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DETECTION OF PARKINSON'S DISEASE DIAGNOSIS USING IMAGE DATASET WITH AUTOENCODER TECHNIQUE

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Abstract: Parkinson Disease (PD) is a kind of neural disorder that affects a range of people. This disease has continuously growing stages to halt entire neural activities of any people. There are many techniques proposed to detect and predict PD using medical symptoms and measurements. The medical measurements provided by different experiments must be effectively handled to produce concrete results on the detection of PD. This saves many people from PD at earlier stage itself. Recent technologies focus on Machine Learning (ML) and Deep Learning (DL) techniques for effective PD data analysis for making efficient prediction system. They are concentrating to build complex artificial neural systems using effective learning functions. However, the existing systems are lacking to attain multi-attribute and multi-variant data analysis to predict PD. To attain multi-variant Parkinson symptom analysis, the artificial neural systems must be equipped with more characteristics. In this regard, the Proposed system is developed using Multi-Variant Stacked Auto Encoder (MVSAE). The MVSAE based PD Prediction System (MSAEPD) helps to analyze more PD symptoms than existing systems. This article provides four different variants of SAE construction procedures to predict PD symptoms. The MSAEPD is implemented and compared with existing works such as MANN, GAE and UMLBD. This comparison shows the MSAEPD system gives 5% to 10% better results than existing works.

Keywords: Parkinson Disease, Multi-Variant, Multi-Attribute, Machine Learning.

I. INTRODUCTION

Parkinsons disease (PD) affect dopamine producing neurons in a specific area of the human brain called substantia nigra. It is long term disorder of the central nervous system. PD causes symptoms such as tremor, cognitive impairment, rigid muscles, loss of automatic movement and sleep disorders etc. More than 10 million people in the world suffer from Parkinsons disease. The main problem in detecting the disease is that, the visible symptoms appear mostly at the later stage where cure no longer becomes possible. Till now there is no correct reason proved for the cause of Parkinsons disease. Reasons, like genetic mutation, vitamin D deficiency, lewy bodies containing abnormal protein in substantia nigra are common. Detection of Parkinsons disease (PD) is very essential for effective treatment of the Parkinsons disease and patient management. However, earlier to the motor symptoms or onset of tremor, the dopaminergic neurons begin to change.

II. RELATED WORKS

[1] Parkinson's disease affects millions of people around the world and consequently various approaches have emerged to help diagnose this disease, among which we can highlight handwriting exams. Extracting features from handwriting exams is an important contribution of the computational field for the diagnosis of this disease. In this paper, we propose an approach that measures the similarity between the exam template and the handwritten trace of the patient following the exam template. This similarity was measured using the Structural Cooccurrence Matrix to calculate how close the handwritten trace of the patient is to the exam template. The proposed approach was evaluated using various exam templates and the handwritten traces of the patient. Each of these variations was used together with the Naïve Bayes, OPF, and SVM classifiers. In conclusion the proposed approach was proven to be better than the existing methods found in the literature and is therefore a promising tool for the diagnosis of Parkinson's disease.

[2] Parkinson's disease affects millions of people around the world and consequently various approaches have emerged to help diagnose this disease, among which we can highlight handwriting exams. Extracting features from handwriting

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[3] Early detection of Parkinson's disease (PD) is very crucial for effective management and treatment of the disease. Dopaminergic images such as Single Photon Emission Tomography (SPECT) using 123 I-Ioflupane can substantially detect PD at an early stage. However, till today, these images are mostly interpreted by humans which can manifest interobserver variability and inconsistency. To improve the imaging diagnosis of PD, we propose a model in this paper, for early detection of PD using image processing and artificial neural network (ANN). The model used 200 SPECT images, 100 of healthy normal and 100 of PD, obtained from Parkinson's Progression Marker's Initiative (PPMI) database and processed them to find the area of caudate and putamen which is the region of interest (ROI) for this study. The area values of ROI were then fed to the ANN which is hypothesized to mimic the pattern recognition of a human observer. The simple but fast ANN built, could classify subjects with and without PD with an accuracy of 94%, sensitivity of 100% and specificity of 88%. Hence it can be inferred that the proposed system has the potential to be an effective way to aid the clinicians in the accurate diagnosis of PD.

