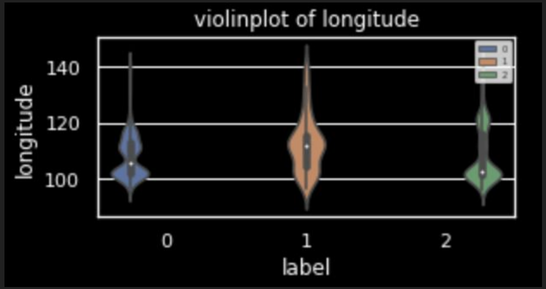
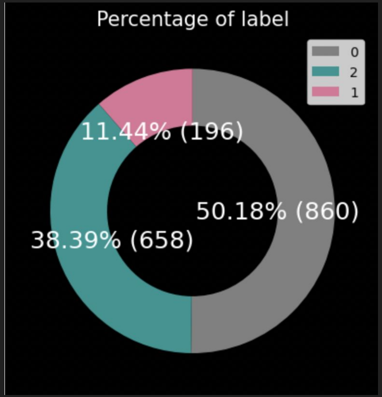
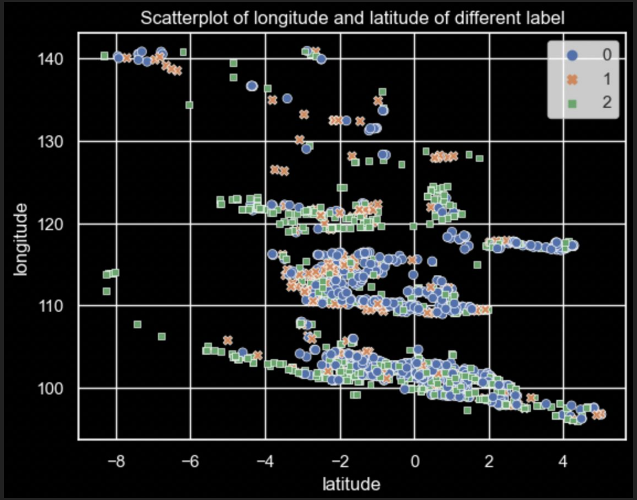
Team: Hawk Eye

Team members: Héctor Mejía, Wanyi Chen & Ignacio Córdova

Data analysis

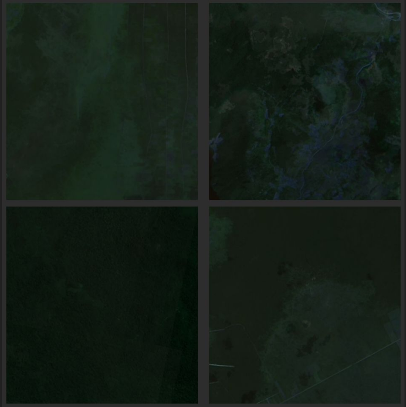




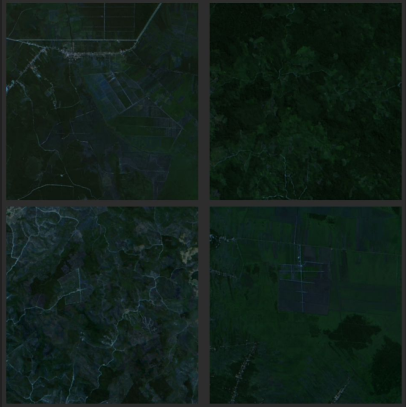


Label 0 Plantation

Label 1 - Grassland/Shrubland



Label 2 - Smallholder Agriculture



Schneider Electric

NUWE

November 19th, 2022

Process

Visualization and data analysis

Brainstorming

Baseline model
F1 Score (0.69, 0.53, 0.54)

