Accessible Large-Scale Plant Pathology Recognition

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Project page : https://github.com/mv-lab/mlplants

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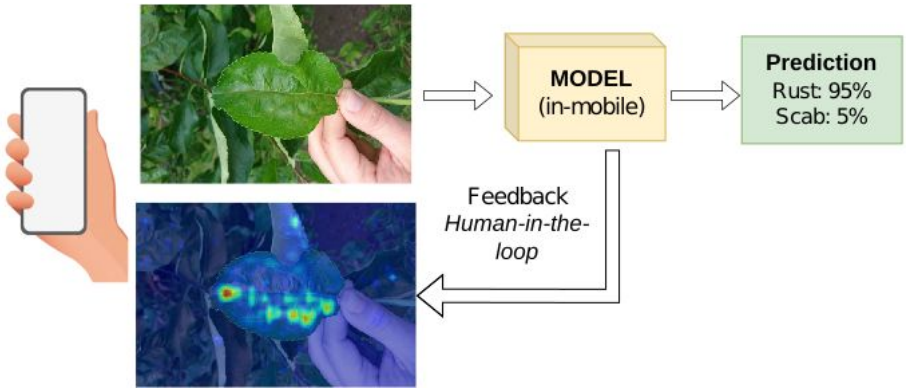
Introduction

Plant diseases are costly and threaten agricultural production and food security worldwide.

Climate change is **increasing the frequency** and severity of plant diseases and pests.

Early detection can have a significant impact, especially in **developing countries**.



Our proposal

We study **efficient computer vision** models that can be deployed in smartphones.

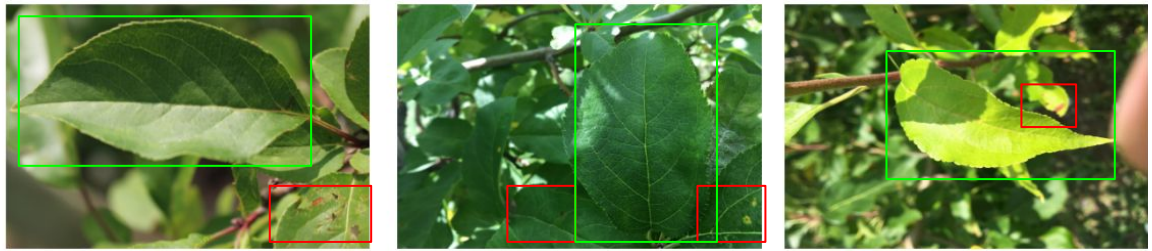
We train state-of-the-art models using the most advanced techniques for image classification and considering **real-world scenarios**: (1) Imbalanced classes, (2) Different backgrounds, light, angles, and noise conditions. (3) Different physiological age of the plants, (4) Co-occurrence of multiple diseases on the same plant, and (5) Different focus of the images.

Results and Challenges

Efficient and compact models can achieve competitive performance if trained using our empirical “tricks”, even using few-shot (FS) data, active learning (AL), or self-supervised (SS) learning.

The main **challenge**, considering an in-the-wild realistic scenario is the noise in training data. For instance, healthy leaves surrounded by diseased leaves, and these with different type of diseases.

Model	img. size	ROC AUC	Mobile
1st place (SEResNeXt [10])	512	0.984	✗
2nd place (ResneSt101 [26])	545	0.981	✗
3rd place (EffNet B7 [22])	768	0.980	✗
ResNet34 [8]	512	0.969	✗
Ours EfficientNet B0 [21]	512	0.975	✓
Ours GhostNet [7]	512	0.970	✓
Ours MobileNetV2 [21]	512	0.967	✓
Ours **FS** MobileNetV2 [21]	512	0.910	✓
Ours **FS** GhostNet [7]	512	0.900	✓
Ours **SS** MobileNetV2 [21]	512	0.973	✓
Ours **AL** MobileNetV2 [21]	512	0.950	✓



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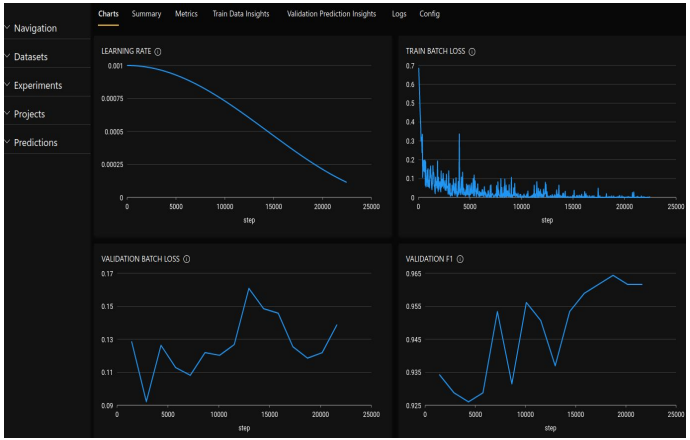
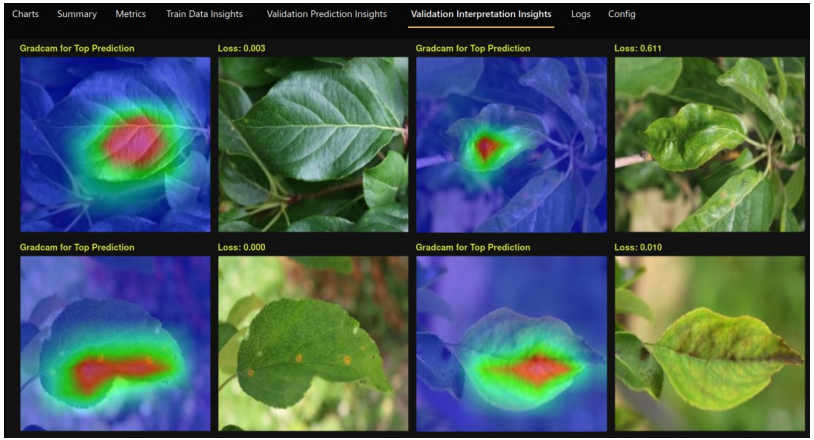
Our **framework** for training and evaluating state-of-the-art image classification models and integrate well-known “tricks” [2] such as custom LR schedulers, advanced augmentations, gradient accumulation, mixed precision, etc.





[1] H2O Hydrogen Torch: https://docs.h2o.ai/h2o-hydrogen-torch/v1.2.0/
[2] He et al. “Bag of tricks for image classification with convolutional neural networks”, CVPR 2019