[4] Nowadays, an important research effort in healthcare biometrics is finding accurate biomarkers that allow developing medical-decision support tools. These tools help to detect and supervise illnesses like Parkinson's disease (PD). This paper contributes to this effort by analyzing a convolutional neural network (CNN) for PD detection from drawing movements. This CNN includes two parts: feature extraction (convolutional layers) and classification (fully connected layers). The inputs to the CNN are the module of the Fast Fourier's transform in the range of frequencies between 0 Hz and 25 Hz. We analyzed the discrimination capability of different directions during drawing movements obtaining the best results for X and Y directions. This analysis was performed using a public dataset: Parkinson Disease Spiral Drawings Using Digitized Graphics Tablet dataset. The best results obtained in this work showed an accuracy of 96.5%, a F1-score of 97.7%, and an area under the curve of 99.2%.

[5] The deep learning is strong on not only images (as explained in the previous Chap. 4) but also on sound-type data. It is possible to show that in a serious disease called as Parkinson's disease (PD). PD is a degenerative disease of the central nervous system. As coming after the Alzheimer's disease, PD is known among critical common neuro degenerative diseases. The number of people with PD worldwide is quite high and is rapidly increasing, especially in countries (developing) in the context of Asia. The Olmsted County (Mayo Clinic) has reported the life-time risk of Parkinson's disease at 2% for men. That value is 1.3 for women. It has been confirmed in many sources that the incidence of males is higher.

III. PROBLEM DEFINITION

- It decreases the diagnosis accuracy.
- It Can't able to assist in Diseases detection at its earlier stage.
- Increases the time of the radiologist in evaluation.
- Hard to implement in Neural network systems.

IV. EXISTING SYSTEM

- Nowadays, an important research effort in healthcare biometrics is finding accurate biomarkers that allow developing medical-decision support tools.
- These tools help to detect and supervise illnesses like Parkinson's disease (PD).
- This paper contributes to this effort by analyzing a convolution neural network (CNN) for PD detection from drawing movements.
- This CNN includes two parts: feature extraction (convolution layers) and classification (fully connected layers).
- Challa K.N.R. et al. have used different machine learning algorithms to improve models that already use important non motor symptoms of Parkinson.
- They used four different machine learning classifier namely Multilayer Perception, Bayesian Network, Random Forest and Boosted Logistic Regression and tested the collected dataset on each four of them to find out the accuracy
- It was observed that though accuracy and area under ROI curve was almost same for every technique.

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V. PROPOSED SYSTEM

Parkinson Disease (PD) is a kind of neural disorder that affects a range of people. This disease has continuously growing stages to halt entire neural activities of any people. There are many techniques proposed to detect and predict PD using medical symptoms and measurements. The medical measurements provided by different experiments must be effectively handled to produce concrete results on the detection of PD. This saves many people from PD at earlier stage itself. Recent technologies focus on Machine Learning (ML) and Deep Learning (DL) techniques for effective PD data analysis for making efficient prediction system. They are concentrating to build complex artificial neural systems using effective learning functions. However, the existing systems are lacking to attain multi-attribute and multi-variant data analysis to predict PD. To attain multi-variant Parkinson symptom analysis, the artificial neural systems must be equipped with more characteristics. In this regard, the Proposed system is developed using Multi-Variant Stacked Auto Encoder (MVSAE). The MVSAE based PD Prediction System (MSAEPD) helps to analyze more PD symptoms than existing systems. This article provides four different variants of SAE construction procedures to predict PD symptoms. The MSAEPD is implemented and compared with existing works such as MANN, GAE and UMLBD. This comparison shows the MSAEPD system gives 5% to 10% better results than existing works.

