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A DEEP LEARNING MODEL TO PREDICT ALZHEIMER DISEASE

Mr. Vaishnav Nayak, Mr. Tushar Chaudhary, Mr. V Varun Pingale

BTech in Computer Science and Engineering, Reva University, Bengaluru, Karnataka, India

School Of Computer Science

Reva University, Bengaluru, Karnataka, India

Prof. Ranjitha U N, (MTech, P.H.D), Reva University, Bengaluru, Karnataka, India

Abstract : The most prevalent cause of dementia is Alzheimer's disease(AD). Alzheimer refers to disorders of the brain including such loss of memory, trouble comprehending and problem - solving skills, and even communicating. This stage of mental treatment initiation is often investigated utilizing a magnetic resonance imaging (MRI) of the brain. In past years, study has concentrated on detecting Hypertension using data such as MRI utilizing computer vision. Technological equipment has aided medical professionals' job and has sped up the medical procedure. In this study, we use convolutional neural network technology (CNN) and apply the theory to classify photos of Vascular dementia (VGG19). The goal of this study is to categorize Alzheimer's disease photos into four classifications recognized by medical specialists, and the findings will be published. There are numerous assessment measures in this study. This study demonstrated that the method utilized is capable of classifying MRI of Alzheimer's disease into four classifications known to medical doctors through testing on the database. The first CNN model has an efficiency of 75.01%, and the second VGG19 model has an effectiveness of 80.28%.

IndexTerms **– Alzheimer Disease (AD), CNN**

I. INTRODUCTION

Alzheimer's disease is the origin of 60% of dementias worldwide. Alzheimer's disease is one of the many forms of dementia. A child's mental capacities continue to deteriorate, making it harder for patients to lead a regular life. As the condition progresses, patients are going to grow more reliant on family and friends for a living. Those suffering from Alzheimer's disease may have difficulty recognizing families. Mild mental stage patients may react violently, but late helps to better understand patients may endure from cardiac arrest and ventilatory malfunction, ultimately resulting in their deaths. If improper medication has been administered before, an effective correct detection of Vascular dementia cannot be made [1]. As neurological dysfunctions begin, all symptoms of Alzheimer's disease grow slowly but become extremely significant over time [2]. So according study, by 2050, each of the 85 individuals will be diagnosed with this condition, and the number of patients will more than double in the years that follow [3]. In accordance with the annual Global Alzheimer's Diseases (AD) study, almost 95% of individuals expect they will have Hypertension in the future [4]. The yearly cost of treating Alzheimer is predicted to be $1 trillion and will continue to rise. by 2030[5], double [6]. The proportion of persons afflicted by Hypertension changes with age. Vascular dementia will affect 5.8 million People aged 65 and over in the U. S. (US) in 2020. It is expected to grow to 13.8 million by 2050[6]. The volume of the brain left ventricle grows in Alzheimer's patients, whereas the frontal lobe and hippocampus diminish. Spatial remembering is hampered when the size of the amygdala diminishes sporadically. Impairment to these neurons causes faulty transmission in planning, judgement, and relatively brief memory [7]. The formation of amyloid and tau protein concentrations is most likely the initial stage in the progression of Alzheimer's disease. Moreover, degeneration, which is connected with brain shrinkage and particularly negatively, has an impact on cognition [8]. Vascular dementia has been diagnosed. There is no treatment and it is considered hazardous to people's wellbeing and living organisms. Many people across the world have been afflicted by this sickness. Consequently, early detection of this condition using desktop methods has become one of the most fascinating and essential study areas in health and technology science [9]. Deep learning algorithms are useful.

Purpose of Study:

Alzheimer's disease is the origin of 60% of dementias worldwide. Alzheimer's disease is one of the many forms of dementia. A child's mental capacities continue to deteriorate, making it harder for patients to lead a regular life. As the condition progresses, patients are going to grow more reliant on family and friends for a living. Those suffering from Alzheimer's disease may have difficulty recognizing

families. Mild mental stage patients may react violently, but late helps to better understand patients may endure from cardiac arrest and ventilatory malfunction, ultimately resulting in their deaths.

Objective

Alzheimer's disease (AD) is a neurological illness that is the leading cause of dementia in older people. The hippocampal is the part of the mind that is afflicted by this illness. Rapid recognition of Alzheimer's disease is critical since it can avoid catastrophic neurological damage in the person. It becomes harmful, and occasionally fatal, for persons above the age of 65. The major goal of this research is to forecast Hypertension and construct an usable model using machine learning methods such as feature extraction and selection. The dataset is represented via photographs. Using the CNN algorithm, the suggested method detects Alzheimer's disease types such as moderate-demented and non-demented.

