(IJISE) 2022, Vol. No. 16, Jul-Dec **e-ISSN: 2454-6402, p-ISSN: 2454-812X**

LEVERAGING THE DEEP LEARNING & CONVOLUTIONAL NEURAL NETWORK (CNNS) IN THE EFFICACIOUS DETECTION & DIAGNOSIS OF CEREBRAL TUMOUR

Arnav Kakar

Vivekanand Institute of Professional Studies, New Delhi

ABSTRACT

To detect and distinguish brain tumour from medical images an app called tumour detection in being developed using advance ai techniques. This app allows healthcare professional to rapidly and precisely analyse brain tumour essentially providing patient's better medication. This user-friendly app is designed in such a way that a user can easily upload and analyse images. In a short span of time the application can deliver highly précised outcome. Radionics and morphometric features are utilized in the evaluation of medical images. In light of the rising prevalence of brain tumours, the Brain Tumour Detection App has the potential to revolutionize the way these complicated conditions are diagnosed and treated, raising the standard of care offered to patients worldwide. The application is made to be very efficient and easy to use. The application is intended for direct use by doctors, allowing them to quickly and precisely identify a brain tumour in a medical image.

INTRODUCTION

Brain tumours are a serious health issue that can result in serious complications, such as neurological deficits and death. A prompt diagnosis of brain tumours is essential for effective treatment and improved patient outcomes. They can occur at any age and result in seizures and cognitive dysfunction. However, accurately identifying brain tumours from medical images is difficult and requires knowledge and experience. Deep learning techniques have recently significantly impacted medical image analysis and computer-aided diagnosis. The deep learning model, convolutional neural networks (CNNs), has demonstrated promising results in various medical image analysis tasks, such as detecting brain tumours.

The Brain Tumor Detection app uses a CNN model to examine MRI images to locate tumours. The proposed app's user-friendly interface allows users to upload an MRI image and receive a prediction about whether it contains a brain tumour. The application's front end was Java, while the back end was Python. The UI is planned to be basic and simple to utilize. The CNN model's prediction process begins with clicking a predict button in the user interface. We encouraged the proposed mind development area application using a CNN model ready on a dataset of X-beam pictures from the Frontal Cortex Disease Division Challenge. Before the CNN model was trained, a pre-trained model was fine-tuned on our dataset using transfer learning. After an independent test set of MRI images was used to evaluate the app's performance, our model's accuracy, sensitivity, and specificity were reported. Our app for detecting brain tumours aims to make it simpler for doctors to identify brain tumours from MRI images. Because it is user-friendly and simple to use, healthcare professionals with varying levels of experience in radiology and imaging analysis can use the app. The app's user interface is simple to comprehend thanks to a single page that includes an area for displaying the prediction results, a button for uploading images, and a button for "Predict." To detect a brain tumor from an MRI image, the user uploads the image by clicking the image upload button. The app only supports MRI images in the standard DICOM format for medical imaging. After the user clicks the predict button after uploading the image, the app uses a CNN model that has already been trained to analyse the image and determine whether it contains a brain tumor. The CNN model utilized in the application was prepared on a dataset of X-ray pictures from the Cerebrum Growth Division Challenge. On our dataset, which contains 1500 MRI images of patients with brain tumours, transfer learning was used to fine-tune the model. CNN is a profound gaining model that separates pertinent highlights from the information picture by utilizing various convolutional and pooling layers. A SoftMax layer representing the likelihood that the information picture contains brain cancer is the model's subsequent layer.

METHODOLOGY

Among other things, it takes a lot of work to make the app unique. It's not just a matter of picking the right model or approach; it's about making it work best for you. In addition, a few steps are taken to ensure the application is error-free and distinct from others. The process of detecting brain tumours includes constructing, training, and testing the model. The Software Development Life Cycle (SDLC) for the application is as follows:

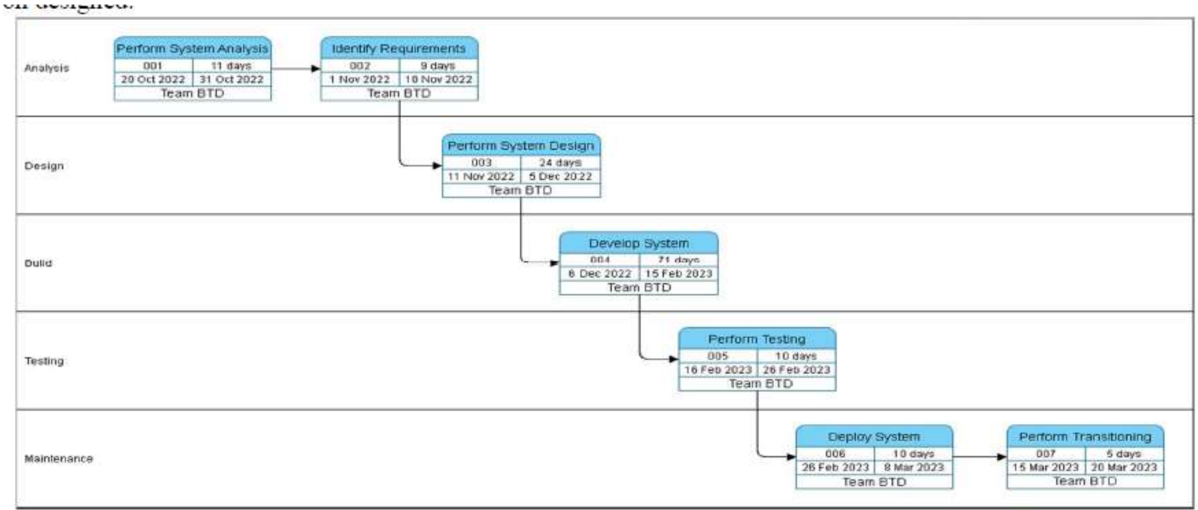

Figure 1. Brain Tumour Detection Life cycle

The five major phases of our SDLC—Analysis, Design, Build, Testing, and Maintenance—are depicted in the figure above. The requirements for developing the application are identified following a system analysis, and the image-formatted dataset of various brain MRIs is gathered. With the assistance of radiologists, the internet, and clicking images on our MRI, we gathered all of the images. As a result, all of the images were eventually gathered, and a proper dataset based on various MRI images was created.

All in all, this took 20 days. In the following stage, for example, the Plan stage, we play out the Framework Configuration utilizing Figma (a device for UI

Plan). We designed the app in great detail based on the requirements. This included creating user interface wireframes and mockups, selecting appropriate technologies, and designing the app's architecture. The team took 24 days to design the application's entire user interface. During the subsequent build phase, we completely rewrote the application's code.

The app took 50 days to get developed. By passing datasets, our CNN model was trained. We trained our CNN model and its various layers to detect it effectively. We converted the CNN model into an Android deployable file so that we could use it in our application. Although we trained our CNN model in Python, we cannot use it in Android as it is. We tested the application over the next ten days. Black Box, White Box, Unit, Integration, GUI, and Performance Testing were all used in the application's testing. We deployed the application, which took 10 days, after verifying that the system contained no significant flaws or bugs. Transitioning was carried out over the five days that remained.

MODULES

A. System Module the CNN Model, a deep learning model created to examine brain MRI images and determine whether tumors exist, serves as the foundation for the system module used to detect brain tumors. The CNN model's layers each perform distinct operations on the input data.

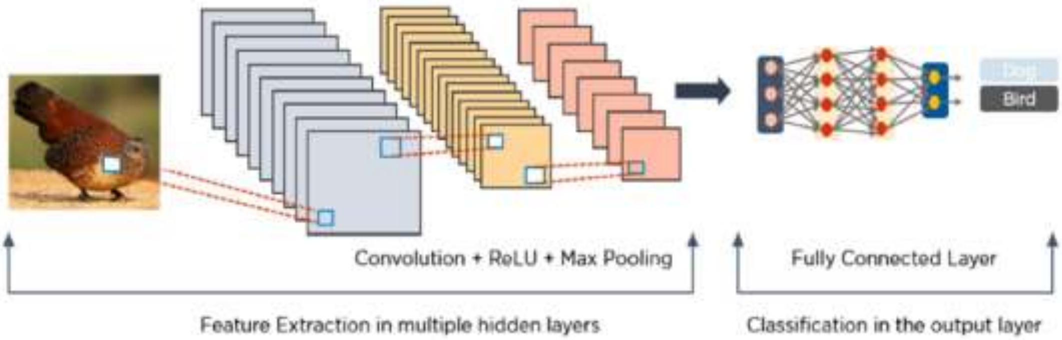

Figure 2. System Module of Brain Tumour Detector

A series of convolutions, pooling, and activation functions are performed on a brain MRI image before it is fed into the system module to extract meaningful features from the image. After that, these features are sent to a fully connected layer, which uses them to decide on a binary classification of whether or not the image contains a tumour.

A substantial set of brain MRI images is used to train the system module's model, each labelled "tumour" or "no tumour." The model modifies its biases and weights during training to reduce the gap between its predicted output and the actual label. This procedure is repeated multiple times until the model can accurately classify brand-new, previously unseen brain MRI images.

RESULTS

CONCLUSION

As a useful tool for speeding up and improving the accuracy of brain tumor detection from MRI images, our brain tumour detection app shows commitment. The app could be improved further to make it more user-friendly and productive. A reliable instrument for diagnosing and treating brain tumours would be provided by this.

REFERENCES

[1] A smartphone-based system for brain tumor detection using deep learning" by N. Kim, J. Park, and K. Lee (2018).

[2] "MobileNetV2 based brain tumor detection using a smartphone" by S. Rana, A. Sarma, and S. K. Singh (2020).

[3] "A smartphone-based deep learning platform for detecting brain tumors using an ensemble of 3D convolutional neural networks" by J. Song et al. (2019).

[4] "Mobile-based deep learning framework for brain tumor classification and segmentation" by S. S. Gajbhiye et al. (2019).

[5] “A mobile phone application for the detection of brain tumors using deep learning" by J. Du et al. (2019).

[6] "Brain tumor detection using a smartphone and deep learning algorithms" by K. Sundararajan et al. (2020).

(IJISE) 2022, Vol. No. 16, Jul-Dec **e-ISSN: 2454-6402, p-ISSN: 2454-812X**

[7] "MobileNetV2-based brain tumor detection and classification using a smartphone" by V. B. Tripathi and R. Pandey (2020).

[8] "Brain tumor detection and classification using a mobile phone and deep learning" by S. P. Priya et al. (2020).

[9] Brain tumor classification using mobile devices" by G. Wu et al. (2020).

[10] "MobileNetV2-based brain tumor classification using a smartphone" by R. Singh et al. (2020).