Association to honor outstanding work of a student or professional in machine vision or image processing.

**Participant MLSS 2020** Participated (acceptance $\leq 7\%$) at the Machine Learning Summer School 2020.

**Heidelberg Life-Science Lab** Mentoring high school students on biomathematical topics since 2016.

**Best Abitur in Physics Award** Received for the best physics A-levels at a given school.

## Selected Publications

[1] **Karsten Roth***, Jae Myung Kim*, A. Sophia Koepke, Oriol Vinyals, Cordelia Schmid, Zeynep Akata.
"Waffling around for Performance: Visual Classification with Random Words and Broad Concepts".
In *The International Conference on Computer Vision (ICCV), Paris, France*, 2023

[2] **Karsten Roth**, Mark Ibrahim, Zeynep Akata, Pascal Vincent*, Diane Bouchacourt*.
"Disentanglement of Correlated Factors with Hausdorff Factorized Support".
In *International Conference on Learning Representations (ICLR), Kigali, Rwanda*, 2023

[3] Zafir Stojanovski*, **Karsten Roth***, Zeynep Akata.
"Momentum-based Weight Interpolation of Strong Zero-Shot Models for Continual Learning".
Best Paper at *INTERPOLATE@NeurIPS 2022, New Orleans, USA*

[4] Michael Kirchhof*, **Karsten Roth***, Zeynep Akata, Enkelejda Kasneci.
"A Non-Isotropic Probabilistic Take on Proxy-based Deep Metric Learning".
In *The European Conference on Computer Vision (ECCV), Tel Aviv, Israel*, 2022

[5] **Karsten Roth**, Latha Permula, Joaquin Zepeda, Bernhard Schölkopf, Thomas Brox, Peter Gehler.
"Towards Total Recall in Industrial Anomaly Detection".
In *The Conference on Computer Vision and Pattern Recognition (CVPR), New Orleans, USA*, 2022

[6] **Karsten Roth**, Oriol Vinyals, Zeynep Akata
"Integrating Language-Guidance into Vision-based Deep Metric Learning".
Oral at *The Conference on Computer Vision and Pattern Recognition (CVPR), New Orleans, USA*, 2022

[7] **Karsten Roth**, Oriol Vinyals, Zeynep Akata.
"Non-Isotropy Regularization for Deep Metric Learning".
In *The Conference on Computer Vision and Pattern Recognition (CVPR), New Orleans, USA*, 2022

[8] Timo Milbich*, **Karsten Roth***, Samarth Sinha, Ludwig Schmidt, Marzyeh Ghassemi, Björn Ommer.
"Characterizing Generalization under Out-Of-Distribution Shifts in Deep Metric Learning".
In *34th Conference on Neural Information Processing Systems (NeurIPS 2021), Vancouver, Canada*, 2021

[9] **Karsten Roth**, Timo Milbich, Björn Ommer, Joseph Paul Cohen, Marzyeh Ghassemi.
"Simultaneous Similarity-based Self-Distillation for Deep Metric Learning".
In *Proceedings of the 38$^{th}$ International Conference on Machine Learning, Online, PMLR 139*, 2021.

[10] **Karsten Roth***, Timo Milbich*, Samarth Sinha, Prateek Gupta, Björn Ommer, Joseph Paul Cohen.
"Revisiting Training Strategies and Generalization in Deep Metric Learning".
In *Proceedings of the 37$^{th}$ International Conference on Machine Learning, Online, PMLR 119*, 2020.