

Karsten Roth

karroth.com
karsten.rh1@gmail.com

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Education

Master Physics

Heidelberg University | Specialization Computer Vision & Machine Learning

- > Master Thesis on Deep Metric Learning and Visual Representation Learning.
- > Current Grade Average: **1.1/4.0**.

2017 – Present
Heidelberg, Germany

Bachelor Physics

Heidelberg University | Focus on Solid State and Medical Physics

- > Bachelor Thesis on 2D and 3D Liverlesion-Segmentation from CT Data.
- > Final Grade: **1.5/4.0**.

2014 – 2017
Heidelberg, Germany

Abitur

Gymnasium Walldorf

- > Final Grade: **1.1/4.0**.

2005 – 2013
Walldorf, Germany

Research Experience

Research Intern

Bengio group, Montreal Institute for Learning Algorithms (MILA)

- > Research Topic: **Unsupervised Representation Learning for 3D Medical Data**.
- > Supervised by JOSEPH PAUL COHEN AND YOSHUA BENGIO.

Sep 2019 – Present
Montreal, Canada

Master Student & Student Researcher

Ommer Computer Vision group, Heidelberg Collaboratory for Image Processing (HCI)

- > Research Topic: **Deep Metric Learning and Visual Representation Learning**.
- > Supervised by BIAGIO BRATTOLI, TIMO MILBICH, PATRICK ESSER AND BJÖRN OMMER.

Oct. 2018 – Present
Heidelberg, Germany

Student Researcher

Ruggieri group, Center for Integrative Infectious Disease Research (CIID)

- > Research Topic: **Multi-Cell Tracking and Colocalization**.
- > Supervised by PHILIPP KLEIN, FRED HAMPRECHT AND ALESSIA RUGGIERI.

Feb. 2017 – Sep. 2019
Heidelberg, Germany

Student Researcher

Hesser Experimental Radiooncology group, University Hospital Mannheim

- > Research Topic: **2D and 3D Segmentation for Liver CT Data**.
- > Supervised by TOMASZ KONOPZCYNski AND JÜRGEN HESSER.

Oct. 2018 – Present
Mannheim, Germany

Research Intern

Ommer Computer Vision group, Heidelberg Collaboratory for Image Processing (HCI)

- > Research Topic: **Improving Self-Supervised Learning Methods by Reinforcement Learning**.
- > Supervised by BIAGIO BRATTOLI AND BJÖRN OMMER.

Feb. 2018 – May. 2018
Heidelberg, Germany

Intern

Hensinger Quantum Computing Group, Sussex University

- > Primary Project: **Frequency Modulation Tool to address ion states**.
- > Supervised by SEBASTIAN WEIDT, DAVID MURGIA AND WINFRIED HENSINGER.

Aug. 2013 – Apr. 2014
Mannheim, Germany

Projects

Deep Metric Learning Baselines

- > Created and implemented a widely used collection of common Deep Metric Learning (DML) Methods in a modular fashion, which can be used as a starting point for DML research.
- > Link: [Here](#)

UNet-Variants for Semantic Segmentation

- > Implemented a highly modular segmentation pipeline using commonly found variants of standard U-Nets.
- > Link: [Here](#)

Cell Proliferation Logbook

- > Created a web-based logbook for cell proliferation data. The motivation was to provide researchers an useful monitoring tool when setting up cell cultures.
- > Regional Finalist Project in Germanys Largest Science Fair Competition *Jugend Forscht*
- > Link: [Here](#)

Self-Driving Car in a Simulation

- > Using Udacitys Drivable Car Environment, I created a pipeline for autonomous driving. Robustness was achieved with advanced image augmentation methods such as artificial shadow generation.
- > Link: [Here](#)

Car-Image Webcrawler

- > Created a webcrawler to index and store car image data to create a car dataset. Discontinued due to licensing issues.
- > Link: [Here](#)

3D Photogrammetry Tool

- > Created a 3D Photogrammetry Image Stitching Pipeline using a collection of 2D Pictures.
- > Regional Finalist Project (Top 90 worldwide) in the Google Science Fair Challenge *Jugend Forscht*

Skills

Technical Python, PyTorch, Keras, Tensorflow, Lasagne, Theano, Git, TeX, Ilastik

Languages German (Fluent), English (Fluent), Chinese (Intermediate), French (Intermediate)

Extra-Curricular

Biomathematics Mentor since 2017 As part of the Heidelberg Life-Science Lab I teach interested students about biomathematics and medical image analysis.

List of Publications

- [1] **Karsten Roth**, Tomasz Konopczyński, and Jürgen Hesser. Liver lesion segmentation with slice-wise 2d tiramisu and tversky loss function, **2019**.
- [2] **Karsten Roth**, Jürgen Hesser, and Tomasz Konopczyński. Boosting liver and lesion segmentation from ct scans by mask mining, **2019**.
- [3] **Karsten, Roth**, Biagio Brattoli, and Björn Ommer. Mic: Mining interclass characteristics for improved metric learning. In *IEEE International Conference on Computer Vision (ICCV)*, **2019**.
- [4] Patrick Bilic, ..., **Karsten Roth**, ..., and Bjoern H. Menze. The liver tumor segmentation benchmark (lits). *CoRR*, abs/1901.04056, **2019**.
- [5] J. Randall, S. Weidt, E. D. Standing, K. Lake, S. C. Webster, D. F. Murgia, T. Navickas, **K., Roth**, and W. K. Hensinger. Efficient preparation and detection of microwave dressed-state qubits and qutrits with trapped ions. *Phys. Rev. A*, 91:012322, Jan **2015**.