HortNet417v1—A Deep-Learning Architecture for the Automatic Detection of Pot-Cultivated Peach Plant Water Stress
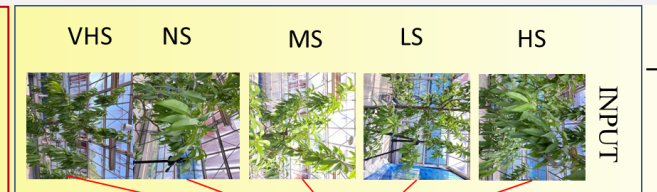
Md Parvez Islam[1] and Takayoshi Yamane[2]

[1]Graduate School of Agriculture, Ehime University; Research Center for Agricultural Robotics, NARO, Japan

[2]Research Center for Agricultural Information Technology and National Institute of Fruit Tree and Tea Science, NARO, Japan

The biggest challenge in the classification of plant water stress conditions is the **similar appearance of different stress conditions**. We introduce **HortNet417v1 with 417 layers** for **rapid recognition, classification, and visualization** of plant stress conditions, such as **no stress, low stress, middle stress, high stress, and very high stress**, **in real time** with **higher accuracy and a lower computing** condition. We evaluated the classification performance by training more than **50,632** augmented images and found that **HortNet417v1** has **90.77% training, 90.52% cross validation, and 93.00% test accuracy without any overfitting issue**, while other networks like **Xception, ShuffleNet, and MobileNetv2** have an **overfitting issue**, although they achieved 100% training accuracy.

HS - high stress,
LS - low stress,
MS - moderate stress,
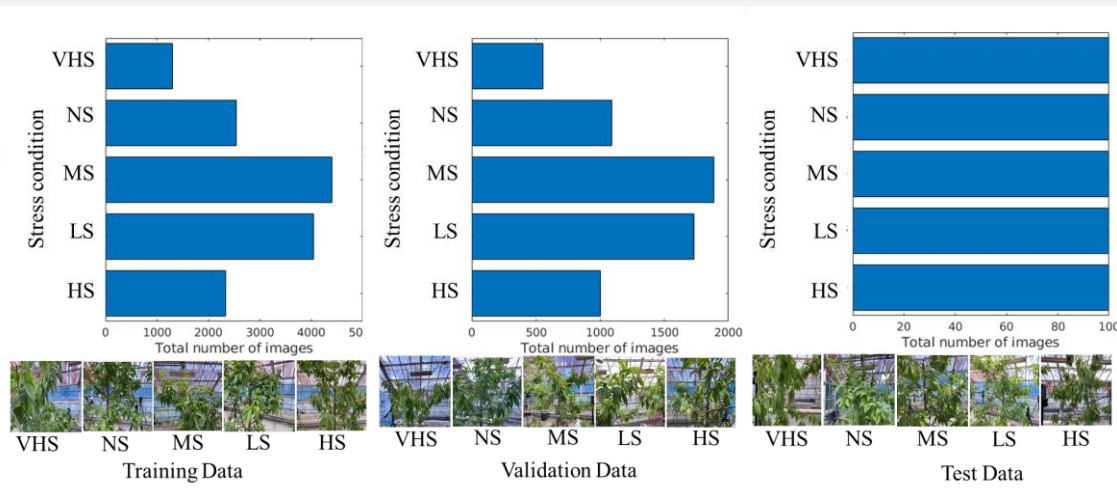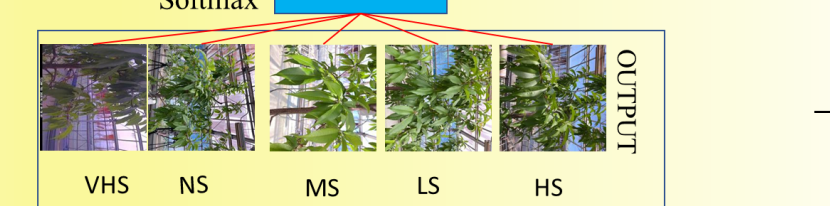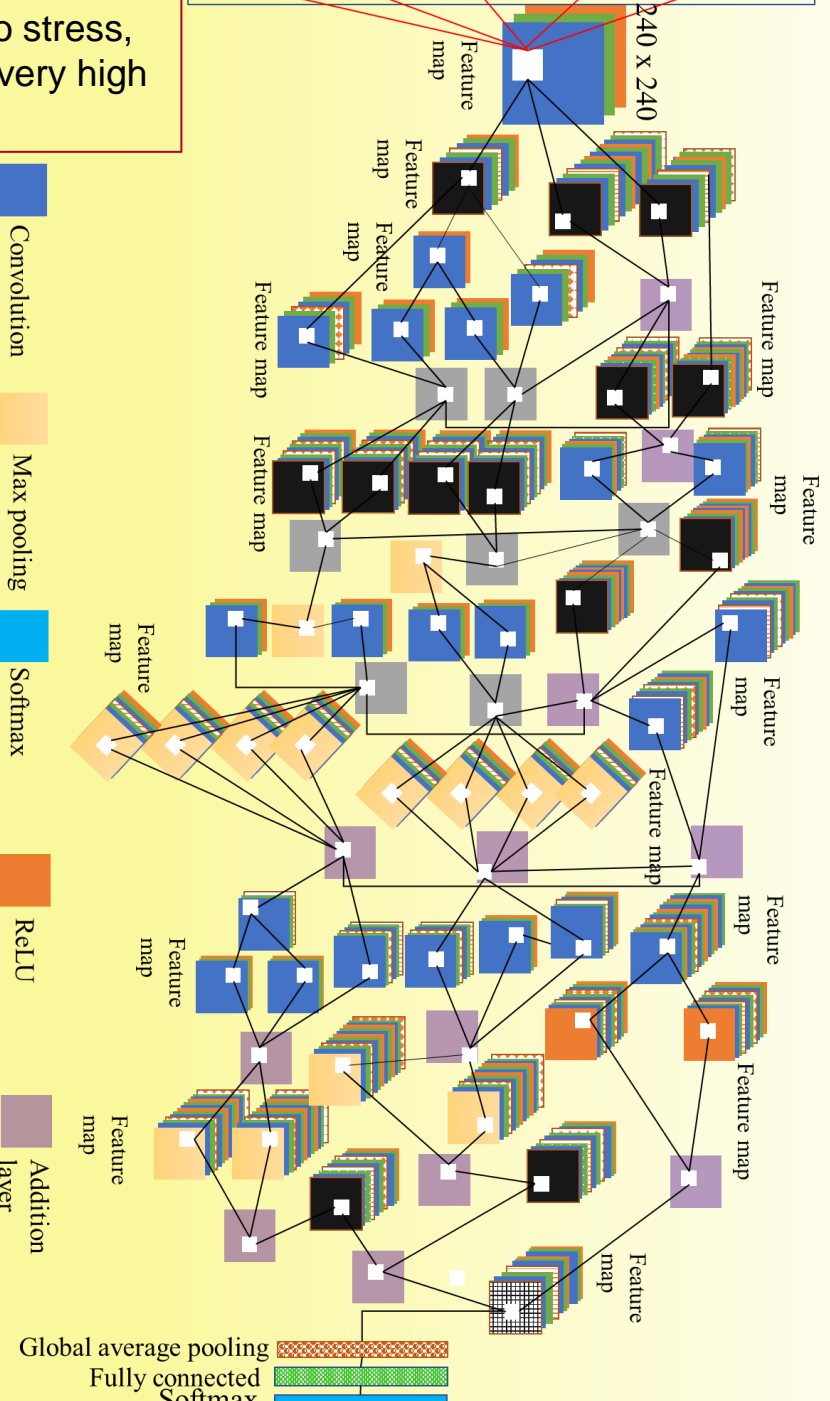NS - no stress,
VHS - very high stress

