e-ISSN:2582-7219

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH IN SCIENCE, ENGINEERING AND TECHNOLOGY

Volume 7, Issue 5, May 2024

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

Impact Factor: 7.521

International Journal Of Multidisciplinary Research In Science, Engineering and Technology (IJMRSET)

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly Peer Reviewed & Referred Journal |

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705151 |

Brain Tumor Detection using CNN with Help of MRI Images

Dr. S.T. Patil, Sohail S. Mujawar

Professor, Vishwakarma Institute of Technology, Savitribai Phule Pune University, Pune, India

PG Student, Vishwakarma Institute of Technology, Savitribai Phule Pune University, Pune, India

ABSTRACT: Detecting brain tumors is a crucial and demanding task in the medical field. When humans perform traditional classification, there is a risk of inaccurate predictions and diagnoses, especially with large amounts of data. The different appearances of brain tumors and their resemblance to normal tissues create challenges in extracting tumor regions from images. We introduce a method for extracting brain tumors from 2D Magnetic Resonance Images (MRI) utilizing a Convolutional Neural Network (CNN). Our research involved a dataset with diverse and different tumor. By employing Keras and TensorFlow, we constructed the CNN, which outperforms traditional approaches in terms of performance. Our CNN model achieved an impressive accuracy of 99%. The main aim and focus of this study is to classify various types of tumors and identify instances with no tumors in MRI scans.

I.INTRODUCTION

Early-stage tumor classification is vital. Brain tumors are usually identified through a biopsy, requiring invasive brain surgery. Computational intelligence methods can aid doctors in detecting and categorizing brain tumors. Our research introduces deep learning techniques and multiple machine learning approaches for different a as identifying healthy brains in MRI scans. These methods aim to help physicians accurately pinpoint tumors in their initial phases.

Radiology demands profound medical knowledge for precise tumor identification. The introduction of a tumor detection program can address the lack of specialist radiologists. Biomedical image processing with MRI imaging helps in spotting and pinpointing brain tumors. We have devised a method that segments and detects brain tumors based on MRI sequence images to delineate the tumor region. This task is complex due to tumor tissue diversity among patients and the similarity between tumor and normal tissues. The primary objective is to distinguish between a tumor-afflicted brain and a healthy one.

Brain tumor detection relies on medical imaging like MRI scans to classify and detect diverse brain tumors. The project's objective is to accurately identify brain tumors to enhance patient diagnosis and treatment plans. This is primarily achieved through machine learning techniques that analyze images and classify tumors. This results in a model that can automatically spot brain tumors in medical images, aiming to expedite procedures and increase accuracy for better healthcare. Patient radiographic images, pathology slides, and medical records are evaluated to assist in diagnosis and treatment. While the human element remains essential, the project strives for high accuracy in brain tumor detection, giving doctors efficient software for tumor identification and causes analysis.

Brain tumors are abnormal cell growths in the brain or skull, which can be either benign or malignant. They can significantly affect a person's life quality and pose life-threatening risks without proper diagnosis and treatment. Identifying and treating brain tumors is challenging due to difficulty in distinguishing them from normal brain tissue with traditional imaging methods. Advanced medical imaging like MRI scans has improved tumor visualization and accurate diagnosis capability. However, manual image analysis for tumor classification is time consuming method and prone to errors. By utilizing image processing techniques, the project aims to provide doctors with a precise and rapid means to detect tumors using MRI images, ultimately enhancing tumor diagnosis and treatment.

II.LITERATURE REVIEW

Mohamed Amine Mahjoubi1, Soufiane Hamida2, Oussama El Gannour3, Bouchaib Cherradi4, Ahmed El Abbassi5, Abdelhadi Raihani6, “Improved Multiclass Brain Tumor Detection using Convolutional Neural Networks and Magnetic Resonance Imaging (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 14, No. 3, 2023.

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly Peer Reviewed & Referred Journal |

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705151 |

Soheila Saeedi, Sorayya Rezayi1, Hamidreza Keshavarz2 and Sharareh R. Niakan Kalhori1, "MRI-based brain tumor detection using convolutional deep learning methods and chosen machine learning techniques" Published: 23 January 2023 Volume 23, article number 16, (2023).

These are some of the research papers that I have studied for the implementation on Brain tumor detection system.

