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Brain Tumor Classification Using Deep Learning Methods

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Abstract

Background: A World Health Organization (WHO) February 2018 report recently has shown that the rate of deaths because of brain or central nervous system (CNS) cancer has the highest rate in the Asian continent. Timely and accurate diagnosis of brain tumor is crucial where small errors pose many risks to treatment. Classifying the types of tumors is an important factor in targeted treatment. Since tumor diagnosis is highly invasive, time-consuming, and costly, there is an urgent need for a precise tool to develop a non-invasive, cost-effective, and efficient tool for brain tumor description and grade estimation. Brain scans by using magnetic resonance imaging (MRI), computed tomography (CT), and other imaging techniques are fast and safe to detect tumors.

Methods: In this paper, we used a standard dataset containing 3064 images from different skull views. The size and position of tumors at different angles make it difficult to detect the tumor in the specimens. This MRI dataset consisted of 3064 slices and 1047 coronal images. Coronal images were recorded from behind. Axial images taken from above included 990 images. Also, there were 1027 sagittal images extracted from the skull side. Images in this dataset belonged to 233 patients. The dataset consisted of 708 Meningioma, 1426 Glioma, and 930 Pituitary tumors; thus, we isolated images from different angles of sagittal, coronal, and axial images and then trained them in different categories by using Inception-V3 and Resent, which are deep learning classification methods to make this process more accurate and faster.

Results: Finally, by adjusting the hyper-parameters of each of these methods with performing pre- processing and weighting combinations, we obtained an acceptable evaluation compared to previous methods.

Keywords: Deep/Machine Learning; Medical Imaging; Classification; Brain Tumor; MRI

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Mobile Devices for Viewing Medical Images: A Review of the Literature

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Abstract

Background: The use of portable computing devices, in particular smartphones, is growing rapidly in healthcare. Several studies have reported that physicians can use tablet computers and smartphones for viewing medical images, but it is not clear to what extent and under which circumstances this approach is acceptable.

Objectives: The purpose of this study was to summarize the current evidence on the use of mobile computing devices (tablet computers, smartphones, and personal digital assistants) in viewing medical images.

Methods: We systematically searched PubMed, Scopus, and Web of Science for original studies that reported the use of any kind of portable computing devices, including tablet computers, smartphones, and personal digital assistants, for viewing radiologic examinations and other medical images. The keywords included mobile phone, m-health, radiology, tele-radiology, radiography, smartphone PACS, and PACS viewer. The electronic search was limited to papers in the English language and the publication date of 2008 onward. After removing duplicates and screening of 327 unique records at the title/Abstract level, the full texts of 137 potentially relevant papers were retrieved and checked against inclusion criteria. Finally, 37 papers were included in this study and reviewed.

Results: Both smartphones and tablet computers have been used by radiologists and physicians with other specialties including surgeons, or-