Model selection: EfficientNet

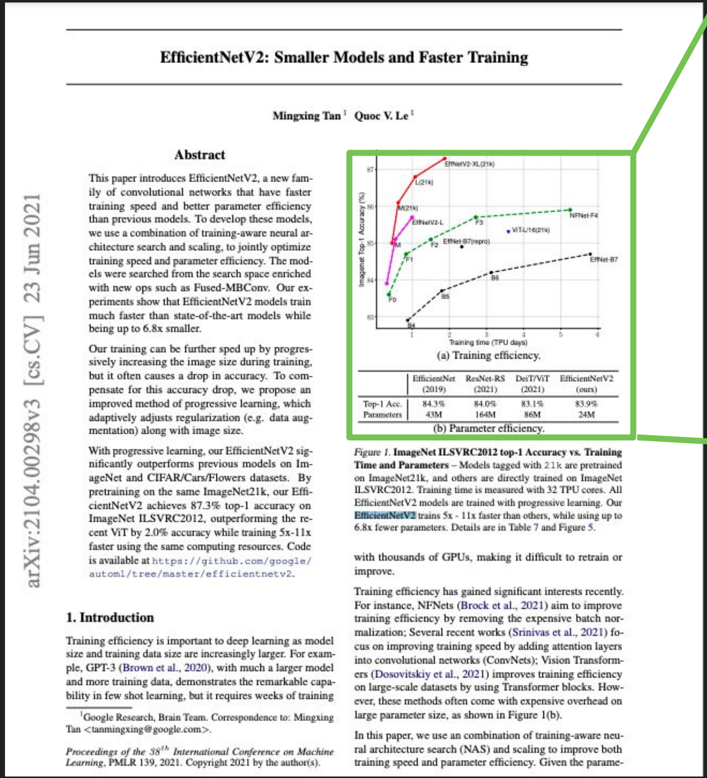
Meeting with **SE Team**

Data Augmentation for imbalanced class

Trainning

Analysis & Submission

Model: EfficientNet V2S



arXiv:2104.00298v3 [cs.CV] 23 Jun 2021

EfficientNetV2: Smaller Models and Faster Training

Mingxing Tan [1] Quoc V. Le [1]

Abstract

This paper introduces EfficientNetV2, a new family of convolutional networks that have faster training speed and better parameter efficiency than previous models. To develop these models, we use a combination of training-aware neural architecture search and scaling, to jointly optimize training speed and parameter efficiency. The models were searched from the search space enriched with new ops such as Fused-MBConv. Our experiments show that EfficientNetV2 models train much faster than state-of-the-art models while being up to 6.8x smaller.

Our training can be further sped up by progressively increasing the image size during training, but it often causes a drop in accuracy. To compensate for this accuracy drop, we propose an improved method of progressive learning, which adaptively adjusts regularization (e.g. data augmentation) along with image size.

With progressive learning, our EfficientNetV2 significantly outperforms previous models on ImageNet and CIFAR/Cars/Flowers datasets. By pretraining on the same ImageNet21k, our EfficientNetV2 achieves 87.3% top-1 accuracy on ImageNet ILSVRC2012, outperforming the recent ViT by 2.0% accuracy while training 5x-11x faster using the same computing resources. Code is available at https://github.com/google/automl/tree/master/efficientnetv2.

(a) Training efficiency.

	EfficientNet (2019)	ResNet-RS (2021)	DeiT/ViT (2021)	EfficientNetV2 (ours)
Top-1 Acc.	84.3%	84.0%	83.1%	83.9%
Parameters	43M	164M	86M	24M

(b) Parameter efficiency.

Figure 1. **ImageNet ILSVRC2012 top-1 Accuracy vs. Training Time and Parameters** – Models tagged with 21k are pretrained on ImageNet21k, and others are directly trained on ImageNet ILSVRC2012. Training time is measured with 32 TPU cores. All EfficientNetV2 models are trained with progressive learning. Our EfficientNetV2 trains 5x - 11x faster than others, while using up to 6.8x fewer parameters. Details are in Table 7 and Figure 5.

1. Introduction

Training efficiency is important to deep learning as model size and training data size are increasingly larger. For example, GPT-3 (Brown et al., 2020), with much a larger model and more training data, demonstrates the remarkable capability in few shot learning, but it requires weeks of training with thousands of GPUs, making it difficult to retrain or improve.

Training efficiency has gained significant interests recently. For instance, NFNets (Brock et al., 2021) aim to improve training efficiency by removing the expensive batch normalization; Several recent works (Srinivas et al., 2021) focus on improving training speed by adding attention layers into convolutional networks (ConvNets); Vision Transformers (Dosovitskiy et al., 2021) improves training efficiency on large-scale datasets by using Transformer blocks. However, these methods often come with expensive overhead on large parameter size, as shown in Figure 1(b).

