

Machine Learning for Agricultural Applications

Assignment 10

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Weed Detection

In this task you will use a U-Net¹ to perform segmentation on the CWFID-dataset.²

Start with the code on

https://github.com/totti0223/deep_learning_for_biologists_with_keras.

Download the data with:

wget <https://github.com/cwfid/dataset/archive/v1.0.tar.gz>

Unpack the data with: `tar -zxvf v1.0.tar.gz`

In the code of totti0223³ a small version of the U-Net is used for 128 x 128 images.

1. **Train basic model** [15 points]

Train the model on the provided training data set and evaluate its predictive accuracy on the provided test data set. Measure the overall accuracy (at the level of individual pixels in the output) and the precision and recall for each of the two classes.

2. **Improve model architecture** [15 points]

Try to improve the predictive accuracy of the model by increasing the size of the U-Net model. For example, you could try to add layers or increase the number of filters in a layer.

3. **Data augmentation** [20 points]

Try to improve the predictive accuracy of the model using data augmentation, by flipping and rotating images (and their corresponding segmentation labels!) in the training set.

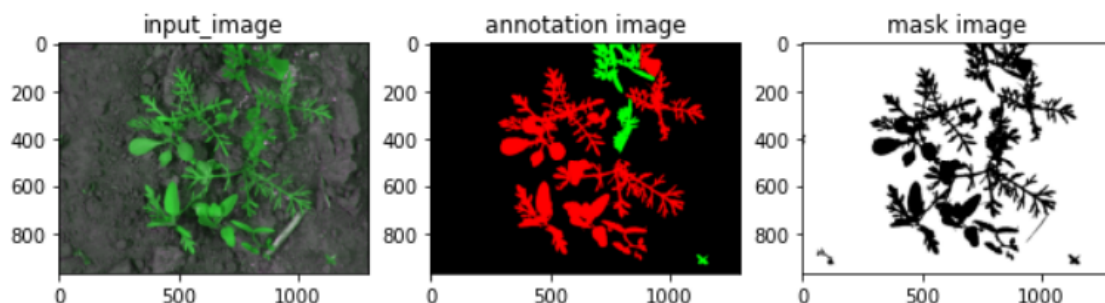


Figure 1: Sample of the CWFID dataset.

¹U-Net: Convolutional Networks for Biomedical Image Segmentation. O. Ronneberger, P. Fischer and T. Brox. 2015, arXiv:1505.04597

²S. 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, http://dx.doi.org/10.1007/978-3-319-16220-1_8, p 105–116

³Yosuke Toda, researcher at Nagoya University / Agri-Heir Co., Ltd.