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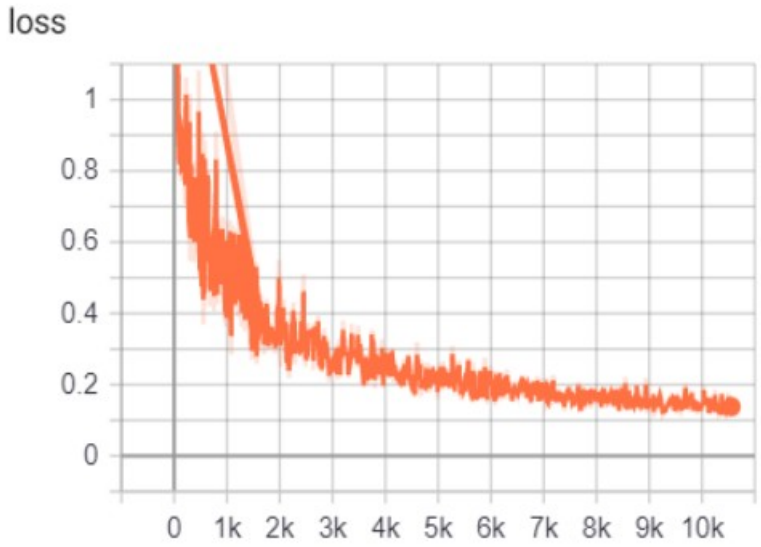
Report DLCV Homework 2

Problem 1

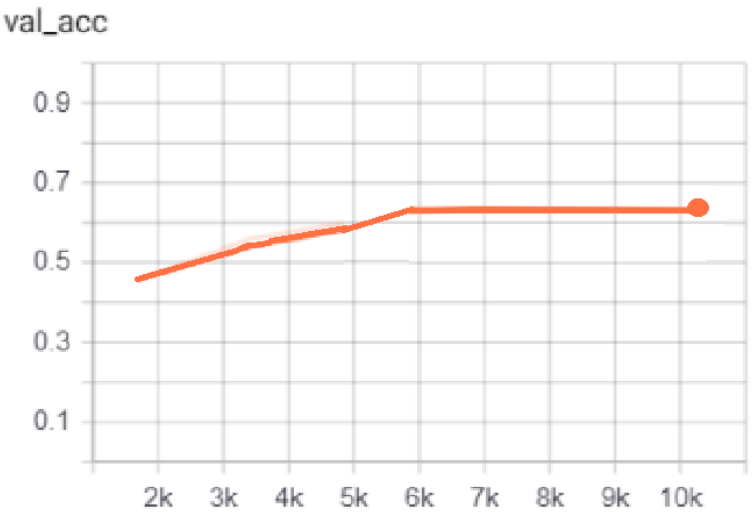
1. Baseline model

1.1. I only normalized the data with MEAN = [0.485, 0.456, 0.406] and STD = [0.229, 0.224, 0.225].

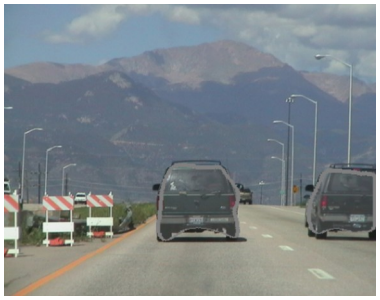
1.2. Training loss versus number of training iterations



IoU score on validation set versus number of training iterations



1.3.Visualization of one semantic segmentation result for each class

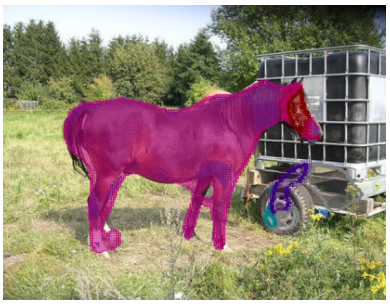

Class 0: background


Class 1: person


Class 2: aeroplane


Class 3: bus


Class 4: Monitor


Class 5: horse


Class 6: dog


Class 7: cat


Class 8: car

1.4.

Validation mIoU score of the baseline model: 0.6270
Validation per-class IoU score of the baseline model:

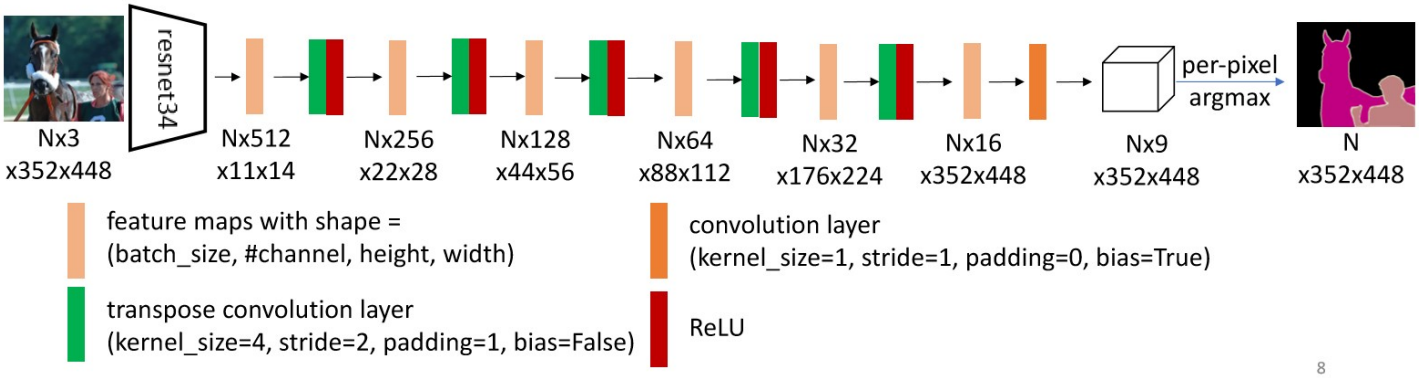
class #0 : 0.89724 class #1 : 0.74072 class #2 : 0.64078 class #3 : 0.72161
class #4 : 0.36778 class #5 : 0.42074 class #6 : 0.56239 class #7 : 0.69957
class #8 : 0.59262

The TV-monitor class has the lowest IoU score. It may be because it is the hardest object to differentiate from its surrounding since there often is another image pictured in the monitor.

