

The Conclusion of Discussion

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Outline

- Suggestive Annotation with Active Learning
- Leverage Instance-level Groundtruth to Pixel-level Information with Deep CB-Net
- Topics and Possible Directions from Two-above Articles

Suggestive Annotation with Active Learning

The article "Suggestive Annotation: A Deep Active Learning Framework for Biomedical Image Segmentation" proposes a strategy to manage the problem: How to reduce the annotation cost.

The strategy is to combine FCN and active learning to make judicious suggestions on the most effective samples for annotating. To be more specifically, I will list the 3 main steps:

- Design a FCN structure to segment the image. The structure should make the net extremely easy and fast to train.
- Use Variance to measure the image's uncertainty, which indicates the value for annotation. The way to calculate Variance is bootstrapping.
- Use FCN to output a 1024-dimensions vector containing high-level abstract features which can measure the similarity between 2 pictures.

Leverage Instance-level Groundtruth to Pixel-level Information with Deep CB-Net

The article "Neuron Segmentation Using Deep Complete Bipartite Networks" proposes a new Complete Bipartite Networks for neuron segmentation, and also manage the problem "What can we do when even human experts can't annotate the data precisely".

The CB-Net uses the structure of complete bipartite graphs to create a more efficient segmentation net, comparing with U-Net. Different scales of feature can be efficiently reused in different decoder part, which leads to 70% fewer learnable parameters than U-Net.

Also, the article proposes the concept of "fuzzy boundary" to leveraging approximate instance-wise annotation into pixel-level information.

Topics and Possible Directions from Two-above Articles

- The suggestive annotation system from the first article inspire us to use it into the auxiliary annotation system for doctors. Lung-node detection,for example,with the ideal that using variance to measure the uncertainty, we can measure which CT-image should be annotated.The problem is how to build a CNN-structure for lung-node detection,which can be trained as fast as the FCN in the first article.
- The first article gives the result that we can achieve the state-of-the art result by using only 50% of the training data, but 50% is also a large number.Maybe we can improve the method and reduce the percentage to 30%.
- The deep CB-Net is an efficient net for image segmentation. Also in lung-node detection problem, the kaggle 2017 results show us that if the lung can be segmented precisely, the training result will be extremely improved. The CB-Net structure can be extened to the lung segmentation problem.

Topics and Possible Directions from Two-above Articles

- The method managing approximate instance-wise annotation can also be used into the auxiliary annotation system to reduce the annotation burden for doctors. The ideal condition is that the doctor approximately circle the pathological area, and our system automatically output a pixel-level ground truth.
- We notice that the ideals in two articles can be fused together, which means we can create a new system with the expert do approximate instance-wise annotation on the suggestive data/region. With these inputs we can also get the state-of-the-art result. The new system will reduce the annotation burden in both the quantity of annotation and the way of annotation.