II. LITERATURE SURVEY

Kavitha et al. [9] recommended using a dataset containing cognitively and physiological characteristics from Brain cancer disease patients, neurocognitive impairment clients, and healthy controls.
Scientists employed a variety of machine learning methods to predict the beginning of Alzheimer's disease in the database, including regression analysis, decision orchards, and regression trees. The study's findings revealed that algorithms based on machine learning may effectively anticipate the emergence of Hypertension in its early stages. The researchers also discovered that some epidemiological and cognitive characteristics, such as age and recollection capacity, were highly predictive of Alzheimer's disease. Hybridization of techniques considering the large volume of medical data is yielding promising improved results.
Overall, the study shows that machine learning can anticipate the start of Alzheimer's disease in its infancy. The findings imply that ml algorithms Algorithm can diagnose Hypertension early, which might lead to earlier treatment and improved outcomes for patients.
Cui, Z., et al. [11] proposed an improved version of the Analytical model, a deep learning design originally designed for image analysis and now customized for Alzheimer's disease detection. The enhanced system comprises additional convolution layer and residual linkages to increase performance of the network. The neural network was developed and evaluated using a collection of brain MRI scans from Alzheimer's sufferers and healthy volunteers. The results showed that the enhanced Inception structure had good diagnostic sensibility, specificity, and accuracy. The researchers also conducted a comparison with other cutting-edge deep-learning algorithms and discovered that the enhanced Inception system outperformed these algorithms as far as of accuracy and sensitivity. Overall, the article demonstrates the possibilities of deep instructional methods.
Originally intended for image analysis, the system was developed to identify brain MRI images into normal participants, sufferers with moderate memory loss, and individuals with Vascular dementia. The network was trained and tested using brain MRI images from dementia patients, people with moderate memory loss, and healthy volunteers. The results demonstrated that the Generative Adversarial network detected Alzheimer's disease with good accuracy, tolerance, and selectivity. In addition, the scientists conducted a comparison with other cutting-edge deep learning models and discovered that the Generative Adversarial network surpassed these networks in regards to precision, sensitivity, and precision. Overall, the article highlights the promise of methods based on deep learning, notably the Generative Adversarial network, for identifying Alzheimer's disease accurately MRI data from the brain was used to study disease. The findings imply that such approaches might be utilized to aid in the early identification recognition and diagnosis of Alzheimer's disease, perhaps leading to early identification and improved patient outcomes.
Helaly et al [12] classified brain MRI images into normal participants, patients with Parkinson disease, individuals with Vascular dementia, and sufferers with confusion using the VGG 19 deep action recognition framework, a deep learning design originally built for image identification. The neural network was developed and tested using a sample of brain MRI images from individuals with the aforementioned disorders. The results demonstrated that the VGG 19 system classified neurological illnesses with good accuracy, susceptibility, and specificity. The scientists also compared the VGG 19 networks to other cutting-edge deep learning techniques and discovered that it surpassed these systems in regards to precision, responsiveness, and specific. The findings imply that such approaches might be utilized as a tool for early diagnosis.

III. OVERVIEW OF THE SYSTEM

Existing System

The existing system has a multistage classifiers approach for classifying diverse subjects utilizing machine learning methods such as Support Vector Machine, Naive Bayes, and K-nearest neighbor. • Using resting-state functional magnetic resonance image (R-fMRI) data, a brain network was constructed, estimating organizations function there in brain area. A deep network was created to offer a precise finding of the early AD.

Disadvantages of Existing System

When a limited number of data instances are used, k-fold cross confirmation is used to minimize overfitting complications. [13].

The first stage includes producing features that recreate the query picture, and the second stage compares those characteristics with information already stored in the database [2]. The Particle swarm optimization (PSO is used to identify the best biomarkers that

indicate AD or MCI).

Proposed System

Using computer vision has been the topic of contemporary study. Technology has aided medical professionals' job and has sped up the medical procedure. In this study, we use convolutional neural networks (CNN) and transfer learning to classify photos of Alzheimer's illness (VGG16 and VGG19). The goal of this study is to categorize Alzheimer's disease photos into four groups recognized by medical specialists, and the outcomes of this study include numerous assessment measures. This study will demonstrate that the technique utilized is capable of classifying MRI of Alzheimer's disease into four classifications known to medical specialists through testing on the dataset.

Advantages of Proposed System

Proposed system is accurate in detecting Alzheimer's and classification. Achieved overall accuracy for CNN model has an efficiency of 75.01%, and the second VGG19 model has an effectiveness of 80.28%.

