Weekly Report

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1 The tasks I have finished this week

I found myself misunderstand the relationship between object detection and semantic segmentation, and it had been causing problems in my research. So I systematically study the knowledge bases and research frontiers of object detection this week.

I mainly focus on 5 important papers and list their key points as follow:

- Literature[1] proposes the framework of object detection with deep learning method(RCNN), and uses selective search technique[2] to reduce the number of RoI.
- Literature[3] improves the classification part of RCNN, optimizes the error back propagation way of the framework and proposes a calculation method to project the RoI on the feature map.This improved framework is called Fast R-CNN
- Literature[4] proposes a Region Proposal Net structure to replace the selective method.This framework is the most popular framework now and is called Faster R-CNN
- Literature[5]proposes an important change in loss function and completely solve the problem of imbalance in positive and negative samples.
- Literature[6] proposes a new structure based on Faster R-CNN and mainly focuses on the frontier problem:Instance Segmentation. This framework is called Mask R-CNN.

2 The tasks I plan to do next week

From the papers mentioned above, I find some relationship with our nodule detection task:

- Our nodule detection task is actually an instance segmentation task, and semantic segmentation structure such as liver segmentation isn't suitable for our task.I will specifically study the Mask R-CNN structure and do some practice next week.
- The research of 3D object detection and instance segmentation task in nature image field has little progress due to the immaturity of 3D photography technology. Literature[7] proposes a network to process the point set 3D data.However,it is common on medical image analysis. So if we can propose a 3D structure of Faster R-CNN or Mask R-CNN in medical image field, it will be valuable.

I will practice these ideals next week.

References

[1] Ross Girshick, Jeff Donahue, Trevor Darrell, and Jitendra Malik. Rich feature hierarchies for accurate object detection and semantic segmentation. In *Proceedings of the IEEE conference on computer vision and pattern recognition*, pages 580–587, 2014.

[2] Pedro F. Felzenszwalb and Daniel P. Huttenlocher. Efficient graph-based image segmenta-

tion. *International Journal of Computer Vision*, 59(2):167–181, 2004.

[3] Ross Girshick. Fast r-cnn. In *Proceedings of the IEEE international conference on computer vision*, pages 1440–1448, 2015.

[4] Shaoqing Ren, Kaiming He, Ross Girshick, and Jian Sun. Faster r-cnn: Towards real-time object detection with region proposal networks. In *Advances in neural information processing systems*, pages 91–99, 2015.

[5] Tsung-Yi Lin, Priya Goyal, Ross B. Girshick, Kaiming He, and Piotr Dollár. Focal loss for dense object detection. *CoRR*, abs/1708.02002, 2017.

[6] Kaiming He, Georgia Gkioxari, Piotr Dollár, and Ross Girshick. Mask r-cnn. *arXiv preprint arXiv:1703.06870*, 2017.

[7] Charles Ruizhongtai Qi, Hao Su, Kaichun Mo, and Leonidas J. Guibas. Pointnet: Deep learning on point sets for 3d classification and segmentation. *CoRR*, abs/1612.00593, 2016.