

Superconverging a zero deforestation model

Schneider Electric European Hackathon

Group: AI bloopers

ID: DT121

Team members: 1

Author: David D. Gaviria

Email: blobquiet@gmail.com



Challenge

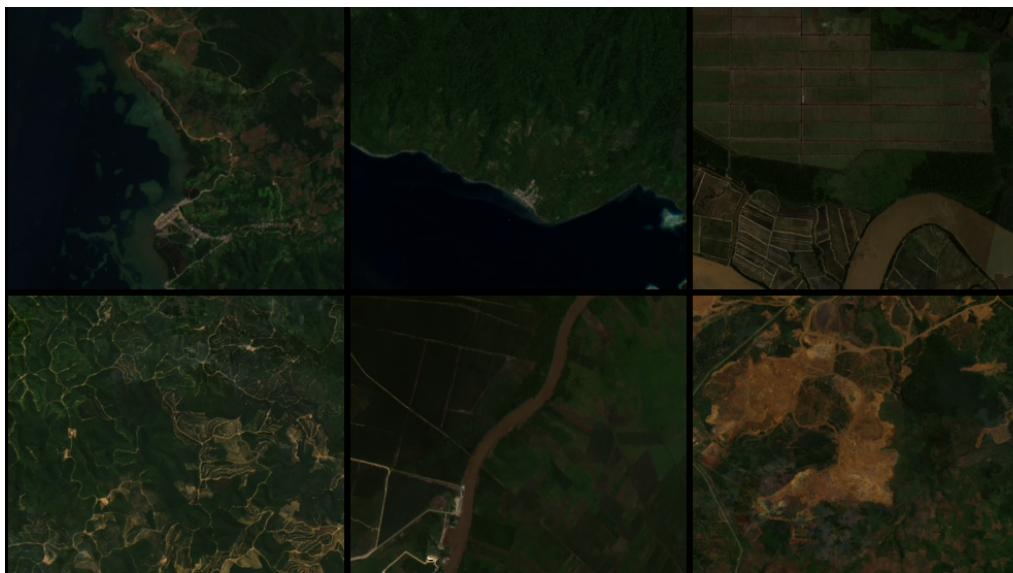
Deforestation occurs for a variety of reasons and has many devastating consequences.

Proposal: Via CNNs, we use satellite images of the earth's surface to detect areas in the midst of deforestation and prevent its expansion.

How we did it?

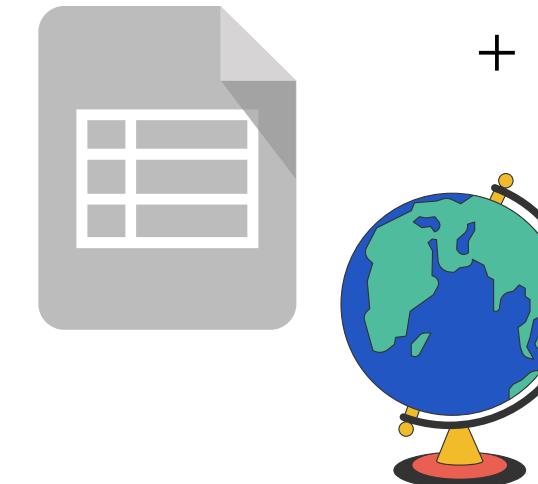
The first tests were conducted solely on images, but with the EDA, we quickly realized that using metadata could provide benefits due to its richness of information. Our strategy consisted of a multi-resolution ensemble approach that takes the most data available and fine-tunes it for a limited number of epochs (only 10).

Therefore, a combination of satellite images + metadata:



Samples of Image used

(credit: <https://nuwe.io/>)



OneHot encode for the year
+ latitude and longitude

Tabular data

Pipeline

Input image as .jpg



CNN Models

- Optimizer: AdamP
- Max Lr: 3e-4
- Scheduler: One Cycle LR

Input metadata



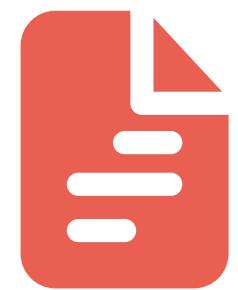
- Longitude
- Latitude
- OneHot encoded year

