Master thesis

Multi-Modal Learning for Multi-Organ Segmentation

Project Description

One of the main limitations of convolutional neural networks is that their performance is mainly limited by the labeled data used for training the networks. This is a big challenge for medical image analysis. It is often difficult to acquire sufficient training data of a certain imaging modality. Moreover, the variations for each modality or across different modalities are large. Some anatomical structures of interest may be more visible in one one modality than the other one. Figure 1 shows some sample variations that may occur for one modality (CT)[1] [1].

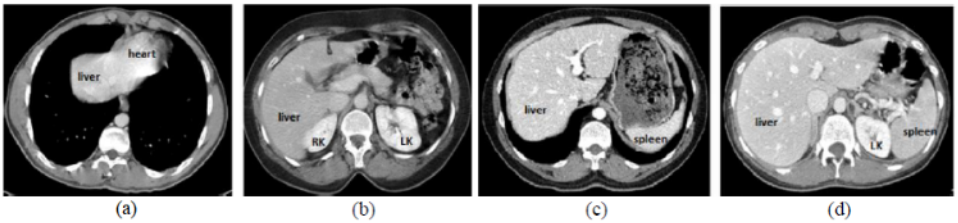

Figure 1: Example images from abdominal CT. Slices show (a) very low contrast difference and unclear boundary between the heart and the liver; (b) unclear boundary due to partial volume effects between the right kidney and the liver; (c) contrast enhanced vascular tissues inside the liver parenchyma; (e) relatively less enhanced vessels compared to (c)

In this project, we are interested to address these challenges by leveraging the information from multiple modalities to improve the segmentation accuracy on each individual modality. This also helps to have a unified segmentation architecture, which is robust against different types of variations that may appear in real applications.

Requirements

Image analysis, deep learning, Python programming skills

Contact

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References

[1] V. V. Valindria, N. Pawlowski, M. Rajchl, I. Lavdas, E. O. Aboagye, A. G. Rockall, D. Rueckert, and B. Glocker. Multi-modal learning from unpaired images: Application to multi-organ segmentation in CT and MRI. In *2018 IEEE Winter Conference on Applications of Computer Vision (WACV)*, pages 547–556, March 2018.

[1] Images taken from https://chaos.grand-challenge.org/Data/