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# A Survey on Classification Algorithms of Brain Images in Alzheimer's Disease

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**ABSTRACT:** Alzheimer's disease (AD) is a neurodegenerative disorders and common cause of Dementia for the people over the age 65, and causes the brain to shrink, brain cells to be damaged and breakdown of energy within the cells, this dementia term generally called as memory loss problem. The symptoms of disease forgetting recent functions and fades away memory of people, taking longer time to complete simple every day task, wandering and getting lost, Trouble handling money and paying bills. Finding from these study will help in understanding the causes and problems of dementia patients, developing a system of Alzheimer's disease detection using Convolutional Neural Network (CNN) architecture using (MRI) scans images as inputs, which were trained using Kaggle dataset. During this study the models are trained on the different various dataset so as to analyze and figure out their performance and accuracy. For classification and to detect the Stages of levels in AD by displaying with result like Demented, Non-Demented, Mild-Demented level, apart from classification, finding area of infected region where the brain is damaged and detected using watershed algorithm, from the given input image the image segmentation is spotlight the affected area in brain MRI images.

**KEYWORDS:** Deep Learning, Alzheimer's Disease, CNN, DNN, MRI.

## I. INTRODUCTION

Alzheimer's disease (AD) is the common name for dementia and a brain disorder. Dementia is a general term for Disease where people suffer from memory loss as a problem that negatively affects thinking capabilities of patient and behavior. Dementia symptoms are mild to severe. Patients lose the ability to respond to their environment, to carry on a conversation and, to control movement. Alzheimer disease is a loss of mental health function, characterized by degeneration of brain tissue and cells. Age is that the biggest risk factor for Alzheimer's patient. It mainly affects people over 65. In AD, patients experience symptoms like Confusion with time or place. People living with Alzheimer's can lose track of dates, seasons and the passage of time. Sometimes they may forget where they are or how they got there. A person living with Alzheimer's disease may put things in unusual places. Especially as the disease progresses, the results of AD will be observed from the age of the first 60s and above. The brain starts to shrink up to some degree in healthy aging but, however, it does not lose neurons in large numbers. In Alzheimer's disease, but damage is widespread, as many neurons stop functioning, lose connections with other neurons, and die. Alzheimer's processes vital to neurons and their networks, including communication, metabolism, and repair. There's no option for people with Alzheimer's. Some people live a long time with disease as mild cognitive damage, while others experience a more rapid symptoms.

Implementing automated classification of Alzheimer's disease from MRI images as an input which helps to improve the accuracy and performance. To detect the infected area from MRI images watershed image segmentation technique is used. It effectively classifies level of Alzheimer disease.

## II. RELATED WORK

Different techniques had been suggested and pointed out for classification and segmentation of AD. These techniques have involved in traditional machine learning and recently exploited deep learning models. By looking into this section of the work exploited for AD classification and finding the area of region through watershed segmentation.

A technique for AD proposed by author Mamata Vishvanath Lohar [1], Their analysis work is targeted on the automated classification ways for the detection of Alzheimer's unwellness, with a primary target up to the prediction accuracy which can be useful for practitioners for detection of Alzheimer's unwellness and even its progression stages as traditional management (NC), delicate psychological feature Impairment (MCI) and Alzheimer's unwellness (AD). This paper is concerning the survey on recent studies in connected field that area unit towards development of semi or



absolutely automatic pc computer identification of the AD progression. Paper presents comparison of ways enforced, categories thought of, data base used, analysis parameters considered and also the results obtained with description concerning the unwellness.

Other work proposed by Pereira [2], Our findings showed AN abnormal international network organization altogether patient teams, as mirrored by AN enlarged path length, reduced transitivity, and enlarged modularity compared with controls. additionally, IMCIc, eMCIc, and AD patients showed a reduced path length and mean cluster compared with the sMCI cluster. At the native level, there have been nodal cluster decreases principally in AD patients, whereas the nodal closeness spatial relation detected abnormalities across all patient teams, showing overlapping changes within the hippocampi and basal ganglion and nonoverlapping changes in membrane bone, entorhinal, and orbitofrontal regions. These findings recommend that the symptom ANd clinical stages of AD area unit related to an abnormal network topology.

Other proposed work by author Modupe Odusami [3], This paper proposes a deep learning-based technique that is in a position to predict MCI, early MCI (EMCI), late MCI (LMCI), and AD. The Alzheimer’s illness Neuroimaging Initiative (ADNI) MRI dataset consisting of 138 subjects was used for analysis. The fine-tuned ResNet18 network achieved a classification accuracy of ninety nine.99%, 99.95%, and 99.95% on EMCI vs. AD, LMCI vs. AD, and MCI vs. EMCI classification situations, severally. The planned model performed higher than different far-famed models in terms of accuracy, sensitivity, and specificity. It is not appropriate to detects infection areas.

