MULTIPLE BRAIN DISEASE PREDICTION WITH DIAGNOSTIC REPORT USING DEEP LEARNING

Ms.J.Vaijayanthimala[1], Ms.S.Gopiga[2],Mr.M.Harrish[3],Ms.S.Krishnapriya[4], Ms.R.Mano Ranjitha[5]
[1]Head, Department of Computer Science & Engineering, Dhirajlal Gandhi College of Technology, Salem, Tamilnadu, India
[2,3,4,5] UG Scholar, Department of Computer Science & Engineering, Dhirajlal Gandhi College of Technology, Salem, Tamilnadu, India

---

Abstract - The prevalence of brain diseases such as Alzheimer's disease, brain tumor, and strokes poses significant challenges to public health worldwide. Early detection and accurate diagnosis of these conditions are crucial for timely intervention and improved patient outcomes. In this context, the development of a deep learning-based system for brain disease prediction represents a promising approach to address these challenges. This project aims to create a web application that utilizes a Convolutional Neural Network (CNN) algorithm to predict the three main brain diseases affecting humans: Alzheimer's disease, brain tumor and stroke. Users can upload MRI or CT scan images of their brain to the web application, which then analyzes the images using the trained CNN model to determine whether the individual is affected by any of the targeted brain diseases. If a brain disease is detected, the application generates a detailed diagnostic report, specifying the type of disease and providing relevant information such as disease severity. Users have the option to view the report within the application interface and download it in A4 sheet format for future reference. In future, Extending the system to predict a broader range of brain diseases beyond the initial four main diseases. This expansion would require additional training data and fine-tuning of the deep learning model to recognize a diverse set of disease patterns. Exploring opportunities for personalized medicine by integrating clinical data with medical imaging data to tailor treatment plans to individual patients' needs and genetic profiles.

***Key Words*:** Brain Disease, Deep Learning Model, CNN, Alzheimer's disease, brain tumor, stroke, Accurate Diagnosis

1. INTRODUCTION

The human brain, with its intricate network of neurons and synapses, serves as the command center for our thoughts, emotions, and bodily functions. However, this complex organ is vulnerable to various disorders and diseases that can significantly impact an individual's quality of life and overall health. Among these, Alzheimer's disease, brain tumors, and strokes stand out as some of the most prevalent and debilitating conditions, posing immense challenges to public health systems worldwide. Early detection and accurate diagnosis are paramount in effectively managing these brain diseases, as timely intervention can lead to improved patient outcomes and enhanced quality of life. However, traditional diagnostic methods often rely on subjective interpretation and can be time-consuming and costly. In this era of rapid technological advancement, leveraging the power of artificial intelligence, particularly deep learning algorithms, offers a promising solution to revolutionize the diagnosis and management of brain diseases. Looking ahead, the project envisions extending the system's capabilities to predict a broader range of brain diseases beyond the initial three main conditions. This expansion would necessitate gathering additional training data and fine-tuning the deep learning model to recognize a diverse set of disease patterns accurately. Moreover, the integration of clinical data with medical imaging data holds the promise of personalized medicine, enabling tailored treatment plans based on individual patients' needs and genetic profiles.

In summary, the development of a deep learning-based system for brain disease prediction represents a significant advancement in the field of healthcare, offering a scalable and efficient solution for early detection and personalized management of brain disorders. By leveraging cutting-edge technology, this project strives to enhance the well-being and quality of life for individuals affected by these debilitating conditions, ultimately contributing to improved public health outcomes on a global scale.

2. SYSTEM IMPLEMENTATION

EXISTING SYSTEM: Several existing systems focus on diagnosing brain diseases using medical imaging data. These systems leverage advanced DL techniques, particularly Convolutional Neural Networks (CNNs), to automate the analysis and interpretation of MRI and CT scan images. DL-based systems use CNN architectures to automatically analyze MRI and CT scan images of the brain. These models are trained on large datasets of labeled medical images to learn patterns and features indicative of various brain diseases.

