

Advanced Computer Vision

Exercise Sheet 9

Winter Term 2023
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Hand in until: 23.01.2024 23:59
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Task 1 – Transfer Learning with U-Net Model in Python

[50 points]

In this exercise, we reconsider the CWFID segmentation data set [1] and U-Net model we already worked on in the last exercise. As the CWFID data set contains only a small number of instances, we want to improve the performance of our model by transfer learning, that is, by pretraining it on a different data set.

As a data set from a similar domain, we want to use the “Deep Weeds” data set [2] to pretrain the model. This is a classification data set, so we cannot directly pretrain our segmentation model on it. Instead, define a classification model that is identical to the first half of your U-Net model (the part in the U-Net model where the spatial dimension is successively reduced). Train this model on the Deep Weeds data set using crossentropy loss. Afterwards, use the trained weights of this model in the first part of your U-Net model. Fine-tune the U-Net model on the CWFID data set, by first freezing all layers with pretrained weights and only training the second half of the model, and then fine-tuning the entire model on the CWFID data. Can you improve results over a U-Net model that has been trained directly only on the CWFID data?

The notebook *deep_weeds.ipynb* contains a method to load and preprocess the Deep Weeds data set to get you started.

[1] S. Haug and J. Ostermann. A Crop/Weed Field Image Dataset for the Evaluation of Computer Vision Based Precision Agriculture Tasks, 2015, Computer Vision - ECCV 2014 Workshops.

[2] Olsen, Alex, et al. ”DeepWeeds: A multiclass weed species image dataset for deep learning.” Nature Scientific reports 9.1 (2019): 1-12.