Segmentation and Classification in Digital Pathology for Glioma Research: Challenges and Deep Learning Approaches

Imaging in medicine is a crucial resource for knowledge in the study of cancer.

Cancer morphological characteristics at its inception, during its course, and in response to treatment offer additional insights to those gained from genetics and

clinical evidence Extraction and classification of visible and latent picture features with accuracy is becoming a more difficult challenge as a result of the complexity and resolution of biomedical picture data rising. The Computational Precision Medicine (CPM) satellite event of the 21st International Medical Image Computing and Computer Assisted Intervention (MICCAI 2018) conference featured four deep learning-based image analysis approaches, which we demonstrate in this work. A segmentation technique is one way to separate the nuclei in whole slide tissue imaging (WSIs) of cases of adult diffuse glioma.

It obtained a Dice similarity coefficient of 0.868 using the datasets from the CPM challenge. To classify adult diffuse glioma patients into oligodendroglioma and astrocytoma classes using radiographic and histologic imaging data, three approaches have been devised. Using the challenge datasets, these techniques attained accuracy scores of 0.75, 0.80, and 0.90, calculated as the proportion of correctly classified instances to all cases. According to the analyses of the four techniques, (1) carefully designed deep learning algorithms can produce high accuracy in the analysis of biomedical image data, and (2) combining radiographic and histologic image information enhances classification performance.

Over the past ten years, biomedical imaging has achieved significant advancements in picture resolution and image capture rates. For many years, radiology has been widely used in both scientific and therapeutic contexts. Researchers are now able to collect larger amounts of more precise radiological data thanks to new imaging technology. Almost 20 years ago, digital microscope scanners were cutting-edge technology. They took many hours to scan a tissue samples at levels of moderate magnification and required continual attention to capture crisp photographs of tissue. Today, it is possible to automatically photograph hundreds of slide tissues in a few minutes.

Researchers are now able to collect more comprehensive morphological data at previously unheard-of resolutions thanks to new scanning technologies and tissue staining techniques. We believe that the FDA will approve WSIs as a main diagnosis in 2017.