**Linear (18,512)
BatchNorm(512)
DropOut(0.3)
Linear(512,128)
BatchNorm(128)**

Concat

TTA

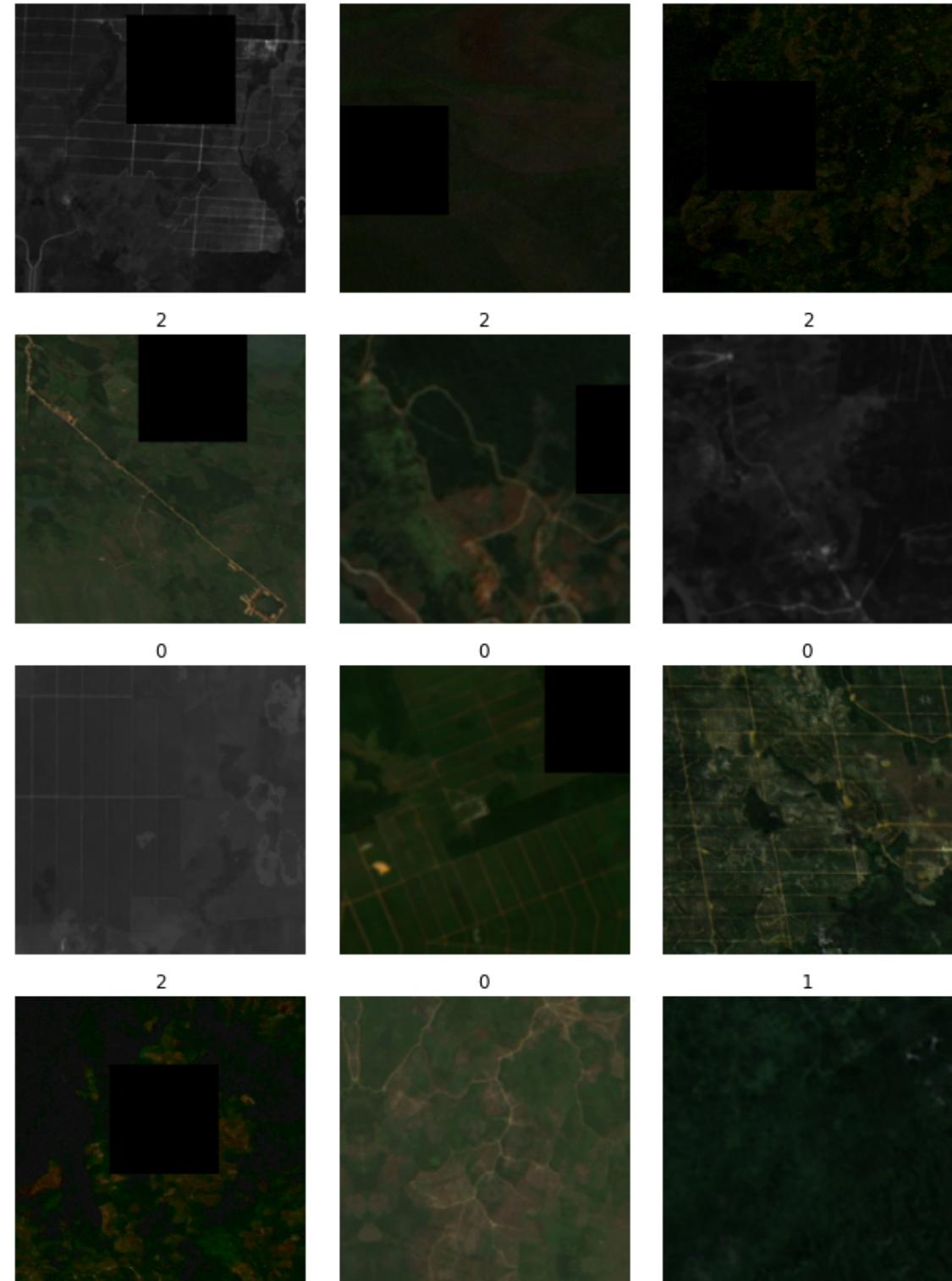
**Ensemble
+Thresholding**



.json
prediction

- TTA x 10
- Batch size: 32