The background class has the highest IoU score, maybe because it is the largest « object » in each image thus the model can learn more about it than for other classes. Moreover the model has a lot of data to learn from since every picture has a background.

2. Improved model

2.1 The model architecture of my improved model is as follows:



I simply changed resnet18 for resnet34.

2.2

Resnet34 has 34 layers in the network. It is therefore a larger network than resnet18 and a larger network can model more complex problems.

2.3

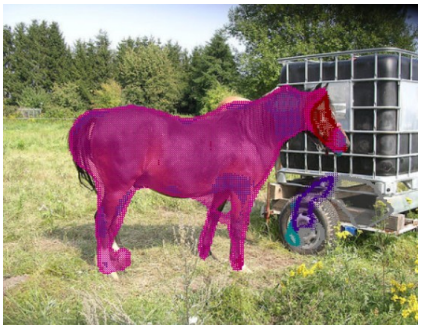
Validation mIoU score of the improved model: 0,6596

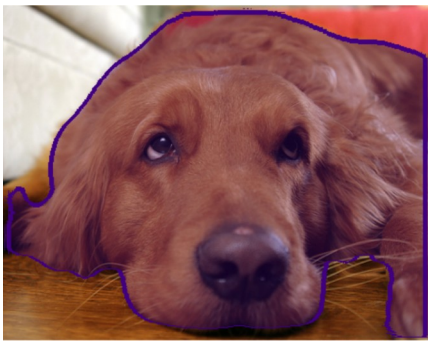
Segmentation of the baseline model:

Segmentation of the improved model:





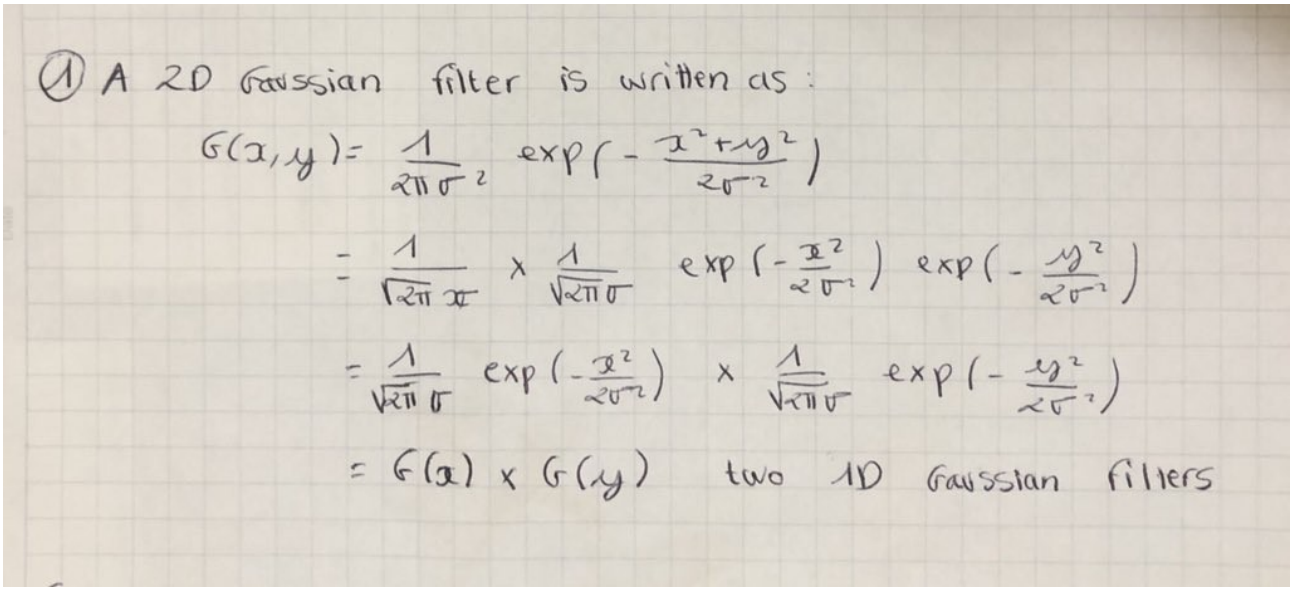




Problem 2

1.



2.

The Gaussian filter is blurring the image : it reduces the image noise and reduces details which smoothes the image.

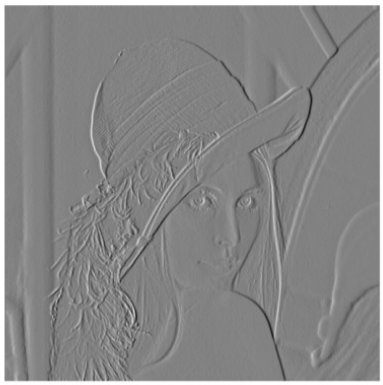
Input image

Output image

3.

$k_x=[-1/2,\ 0,\ 1/2]$ and $k_y=[-1/2,\ 0,\ 1/2]^T$

I_x output



I_y output

4.

The Gaussian filter removed noise from the image thus it has less detail and contrast than the original image when visualising the gradient magnitude.

Original image

Gaussian filtered image

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