Defense Day

The next defense session takes place on 18th of May at 10:00h online. You can join using this Skype link.

Schedule

10:00 - 10:25 Maximilian Kraus (Master's Thesis Final)

Title: Multi-Object Tracking in Aerial and Satellite Imagery

Advisor: Emec Ercegic

Keywords: Computer vision, tracking, object detection

Abstract: Within the scope of this master thesis, we propose AerialMPTNet, a novel regression-based deep neural network able to tackle the challenges of pedestrian and vehicle tracking in geo-referenced aerial imagery. AerialMPTNet fuses appearance features by a Siamese Neural Network with movement prediction of a Long Short-Term Memory and adjacent graphical features of Graph Convolutional Neural Network. In contrast to previous works, we encode the motion model and the adjacent neighbor modeling in an end-to-end fashion as part of the neural network. Consequently, our network can learn motion characteristics directly from the data and additionally learns to weight the influence of surrounding objects.

10:25 - 10:50 Felix Schiegg (Master's Thesis Final)

Title: Boundary Detection and Semantic Segmentation of SEM-Images

Advisor: Noah Klarmann

Keywords: Image Segmentation, CNN

Abstract: In the semiconductor industry measuring the pitches between components on SEM images of microchip's cross-sections is a crucial aspect of reverse engineering. The manual evaluation and interpretation of these images is a time-consuming and repetitive process. The goal of this master's thesis is the partial automation of the reverse engineering process in the semiconductor industry by semantically segmenting the images using Convolutional Neural Networks (CNN). A small dataset of pixel-wise labeled images of cross-sections of microchips is created. An in-depth analysis of a suitable architecture, backbone, batch size and data augmentation methods is performed, creating a baseline for this use-case. It is further confirmed that for small datasets, smaller networks and small batch sizes exhibit more consistent results. Finally, task-specific improvements are evaluated. The main contribution of the work at hand is threefold: (i) Through an exhaustive study a baseline for later work is established. (ii) A method to explicitly include expert knowledge is proposed. (iii) By combining the strengths of tested state-of-the-art network architectures, a new architecture called PUBNet is developed that allows for accurate segmentation of closely spaced elements. This is of great value for the precise measurement of the pitches. This work forms the base to segment these images. It is a highly relevant step towards the creation of tools to automate the reverse engineering process in the semiconductor industry.

10:50 - 11:15 Tobias Schuster (Master's Thesis Final)

Title: Analysis of the Influence of Image Synthesis GANs on CNN Performance

Advisor: Soubarna Banik

Keywords: Computer vision, Image Synthesis, GAN, CNN

Abstract:
Deep learning methods, in particular convolutional neural networks (CNNs), have led to an enormous breakthrough in a wide range of computer vision tasks, primarily by using large-scale annotated datasets. However, obtaining such datasets in the automotive domain remains a challenge.

In this thesis, methods for generating synthetic pedestrian images using state-of-the-art Generative Adversarial Networks (GANs) are presented. Furthermore, it is shown that generated pedestrian images can be used for synthetic data augmentation, and improve the performance of CNNs for pedestrian classification. This methodology is demonstrated on a limited dataset consisting of the INRIA person dataset and additionally a small person dataset created during this thesis. First, GAN architectures for synthesizing high-quality pedestrians and different weather conditions are explored. Then, a CNN is trained and the performance is compared using no data augmentation, classic data augmentation and different synthetic data augmentation techniques. In addition, to explore the influence of the synthesized examples on the classification process two visualization methods are used.

The classification performance using no data augmentation yielded a person classification rate of 91.36%. By adding the synthetic data augmentation the results increased up to 98.64% on the test set. It is expected that this approach to synthetic data augmentation can generalize to other automotive classification applications and thus support researchers’ efforts to improve automotive safety.