- 0.9/0.1 train test split
- 10 Epochs

Data Augmentation



A Albulmentations

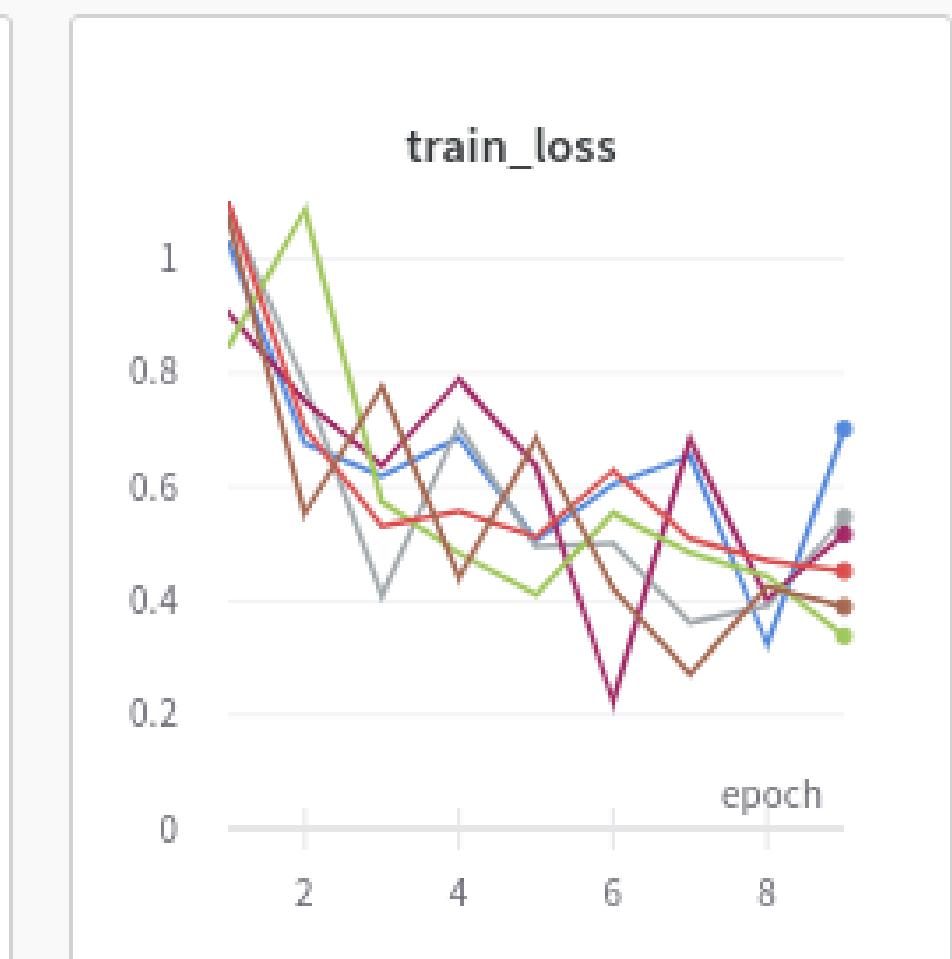
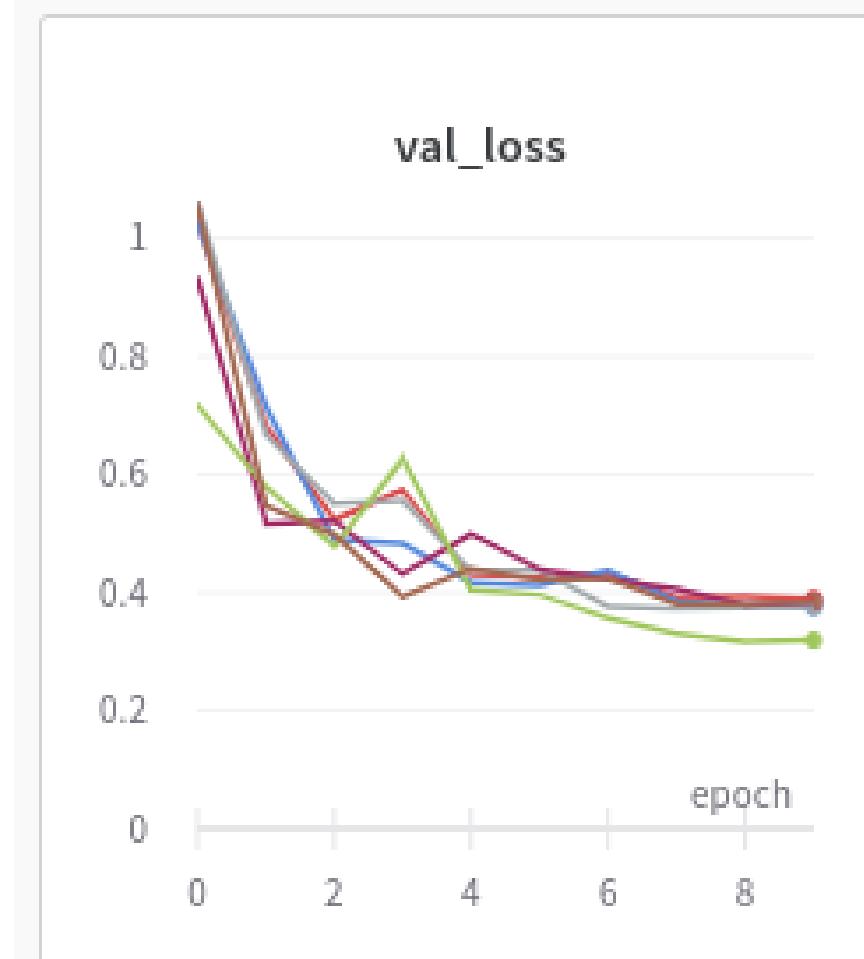
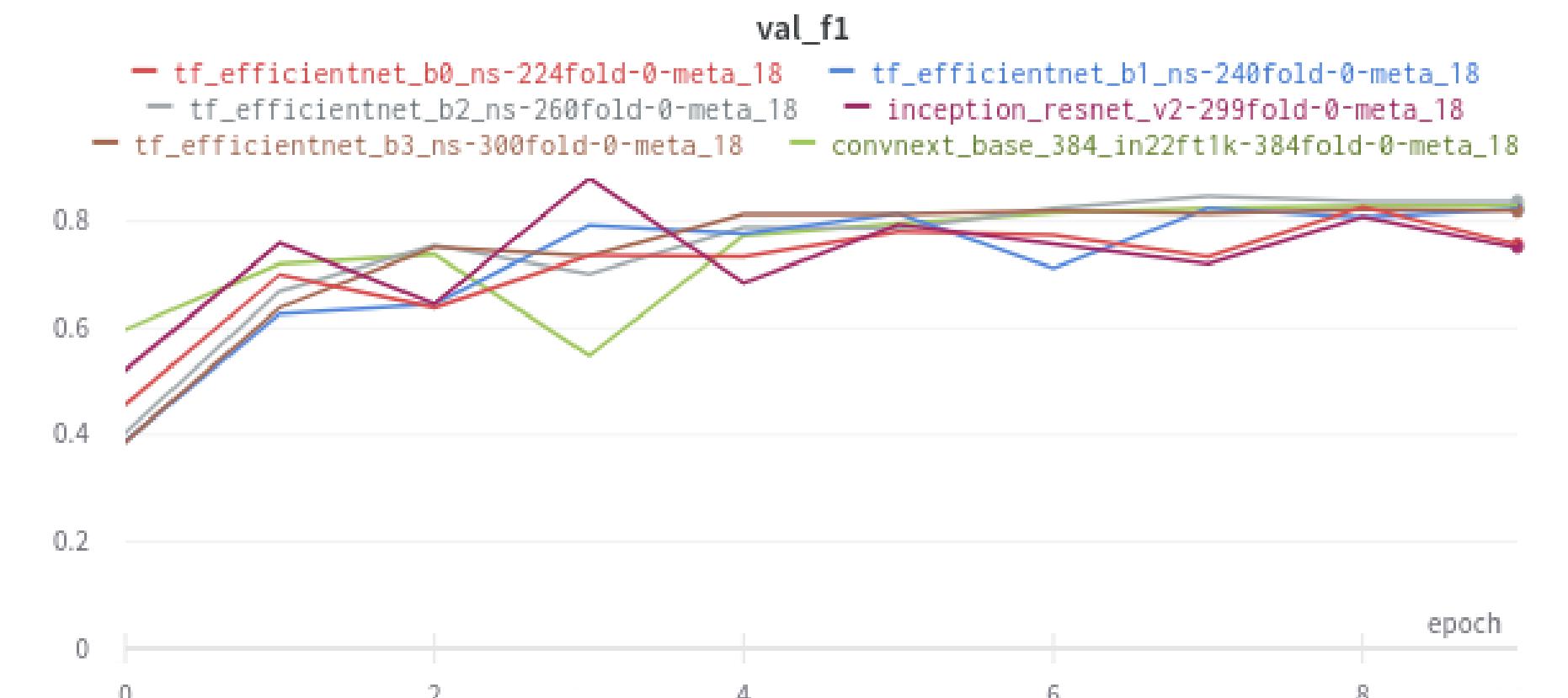
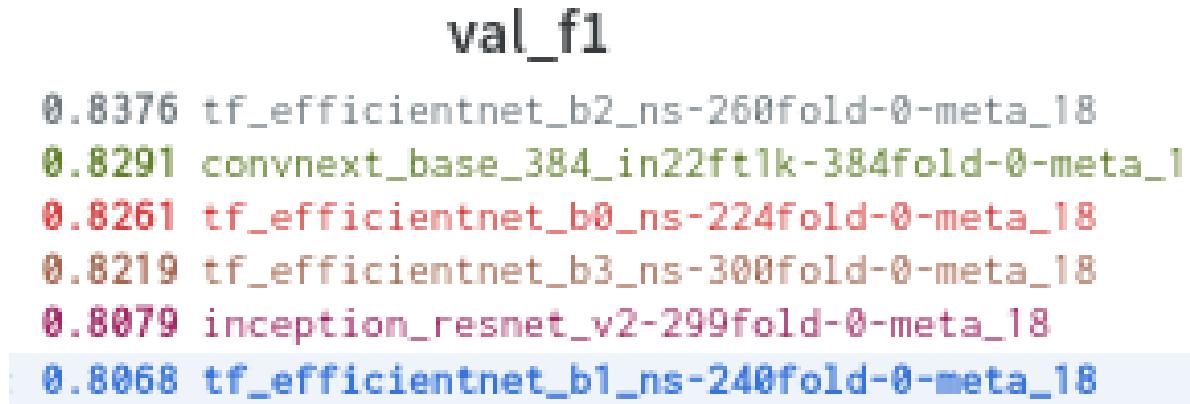
- RandomResizedCrop
- Rotate
- Flip
- Affine
- RandomBrightnessContrast
- One of
 - ColorJitter
 - HueSaturationValue
- ToGray
- ShiftScaleRotate
- One of
 - Blur
 - GaussNoise
- IAASharpen
- Cutout