Visualization of the input image dataset
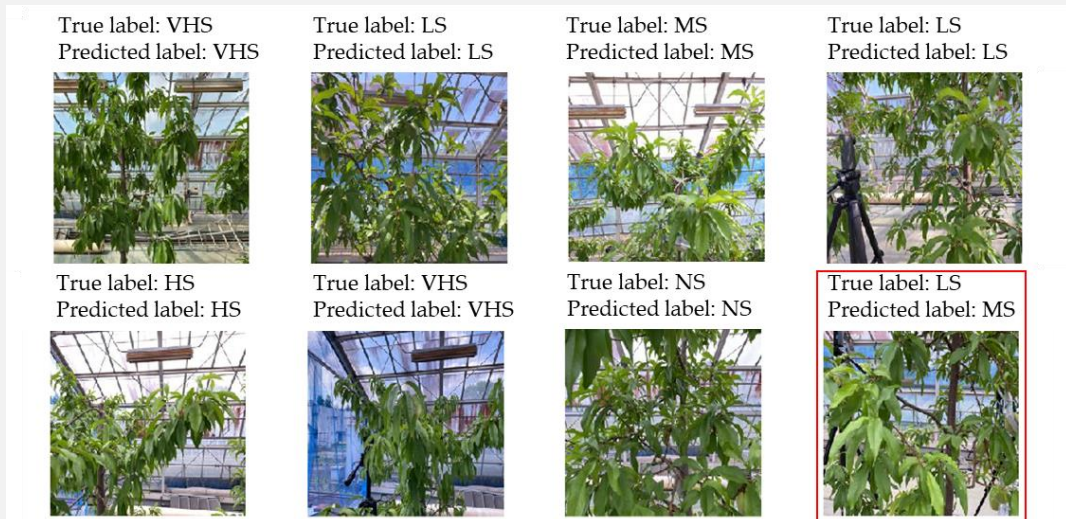
Prediction based on test image datasets

