BRAIN NEOPLASM IDENTIFICATION USING CNN WITH VGG-16 MODEL

Project Reference No.: *47S_BE_1622*

College ***:*** *New Horizon College of Engineering, Bangalore,*
Branch ***:*** *Department of* Computer Science and Engineering
Guide(S) ***:*** Ms. Soja Rani S., Dr. Nirmala M.
Student(S) ***:*** Ms. Shree Raksha C.
Mr. Sai Kumar Reddy J.
Mr. Solletihruday

Introduction:

A brain tumor ranks fourth in the United States for both men and women, but it is the tenth most common tumor in males and the ninth most common tumor in women. Within the single digits, brain tumors have a 5-year survival rate, making them the most common basic tumor. According to a recent analysis released by Brain Cancer Action, brain tumors are predicted to rank as the second most common cause of tumor deaths inside the United States by 2020.

Brain tumors present a formidable challenge to healthcare professionals, causing significant morbidity and mortality worldwide. Among the various methods used for their detection, manual interpretation of MRI images remains a common practice, despite its limitations in accuracy and efficiency. The critical role of the brain in regulating bodily functions underscores the urgency of developing more reliable and timely diagnostic approaches. To address this need, this study proposes an automated system that leverages advanced image processing techniques and TensorFlow algorithms for the detection and classification of brain tumors. By harnessing the power of Convolutional Neural Networks, the system aims to improve the accuracy and speed of diagnosis, potentially enabling earlier interventions and better treatment outcomes. This introduction provides an overview of the challenges associated with current diagnostic methods, the significance of early tumor detection, and the potential of automated systems to revolutionize brain tumor diagnosis and management. Through comprehensive evaluation and validation, this study seeks to demonstrate the efficacy and reliability of the proposed system in clinical practice.

Objectives:

The objective is to develop an automated system using TensorFlow algorithms for accurate brain tumor detection from MRI images, aiming to improve reliability and speed compared to manual methods. This system seeks to mitigate interpretation biases, reduce turnaround times, and enable earlier interventions, ultimately revolutionizing brain tumor diagnosis. Through comprehensive evaluation, the system's efficacy and reliability will be demonstrated across diverse patient populations and imaging conditions. Integration into clinical practice will enhance accessibility and usability for healthcare professionals, facilitating improved patient care and outcomes.

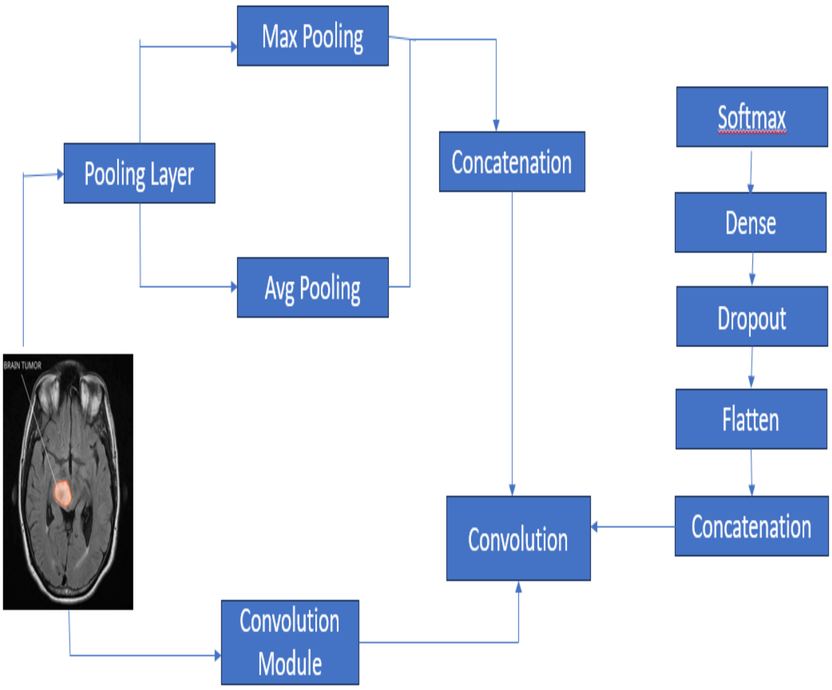
The primary objectives of this study include