From our research analysis, we have identified that existing algorithms are effective for brain tumor detection, with most images trained on Kaggle datasets. Current systems employ various algorithms for detecting brain tumors, primarily focusing on binary classification without distinguishing different types of tumors. Implementing multi-class classification for various brain tumors can streamline the process and yield more precise results. Existing systems, trained and tested on Kaggle datasets, have achieved accuracy rates between 91% and 95%. There is a need for a system that can provide comparatively better accuracy for tumor detection. Manual evaluation of MRI brain images by radiologists is tedious, and current machine learning techniques have limited accuracy and computation speed. The insights provided here can significantly contribute to developing an improved detection system.

III.METHODOLOGY OF PROPOSED SURVEY

The research proposes a classifier for classification on brain tumors from MRI images using CNN technology. Magnetic resonance imaging (MRI) scans utilized to train the model. The CNN deep learning architecture consists of four convolutional layers to extract features. Subsequently, the softmax classifier categorizes the brain images into four distinct classes. The CNN model undergoes training over multiple epochs to enhance its accuracy. Evaluation of the model's performance is conducted using specific metrics, resulting in an impressive 99% accuracy achieved by the proposed CNN model.

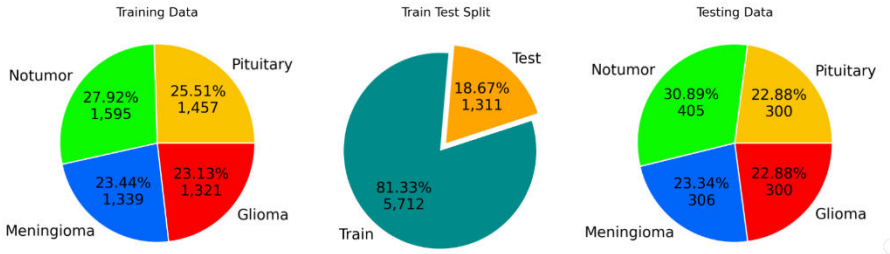

Figure 1. Data split representation

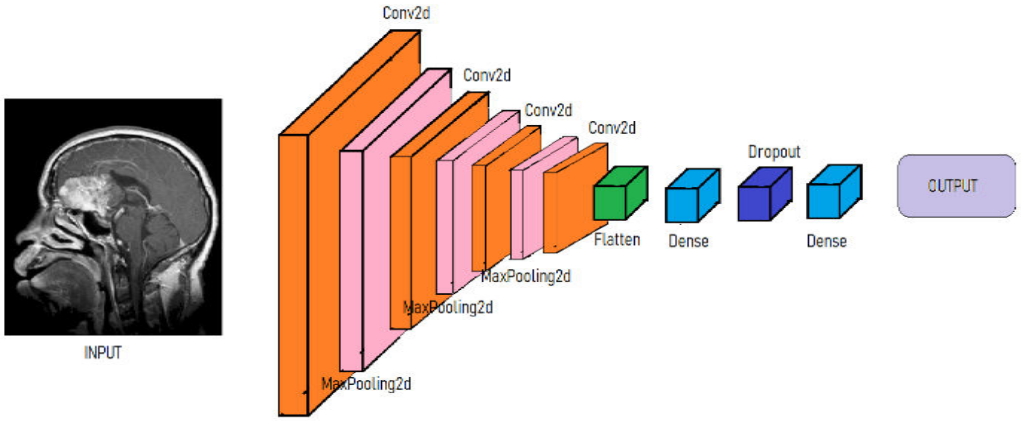

Figure 2. System Architecture

| ISSN: 2582-7219 | www.ijmrset.com | Impact Factor: 7.521| Monthly Peer Reviewed & Referred Journal |

| Volume 7, Issue 5, May 2024 |

| DOI:10.15680/IJMRSET.2024.0705151 |

Figure 2 represents the system architecture. System accepts the input as an image.
Proposed method uses "Brain Tumor Data" on Kaggle. The dataset consists a total of 7023 images of MRI Images, which are categorized into four distinct classes. The dataset focuses on brain tumors and their classification. The four classes are as follows: • Glioma: Cancerous brain tumors in glial cells. • Meningioma: Non-cancerous tumors originating from the meninges. • No Tumor: Normal brain scans without detectable tumors, • Pituitary: Tumors affecting the pituitary gland, which can be cancerous or non-cancerous. The images in this dataset have varying sizes. After pre-processing and removing excess margins and is resized.

