



## Abschlussvortrag Masterarbeit Behzad Sezari

„Cost-Effective Active-Learning in Autonomous-Driving Application with Deep-Learning“

The visual perception and understanding in the autonomous driving application is subject to stringent performance requirement. Recently, incredible progresses on visual recognition tasks have been made by deep learning approaches. With sufficient annotated data, deep convolutional neural networks (CNNs) are trained to directly learn features from raw pixels, which have achieved very good performance for e.g. image classification, detection and segmentation tasks. However, these approaches are data-driven and highly dependent on large number of annotated training sample, which may require considerable amount of human effort. The goal of this master thesis is to improve the current machine learning workflow by applying active learning approach and pipeline, which selects and annotates the most informative unlabeled samples and still achieves promising performance [2], [3]. For pixel-wise semantic-segmentation task, we inspire from Auto-encoder based model-architectures which already their performance are proven in practice [4], [5]. The reason behind using auto-encoders in semantic segmentation is that the model not only extracts compressed representative features from input (“What” to extract), but also knows “Where” to put this features to reconstruct the output, usually with same size as input image, using this compressed input space representation. In which, every pixel in output represents a class. Moreover, determining sufficient less batches of unlabeled data-sets with high quality to be labeled for model is always challenging; While data-labeling efforts and computation time are considerably costly. So, by adopting active-learning methods for smart data pre-selection, we will take advantage of statistical approaches by combination of region-based methods to filter out and rank most representative frames for labeling and model retraining [1]. In that sense, we are going to facilitate the model with such sampling tools to make it smarter in choosing its own desirable data representing high uncertainty, to be annotated for the model.

Betreuer der Arbeit: Prof. Dr. Andreas Rausch, Prof. Dr. Ralph Ewert (Technische Informationsbibliothek)

Datum: Donnerstag, 29. Oktober 2020, 9:30 Uhr

Ort: Online-Meeting über BBB

Link: <https://webconf.tu-clausthal.de/b/sim-uc9-rvy>

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- [2] K. Wang, L. Lin, X. Yan, Z. Chen, D. Zhang and L. Zhang, "Cost-Effective Object Detection: Active Sample Mining With Switchable Selection Criteria," in *IEEE Transactions on Neural Networks and Learning Systems*, vol. 30, no. 3, pp. 834-850, March 2019.
- [3] L. Lin, K. Wang, D. Meng, W. Zuo and L. Zhang, "Active Self-Paced Learning for Cost-Effective and Progressive Face Identification," in *IEEE Transactions on Pattern Analysis and Machine Intelligence*, vol. 40, no. 1, pp. 7-19, 1 Jan. 2018.
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- [5] Simonyan, Karen and Andrew Zisserman. "Very Deep Convolutional Networks for Large-Scale Image Recognition." *CoRR abs/1409.1556* (2014)