Deep learning Based Model for Classification of MRI Brain Tumor

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ABSTRACT

The human brain is a complex organ composed of the brain, brainstem, and cerebellum. Brain cancer is the biggest internal threat as it affects brain cells at a cellular level, resulting in high mortality rates. Early detection and accurate classification of brain tumors increase the survival chances of patients. Magnetic resonance imaging (MRI) is the primary method used in brain imaging due to its accuracy in estimating human soft tissues. However, brain tumors fall into three significant categories, making diagnosis time-consuming for doctors, leading to errors. Therefore, computer-aided diagnosis systems based on machine learning are proposed to reduce doctor error rates. This project employs a deep learning method to recognize and classify MRI images, providing doctors with accurate diagnoses

INTRODUCTION

The human brain is a complex organ composed of the brain, brainstem, and cerebellum. Brain cancer is the biggest internal threat as it affects brain cells at a cellular level, resulting in high mortality rates. Early detection and accurate classification of brain tumors increase the survival chances of patients. Magnetic resonance imaging (MRI) is the primary method used in brain imaging due to its accuracy in estimating human soft tissues. However, brain tumors fall into three significant categories, making diagnosis time-consuming for doctors, leading to errors. Therefore, computer-aided diagnosis systems based on machine learning are proposed to reduce doctor error rates. This project employs a deep learning method to recognize and classify MRI images, providing doctors with accurate diagnoses

Dataset

the project will utilized the dataset gotten from Kaggle [1] which consist of 7022 human brain MRI images classified into 4 classes: glioma - meningioma - no tumor and pituitary. The no tumor class images will be taken from the Br35H dataset. 5712 images will be used as the training set and 1311 images will be used as the test set.

Figure 1 Dataset

METHODOLOGY

AlexNet

The AlexNet model consist of eight layers which include five (5) convolutional layer, three (3) max-pooling layers and three (3) dense layers. Additionally, it will utilize RELU activation function for an improved training performance as compared to other activation function[2]

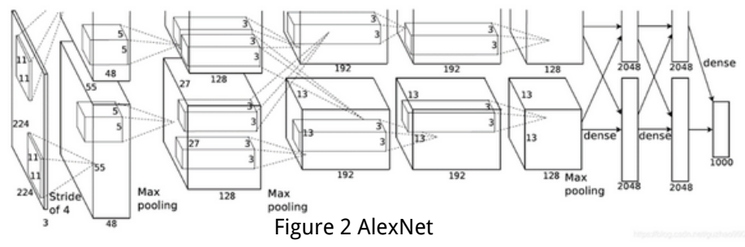


Figure 2 AlexNet

LeNet

The Lenet model consists of seven layers, which are three (3) convolution layers, two (2) pooling layers and two(2) fully connected layers[3]

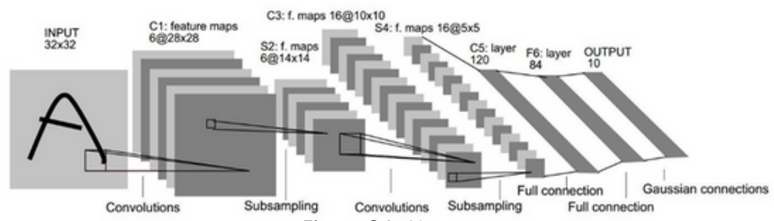


Figure 3 LeNet

VGG16

VGG16 model consists of seven layers, including thirteen (13) convolution layers, five (5) pooling layers and three(3) fully connected layers[4]

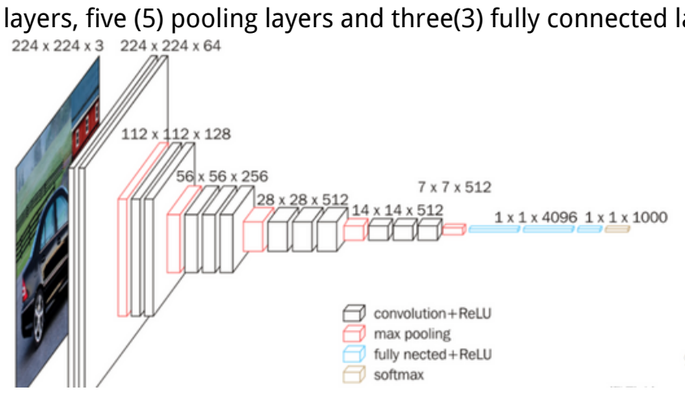
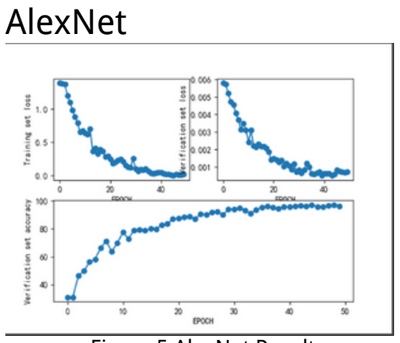


Figure 4 VGG16

RESULT

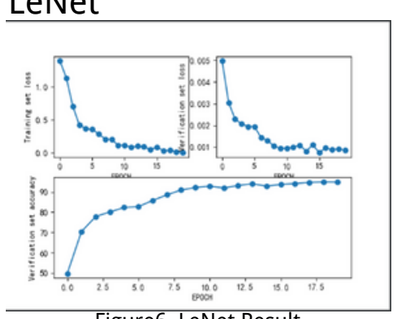
AlexNet



the accuracy of the model was 96%, the final average loss of the test is 0.0005 and the final F1-Score is 0.9925

Figure 5 AlexNet Result

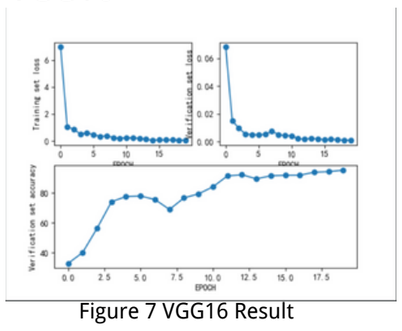
LeNet



the accuracy rate of this model was 94% , the final average loss of the test is 0.0008 and the final F1-Sorce is 0.9996

Figure6 LeNet Result

VGG16



the accuracy rate of this model was 94% ,the final average loss of the test is 0.0012 and the F1-Score is 0.9821.

Figure 7 VGG16 Result

GUI

It can be seen that the prediction results of three models for this image are given in the GUI, and the final prediction results obtained through integrated learning are given in the program

Figure 8 GUI

REFERENCES

[1]Masoud N(2021), Brain Tumor MRI Dataset [online] Kaggle Available at: https://www.kaggle.com/datasets/masoudnickparvar/brain-tumor-mri-dataset

[2]Guo YY, Wang X, Xiao PC, Xu XZ (2020) An ensemble learning framework for convolutional neural network based on multiple classifiers. Soft Comput 24:3727–3735. https://doi.org/10.1007/s00500-019-04141-

[3]Yann L, Yoshua B, Leon B and Patrick H. Gradient-Based Learning Applied to Document Recognition. Proceedings of the IEEE 1998

[4]Karen S and Andrew Z Very Deep Convolutional Networks for Large-Scale Image Recognition. Computer Vision and Pattern Recognition 2015