IMG_5267HS: High stress (0.59)

IMG_2983MS: Middle stress (0.91)

IMG_0993LS: Low stress (0.91)

IMG_2586NS: No stress (0.98)

IMG_1399VHS: Very high stress (0.98)
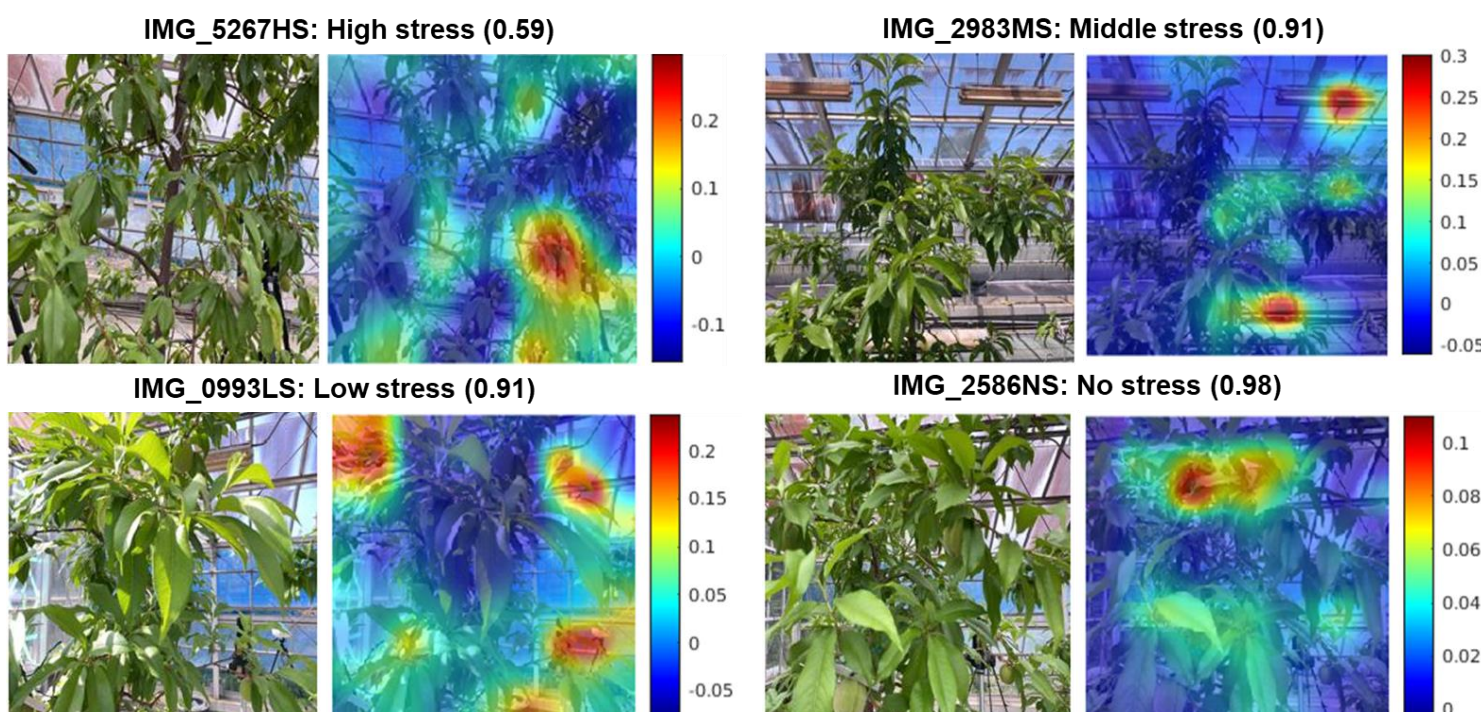
Visualization of the HortNet417v1 network **decision** behind the **prediction of classification** of the **plant stress condition**.

Conclusion

Classification of uneven data sets under various stress conditions, which may lead to **lack of information and diversity** of images and stress conditions. the authors plan to modify the network structure, optimize the network hyperparameters, and train the network with more data to improve the prediction accuracy in **real time**.

Reference

Islam, M.P.; Yamane, T. HortNet417v1—A Deep-Learning Architecture for the Automatic Detection of Pot-Cultivated Peach Plant Water Stress. Sensors 2021, 21, 7924. https://doi.org/10.3390/s21237924