**International Journal of Innovative Research in Engineering**
*Volume 6, Issue 2 (March - April 2025), PP: 116-118.*
https://www.doi.org/10.59256/ijire.20250602013
*www.theijire.com*
***ISSN No: 2582-8746***

# Brain Hemorrhage Detection Using Convolutional Neural Networks (CNNs)

**R. Nivethitha[1], A. Annalakshmi[2], D. Beninal[3], G. Gowri Sakthi[4]**
[1]*Assistant Professor, Department of Computer Science and Engineering, K.L.N. College of Engineering, Sivagangai, Tamilnadu, India.*
[2, 3, 4]*Final Year Students, Department of Computer Science and Engineering, K.L.N. College of Engineering, Sivagangai, Tamilnadu, India.*

**How to cite this paper:**
R. Nivethitha[1], A. Annalakshmi[2], D. Beninal[3], G. Gowri Sakthi[4] "Brain Hemorrhage Detection Using Convolutional Neural Networks (CNNs)", IJIRE-V6I2-116-118.



***Abstract:*** *To detect the brain hemorrhage detection using CT (Computered Tomography) scan images. To identify the brain hemorrhage, the deep learning models like Convolutional Neural Network (CNN) proposed for the classification.To the brain hemorrhage is the internal bleeding in the sourrounding tissues of the brain and the blood cells got damaged by this bleeding. the major causes of death and severe disability.To the classification of brain hemorrhage detection using CT scan images based on the convolutional neural network (CNN)To the proposed approach and experimental results are compared by carried out different experiments using hybrid deep learning models.*

***Keywords:*** *Convolutional Neural Networks, Deep learning, Brain hemorrhage, CT (Computed Tomography).*

## I.INTRODUCTION

The Machine learning to predict Brain hemorrhage, also known as intracranial bleeding, is a critical medical condition caused by the rupture of blood vessels in the brain. It can result from trauma, high blood pressure, aneurysms, or other underlying medical conditions. Accurate and timely detection of brain hemorrhages is essential, as delays in diagnosis can lead to severe neurological damage or even death. Computed Tomography (CT) scans are the primary imaging modality used to detect brain hemorrhages due to their speed and sensitivity to blood densities. With the rapid advancements in Artificial Intelligence (AI) and deep learning, there is a growing interest in developing automated systems to assist medical professionals in diagnosing critical conditions.

## II. OBJECTIVE

The primary objective of this project is to develop an automated system for detecting brain hemorrhages from CT scan images using Convolutional Neural Networks (CNN). This system aims to assist radiologists by reducing diagnostic time and improving accuracy in identifying hemorrhagic conditions. By training a CNN model on a labeled dataset of brain CT images, the project seeks to enable the model to effectively distinguish between hemorrhagic and non-hemorrhagic scans. Image preprocessing techniques such as normalization, resizing, and data augmentation will be applied to enhance the quality and diversity of the input data.

## III. LITERAURE SURVEY

### [1] Neural Network-Based Brain Hemorrhage Classification Using Head CTScan

Neural network-based approach for the classification of brain hemorrhages using head CT (Computed Tomography) scans. Brain hemorrhage is a critical condition that demands rapid diagnosis and intervention. Manual interpretation of CT scans can be time-consuming and may lead to human error, especially in high-pressure emergency scenarios. To address this, the paper explores the application of deep learning techniques specifically Convolutional Neural Networks (CNNs)—to automatically analyze CT images and classify the presence of hemorrhage.

### [2] Microwave Antenna-Assisted Machine learning A Paradigm shift in non-invasive Brain Hemorrhage Detection

Microwave Antenna-Assisted Machine Learning: A Paradigm Shift in Non-Invasive Brain Hemorrhage Detection introduces an innovative approach to brain hemorrhage detection by combining microwave imaging technology with machine learning algorithms. Unlike traditional CT or MRI-based diagnostics, this research explores a non-invasive, portable, and potentially more affordable solution using microwave antennas to capture brain activity and structural changes indicative of hemorrhage.

**[3] Exploring Deep Learning and ML approaches for Brain Hemorrhage Detection**

Deep Learning (DL) and traditional Machine Learning (ML) approaches for the detection of brain hemorrhages from medical imaging, particularly CT scans. Brain hemorrhage is a medical emergency that demands quick and accurate diagnosis, and conventional manual assessment methods are often limited by time constraints and human variability. With the advancement of artificial intelligence, this paper investigates how automated systems can assist clinicians in improving diagnostic efficiency and accuracy. The study compares different models and algorithms, such as Convolutional Neural Networks (CNNs) in the deep learning domain, and classifiers like Support Vector Machines (SVM), Decision Trees, and k-Nearest Neighbors (k-NN) from traditional machine learning.

