

EXPERIMENTS WITH IMAGE AUGMENTATION FOR SEGMENTATION

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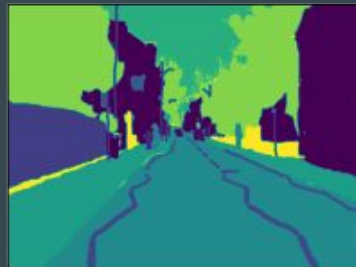
Overview

- 2 datasets
- 4 models
- 20 augmentation techniques (Geometric, Filters, Erasing, Colors)
- Measuring impact on test set metrics

Camvid

- Images captured from a driving car
- 32 distinct labels (pedestrian, road, car, sidewalk, fence...)
- 370-100-230 split

Camvid dataset



Drone

- images taken from drone flying in urban areas.
- 23 distinct labels (water, roof, person, grass ...)
- 240-80-80 split

Drone dataset

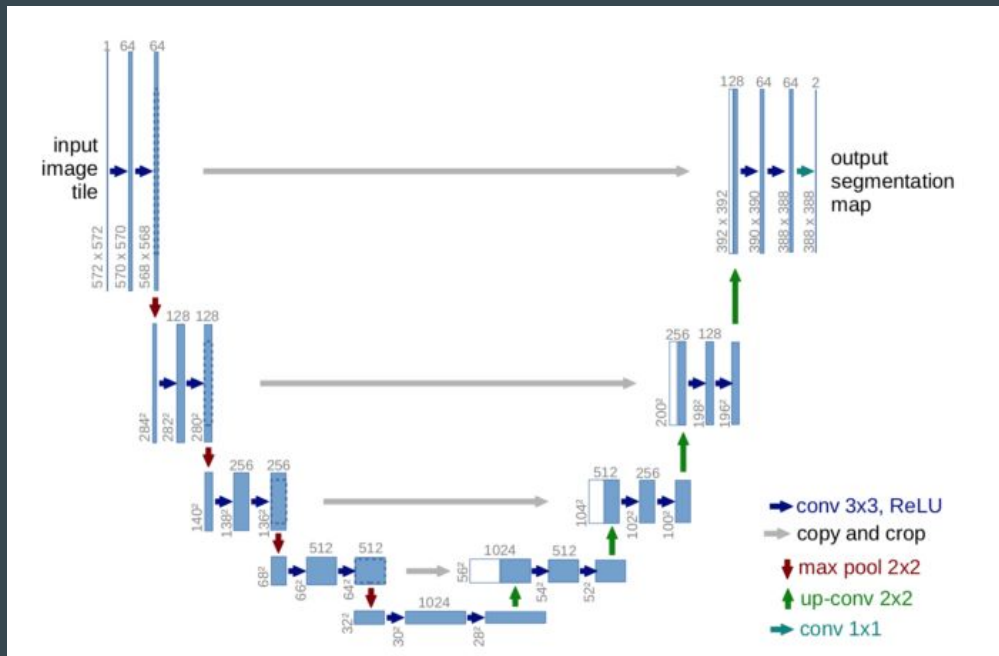
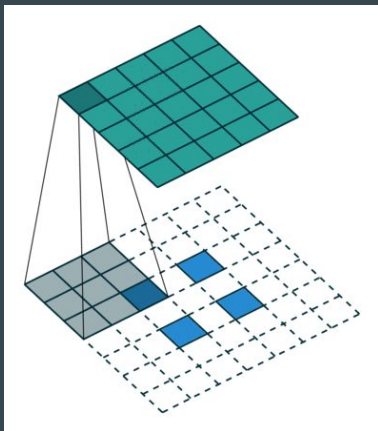


Segmentation

- Assign a class to each pixel
- Each pixel is a probability vector
- Network output is Height*Width*Classes with softmax activation on each pixel
- Input is the same resolution as output

U-net

- Encoder and decoder (Contracting and expanding path)
- On expansion concatenated with results from contracting path



