

## Packages and Data

Install and activate the conda environment with:

```
conda env create -f environment.yml
conda activate deep-learning
```

Download and unzip the files to `./data`, so that the filestructure is like this:

```
./data
|-- EuroSAT_MS
|   |-- AnnualCrop
|   |-- Forest
|   |-- HerbaceousVegetation
|   |-- Highway
|   |-- Industrial
|   |-- Pasture
|   |-- PermanentCrop
|   |-- Residential
|   |-- River
|   |-- SeaLake
|-- EuroSAT_RGB
    |-- AnnualCrop
    |-- Forest
    |-- HerbaceousVegetation
    |-- Highway
    |-- Industrial
    |-- Pasture
    |-- PermanentCrop
    |-- Residential
    |-- River
    |-- SeaLake
```

## Splitting Data

You can either manually create and validate train/val/test splits, or skip it, as the training routines automatically create splits and validate them before training a model.

If you want to manually create splits, you can do this with:

```
# will create splits for ./data/EuroSAT_RGB/
python -m eurosat.utils.data_prep.py
```

```
python -m eurosat.utils.data_prep.py -d <custom-path>
```

## RGB Training/Testing models

To train and test the RGB models, run:

```
python -m eurosat.rgb.train
```

```
python -m eurosat.rgb.test
```

The training script will train two models: One with simple data augmentation, and another one with complex data augmentation. Each model is trained for 10 epochs, and the best model is saved in: `./models/ms-simple-augmentation.pth`, and `./models/ms-complex-augmentation.pth` respectively. Furthermore, a TPR plot is generated and saved in `./plots/rgb-tpr.png`

The testing script will load both models from the training step and evaluate them on the testing split. Furthermore, the top/bottom 5 plots are generated for both models and saved under: `./plots/rgb-complex-ranking.png`, and `./plots/rgb-simple-ranking.png` respectively.

## MS Training/Testing models

The MS training/testing scripts work analogously to the rgb models. Models can be trained and tested with:

```
python -m eurosat.ms.train
```

```
python -m eurosat.ms.test
```

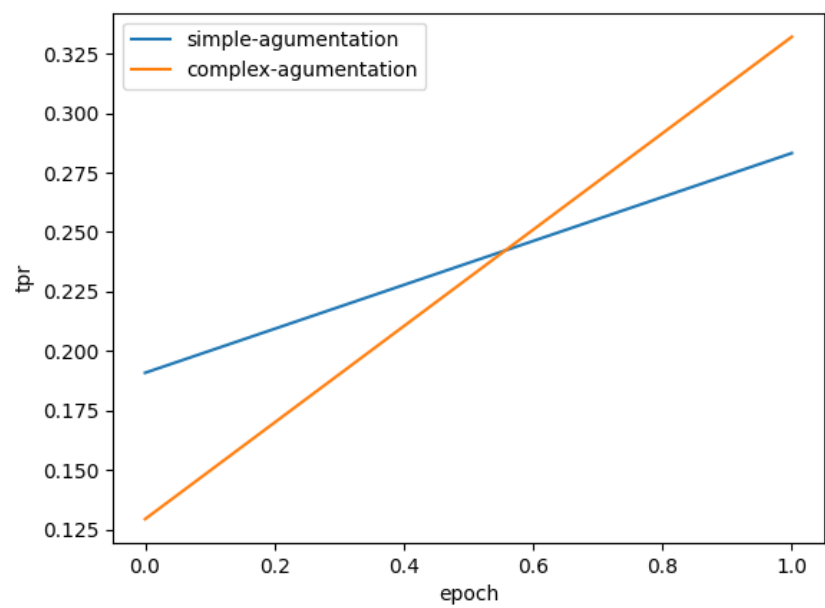
Again Training trains two models. The models work for inputs with 6 channels (see `./eurosat/ms/dataset.py`). They are again based on Mobilenet with pretrained weights. To allow for 6 channels, datapoints are split into two images with 3 channels. Mobilenet is then run twice with both parts. The two trained models differ in how they put both outputs back together. One model adds both output tensors together before the final classification layer, and the other model concatenates the layers. The best models of training are saved in `./models/ms-add.pth` and `./models/ms-concat.pth` respectively.

