

## Master Thesis

### **(1) Multi-task learning for visual quality control**

Transfer learning from neural networks pre-trained on large-scale visual recognition datasets (e.g. ImageNet) has been the standard approach in computer vision for many years. However, this approach provides little benefit in situations where the image statistics deviate substantially from photographic images. One example of such a situation is visual quality control in industrial production lines. In this thesis, we will compile a large-scale dataset for visual quality control and evaluate to what extent pre-training on this dataset benefits image classification and segmentation problems in the context of visual quality control. This thesis will be carried out in collaboration with [Layer7 AI GmbH](#) in Tübingen. Possible work locations are Göttingen and Tübingen.

**Supervisor:** Prof. Dr. Alexander Ecker, University of Goettingen

### **(2) Contrastive learning for visual quality control**

In Machine Learning, self-supervised learning approaches have seen tremendous progress in the past two years. Using only cheap unlabeled data samples, these methods are able to find representations that can be adapted with only a few labels to a range of downstream tasks like object recognition. However, while these approaches are well studied for highly variable natural images, it is unclear how well these approaches transfer to other settings like visual quality control in manufacturing, where images are highly uniform and only differ in very localized aspects like scratches or dents. In this thesis, we will apply and adapt a promising set of recent contrastive and non-contrastive self-supervised learning techniques to the context of visual quality control, with a particular focus on the data augmentations necessary to find good representations. This thesis will be carried out in collaboration with [Layer7 AI GmbH](#) in Tübingen.

**Supervisor:** Dr. Wieland Brendel, University of Tuebingen

#### **Requirements**

- Good mathematical understanding (in particular statistics and linear algebra)
- Python programming
- Experience with deep learning (PyTorch or Tensorflow )

#### **Contact**

Please use following [link](#) to apply and fill out the application form. Otherwise, we cannot consider your application. Thanks!

If you have any further questions, please feel free to contact us at [recruiting@layer7.ai](mailto:recruiting@layer7.ai).