Advantage:

- The improved accuracy of Diseases nodule detection.
- Removes the noises that create false detection of Diseases.
- Features extraction where features like area, perimeter, centroid, diameter, eccentricity and mean intensity are extracted from the image. These features are used as training features to develop the classifier.
- The classification module classifies the detected nodule as malignant or benign by using the trained classification method.

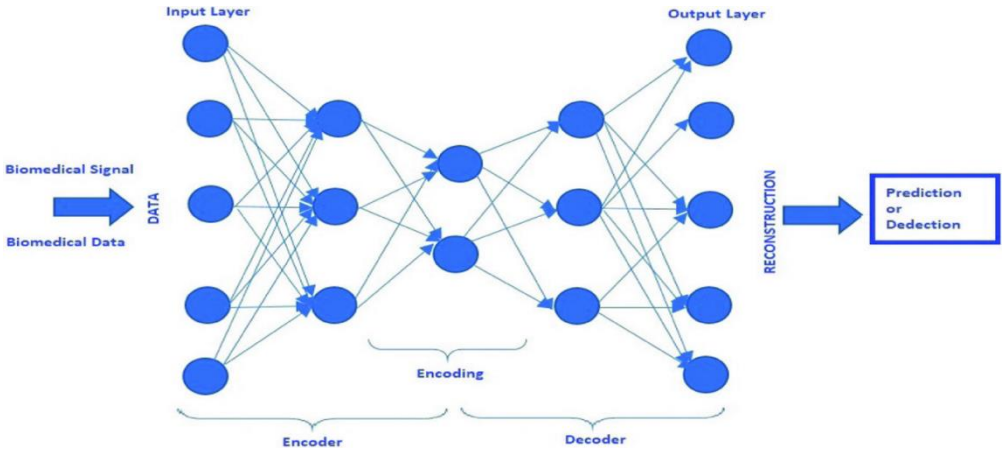

Figure 1: Architecture Diagram

VI. IMPLEMENTATION

The Proposed system uses Stacked Auto Encoder (SAE) variants on huge Parkinson dataset. SAE is the technique of Artificial Neural Network (ANN), that is used to effectively code the input data features based on relevant learning rates. SAE allocates the data features in a stacked format and expertise the decision making system in data prediction. Also, SAE helps to reduce the data features according to the dimensions. The data reduction eliminates noise rates and missing data. The Classless SAE, Clustered SAE are used for making trained data features under unsupervised and supervised categories respectively. Multi-level Balanced SAE and Multi-Variant SAE are used for feature classification based on trained Parkinson data.

VII. TESTING

Testing is performed to identify errors. Testing is used for equality assurance. Testing is an integrated part of the entire development and maintenance process. The goal of the entire during phase is to verify that the specification has been accurately and completely incorporated into the design as well as to ensure the correctness of the design itself. Testing is one of the important factor in the software development phase.

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VIII. CONCLUSION

In this article, we present a new algorithm, named N2A-SVM, to predict Parkinson's disease gene. N2A-SVM includes three steps: (1) extracting the vector representation of each gene in the PPI network using node2vec; (2) reducing dimension of the obtained vector using autoencoder; (3) predicting the genes associated with Parkinson's disease using SVM. We compare N2A-SVM with RWR and distance-based method and prove that N2A-SVM performs better than the compared methods. In addition, we use the N2A-SVM algorithm to discover new genes associated with Parkinson's disease. Ten genes most likely to be associated with Parkinson's disease have been proved by literature study. In the future, we will use this method in the prediction of other related diseases, and hope to apply biological experiments to verify the results.In this study, we propose a stacked sparse auto-encoder (SSAE) based multi-modal feature coding method to conduct two kinds of binary classifications simultaneously for PD diagnosis. The extensive experimental results show that the proposed method outperforms the common DL methods in the multi-modal longitudinal dataset based on PPMI. In addition, our method exhibits the most stable performance on different classification tasks at the same time point and the same classification tasks in the vertical direction.

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