Models

- Inception, Mobilenet, Resnet, Vgg
- Used as encoder part of the U-net
- Encoder pre-trained on imagenet and frozen

Metrics

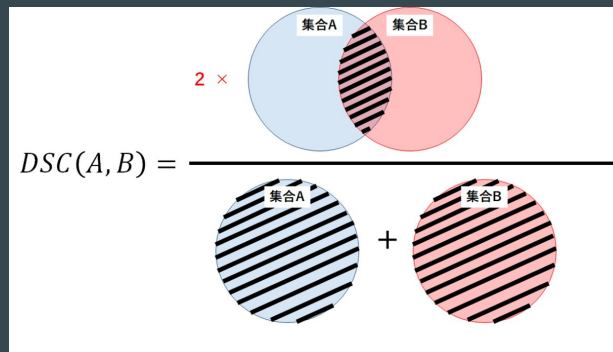
Dice Loss - basically F1 score (Weighted)

$$DiceLoss = 1 - DSC = 1 - \frac{2TP}{2TP + FP + FN}$$

Mean IOU (Macro)

$$IoU = \frac{TP}{TP + FP + FN}$$

Both in range $\langle 0,1 \rangle$



No-aug models results

Most of the models performed reasonably well

Resnet on Camvid failed to learn

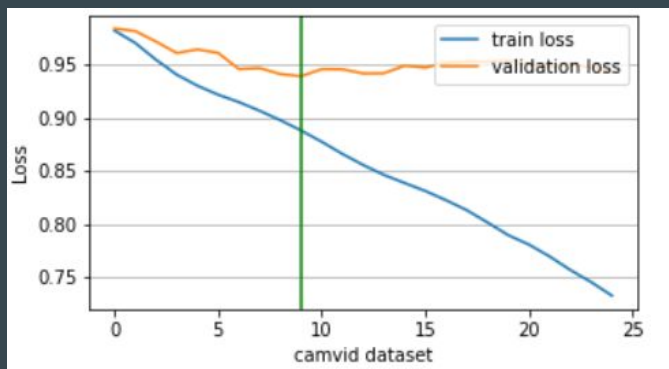


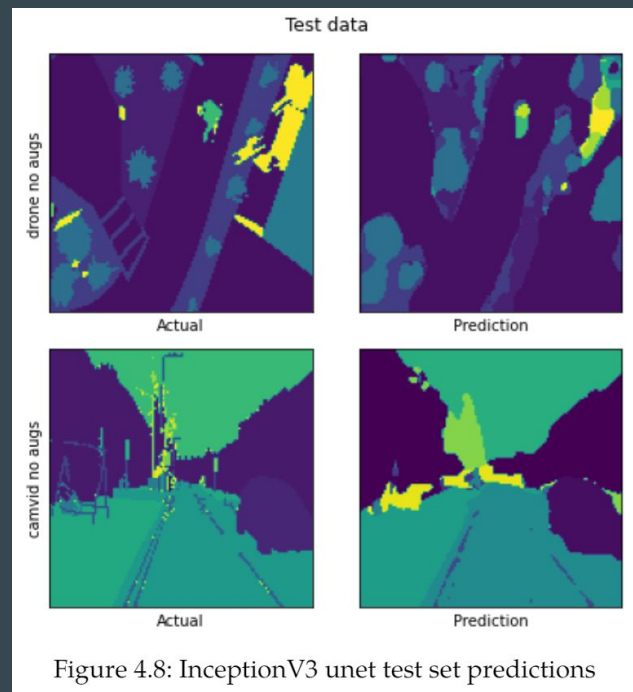
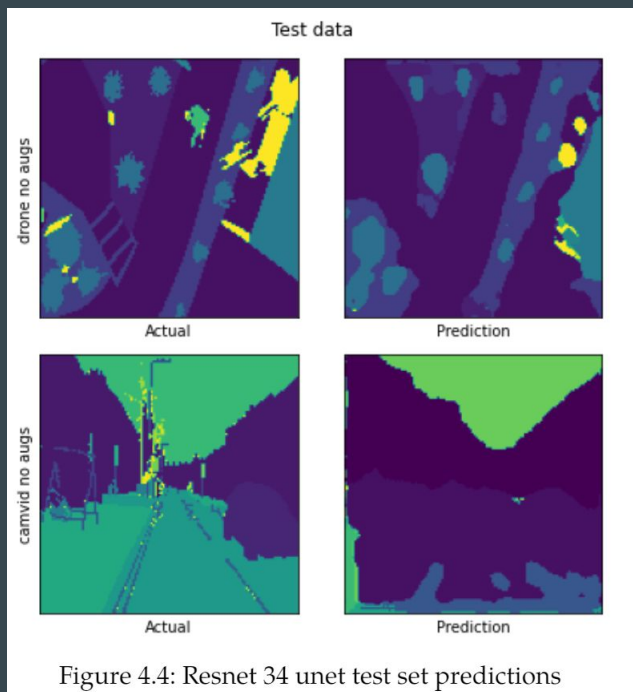
Table 4.1: Camvid dataset metric

