OCELTO 2023 : Cell Detection from Cell-Tissue Interaction

Abstract

Cell detection in histology images is one of the most important tasks in computational pathology. According to [1], understanding tissue structures and individual cells can boost cell detection performance. Our team use original Mask R-CNN finish OCELOT 2023 challenge. Our team not preliminary results in the validation.

Introduction

Cell detection in histology images is one of the most important tasks in computational pathology. The OCELOT datasets provides overlapping cell and tissue annotations on images acquired from multiple organs stained with H&E. The training set contained 400 Cell images and 400 Tissue images with the size of 1024×1024 pixels, and each image was provided annotations, Cell annotation including the corresponding Tumor Cell (TC) and Background Cell (BC),Tissue annotation including Background and Cancer Area and Unknown(UNK).

Method

Our team introduced three pre-processing strategies with deep learning network Mask R-CNN for cell segmentation and classification. The first strategy is using two flipping ways (horizontal flip and vertical flip), three rotations (90°, 180°, 270°) and two gaussian blurred ways to increase the diversity of H&E images which is a common way of image augmentation. To increase the amount of training set, the training images were cropped into 512×512 with overlay on 7/8 regions. The third pre-processing strategy of our team used a H&E normalization method [2] as augmentation dataset, which calculating stain vectors of hematoxylin and eosin for signal separation. With the preprocessing, there were 550 images for training with 29884 annotated tumor cells and 16309 annotated Background cells, and 79 images for validation set with 7911 annotated tumor cells and 4184 annotated Background cells. The pre-trained weight of ImageNet ILSVRC 2012 dataset was used in the training processing. The size of input images was set to size 512x512. The SGD optimizer was used with learning rate 0.001. In this submission, our team used the original Mask R-CNN for cell recognition. This algorithm was implemented by using python 3.6.11 and Tensorflow 1.10.0 and Keras 2.2.4 on Linux with 1 NVIDIA GeForce GTX 1080 Ti GPU.

Reference

[1] J Ryu, A V Puche and JW Shin et al. OCELOT: Overlapped Cell on Tissue Dataset for Histopathology. CVPR 2023

[2] M.Macenko et al., “A method for normalizing histology slides for quantitative analysis,” in 2009 IEEE international symposium on biomedical imaging: from nano to macro, 2009, pp. 1107–1110.