Chapter 7
Brain Tumor Detection From MRI Images Using Deep Learning Techniques

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ABSTRACT

Machine learning and deep learning algorithms are utilized to identify brain tumors in a number of research papers. When these algorithms are applied to MRI images, it takes exceedingly slight time to expect a brain tumor, and the increased accuracy makes it easier to treat patients. The performance of the hybrid Convolution Neural Network (CNN) used in the proposed work to detect the existence of brain tumours is examined. In this study, we suggested a hybrid convolutional neural network followed by deep learning techniques using 2D magnetic resonance brain pictures, segment brain tumors (MRI). In our research, hybrid CNN achieved an accuracy of 98.73%, outperforming the results so far.

INTRODUCTION

The brain is a pivotal component of the human body, overseeing the operation of all other organs and enabling decision-making. (Abd El Kader et al., 2021). The research done in this publication detects whether the brain is healthy or injured by using deep learning techniques. In this work, hybrid CNN was used to classify brain tumors and normal brains (Muhammad, 2018). Artificial neural networks (ANNs) emulate the functioning of the human nervous system through an extensive network of connections. They learn from training data using simple processing units and retain acquired knowledge. To generate the intended output, a model is trained by employing an activation function on input features and hidden layers. Medical imaging in CNNs (convolutional neural networks) encompasses various non-invasive methods for internal body examination (Abd El Kader et al., 2021). Its primary application in the human body is for therapeutic and diagnostic purposes, significantly influencing the effectiveness of treatments and overall health outcomes. The effectiveness of image processing at an advanced level hinges on the

DOI: 10.4018/979-8-3693-2964-1.ch007

crucial process of picture segmentation (Gokila, 2021). In this context, our primary focus has been on isolating brain tumors from MRI scans. This aids medical professionals in pinpointing the exact location of the tumor within the brain. The model we've introduced yielded an impressive accuracy of 98.73%, surpassing the current state-of-the-art results.

LITERATURE REVIEW

According to Isselmou Abd El Kader (2021), deep wavelet auto-encoder model has the capacity to detect and categorise the tumour with high accuracy, quick turnaround, and little loss validation by analysing the pixel pattern of an MR brain picture. In order to detect the presence of brain tumours, P Gokila Brindha (2021) suggested a self-defined Artificial Neural Network (ANN) and Convolution Neural Network (CNN), and their effectiveness is evaluated. Using a convolutional neural network, Arkapravo Chattopadhyay (2022) devised an approach to segment brain tumours from 2D MRI images of the brain. proposed technique using "Python" and "TensorFlow" with "Keras". An innovative method for detecting brain tumours is proposed by Hareem Kibriya (2023) using a collection of deep and manually built feature vectors (FV). The distinctive FV combines sophisticated VGG16-based features with manually produced GLCM-based features. (grey level co-occurrence matrix). Using brain magnetic resonance imaging (MRI), Debnath Bhattacharyya (2011) proposes an image segmentation technique to identify or detect tumours. a series of image segmentation algorithms that produce excellent results when applied to images of brain tumours are proposed. (2020) Md. Ariful Islam For organising input-output data, a graphical user interface has been employed, and an algorithm has been created.

METHODOLOGY

To further validate our work, we used SVM classifier and additional activation algorithms. The following steps are taken in order to apply CNN to the brain tumour dataset:

1. Import the necessary packages
2. Secondly, import the data folder (Yes/No)
3. Assign photos a class label (1 for brain tumour, 0 for no brain tumour).
4. Create 256x256-pixel shapes out of the photos.
5. Make the Image Normal
6. Separate the photos into the test, train, and validation sets.
7. Build the chronological model.
8. Put the model together.
9. Use the train dataset as an example.
10. Use the test photos to evaluate the model.
11. Draw a graph comparing the accuracy during training and validation.
12. Create a confusion matrix comparing actual and expected output.

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