Model	Test set MIOU
Mobilenet v2 Unet	0.190
Resnet34 Unet	0.049
Vgg 19 Unet	0.238
Inception v3 Unet	0.264

Table 4.2: Drone dataset metric

Model	Test set MIOU
Mobilenet v2 Unet	0.172
Resnet34 Unet	0.244
Vgg 19 Unet	0.319
Inception v3 Unet	0.295

No-aug models results



Geometric

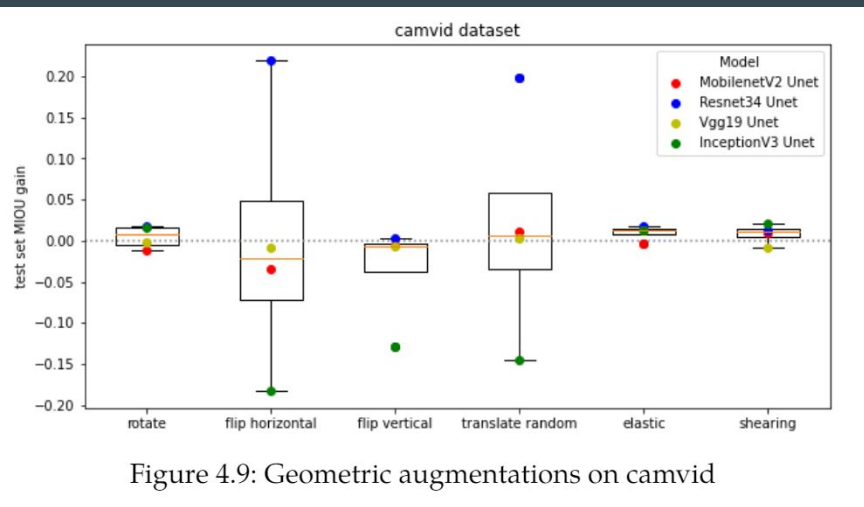


Figure 4.9: Geometric augmentations on camvid

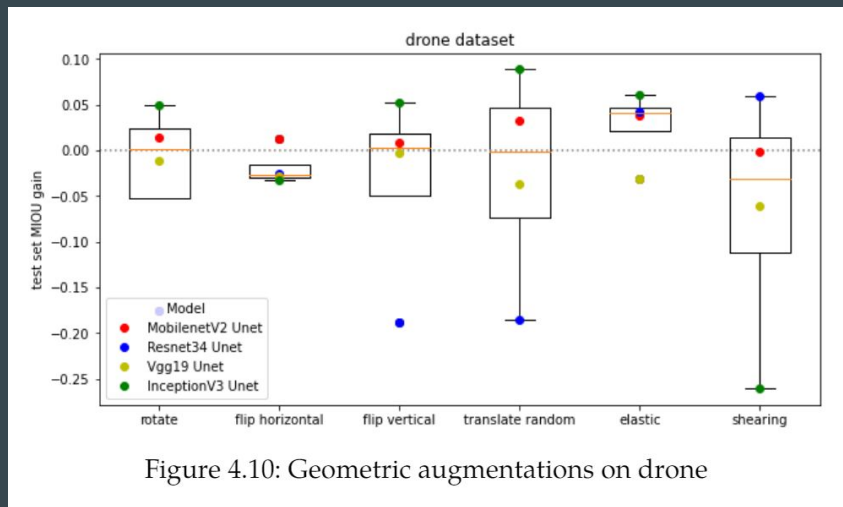
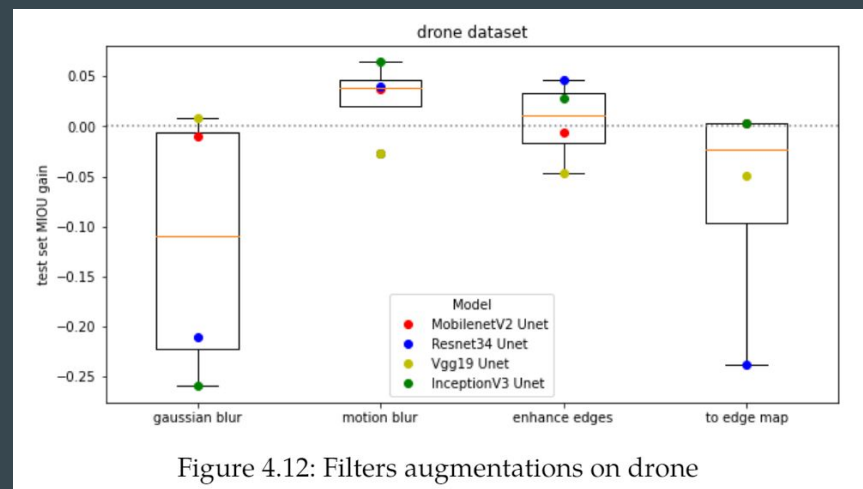
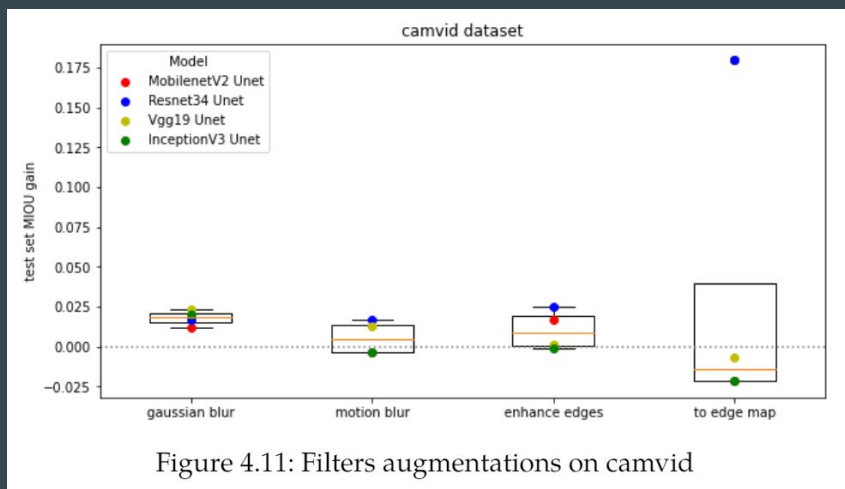
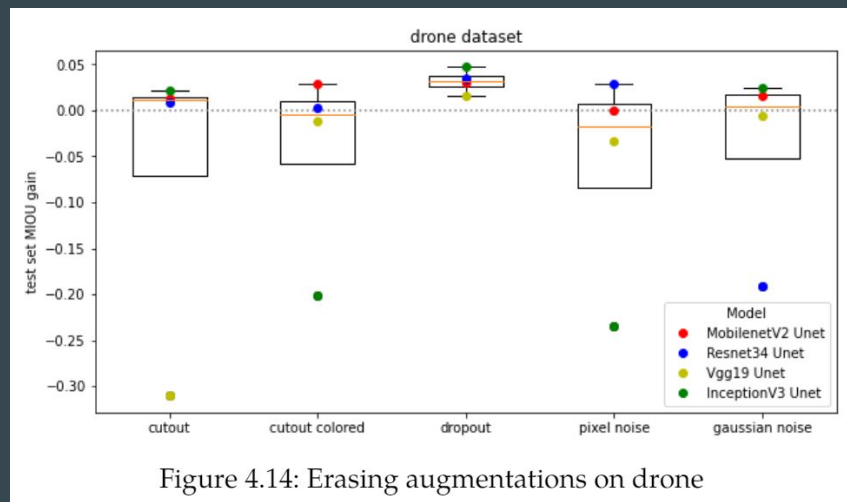
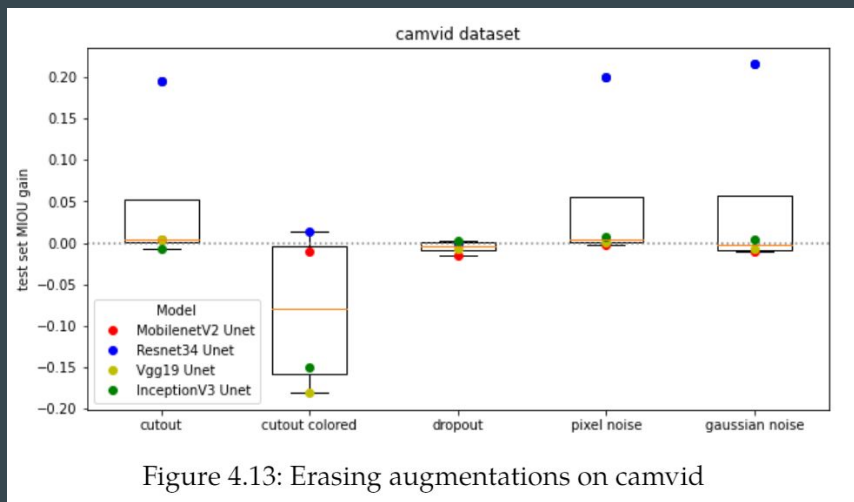


