U-net

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The Unet network and training strategy brings forward a novel network and training strategy for convolutional neural networks. In essence, the architecture provided in U-Net consist of a max pooling phase (downsampling) and a up convolutional phase (upsampling). These sampling phases are split symmetrically, giving the network a U-like shape. The authors also introduce deformation stages to give the network learning invariance [2].

The key need for U-net was a network, for image processing, that was both fast to train as well as accurate. The goal to have systems capable of classifying biomedical images is of high importance, and having high accuracy is required. ISBI had released several challenges by the time the paper was published, band the authors beat all competitors for the 2015 cell tracking challenge (intersection over union of 0.9203 and 0.7756 for PhC-U373 and DIC-HeLa, respectively). Therefore, U-net fills a gap in image processing by providing an accurate and fast training strategy for convolutional neural networks [2].

One limitation of the U-net system, in my opinion, is the arbitrary sharing of information between the downsampling and up-sampling of the network. While this shows to yield great results, there is no information in the paper about how pruning this sharing of information affects the network. It would be both interesting and beneficial to see how perturbations to the U-net network impacts performance [2].

An interesting area of the paper, or general idea, is how mixing both course and fine grain details of an image can help improve the performance of the neural network. Considering image pre-processing was originally done by hand, I am interested in how the system is decoding the image. It must be gathering important features about the medical images, and gathering the information it is learning could be crucial to the biomedical industry [2].

The paper by Dubost et al. evaluated the performance of a neural network with a modified U-net architecture. The aim of the research was to make a predictive method for counting the number of lesions on the basal ganglia for MRI data. The neural network was trained using weak labels, only using one global label per image. Overall, the authors got an sensitivity of 62%, with 1.5 false positives per scan

[1].

References

[1] F Florian, G Gerda, Hieab Adams, A Arfan, Wiro Niessen, Meike Vernooij, and Marleen de Bruijne. Gp-unet: Lesion detection from weak labels with a 3d regression network. 2017.

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