Brain magnetic resonance imaging, or MRI, is a modality of medical imaging using magnetic fields to capture images of the brain to detect tumors or other neurological conditions. In the past decade, using a combination of brain MRI and deep learning, researchers have used neural networks to detect the presence of tumors with greater accuracy and efficiency. Additionally, programmers use image processing to standardize datasets, make scans more readable, and reduce variability in the data. This paper presents a convolutional neural network model designed to classify various processed brain MRI images and determine the existence of tumors.

There are four main steps within the experiment. First, we acquired the dataset from Kaggle and split the images into three groups: train, validation, and test. The training set consisted of 70% of the data, the validation 10%, and the test set 20% to provide the model sufficient data to train upon. Second, we augmented the images by normalizing the data, resizing the scans, and flipping the images. Third, we built the model using the V3 architecture and dropout layers to prevent overfitting alongside the Adam optimizer and improved it using both the validation and training data. Last, we asked the model to predict whether or not each brain MRI in the testing data contained a tumor and plotted the accuracy of the results.

The model achieved outstanding results in classifying brain MRI images. On the last epoch of training the model, the model achieved a training accuracy of 0.9796, a training loss of only 0.0632, a validation accuracy of 1.0, and a validation loss of 0.0258. When classifying the test data, the model had an accuracy of 1.0 on 29 samples. These results indicate the high potential of deep learning techniques to correctly classify brain tumors, making it a valuable tool in practice.

In conclusion, seeing the remarkable results of the model ensures its viability in the healthcare field to diagnose conditions with greater precision and accuracy than humans. Although this model was trained on a smaller dataset with approximately 140 samples, training it on a more sizeable and diverse dataset would enhance its performance in a hospital setting. Ultimately, we have only uncovered the tip of the iceberg of artificial intelligence's impact on healthcare, and in years to come, highly-developed models will be able to work alongside doctors and scientists to promote patient care and diagnose rare cases.