Training also creates a tpr plot for both models in `./plots/ms-tpr.png`

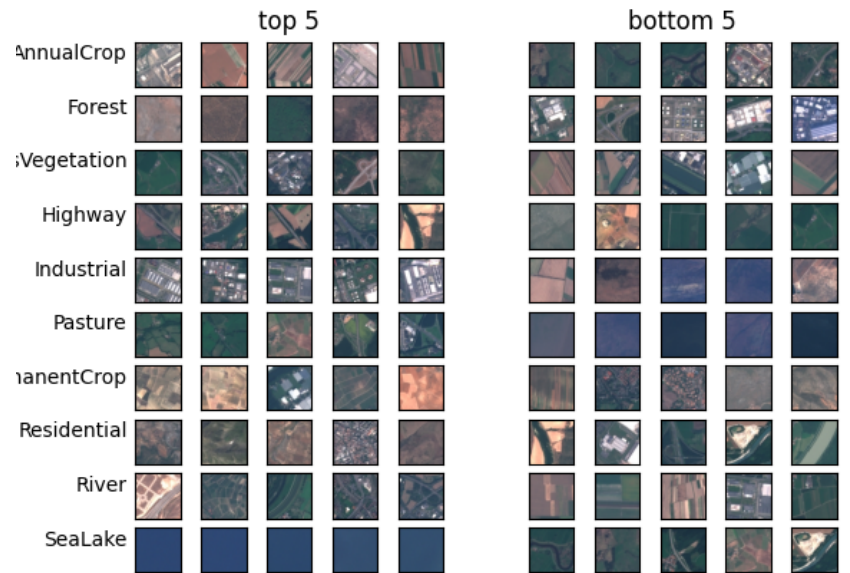
Test again evaluates the models against the test set. It creates top/bottom 5 plots under: `./plots/ms-concat-ranking.png` and `./plots/ms-add-ranking.png` respectively

