

Weekly Report

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2018.3.25

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What I have done this week

What I plan to do next week

Solve the memory lacking problem for the network structure

Begin the training of GAN

What I have done this week

This week, I mainly focus on the experiment including how to train a net to implement the semantic segmentation for **Lung Nodule Cube**, how to do data augmentation and how to choose the proportion of augmented dataset : raw dataset. I also try many different net structures since the net work I propose last week is not strong enough and the result is not good.

The target last week is to extend the adversarial net into lung nodule segmentation task. I build the train system and the system can work normally. However, the result of the semantic segmentation net is not so good, and the test VoE of the validation dataset can't reach a good result. I think I should train a net which can do semantic segmentation perfectly first, and then we can test if the adversarial strategy can improve the performance of it.

In short, this week I mainly learn the tricks about how to train a network and slight turn the structures of the network. I also finish a module about doing data augmentation for 3D and 2D images including rotating, flipping and affine transformation.

I have find a good structure which can make the semantic segmentation result achieve 0.75 Test VoE, and it can reach about 0.5 Test VoE(which means can draw a good outline of lung nodule) in 30 minutes.

Firstly, I read 4 articles about the **deep adversarial network** and the **state-of-art semantic segmentation jobs**, and they are:

1. Paper[1] describe a method to use the unannotated data and deep adversarial net to improve the performance of semantic segmentation network.
2. Paper[2] is the paper from which paper[1] mainly gets inspirations. Paper[2] proposes a method to use deep adversarial net to criticize segmentation network by evaluate the similarity between ground

truth and segment prediction. It also explains why the adversarial strategy succeeds here(because the traditional semantic segmentation network predict label by per pixel, which lack the consistency in continuity.)

3. Paper[3],[4] proposes a new convolution structure called dilation convolution, and uses it to build a more efficient and precise semantic segmentation network.

Then, I implement the deep adversarial net on my lung nodule dataset. The main problem is choosing a suitable network structure when extend the ideal to 3D dataset. I use the dense block and redesign a network for adversarial net, choose the recommended parameters in paper and train two network. The criticism from adversarial net quite improve the segment network's performance, but the improvement is not very high. I decides to try various combinations of hyper-parameter and see if the strategy works on 3D dataset.

What I plan to do next week

Solve the memory lacking problem for the network structure

I find it is useful to extend the growth rate of the dense net, which can improve the result of semantic segmentation remarkably. However, the consumption of memory for a GPU is $O(n^2)$, n is the number of growth rate. so it is difficult to add more growth rate for densenet structure, and next week I will try to solve this problem.

Begin the training of GAN

I will begin the training of GAN and the cluster method I proposed last week.