Brief Description for MRBrainS18 - HUST-LRDE

Canpei Hu, Élodie Puybareau, Thierry Géraud, Yongchao Xu

September 12, 2018

Github : https://github.com/hucanpei/MRBrainS18

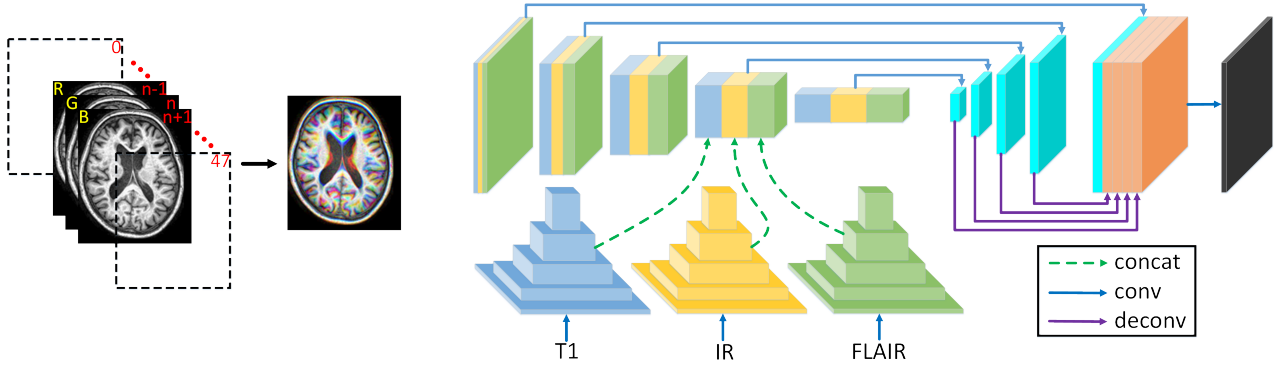Figure 1: pipeline

We use a HED-like [1] FCN structure with $3\times$ VGG16 as backbone, with carefully preprocessing. We use preprocessed T1,IR,FLAIR volumes.

Problems:

- The edge at the tissue boundary is not clear.

- Some small organizations are difficult to segment.

- There are many neighbors between different organizations.

Conclusions:

- Shallow network works much better than deep network.

- Transfer learning plays a big role.

- Multimodal image have great benefits for segmenting CSF and GM.

Preprocessing(shown in 2):

- histogram equalization(only for T1);

- stack 3 continue slices as a RGB image;

- rotate for $[0, \pm5, \pm10, \pm15]$ for data augmentation;

- crop to reduce background in image and ensure width and height can be devided by 16;

Pipeline: Following [2], which is a HED-like [1] structure. It is an simple and efficient decoder, which can handle little object better. Simply pass image in 3 modalities through 3 streams of VGG, and concat them in every stage, shown in 1.
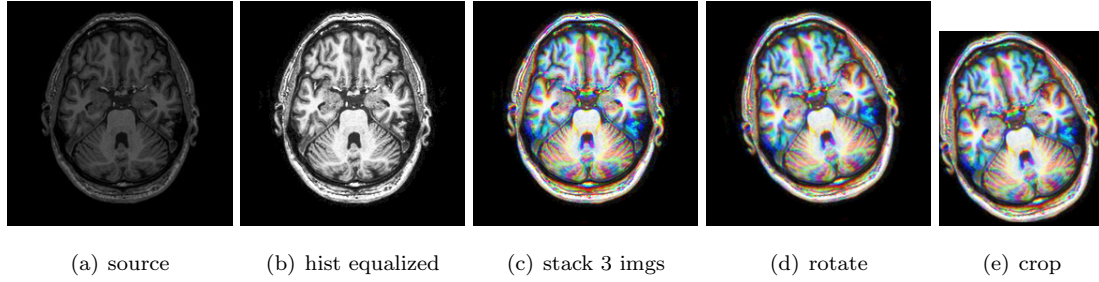

(a) source   (b) hist equalized   (c) stack 3 imgs   (d) rotate   (e) crop

Figure 2: preprocess

Parameters:

- Total number of iterations: 80k.

- $loss : CrossEntropy,\ optimizer : SGD$.

- $base\_lr : 10^{-3},\ lr\_decay : 0.1/4k$ iterations.

- $momentum : 0.99$.

- $weight\_decay : 0.0005$.

LOSO Results:

Dice	CSF	GM	WM
3*VGG16	**0.8247**	**0.8353**	**0.8663**
VGG16	0.8053	0.8203	0.8628
without transfer	0.7821	0.7995	0.8457
Resnet50	0.7808	0.7896	0.8179

References

[1] Saining Xie and Zhuowen Tu. Holistically-nested edge detection. In *IEEE International Conference on Computer Vision*, pages 3–18, 2016.

[2] Yongchao Xu, Thierry Géraud, Isabelle Bloch, and Télécom ParisTech LTCI. From neonatal to adult brain mr image segmentation in a few seconds using 3d-like fully convolutional network and transfer learning. In *Proceedings of the 23rd IEEE International Conference on Image Processing (ICIP), Beijing, China*, pages 4417–4421, 2017.