

Chapter 6

CNN–Based Approach for Brain Tumor Detection and Severity Prediction

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ABSTRACT

Artificial intelligence is widely used in healthcare, especially in medical imaging. It leads to advanced diagnosis using innovative approaches to analyze complex data more accurately and provide personalized treatments. This helps the clinicians efficiently analyze the imaging data, leading to early detection of diseases like brain tumors, cancer, cardiovascular diseases, etc. The research work focuses on the detection and severity prediction of brain tumors. Magnetic resonance imaging (MRI) scan images are preprocessed in the proposed model using different methods. The convolutional neural network model (CNN) is used to detect and predict brain tumors and can be used in personalized treatments. The proposed method has an

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accuracy of about 98% in classification and severity prediction.

INTRODUCTION

Timely and accurate detection of Brain Tumors is crucial for effective and personalized treatments for patients. Existing detection methods are based on manually predicting tumors through MRI images. These methods are time-consuming, and they are also prone to human errors, which in turn delay the early detection process. The best solution for these problems is to incorporate deep learning algorithms to predict the tumors better and identify their severity levels. The solutions proposed by integrating AI provide promising advancements in Healthcare, which mainly enhance accuracy and lead to better diagnosis of diseases. Hence, it can also be used in brain tumor detection and severity prediction.

There are many challenges in the manual interpretation of MRI images by different radiologists since different radiologists may predict other results. The consequences of these misinterpretations may result in under-detection, in which a brain tumor may not be detected even if it is present, or it can also lead to over-detection, where a tumor is incorrectly detected even if it is not present. To address these issues, AI models can be used to predict better and detect severity.

The AI models can quickly and efficiently process a large amount of data (images) to detect brain tumors. It can process the MRI and CT scan images and identify the abnormalities more efficiently than humans may have overlooked. Its capability to identify patterns and minute details, which may be missed by human interpretation, leads to better prediction. By integrating these AI models, radiologists can accurately predict brain tumors.

On the other hand, it can also identify the severity levels depending on the brain tumors' size, position, and shape. This helps the professionals develop a better treatment approach for the patients, such as surgery, chemotherapy, radiation, etc. The models can also be trained continuously, and the results can be improved further. Many existing AI models are based on deep learning algorithms. Still, most models focus on brain tumor detection, whereas severity levels are not predicted.

Hence, this paper proposes an advanced brain tumor and severity prediction model. It uses the CNN model to automate the classification and severity levels detection process. This model proposes a prediction with better accuracy, which overcomes the drawbacks of the manual diagnosis process. This helps identify a better treatment strategy for patients to achieve better outcomes. It can also help in personalized treatments depending on the clinical data. Therefore, this work provides a valuable and impactful contribution to the advancements in the healthcare field.

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