Figure 4.10: Geometric augmentations on drone

Filters



Erasing



Color space

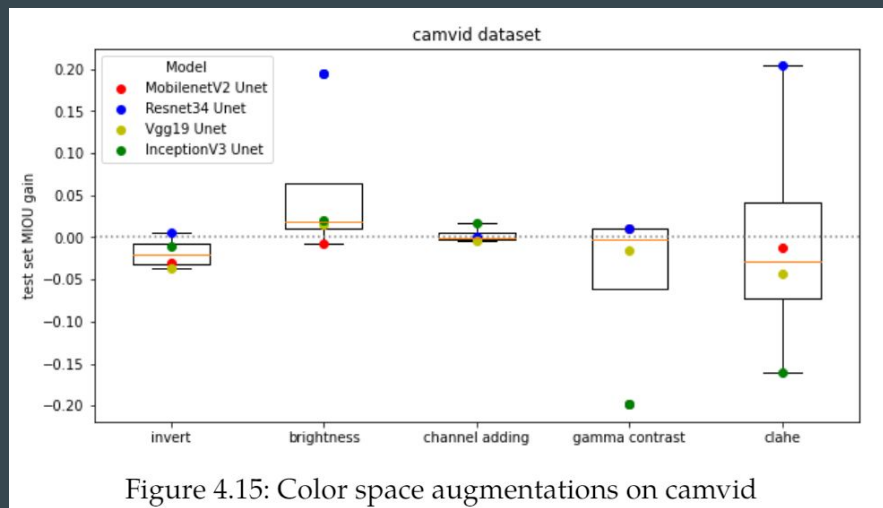


Figure 4.15: Color space augmentations on camvid

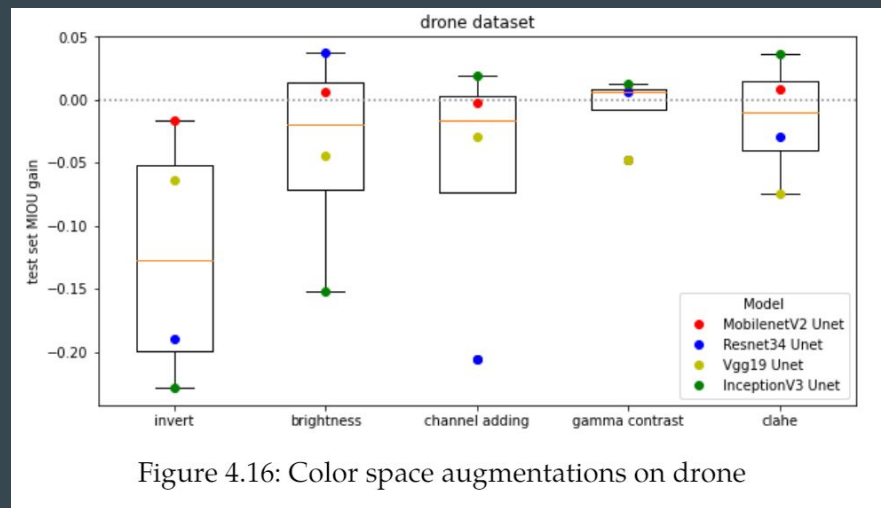