## IV. EXISTING SYSTEM

The existing system involves the prediction of brain hemorrhages primarily relies on manual interpretation of CT scan images by experienced radiologists and neurologists. This traditional method, while effective, is time-consuming and subject to human limitations such as fatigue, oversight, and variability in diagnostic accuracy. In emergency situations where every second is critical, delays in identifying hemorrhages can lead to severe consequences, including permanent brain damage or death. Moreover, in many under-resourced or rural areas, access to expert radiological assessment is limited, further complicating timely diagnosis. Although some existing systems incorporate basic image processing techniques or rule-based algorithms, they lack the intelligence and adaptability offered by modern deep learning models.

## V. PROPOSED SYSTEM

The proposed system introduces an automated, AI-driven solution for brain hemorrhage detection using Convolutional Neural Networks (CNN), a type of deep learning architecture highly effective in image classification tasks. Unlike traditional manual diagnosis, this system is designed to analyze CT scan images and automatically detect the presence of brain hemorrhages with high accuracy and speed. The model is trained on a labeled dataset of CT scans, allowing it to learn and extract relevant features such as texture, shape, and intensity variations associated with hemorrhagic regions.

## VI. ARCHITECTURE DIAGRAM

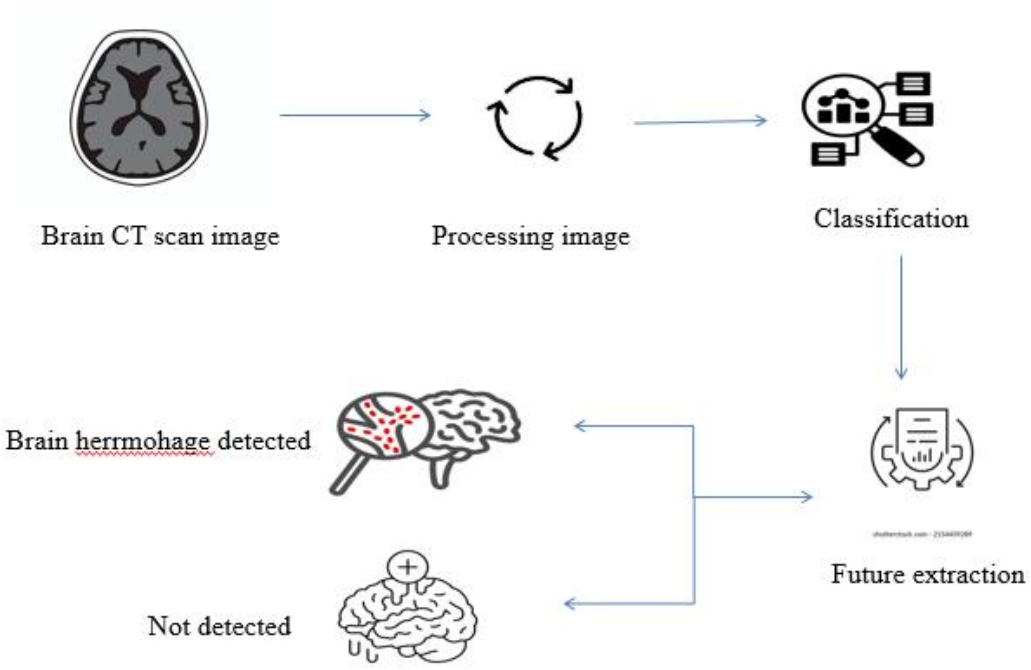


*Fig6.1 Architecture for brain hemorrhage*

## VII. SYSTEM OVERVIEW

**1. Data Collection**

This initial stage involves collecting a diverse set of brain images, Computered Tomography (CT) scans, and other relevant imaging modalities. The dataset should be comprehensive, featuring various demographics and stages of hemorrhage to provide a robust training foundation.

**2. Data Preprocessing**

Normalization: CT scan images may have varying pixel intensity ranges. To standardize the input data, the images

are normalized to a common range. Resizing: The CT scan images are resized to a fixed input size suitable for CNN models (e.g., 224x224 pixels). Data Augmentation**:** Techniques such as rotation, flipping, zooming, and shifting can be applied to increase the diversity of training images and prevent over fitting.