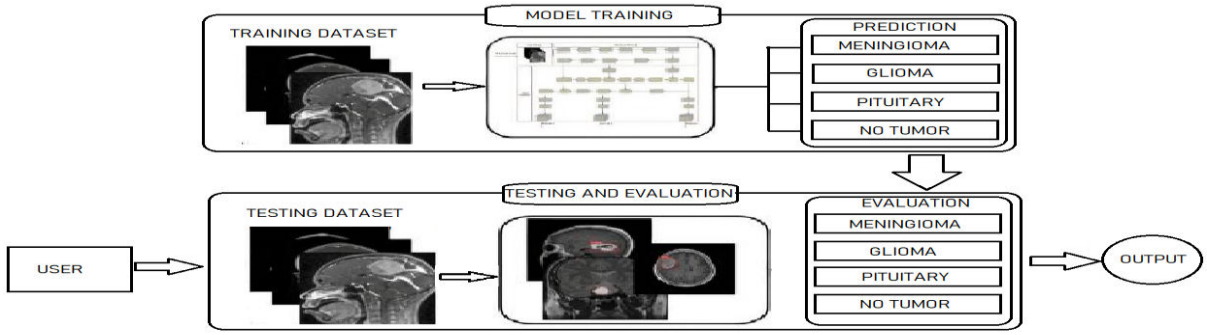

Figure 3. System working overview

IV.CONCLUSION AND FUTURE WORK

We present a brain tumor classifier utilizing MRI images and convolutional neural network (CNN) classifiers in this study. MRI images are utilized as the input data. CNN deep learning architecture comprises four convolutional layers. The convolutional layers extract features, and the softmax classifier classifies brain images into four categories: glioma tumor, pituitary tumor, meningioma tumor, and no tumor. The CNN model is trained across multiple epochs, and its performance is assessed using different metrics. The CNN model we propose achieved an accuracy of 99%.

REFERENCES

[1] Mohamed Amine Mahjoubi1 , Soufiane Hamida2 , Oussama El Gannour3 , Bouchaib Cherradi4 , Ahmed El Abbassi5 , Abdelhadi Raihani6, "Improved Multiclass Brain Tumour Detection using Convolutional Neural Networks and Magnetic Resonance Imaging (IJACSA) International Journal of Advanced Computer Science and Applications, Vol. 14, No. 3, 2023 .
[2] Soheila Saeedi, Sorayya Rezayi1, Hamidreza Keshavarz2 and Sharareh R. Niakan Kalhori1, "MRI-based brain tumor detection using convolutional deep learning methods and chosen machine learning techniques" Published: 23 January 2023 Volume 23, article number 16, (2023).
[3] Abd-Ellah, M. K., Khalaf, A. A. M., Awad, A. I. & Hamed, H. F. A. TPUAR-Net: Two parallel u-net with asymmetric residual-based deep convolutional neural network for brain tumor segmentation. In *Image Analysis and Recognition* (eds Karray, F. *et al.*) 106–116 (Springer, 2019).
[4] Abd-Ellah, M. K., Awad, A. I., Khalaf, A. A. M. & Hamed, H. F. A. Classification of brain tumor MRIs using a kernel support vector machine. In *Building Sustainable Health Ecosystems: 6th International Conference on Well-Being in the Information Society, WIS 2016, CCIS*, vol. 636, 151–160. (2016).
[5] Havaei, M. *et al.* Brain tumor segmentation with deep neural networks. *Med. Image Anal.* **35**, 18–31. (2017).
[6] Le, H. T. & Pham, H.T.-T. Brain tumour segmentation using U-Net based fully convolutional networks and extremely randomized trees. *Vietnam J. Sci. Technol. Eng.* **60**, 19–25. (2018).
[7] He, K., Zhang, X., Ren, S. & Sun, J. Identity mappings in deep residual networks. In Leibe, B., Matas, J., Sebe, N. & Welling, M. (eds.) *Computer Vision – ECCV 2016*, 630–645 (Springer International Publishing, Cham, 2016).
[8] Ye, F., Pu, J., Wang, J., Li, Y. & Zha, H. Glioma grading based on 3d multimodal convolutional neural network and privileged learning. In *2017 IEEE International Conference on Bioinformatics and Biomedicine (BIBM)*, 759–763, (2017).

INTERNATIONAL STANDARD SERIAL NUMBER INDIA

INTERNATIONAL JOURNAL OF MULTIDISCIPLINARY RESEARCH

IN SCIENCE, ENGINEERING AND TECHNOLOGY

| Mobile No: +91-6381907438 | Whatsapp: +91-6381907438 | ijmrset@gmail.com |

www.ijmrset.com