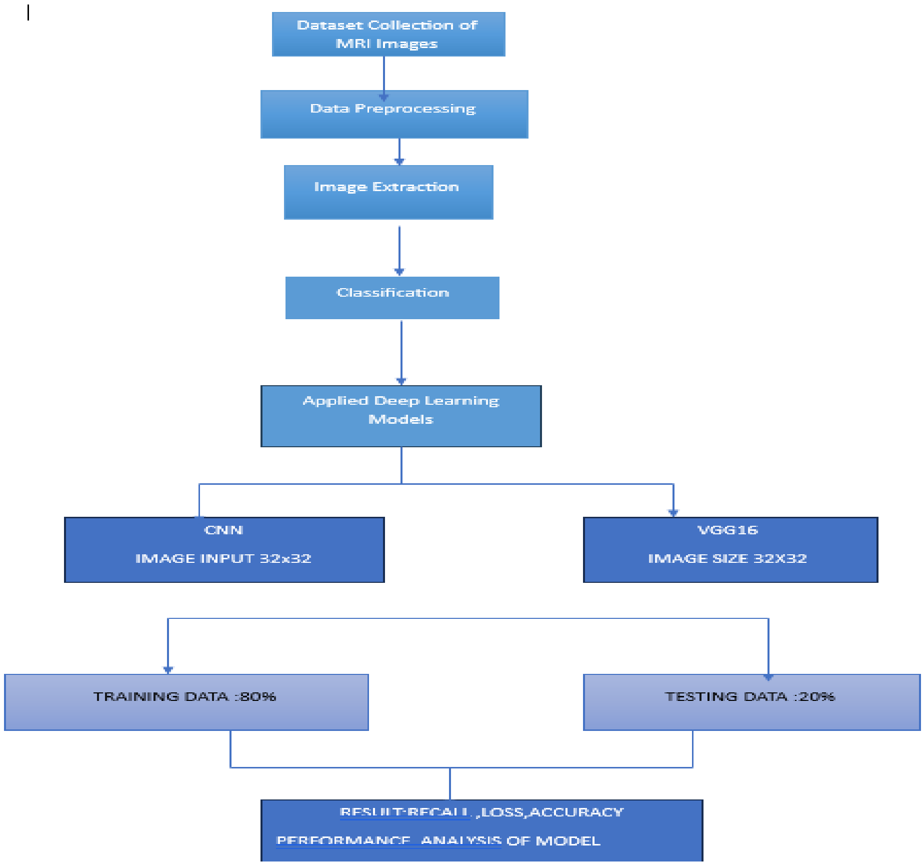
(a) Utilizing VGG-16: Investigating the effectiveness of the VGG-16 model in accurately classifying MRI images into tumor and non-tumor categories.
(b) Automation: Developing an automated system for brain tumor detection to reduce the reliance on manual interpretation and improve diagnostic efficiency.
(c) Performance Evaluation: Assessing the performance of the VGG-16 model in terms of accuracy, precision, recall, and other relevant metrics on a dataset of MRI images.

Methodology:

We will use the Python language for this. The foremost libraries we found essential had been keras for building the principle model, sklearn for plotting and studying statistics, PIL photos for changing numbers, and different libraries inclusive of pandas, numpy, matplotlib and tensor flow.A multi-layer convolutional neural network was designed and put into use for tumour identification. A convolutional layer was used as the start layer to create an input shape measuring 64 × 64 ± 3 for the MRI scans, which resulted in a homogeneous dimension for every image. We created a convolution kernel entangled with the input layer after gathering every image in the same aspect. With the help of three channel tensors, we were able to create 32 convolutional filters, each measuring three by three. For malignant concerns, the cumulative model—which included the hidden layers—produced the most accurate result. It was composed of seven steps. ReLU was an activation function, so it had nothing to do with the output. ReLU can be expressed mathematically as $F(x) = \max(0, x)$

PROPOSED ARCHITECTURE





Conclusion:

The proposed approach for brain tumor diagnosis was based on deep learning, and brain magnetic resonance was used for tumor evaluation using automated classification methods. For image improvement and better classification, a CNN model was used in this paper. The study successfully yielded better outcomes while requiring less computing time. Our method was used to identify brain tumors in MR images. Medical image analysis appears to have a lot of potential for using deep learning models like the VGG-16 model. Accurately classifying brain tumor images can help with prompt diagnosis and treatment planning, which will ultimately improve the prognosis of patients. Nevertheless, additional investigation and verification are required to evaluate the model's applicability to various datasets and clinical contexts.Requiring careful consideration of ethical and regulatory aspects, along with collaboration between researchers, healthcare professionals, and policymakers, is imperative for the development and deployment of such models.

Scope for future work:

The future enhancements for brain neoplasm detection using deep learning models revolve around integrating multimodal data for improved accuracy, leveraging transfer learning and pre-training to address data limitations, and enhancing model interpretability for increased trust in clinical applications. The focus includes real-time detection capabilities, robustness across diverse datasets and populations, and seamless integration into clinical workflows. Further developments in data augmentation strategies, collaborative data sharing, continuous model validation, and ethical considerations are essential for advancing the effectiveness, applicability, and responsible deployment of these models in medical settings.