# Model Report

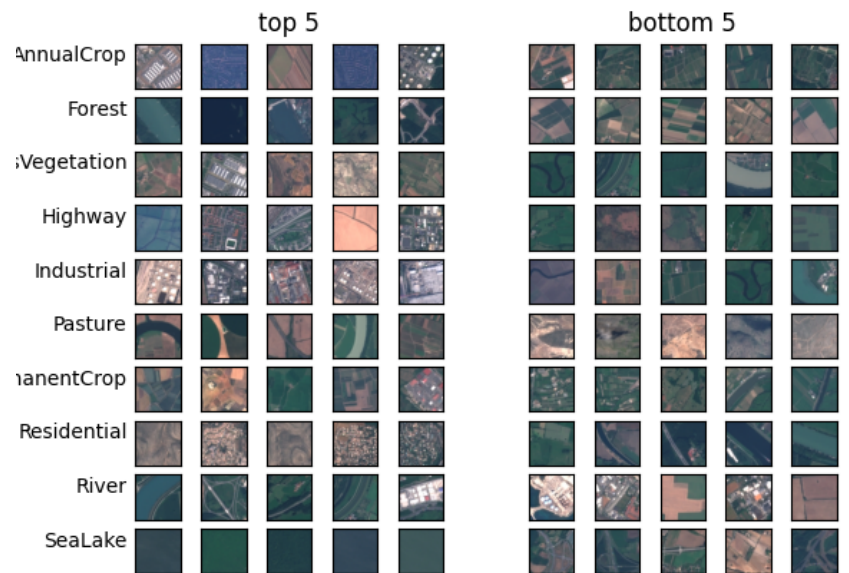
## RGB Models



TPR for RGB models

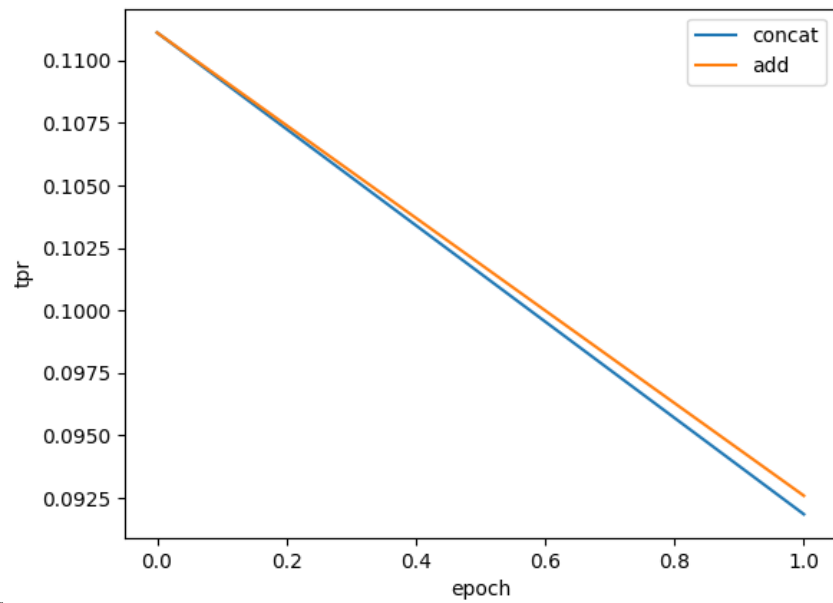


Complex Augmentation Model

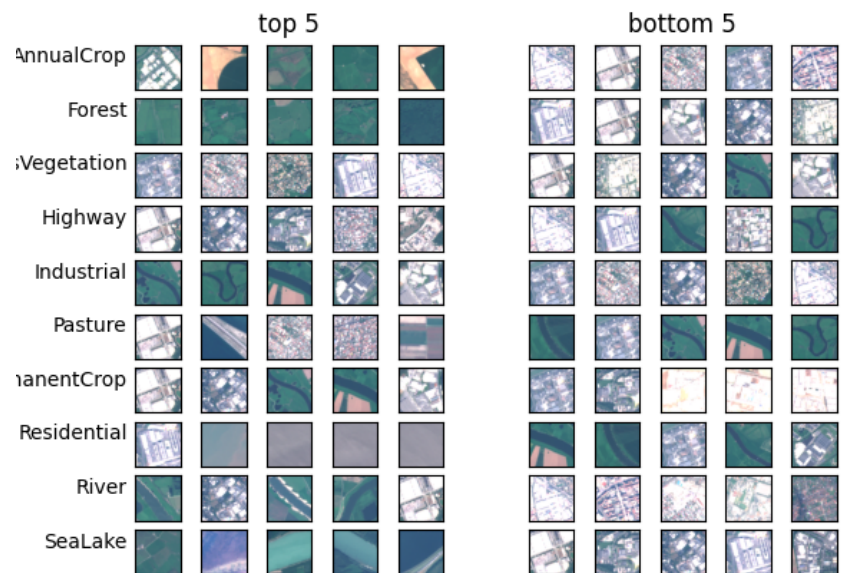


Simple Augmentation Model

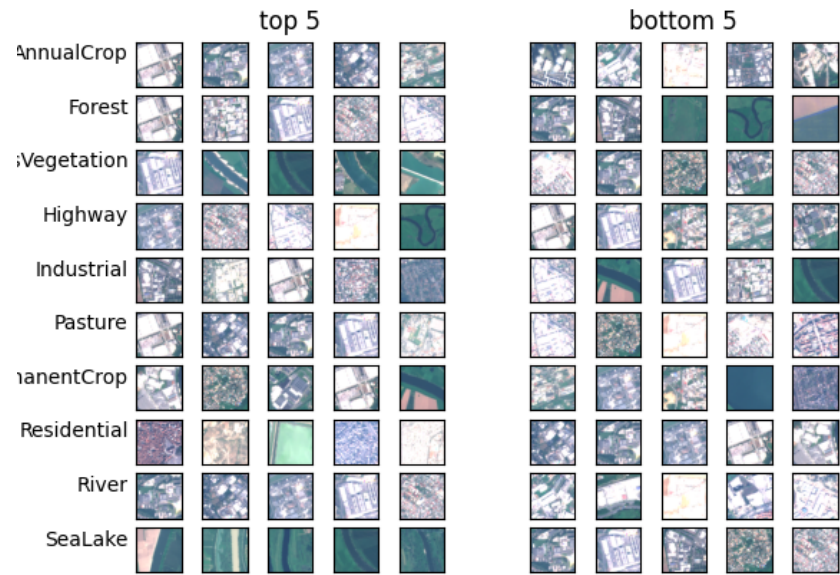
## MS Models



TPR for MS models



Concatenation Model



Addition Model