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Using Machine Learning Techniques Detection of Alzheimer's Disease

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Abstract: *Using first-order statistical features, this paper presents a new method for detecting Alzheimer's disease (AD) in 3D brain Magnetic Resonance images. Alzheimer's disease is a neurological condition that mostly affects the elderly. Because Alzheimer's disease is a progressive disease, early detection and classification can greatly aid in disease management. Recent research has used voxel-based Magnetic Resonance brain image feature extraction approaches in conjunction with machine learning algorithms to achieve this goal. Because Alzheimer's disease alters and damages the grey and white matter of the brain, their study has proven to be more successful in predicting the condition. The proposed method separates Magnetic Resonance images of white and grey matter from 3D structural brain Magnetic Resonance images, generating 2D coronal slices.*

Keywords: Alzheimer's Disease prediction system, IoT, machine Learning, Supervised learning, NLP, Alzheimer's Disease

I. INTRODUCTION

Alzheimer's disease (AD) is a neurodegenerative disease that primarily affects the elderly population. It is a progressive disease, and there is no treatment to slow or reverse its progression. According to reports from 2005 to 2030, the percentage estimate of the number of people affected by AD has steadily increased. Alzheimer's disease affects 40 million people worldwide. It is clearly possible to reach 135 million by 2050. However, while Alzheimer's disease is incurable, early detection and treatment can control neuronal degeneration. In the current context, Computer-Aided Diagnostics employs advanced computer programmes and algorithms in the fields of image processing and pattern recognition to identify features of interest or the observed MR image's region of interest (FOI / ROI). The developed programmes are expected to highlight the necessary functions while maintaining control of the false negative systems, which are much better inaccuracies and can greatly assist the neurologist in understanding the physiological changes in the brain if carefully developed. As a result, significant research is being conducted around the world to classify and detect the various stages of neurodegenerative diseases such as Alzheimer's disease. Shide Song et al. proposed a method for classifying and detecting AD based on cortical thickness in MR images using a Gaussian Mixer Model in one of the research articles found in the literature (GMM). The GMM algorithm is used to reduce dimensionality and extract desired features. Then, for AD classification and detection, a GMM model with a Bayesian framework is used. When compared to other traditional classifiers such as Support Vector Machine (SVM) and Linear Discriminant Analysis (LDA), the authors claim that the proposed model has higher classification accuracy. It was also stated that the maximum number of components of each class's distribution is two. Ruben Armananzas et al. proposed a machine learning technique for classifying and diagnosing Alzheimer's disease using functional MR images. The Statistical Parametric Mapping Toolkit was used to create individual statistical voxel maps from functional MRI images. Then, using active filters, active voxels were chosen. The relevant voxels were then chosen using one of four feature scoring schemes. This wrapper access scheme was guided by six pattern recognition techniques. The classification is then tested using nested inner and outer cross-validation loops with multiple voxel sets ranked by importance. Using Boltzmann machines, Xiao Zheng et al. proposed an algorithm to diagnose Alzheimer's disease in its early stages (RBM). The proposed algorithm employs a Boltzmann machine for multimodal data classification via learning with privileged information (LUPI). Although SVM classifiers can effectively classify single modal data, they cannot process multimodal data. In addition, for effective brain disease classification, a combination of RBM and SVM classifiers

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using learning with privileged information (LUPI) was proposed in this paper. By modelling MR images as fractal objects, Salim Lahmiri and Mounir Boukadoum proposed a new classification method for AD diagnosis. The proposed method extracts features using feature multiscale analysis and Hursts exponents. The extracted features are then used to train SVM classifiers for classification. SVM classifiers were initially used to distinguish AD from healthy people, and then SVM classifiers were used to distinguish AD from mild cognitive impairment (MCI). Multilevel SVM classifiers were used to classify all three classes in the third experiment. The results show that all three methods have high classification accuracy. This method can be improved to classify 3D images. Detection of Alzheimer's disease using discrete wavelet transform (DWT) brain MRI with fractal features, Srinivasan et al. As a preliminary step, they performed image preprocessing tasks such as image enhancement, region of interest extraction, and skull removal. Another 2D DWT is used to extract fractal features (haar, db2, and symlet as mother wavelets). There were two types of fractal feature extraction methods used (differential box counting and triangular prism). Four classification techniques were used in their experiment for performance analysis. According to the results, the fractal feature based on symlet wavelets with SVM classification has a maximum accuracy of 89.7%.

