Chapter 4
Towards Design of Brain Tumor Detection Framework Using Deep Transfer Learning Techniques

Prince Rajak
National Institute of Technology, Raipur, India

Anjali Sagar Jangde
National Institute of Technology, Raipur, India

Govind P. Gupta
https://orcid.org/0000-0002-0456-1572
National Institute of Technology, Raipur, India

ABSTRACT

Brain tumor has surpassed all other types of cancers as it is the most diagnosed malignancy worldwide, and it is also the leading cause of death. Early detection and diagnosis of a brain tumor allow doctors to give better therapy and a higher chance for the patient's life. Recently, many strategies that leverage machine learning and deep learning models for detection and categorization have been presented. This chapter focuses on the design of a novel brain tumor detection and classification framework using well-known deep transfer learning models such as DenseNet201, DenseNet169, DenseNet121, MobileNet_v2, VGG19, VGG16, and Xception. Performance evaluation of the proposed framework is evaluated using a benchmark dataset in terms of accuracy and loss. It is observed that with DenseNet201, a training accuracy of 97.49% and a validation accuracy of 96.43% are observed. However, for MobileNet v2, Densenet169, and Xception model, 96% accuracy is observed. As a result, it is observed that the DenseNet201 model outperformed all other models in terms of accuracy.

DOI: 10.4018/978-1-6684-5264-6.ch004

INTRODUCTION

Recently, Brain Tumor (BT) detection becomes a fundamental research challenge due to increase in cases worldwide and this problem has attracted researchers to find out AI-based detection tools for early diagnosis There are primary and secondary BT. In primary BT, a tumor grows in the brain, it can be described as 'high' and 'low' grade tumor. High grade tumor grows faster as compared to low grade whose growth is slower. The secondary BT are the tumor that grows in another part of body such as lung, breast, etc., and then spread through the brain, it is also called as metastatic. Figure 1. shows some of the types of BT and a healthy brain image. BT is the abnormal growth of cells in the brain. There are many methods that are used for detection of BT with high accuracy. The rise in artificial intelligence (AI) and machine learning (ML) field help in BT surgery. Brain surgery with AI is resulting safer and more efficient and precise. These methods are performing better in different field like early diagnosis of BT, surgery, optimizing the surgical plan, better prediction the prognosis and providing efficient support during the operation.

Early detection and identification of BT are crucial for the patient's efficient and prompt therapy. Our visual cortex's capacity to discern levels of MRI (Magnetic Resonance Imaging) images limits our ability to identify BT. So, the next technology, known as CAD (Computer-Aided Diagnosis), was invented to help radiologists detect different types of tumors and provide improved visualization capabilities. This technology automatically analyses photos and recognizes BT, as well as performs numerous operations such as segmentation, classification, and others that help doctors better comprehend and save their patients' lives, as well as researchers working in

Figure 1. Types of BT and No-tumor brain