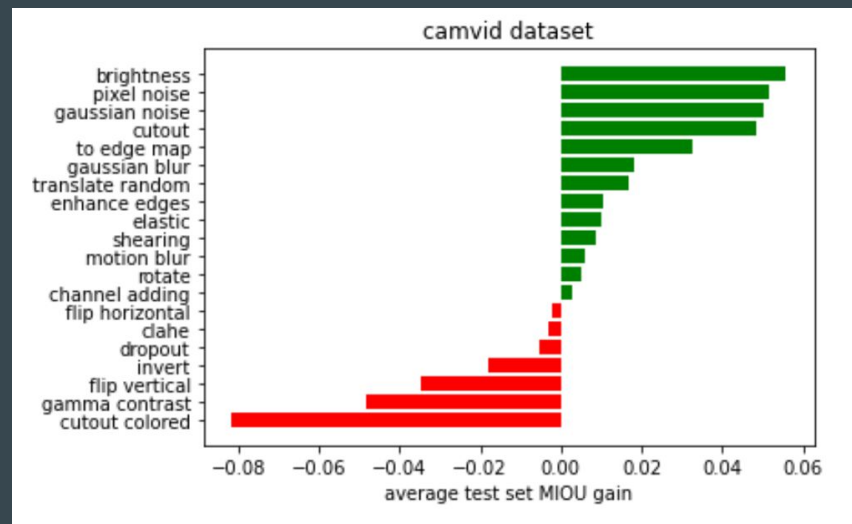
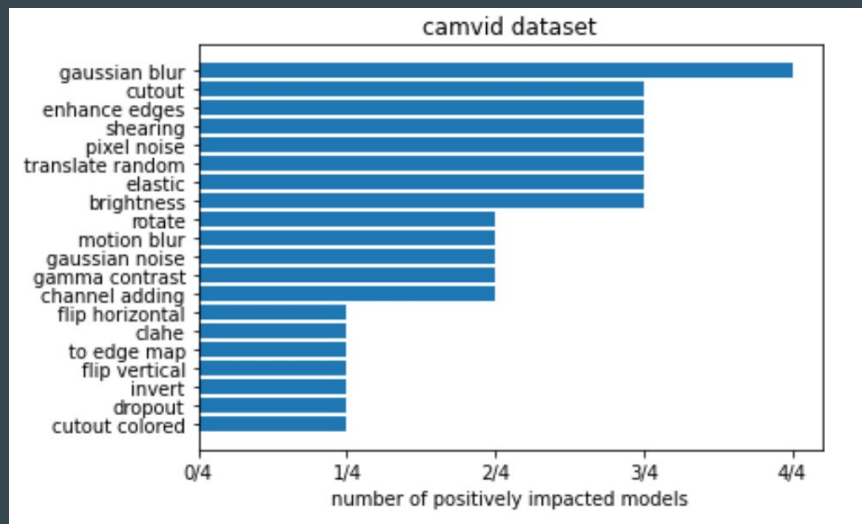
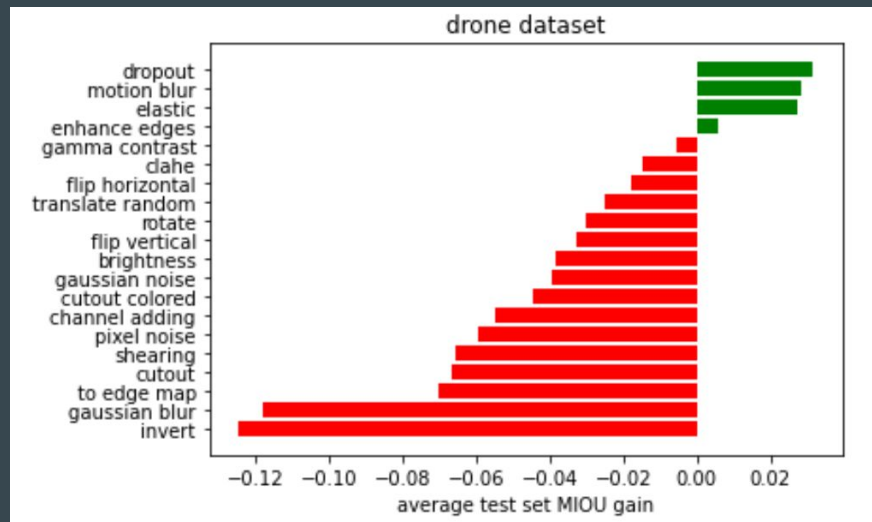
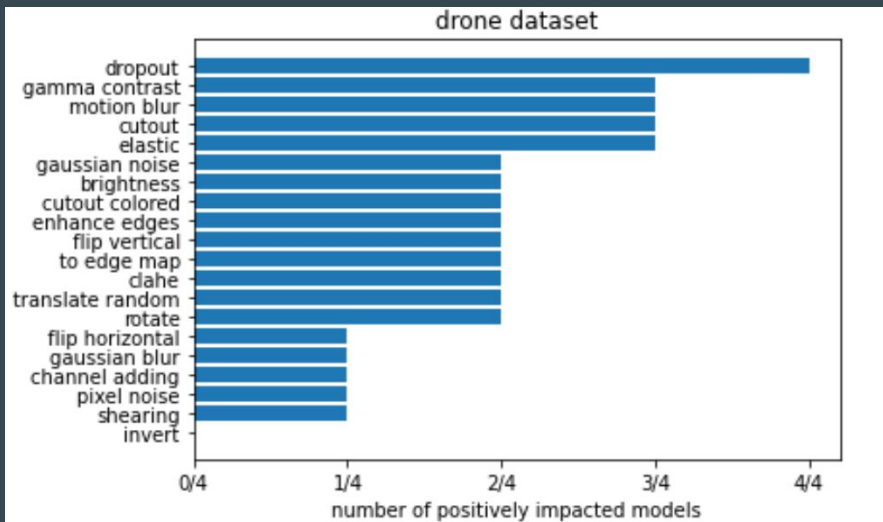


Figure 4.16: Color space augmentations on drone

Camvid dataset



Drone dataset



Conclusions

Some reasonable improvements (Motion blur, elastic, enhance edges...)

Big variance

More Models/Datasets?

Finish