In this paper, we use an combination of training-aware neural architecture search (NAS) and scaling to improve both training speed and parameter efficiency. Given the parame-

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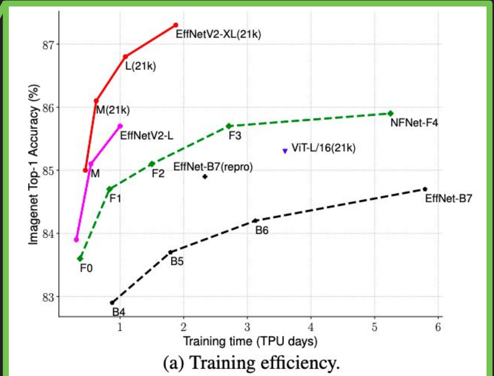
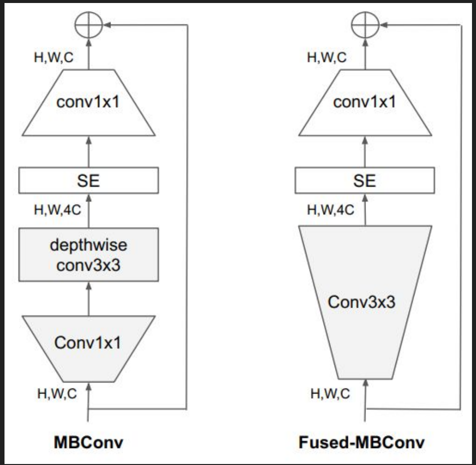
Proceedings of the 38th International Conference on Machine Learning, PMLR 139, 2021. Copyright 2021 by the author(s).



(a) Training efficiency.

	EfficientNet (2019)	ResNet-RS (2021)	DeiT/ViT (2021)	EfficientNetV2 (ours)
Top-1 Acc.	84.3%	84.0%	83.1%	83.9%
Parameters	43M	164M	86M	24M

(b) Parameter efficiency.



We created the following classes:

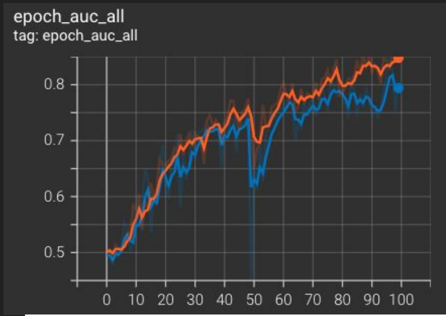
`< ModelGenerator >`

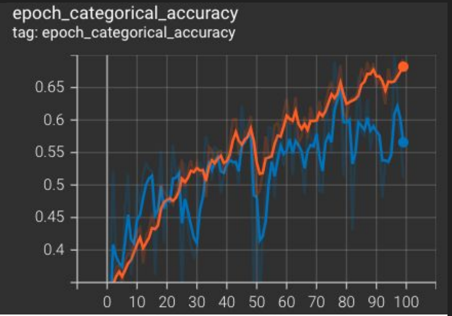
`< BalanceDatasetGenerator >`

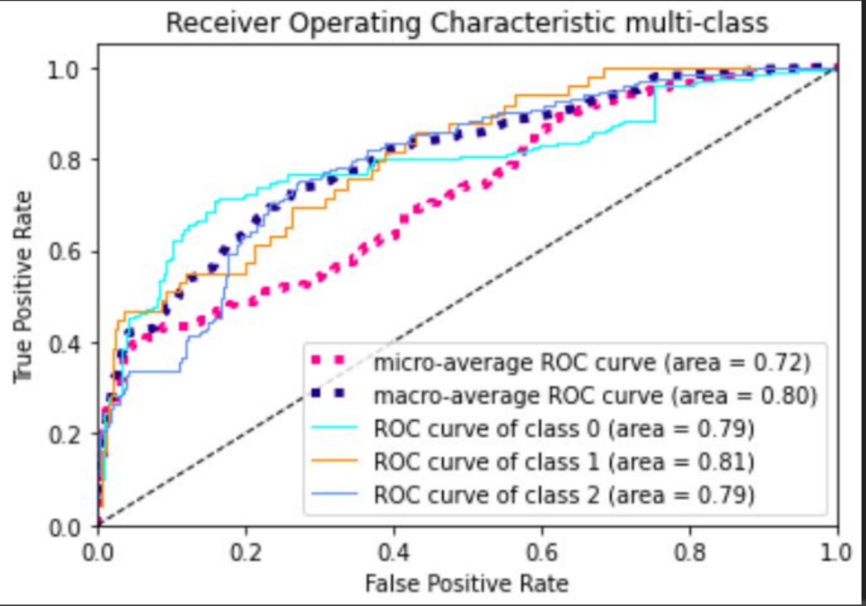
`< ImageAugmentationEngine >`

Results and performance

	precision	recall	f1-score	support
plantation	0.67	0.78	0.72	234
grassland	0.21	0.71	0.33	49
smallholder_agriculture	1.00	0.07	0.12	165
accuracy			0.51	448
macro avg	0.63	0.52	0.39	448
weighted avg	0.74	0.51	0.46	448







Future steps (required more time):

- Perform **cross-validation**
- **Fine-tune** the model
- Apply **transfer learning** using a trained model on satellite imagery