

U-Net for Semantic Segmentation

About Me

- I am the M1 fresh student in Nakano Lab
- I graduated from University of Waterloo Mechanical Engineering
- I am very interested in computer vision, autonomous driving car, investment and entrepreneurship
- If you are from Komaba campus, I would love to join and appreciate that if you want to have someone together for lunch or dinner

Pixel level classification

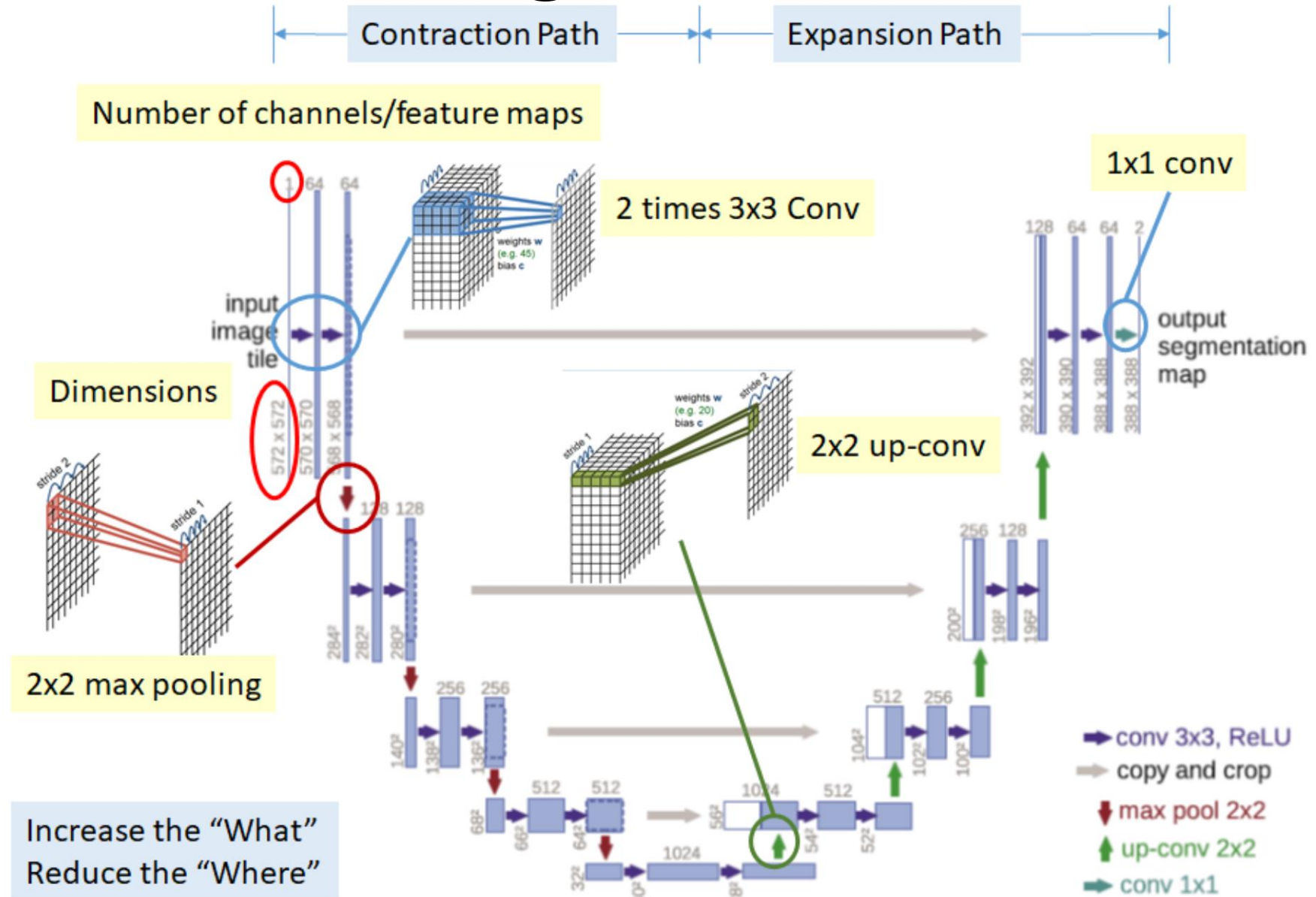
- In biomedical images, classification and pixel level labeling of the cells from microscope images are extremely important
- In autonomous driving
 - Pixel level labeling of the driving road area and precise classification of the current driving line is a must
 - Bounding boxes around objects such as near cars may not be safe enough to inform the car that how close the cars are
- From satellite images, people would like to see the precise multi classification to analyze afforestation and urbanization