II. LITERATURE SURVEY

1.Automated Alzheimer's Disease Classification Using Deep Neural Network (DNN) by Random Forest Feature Elimination Determining Alzheimer's Disease (AD) in its early stages is critical for planning appropriate care for the patient. The goal of this study was to develop a fast and accurate automated classification system for determining AD with the least amount of data collected from the patient. Magnetic resonance imaging (MRI) is widely used to diagnose Alzheimer's disease.

2. Muhammad Hammad Memon, Jianping Li, Amin ulHaq, and Muhammad Huain Memon METHOD OF EARLY STAGE ALZHEIMER'S DISEASE DIAGNOSIS In this study, we proposed a machine learning-based method for accurately diagnosing Alzheimer's disease. For accurate Alzheimer's disease prediction, we used machine learning classifiers.

3.H. M. Tarek Ullah, Dr. DipNandi, Zishan Ahmed Onik, Riashat Islam Deep Convolutional Neural Networks are used to detect Alzheimer's disease and dementia from 3D brain MRI data. In this paper, an alternative approach that is faster, less expensive, and more reliable is discussed. Deep Learning is the cutting-edge of Machine Intelligence. Convolutional Neural Networks are biologically inspired multilayer perceptrons with image processing capabilities.

4.Cucun I Ketutfind it very Angkoso. MauridhiHery Purnomo, Eddy Purnama Alzheimer's Disease Brain Tissue and Cerebrospinal Fluid Analysis Detection Alzheimer's disease (AD) is a neurodegenerative disorder that causes memory and thinking skills to deteriorate over time. To determine the best treatments, a more accurate diagnosis and appropriate management are required.

5.Tadanori Fukami, Kota Oishi, NorihideMaikusa, and Hiroki Fuse Alzheimer's Disease Detection Using Shape Analysis of MRI Images We tested the effectiveness of a method for classifying healthy subjects and Alzheimer's disease patients using brain shape information in the current study.

6.R. P. Tewari, Aarti Sharma, J. K. Rai Relative Measures to Characterize EEG Signals for Early Detection of Alzheimer's The best feature for classification is relative entropy. The Kruskal-Walis test is used to statistically validate all of the findings. The selection of the relevant feature will be beneficial for early Alzheimer detection and may improve the quality of life of Alzheimer's patients.

III. PROPOSED SYSTEM DESIGN

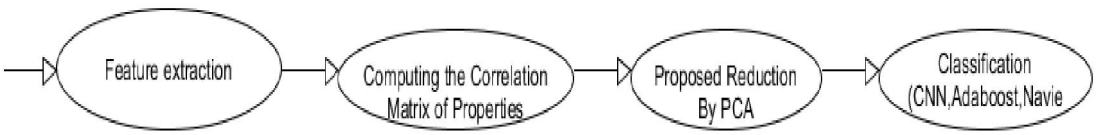

Figure: Proposed System

First we will deploy the IoT setup with various sensors, these are completely wearable devices or sensors that automatically capture data from human bodies, the generated data should be analog data that needs to be converted to digital data. ADC is a converter that is used in middleware architecture for data conversion. Arduino is a

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microcontroller that uploads data to a cloud server in parallel. The cloud data service provides streaming data to machine learning algorithms to predict heart disease. This research worked with various machine learning algorithms as well as deep learning algorithms. Experimental analysis was performed with numerous synthetic real-time healthcare monitoring data.

IV. CONCLUSION

An effort has been made in this work to study 3D brain MR image slices for AD diagnosis. For this study, all three different views of grey matter and white matter slices (Axial, Sagittal, and Coronal) were used. Slice number 51 was chosen and used for further analysis based on several observations. Each slice has had its first-order statistical feature extracted. The features are used to generate the correlation heat map. PCA is used for feature reduction. The proposed algorithm's performance has been studied using four classification methods: logistic regression, Naive Bayes, SVM, and Adaboost. These experiments make use of the publicly available brain MR image data set OASIS. The results of the experiments show that the maximum

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