Other proposed work by author Guilherme Folego[4], This projected technique, ADNet, was evaluated on the CADDementia challenge and outperformed several approaches among the previous art. This method's with machine-learning domain adaptation, ADNet-DA, it reached 52.3% accuracy. Contributions of our study embrace creating a deep learning system that's entirely automatic and relatively fast, presenting competitive results whereas not using any patient's domain-specific info concerning the pathological state. we've an inclination to were able to implement Associate in Nursing end-to-end CNN system to classify subjects into AD, MCI, or CN groups, reflective the identification of distinctive parts in brain footage. throughout this context, our system represents a promising tool realize biomarkers to assist with the identification of AD and, eventually, many alternative diseases.

### III. SUMMARY OF COMMONLY USED AD DIAGNOSIS APPROACHES WITH OBSERVATION

Authors	Published	AD Diagnosis Approaches	Observation
Hans-Wolfgang Klafki, Matthias Staufenbiel, Johannes Kornhuber, Jens Wiltfang	03 October 2006	Therapeutic approaches to Alzheimer's disease	The Authors search for novel therapeutic approaches while targeting the presumed underlying pathogenic mechanisms has been a majorly focused in research and keeping expectation that novel medications with disease-modifying properties will emerge from these efforts in the future. In this survey, currently available drugs as well as novel therapeutic strategies, in particular those targeting amyloid and tau pathologies, has been discussed.

<p>Hsin-Yi Chen, Jian-Qiang Chen, Jun-Yan Li, Hung-Jin Huang, Xi Chen , Hao-Ying Zhang , and Calvin Yu-Chian Chen.</p>	<p>March 19, 2019</p>	<p>Deep Learning and Random Forest Approach for Finding the Optimal Traditional Chinese Medicine Formula for Treatment of Alzheimer’s Disease</p>	<p>The Authors search On the thought of the world largest traditional Chinese medicine (TCM) database, a network- pharmacology-based approach was utilized to analyze TCM candidates which will dock well with multiple targets. Support vector machine (SVM) and multiple regression toward the mean (MLR) methods were utilized to get predicted models. specifically, the deep learning method and also the random forest (RF) algorithm were adopted.</p>
<p>Muhammad Ovais<sup>1,2,3*†</sup>, Nashmia Zia<sup>2,4</sup>, Irshad Ahmad<sup>5</sup>, Ali Talha Khalil<sup>6</sup>, Abida Raza<sup>2</sup>, Muhammad Ayaz<sup>7*</sup>, Abdul Sadiq<sup>7,8</sup>, Farhat Ullah<sup>7</sup> and Zabta Khan Shinwari<sup>1,6,9</sup></p>	<p>23 October 2018</p>	<p>Phyto-Therapeutic and Nanomedicinal Approaches to Cure Alzheimer’s Disease: Present Status and Future Opportunities</p>	<p>In order to combat the situation, indispensable and cutting edge approaches like nanomedicine have been proposed as a implicit treatment modality. In this review paper, arising phyto- remedial and nanomedicinal approaches for treating announcement are banded. In addition, recent trends in arising theranostics for announcement using NPs delivery across the blood – brain hedge( BBB) and their medium of action are developed.</p>
<p>Bojan Bogdanovic, Tome Eftimov &amp; Monika Simjanoska</p>	<p>20 April 2022</p>	<p>In-depth insights into Alzheimer’s disease by using explainable machine learning approach</p>	<p>The conclusions deduced from the intelligent model’s data- driven interpretability brazened all the established hypotheses. This exploration easily showed the significance of resolvable Machine learning approach that opens the black box and easily unveils the connections among the features and the diagnoses</p>
<p>NivedhithaMahendranDurai Raj VincentP M</p>	<p>February 2022</p>	<p>A deep learning framework with an embedded-based feature selection approach for the early detection of the Alzheimer's disease</p>	<p>A deep learning-method for classification model with an embedded feature selected approach is used to classify an AD patients record. An AD data set DNA</p>





		<p>methylation which is having ( 64 records with 34 cases and 34 controls) from the GEO omnibus database was used for the analysis. Before concluding the applicable features, the data were preprocessed by performing quality control, normalization and downstream analysis. As the number of associated CpG spots was huge, four bedded- predicated point selection models were compared and the best system was used for the proposed type model.</p>
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#### IV. CONCLUSION & FUTURE SCOPE

##### Conclusion:

In this paper, summarizing all the related work and summary of AD approaches with observation by authors with the performance and accuracy of several AD approach by using MRI brain images, As a part of further research work the authors will give the outcomes results that will classifies with the stages Mild Demented, Moderate Demented, Non-Demented, Very Mild Demented. Using Convolutional Neural Network architecture, and for detecting infected area of region using Watershed image segmentation algorithm.

##### Future Scope:

Future work includes using data from other modalities like PET, FMRI to improve the performance and accuracy with best results.

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