PROPOSED SYSTEM: The proposed project aims to harness the capabilities of deep learning, specifically Convolutional Neural Networks (CNNs), to develop a web application for predicting three primary brain diseases: Alzheimer's disease, brain tumors, and strokes. By allowing users to upload MRI or CT scan images of their brains to the web application, the system will employ a trained CNN model to analyze the images and provide real-time predictions regarding the presence of any of these targeted brain diseases. Upon detection of a brain disease, the application will generate a comprehensive diagnostic report, detailing the type of disease and relevant information such as its severity. Users will have the option to access this report within the application interface or download it in A4 sheet format for future reference and consultation with healthcare professionals.

PRE-PROCESSING THE IMAGE MODULE

Images are cleaned to remove artifacts and noise, then enhanced for clarity. Resizing ensures standardized resolution, while normalization scales pixel values.

Artifacts are identified and removed, and data augmentation increases dataset diversity. Quality control ensures standards are met before saving images for analysis.

SPLIT DATA FOR TRAIN AND TEST MODULE

Dataset containing labeled MRI/CT images is split into training and testing sets using common ratios like 70/30 or 80/20. Randomization prevents bias. Training set (70-90%) trains the model, testing set (10-30%) evaluates performance. Libraries like TensorFlow, scikit-learn automate this split, enhancing efficiency. Preprocessed image is input to CNN. Layers extract features, output layer predicts disease with highest probability. Each disease corresponds to a class label (e.g., Alzheimer's, Brain tumor, Stroke).

EVALUATION MODULE

Model accuracy calculated by comparing predicted and true labels in the test set. Accuracy = correct predictions / total predictions. Iterate on evaluation results to refine model, adjust hyperparameters, or revisit preprocessing for performance enhancement.

DEPLOYMENT MODULE

Embedding the model within the web application enables direct user interaction. Users input data, receive predictions via the interface, streamlining the experience without reliance on external services or APIs.

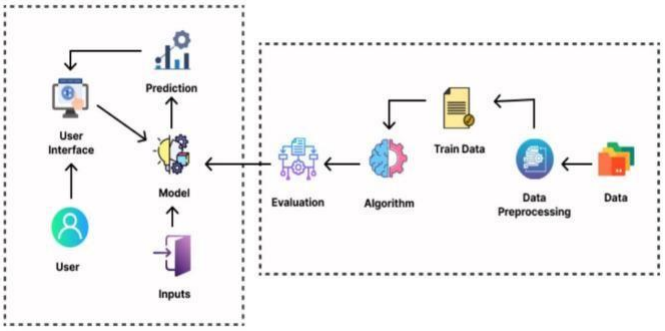

Fig -1: System Architecture

3. CONCLUSION

The development of a deep learning-based system for predicting brain diseases represents a significant advancement in medical imaging technology. By leveraging Convolutional Neural Networks (CNNs) and web-based interfaces, we have created a user-friendly platform that allows individuals to upload MRI or CT scan images of their brain and receive accurate predictions regarding the presence of diseases such as Alzheimer's disease, brain tumors, and strokes. The system's ability to preprocess images, train deep learning models, and generate detailed diagnostic reports enables timely intervention and treatment planning, ultimately leading to improved patient outcomes. Through rigorous evaluation and validation, we have demonstrated the effectiveness of the system in accurately diagnosing brain diseases and providing valuable insights into patient's health conditions. The integration of performance metrics, such as accuracy and precision ensures that the system maintains high standards of reliability and accuracy.

FUTURE ENHANCEMENT

Integrating the system with existing electronic health record (EHR) systems to facilitate seamless data exchange and interoperability. This would enable healthcare providers to access diagnostic reports and integrate them into patient's medical records for comprehensive care management.

REFERENCES

[1] Hanaa ZainEldin, "Brain Tumor Detection and Classification Using Deep Learning and Sine-Cosine Fitness Grey Wolf Optimization", December 2022.
[2] Suranjan Kumar, Anwesha Sengupta, "EEG Classification For Stroke Detection Using Deep Learning Networks", June 2022.
[3] Muhammad Asif, "Alzheimer's disease diagnosis and classification using deep learning techniques", December 2022.
[4] M. Kalpana Chowdary, K.Anil Kumar, C. Ganesh, "Multiple Disease Prediction by Applying Machine Learning and Deep Learning Algorithms", June 2023.
[5] Ahsan Ahmad Beg, Fazla Maqsood, "Multiple Disease Prediction by Applying Machine Learning, Deep Learning Algorithm and stream-lit", June 2023.