Proposed System Design

In this project work, I used five modules and each module has own functions, such as:

1. Dataset
2. Preprocessing
3. Split dataset
4. Classification

Dataset

Alzheimer's Database was applied in this study (4 classes of images). The information was got from the Kaggle, which offer internet dataset for investigation and evaluation in a variety of fields, at www.kaggle.com/tourist55/alzheimers-dataset-4-class-of-images. The resulting dataset comprises 6400 photographs with a resolution of 176 x 208 pixels that are divided into two sets: a Train set with 5121 images and fourteen classes and a Test set with 1279 photographs and four classifications. The dataset is divided into four categories: mildly demented, moderately demented, non-demented, and very mildly demented. The following are samples of photos from each class.

Preprocessing

Pre-processing is a technique used to improve image quality and boost visualization. Image processing is an important aspect in medical imaging that helps to enhance picture quality. This might be one of the most important variables in attaining good outcomes and accuracy in the next phases of the suggested technique. Alzheimer's images may have a separate problem that causes poor and low visualization. If the photos are inadequate or of poor quality, the outcomes may be disappointing. During the preprocessing stage.

Split dataset

Our dataset is now divided into data for testing and training. The goal of just this split is to evaluate our precision on new dataset and to identify how effectively our model has generalized on learning algorithm. This is preceded by a model fitting, which is an important phase in the model construction process.

Classification:

It is the final phase in which we evaluate very well how your model works on test dataset using several scoring criteria; I chose the 'overall accuracy' to analyze my model. We start by creating a model example, then we fit the trained data to the model using a knowledge for decision making, and then we use it predict function to generate forecasts on x test or the test samples, and these projections are saved in a method named y test hat. For evaluating the model, we will input the y test and y test hat through the accuracy score functions and store the results in a variable named test accuracy, which will represent our model's accuracy rate. We repeated these methods for several other classification techniques models and obtained.

