Automatic biomedical image analysis and interpretation

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Résumé

Medical images are widely used for clinical diagnosis, treatment and research purposes, and play a key role in medical care. Interpretation of medical images requires special training and expertise. Digital pathology (DP), also known as computational pathology, is a branch of the medical field that uses digital image processing technology and computer science methods to conduct pathology research and clinical pathology diagnosis.
In the context of whole slide images (WSI), typically, in the range of thousands of pixels to billions of pixels, richer information related to the tumor micro-environment and immune micro-environment can be obtained. The challenges of digital pathology image analysis mainly come from the data volume of WSI, the heterogeneity of histology and image appearance, the expensive cost of data annotation, and the need for model interpretability. Moreover, medical images involves patients' private information, which limits the acquisition of medical imaging samples.

Our research focuses on cell segmentation in multi-modality H&E stained microscopy images, and we have successfully targeted a challenge, NeurIPS22-CellSeg. The challenge is in weakly supervised task setting, which contains limited labeled patches and many unlabeled images. So far, we have successfully reproduced the best performing model in this challenge and tried to introduce self-supervised learning into the challenge task.
Our contributions are as follow: (1) we conducted a survey on self-supervised learning in biomedical images semantic segmentation; (2) we successfully reproduced the best performing model in the challenge; (3) we introduced self-supervised learning method and uncertainty estimation for potential performance gain.

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