

# Trimble Test report

Boudo Louis

boudo.louis@gmail.com

## Introduction

Our main goal is to do a binary classification between field and road image.



Figure 1: exemple of images in dataset

## 1 Methodology

To complete this task i choose to do a transfert learning on EfficientNetV2S, which is one of the most accurate classifier on PaperWithCode.

The archictecture is composed of a backbone (EfficientNetV2S) connected to a Dropout and a Dense layer that act as a classifier for our two classes. I use Lion optimizer, which is a state of art optimizer.

For training, in order to find the best model, I test different hyperparameters :

- **Dropout probability** : 0.0 , 0.5 , 0.7
- **learning rate** : 1e-5 , 1e-6

The whole model was implemented, trained and evaluated in Keras in 20 epochs. I also add a Streamlit api that can be easily used to do inferences.

## 2 Dataset Analysis

Our data is composed of 153 images for training and 10 images for testing. I use 20% of training images for validation. However the dataset, had some issues.

First, there is twice more roads images than field images. Field images arent very varied, most of the fields are green.

We have the same problem with road images, most of them are taken with the point of view, with an asphalt road. So there's little to none offroad image, which can ressemble to a field.

We can also note that there's little to none samples with occlusion or many object in the scene. All images are just landscapes with nothing but a road or a field.

And finally, there is an error , two road images are wrongly placed in field category in training dataset's. As we only have 45 images of fields, 2 images reprensents an error of 5%, this lead to problems during classification as the model will unable to correctly distinguish roads and fields.

I decided to modify the training set by deleting theses two images.

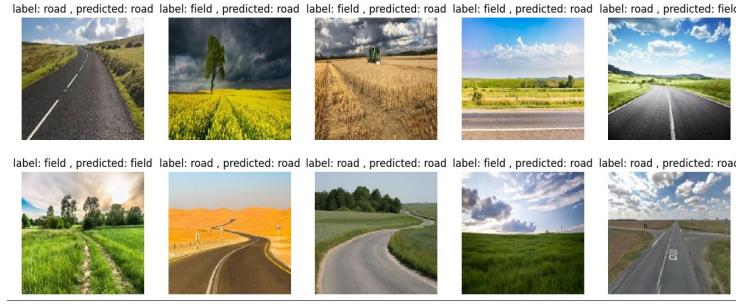


Figure 2: Results of test set

### 3 Results

During test, hyperparameters have different influences :

- **Learning rate**, a low learning rate doesn't converge in 20 epochs.
- The **Dropout**, a higher dropout allows a better generalization otherwise, we overfit.

The best model, give an accuracy of 80% with 0.7 probability of Dropout and a learning rate of 1e-5.

Even with this small dataset, my model is able to correctly classify snowy road as road, however, it fails to label roads that are dirt tracks. That can be explained by the fact that, there still grass in the middle of road, which our model interprets as a field and vice versa.

Also images without high grass and clear horizon tend to be classified as road, and like before, dataset's samples are the cause.

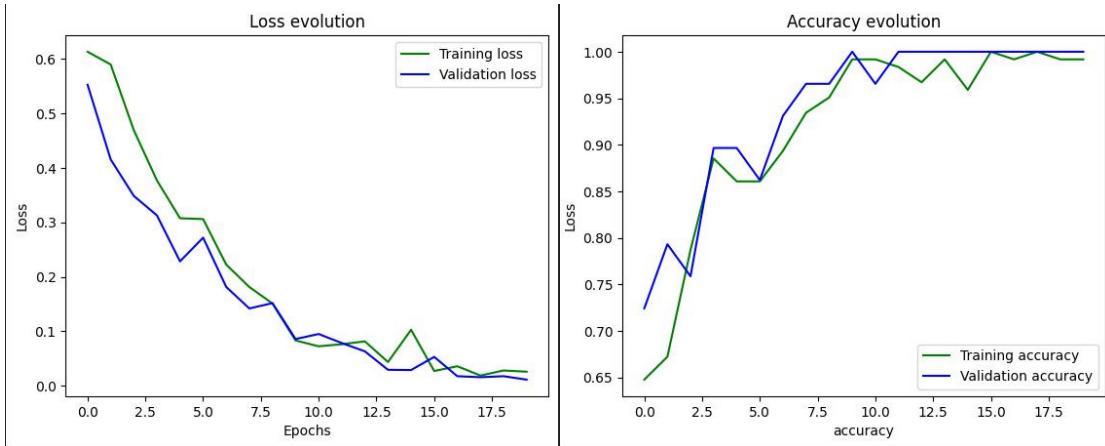


Figure 3: Loss and accuracy graph with  $lr=1e-5$ ,  $\text{Dropout} = 0.5$

### 4 Conclusion

The model produces a 80% accuracy on the given Test dataset, however a better dataset may give much different results. Also with more varied data, we will have better generalization. With only 10 images on the test set, we can't really check if the model is good or not.