IV. ARCHITECTURE

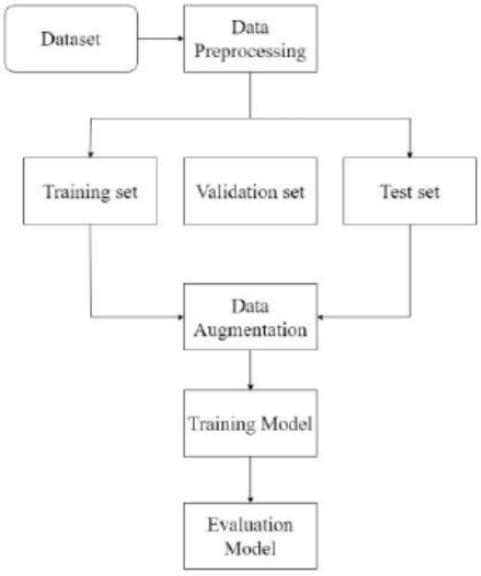

Fig 1: Frame work of Alzheimer's disease detection

V. RESULTS / SCREENSHOTS

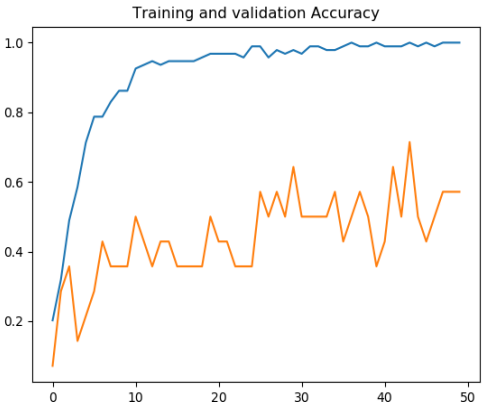

Fig 2: Training Accuracy Graph

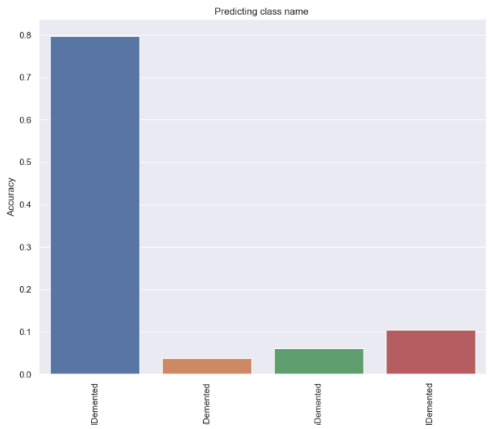

Fig 3: Prediction Graph

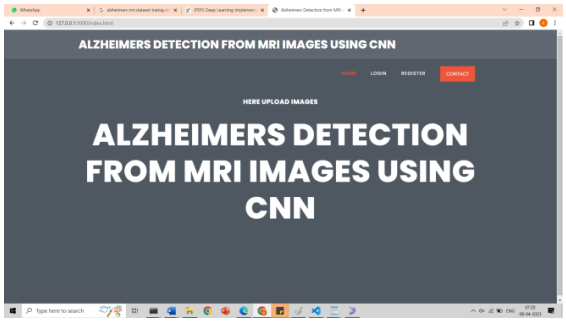

Fig 4: Home page with register login tabs and contact page

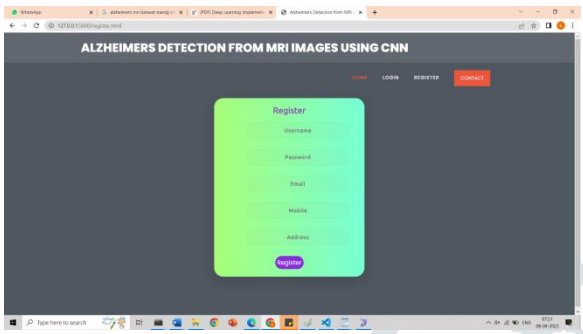

Fig 5: Registration Page for user to register with application with valid details

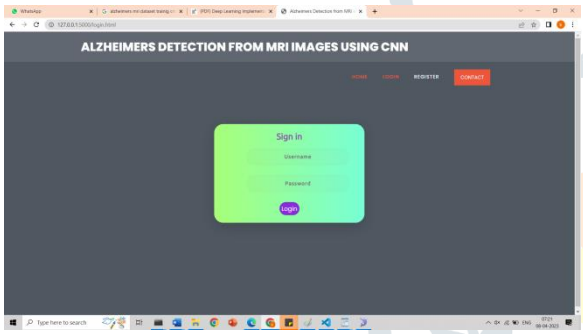

Fig 6: Login : login with valid user name and password

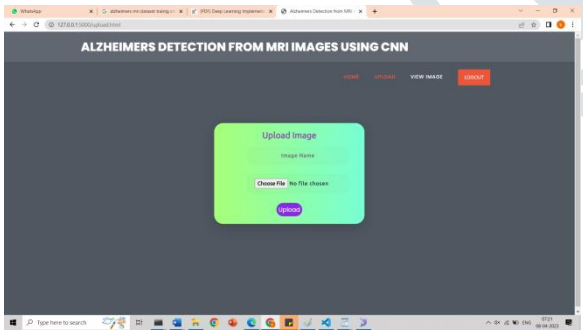

Fig 7: User home page to upload file and view image

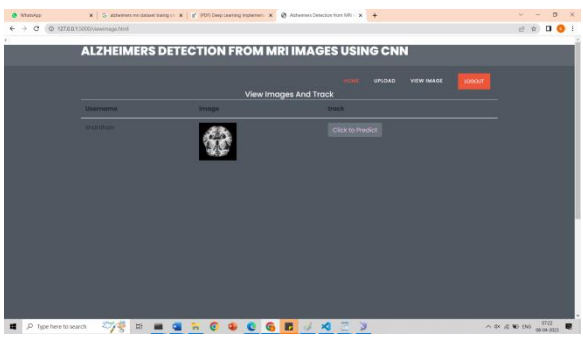

Fig 8: View uploaded image

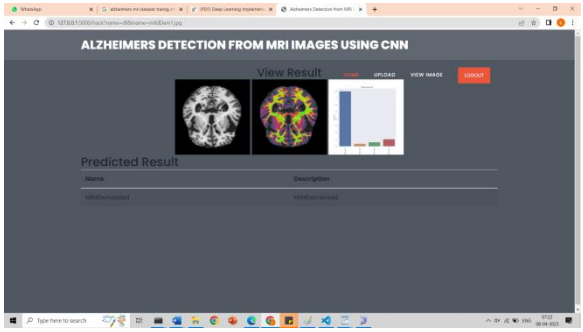

Fig 9: Alzheimer's prediction results

VI. CONCLUSION

A transfer learning strategy for detecting Alzheimer's disease using standardized MRI data is proposed in this work. We used CNN and VGG19 to do various Alzheimer's disease diagnoses and demonstrated that the approach enables for various medical picture categories that can be extended to comparable areas. Many techniques (CNN, VGG16, VGG19) are used in this work to multi-classify Alzheimer's disease dataset. Many computers vision classification produce decent results, yet there is still potential for development. VGG19 has the best performance, scoring 80% for correctness, 60% for precision, and 60% for overall. On the other hand, on all performance indicators examined, had superior performance data than the CNN handmade model. This investigation also has excellent healthcare computer vision since it employs multiple assessment measures.

Future Enhancement

For future study, the researcher advises adopting a more balanced dataset, testing for each layer of the CNN model topology, and researching with comparable or alternative transfer active learning such as Inception V4.

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