**3. Convolutional Neural Networks**

The core of the detection system is a CNN model designed to automatically extract features from CT scan images. CNNs are effective at capturing hierarchical patterns, making them suitable for image recognition tasks like this one.

**4. Model Training**

Dataset: The training data would consist of labeled CT scan images, where each image is marked as either showing a hemorrhage or not. Loss Function**:** Binary cross-entropy is used for binary classification tasks. Optimizer**:** Adam or SGD (Stochastic Gradient Descent) optimizers are used to minimize the loss function. Training Process: The model is trained over several epochs to learn the patterns associated with brain hemorrhages.

**5. Model Evaluation**

Accuracy: The model is evaluated based on metrics like accuracy, precision, recall, F1-score, and AUC (Area under the Curve). Confusion Matrix: This helps evaluate true positives, false positives, true negatives, and false negatives.

## VIII. FUTURE ENHANCEMENT

The project utilizes the power of deep learning to automate the process of detecting brain hemorrhages in CT scan images, a critical task in emergency medical settings. Through the development and implementation of a CNN model, the system demonstrates the potential to assist healthcare professionals by providing rapid, accurate, and reliable predictions, which can significantly reduce diagnostic time and improve patient outcomes.

## XI. CONCLUSION

The Brain Hemorrhage Detection System using CT scans and Convolutional Neural Networks (CNN) represents a significant step toward integrating artificial intelligence in the healthcare industry, specifically in the field of radiology. The project utilizes the power of deep learning to automate the process of detecting brain hemorrhages in CT scan images, a critical task in emergency medical settings. Through the development and implementation of a CNN model, the system demonstrates the potential to assist healthcare professionals by providing rapid, accurate, and reliable predictions, which can significantly reduce diagnostic time.

## References


1. *V. R. K. R. R. Krishna**, S.** R. A. Nair, and P. V. R. R. Prabhu, "Deep Learning in Brain Imaging: A Survey,"* Front. Neurosci. *vol. 17, no. 6, pp. 710508, Apr. 2023.*
2. *A. A. Rao**,** S. S. R. Arora, and M. R. Jain, "RSNA Intracranial Hemorrhage Detection: A Machine Learning Approach,"* Radiology, *vol. 302, no. 3, pp. 230-241, Jun. 2022.*
3. *M. A. Hussain, A. A. Ahmed, and H. A. Soliman, "Real-Time Brain Hemorrhage Detection with Convolutional Neural Networks and Transfer Learning," IEEE Trans. Neural Netw. Learn. Syst., vol. 33, no. 7, pp. 2806-2817, Jul. 2022*
4. *T. A. Khan, R. M. Islam, and L. S. Sabri, "AI in Brain Hemorrhage Detection: A Comparative Study of Different Neural Network Architectures,"* Med. Image Anal., *vol. 58, pp. 101597, Feb. 2021.*
5. *A. S. Patel M. P. Singh,, and R. K. Mehta, "Improving Brain Hemorrhage Detection Using Deep Learning and Transfer Learning on CT Scans,"* Comput. Biol. Med., *vol. 161, pp. 106379, Apr. 2024.*
6. *Y. P. Sharma, T. V. Ng, and M. S. Patel, "Advanced Convolutional Neural Networks for Multi-Class Brain Hemorrhage Classification,"* Med. Image Anal., *vol. 80, pp. 102427, Jul. 2025.*
7. *C. B. Smith, P. S. Harrison, and L. J. Miller, "A Comparative Study of Deep Learning Models for Brain Hemorrhage Detection in CT Imaging,"* J. Digit. Imaging, *vol. 37, no. 4, pp. 526-533, Jun. 2024.*
8. *T. Y. Liu, J. H. Lee, and R. P. Kumar, "Enhanced Brain Hemorrhage Detection Using Hybrid CNN-RNN Models on Longitudinal CT Scan Data,"* Comput. Methods Programs Biomed., *vol. 211, pp. 106380, Apr. 2025.*
9. *D. R. Kumar, A. A. Garcia, and L. F. Thompson, "Real-Time Detection of Brain Hemorrhages in CT Imaging Using CNNs and Edge Computing,"* IEEE Access, *vol. 13, pp. 14432-14441, Mar. 2024.*
10. *X. Wei, D. Y. Wang, and S. R. Fong, "Detection of Intracranial Hemorrhage Using Deep Convolutional Neural Networks,"* IEEE Trans. Biomed. Eng., *vol. 66, no. 8, pp. 2257–2265, Aug. 2019.*