Taking inspiration from Contrastive Learning the composition of simple augmentations for learning good representations, gray and color distortions were adopted.

Additionally, key to the locality of the augmentation was a heavy cropping strategy, where random resized crops were fed into the models followed by random brightness and contrast changes including color jitter, random flipping, random rotation, random scaling, and random blur/noise/sharpen changes.

Results

Following the challenge instructions, the F1 score with macro was used in order to find the best models for comparison

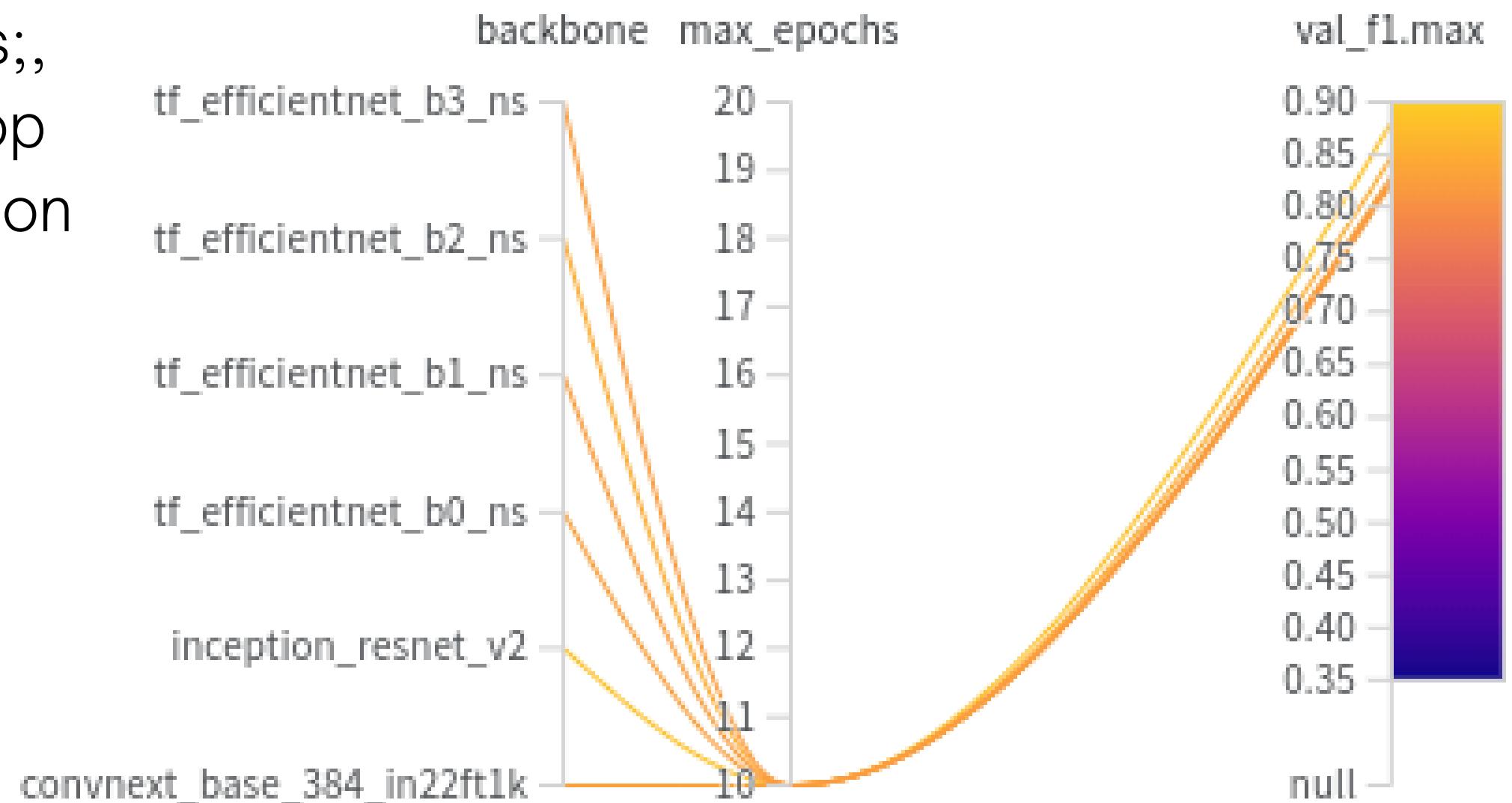


Ensemble

Since a multi-resolution approach has shown improvements in other scenarios;, ensemble learning was used with the top models in order to enhance the prediction and take advantage of the diversity provided by multiple models.

The following were our **top six pretrained models**, using an **average**:

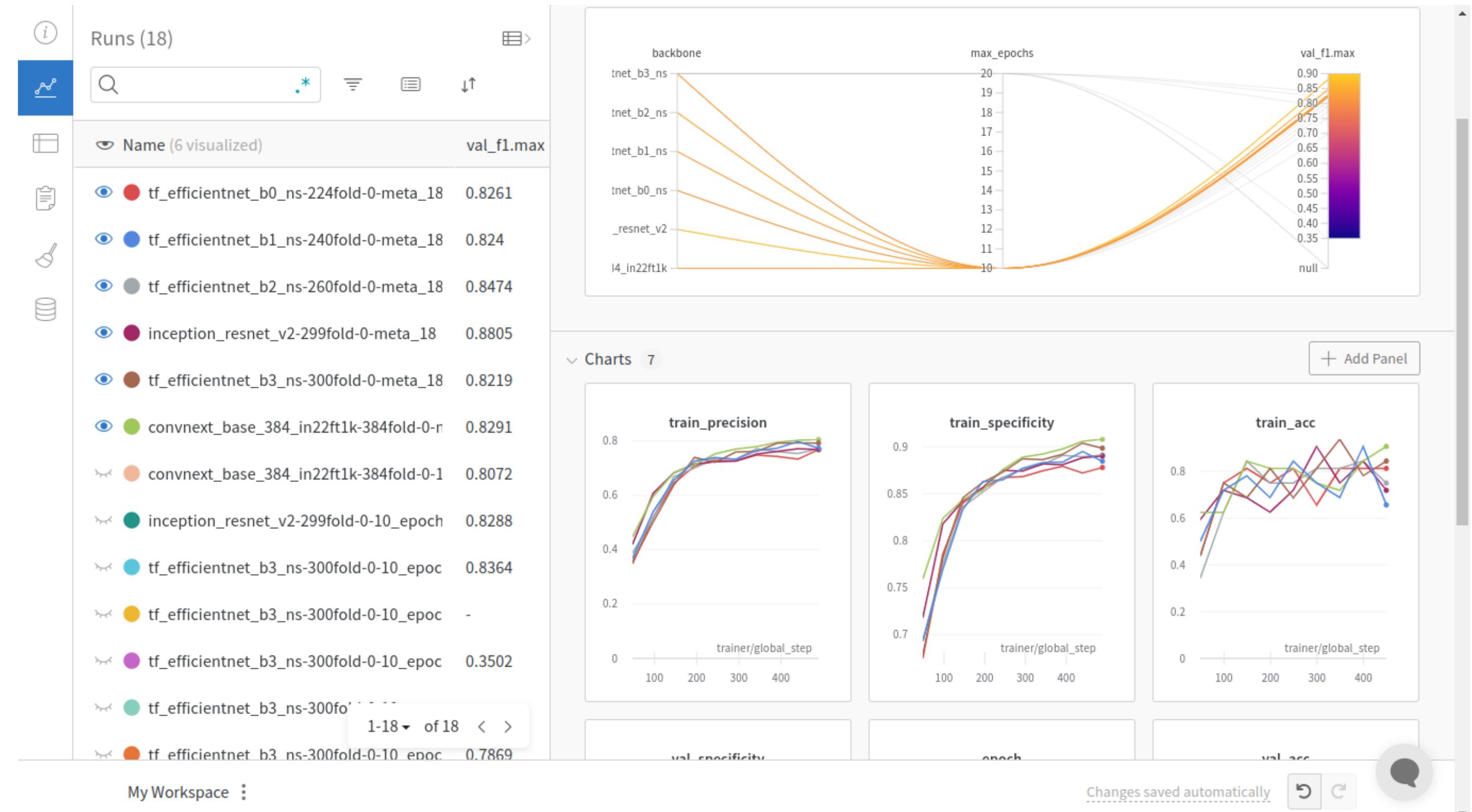
- EfficientNet B3, B2, B1, B0 with Noisy Student weights
- ConvNext Base
- Inception resnet v2