U-Net for Semantic Segmentation

U-Net is mainly consisted of 3*3 convolution, 2*2 max pooling, 2*2 up-convolution

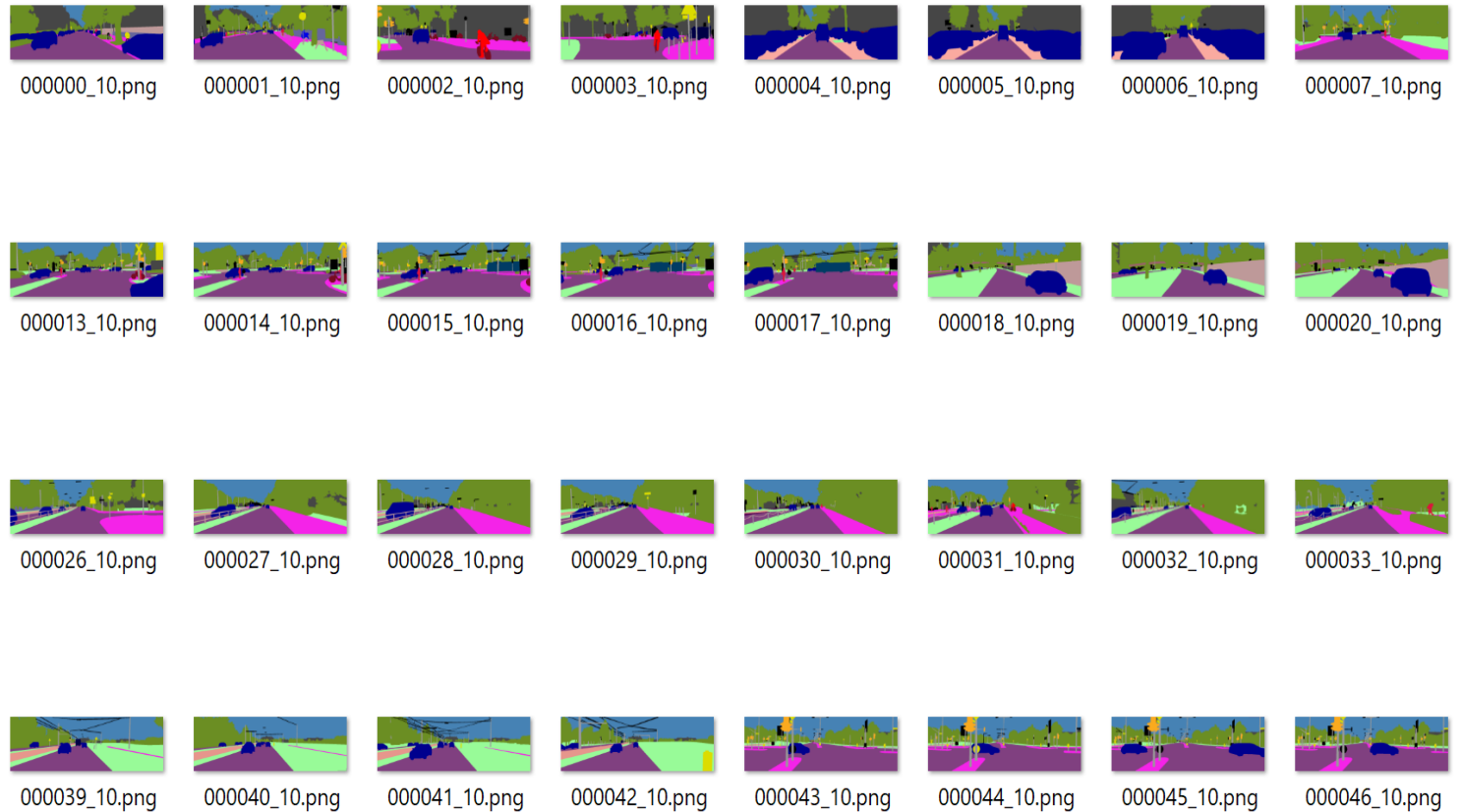
Two main paths for U-Net are:

- Contraction path - feature extraction, classification
- Expansion path – increase to high resolution segmentation map, combine the localization information with the feature information

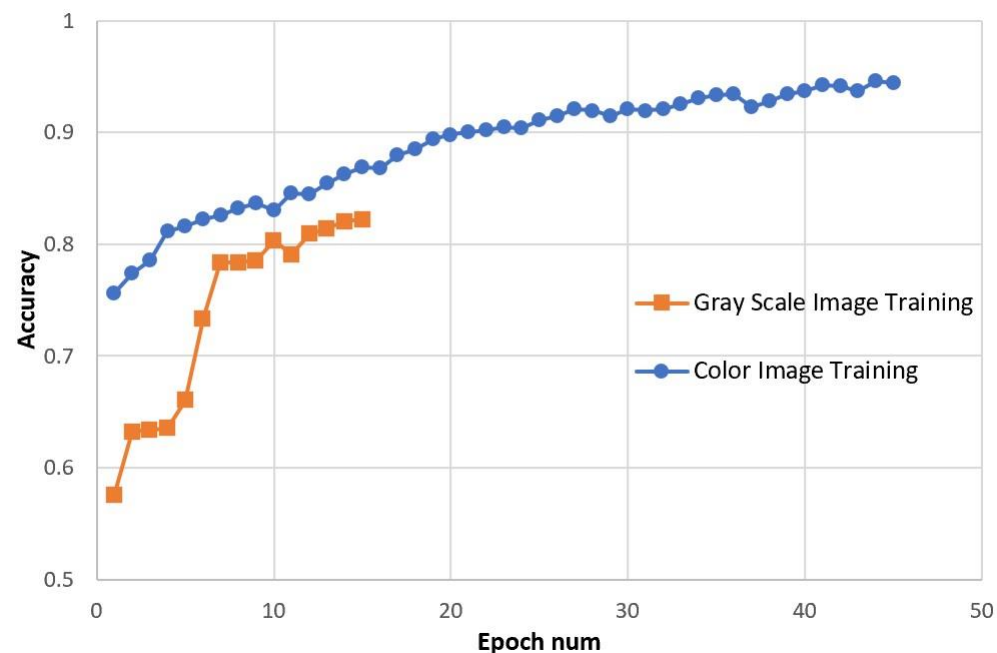
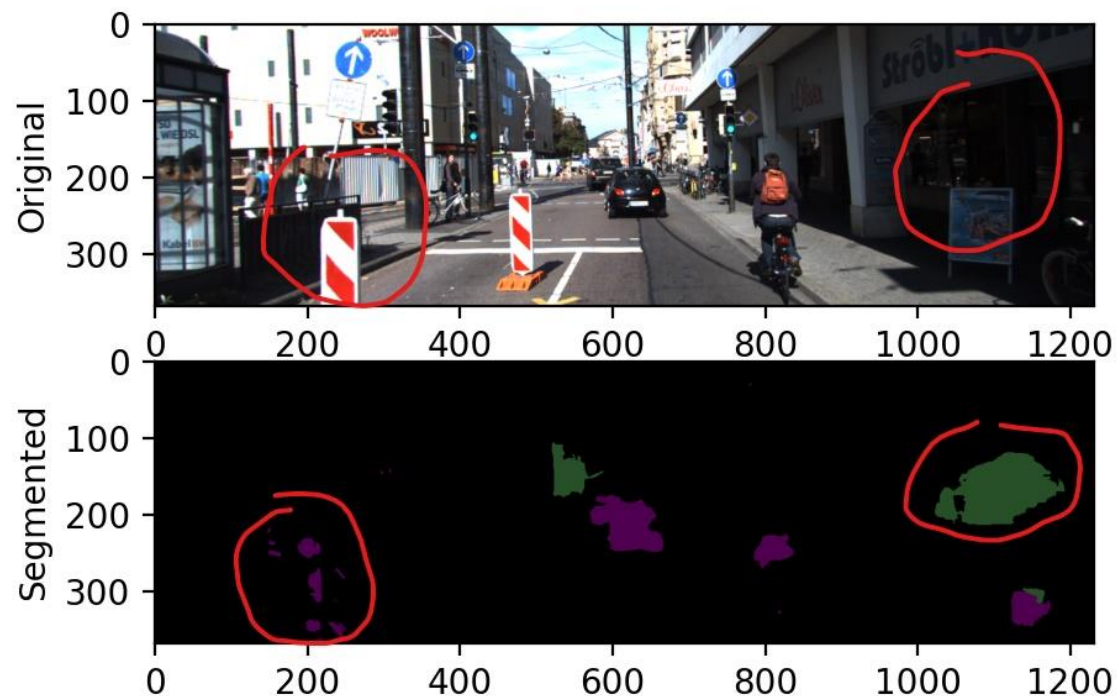
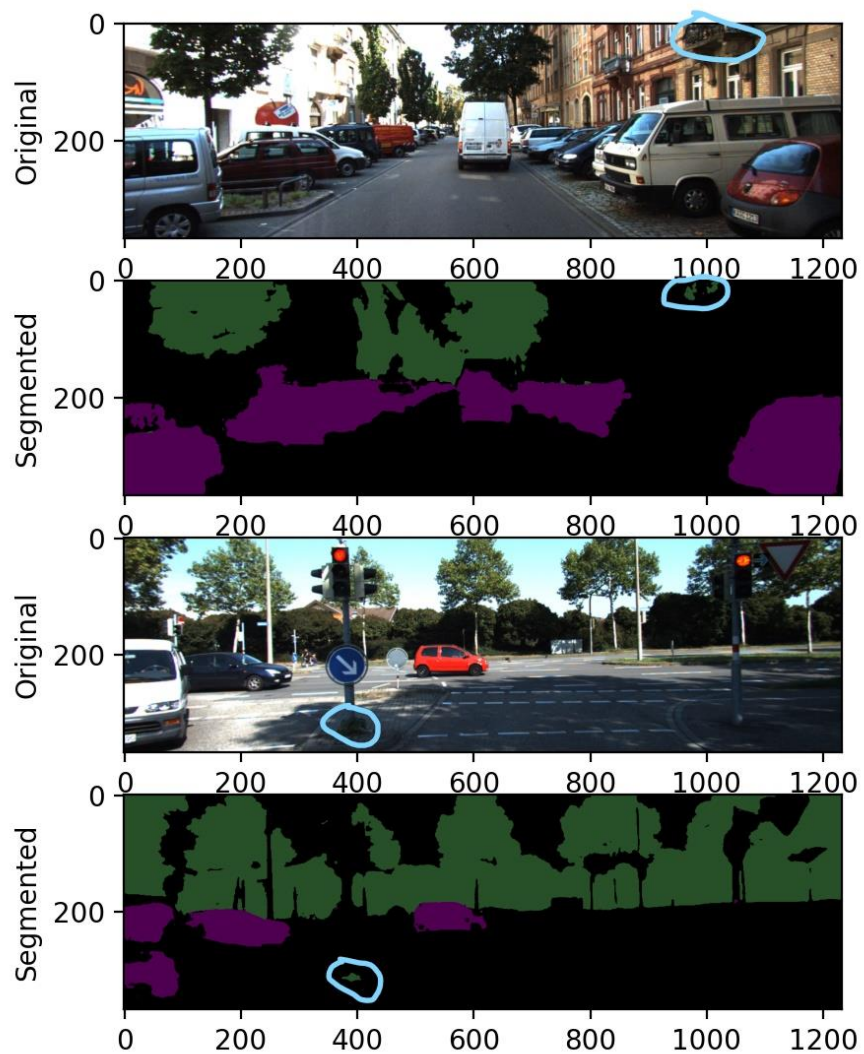


Multi-Semantic Segmentation on KITTI Dataset

- 4 out of 33 labels are chosen for training, which are car, plants, human, and else
- Smaller U-Net structure
- But with image size 368*1232
- Very limited computational power trained by CPU with only 45 epochs 155 images for over 8 hrs



Examples of result



Potential Pull Requests

- Modify the loss function such that small objects such as human can be identified during testing
- I would love to see how to write this in Pytorch since I am still learning
- I would appreciate to see how to train the network with CUDA, I tried hundreds time to make my laptop compatible with CUDA but I failed
- Include more types of object for semantic segmentation
- Change the U-Net structure with different backbone such as ResNet