

Malignancy Assessment of Brain Tumors Using Convolutional Neural Network

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Abstract : The central nervous system in the World Health Organization defines grade 2, 3, 4 gliomas according to the aggressiveness. For brain tumors, using image examination would have a lower risk than biopsy. Besides, it is a challenge to extract relevant tissues from biopsy operation. Observing the whole tumor structure and composition can provide a more objective assessment. This study further proposed a computer-aided diagnosis (CAD) system based on a convolutional neural network to quantitatively evaluate a tumor's malignancy from brain magnetic resonance imaging. A total of 30 grade 2, 43 grade 3, and 57 grade 4 gliomas were collected in the experiment. Transferred parameters from AlexNet were fine-tuned to classify the target brain tumors and achieved an accuracy of 98% and an area under the receiver operating characteristics curve (Az) of 0.99. Without pre-trained features, only 61% of accuracy was obtained. The proposed convolutional neural network can accurately and efficiently classify grade 2, 3, and 4 gliomas. The promising accuracy can provide diagnostic suggestions to radiologists in the clinic.

Keywords : convolutional neural network, computer-aided diagnosis, glioblastoma, magnetic resonance imaging

Conference Title : ICIET 2019 : International Conference on Imaging Engineering and Technology

Conference Location : Tokyo, Japan

Conference Dates : June 10-11, 2019