Tools used

With online tools like Pytorch Lightning, Colab, and Weights and Biases it was easier to compare the results on the fly!

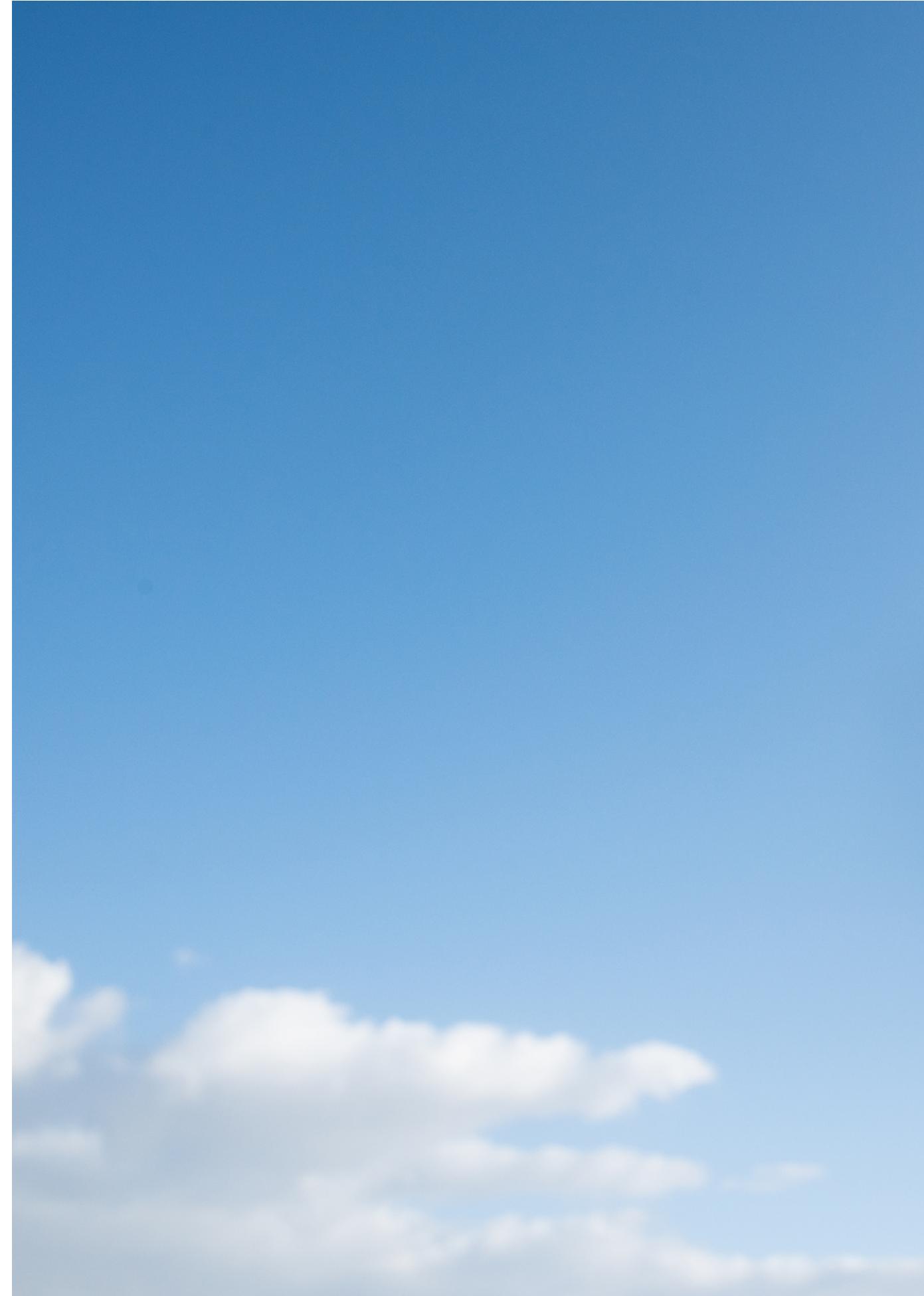
Click [here](#) for the report

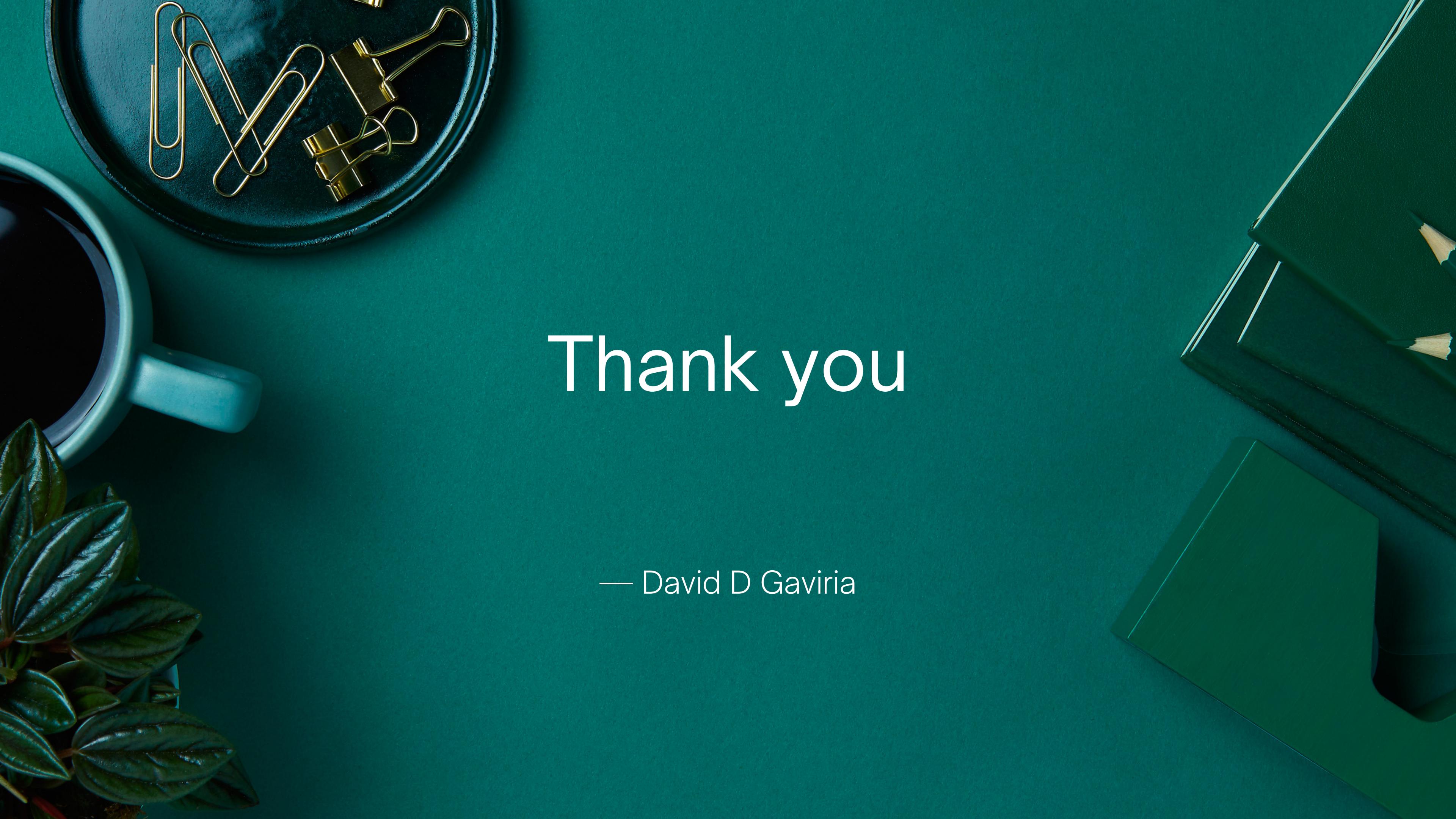


Future Work

In order to improve further some of the following may be attempted:

- Test different split ratios.
- Use K-fold Cross Validation instead of Hold-out.
- Use an ensemble of Vision Transformers.
- Test more aggressive resizes in the data augmentation.
- Focal Loss for handling imbalanced data.





Thank you

— David D Gaviria