Karsten Roth

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/Karsten Roth

Education

Master Physics 2017 – Present
Heidelberg University | Specialization Computer Vision & Machine Learning *Heidelberg, Germany*
- Master Thesis on Deep Metric Learning and Visual Representation Learning.
- Current Grade Average: **1.1/4.0**.

Bachelor Physics 2014 – 2017
Heidelberg University | Focus on Solid State and Medical Physics *Heidelberg, Germany*
- Bachelor Thesis on 2D and 3D Liverlesion-Segmentation from CT Data.
- Final Grade: **1.5/4.0**.

Abitur 2005 – 2013
Gymnasium Walldorf *Walldorf, Germany*
- Final Grade: **1.1/4.0**.

Research Experience

Research Intern Sep 2019 – Present
Bengio group, Montreal Institute for Learning Algorithms (MILA) *Montreal, Canada*
- Research Topic: **Unsupervised Representation Learning for 3D Medical Data**.
- Supervised by Joseph Paul Cohen and Yoshua Bengio.

Master Student & Student Researcher Oct. 2018 – Present
Ommer Computer Vision group, Heidelberg Collaboratory for Image Processing (HCI) *Heidelberg, Germany*
- Research Topic: **Deep Metric Learning and Visual Representation Learning**.
- Supervised by Biagio Brattoli, Timo Milbich, Patrick Esser and Björn Ommer.

Student Researcher Feb. 2017 – Sep. 2019
Ruggieri group, Center for Integrative Infectious Disease Research (CIID) *Heidelberg, Germany*
- Research Topic: **Multi-Cell Tracking and Colocalization**.
- Supervised by Philipp Klein, Fred Hamprecht and Alessia Ruggieri.

Student Researcher July 2017 – May 2019
Hesser Experimental Radiooncology group, University Hospital Mannheim *Mannheim, Germany*
- Research Topic: **2D and 3D Segmentation for Liver CT Data**.
- Supervised by Tomasz Konopzcynski and Jürgen Hesser.

Research Intern Feb. 2018 – May. 2018
Ommer Computer Vision group, Heidelberg Collaboratory for Image Processing (HCI) *Heidelberg, Germany*
- Research Topic: **Improving Self-Supervised Learning Methods by Reinforcement Learning**.
- Supervised by Biagio Brattoli and Björn Ommer.

Intern Aug. 2013 – Apr. 2014
Hensinger Quantum Computing Group, Sussex University *Mannheim, Germany*
- Primary Project: **Frequency Modulation Tool to address ion states**.
- Supervised by Sebastian Weidt, David Murgia and Winfried Hensinger.

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: /Deep-Metric-Learning-Baselines

UNet-Variants for Semantic Segmentation

- Implemented a highly modular segmentation pipeline using commonly found variants of standard U-Nets.
- Link: /unet-lits-2d-pipeline

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 and checking the health and growth status.
- Regional Finalist Project in Germanys Largest Science Fair Competition *Jugend Forscht*
- Link: /cellproliferationlogbook

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: /Simulated_SelfDriving_Car

Kaggle Carvana Image Segmentation Challenge

- Straightforward Top-5% solution using pixelweighted criteria.
- Link: /Carvana_Image_Masking_Challenge

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**.