IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

# Automated Identification Of Parkinson's Disease Diagnosis Using Deep Learning Approach

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***Abstract*** -Due to their fragility, high expense, and difficulty in performing procedures, brain disorders are among the hardest diseases to cure. However, since the outcomes are unknown, the procedure itself need not be successful.Adults suffering from one of the most prevalent brain diseases, hypertension may experience varying degrees of forgetfulness and memory issues.Because of these factors, it's critical to diagnose Parkinson's disease using brain MRI scans, as well as to assess the patient's degree of deterioration and memory loss.We address techniques and strategies for using deep learning to the diagnosis of Parkinson's in this research.The proposed method is applied to improve patient care, save costs, and facilitate rapid and precise analysis in large-scale studies. Parkinson's diseases progressive neuro degenerative disorder that affects millions of people worldwide. A brain MRI scan has demonstrated potential as a technique for early Parkinson's disease detection and early detection can improve patient outcomes. The analysis of brain MRI scans for Parkinson's disease has been using more and more deep learning techniques, like convolutional neural networks (CNNs), in recent years. An investigation of Parkinson's disease using brain MRI scans is suggested in this research using a CNN-based network. The suggested system consists of multiple steps: preprocessing the data, extracting features, training the CNN model, and assessing the model's performance on a test set.The proposed work outcomes shows how well the suggested CNN-based method performs in correctly identifying Parkinson's from brain MRI data. The suggested method may enhance Parkinson'sdisease early diagnosis and surveillance, which would benefit patients' outcomes.

## I. INTRODUCTION

About 44 million people worldwide suffer with Parkinson's disease (AD), the neurodegenerative condition that primarily affects older folks.The early symptom of the disease is Tremors, muscle stiffness, slowing of movement. Years before the first symptom appears, damage begins to develop in the area of the brain that controls memory. The brain eventually shrinks dramatically as a result of the neuron's loss in other areas. The disease has the following stages: Mild, ModerateandSevere.The mild stage, which is the initial stage, consists of issues arising from changes in gait, posture, or facial expressions.The moderate stage is the middle and longest stage, characterized by challenges with standing, walking, and other physical activities. The severe stage is the late stage in which the patient is wheel chair bound and bed ridden. After China and the United States, India has the third-highest caseload in the world, with over 4 million people suffering from Parkinson'sdisease. It is estimated that by the end of 2030, there would be over 7.5 million Parkinson's and dementia cases in India.Predicting the illness early reduces the chance of mortality. To do this, the disease classification is implemented using a variety of techniquesEvery three seconds, someone new suffers from Parkinson's disease. In order to comprehend these changes in the brain, research and study are necessary. MRI images are used as input in this work and deep learning techniques are used in automated identification of Parkinson's disease. Therefore, when those factors show signs of change, one can recognize such changes and take the necessary medication.

## II. EXISTINGSYSTEM

Millions of individuals throughout the world suffer from Parkinson's disease, a chronic neurological condition. It is a slowly worsening illness that finally results in death and affects daily functioning, memory, and cognitive function. Due to the growing prevalence of Parkinson's disease, there is a need for effective early detection and prediction systems to aid in early diagnosis and treatment. There are various existing systems for Parkinson's disease prediction, each with their own unique advantages and disadvantages. One such system is the Parkinson's disease Neuroimaging Initiative (ADNI). ADNI is a large-scale research effort that usesneuroimaging, genetics, and other biomarkers to identify early signs of Parkinson's disease. The data collected from ADNI is used to develop predictive models for Parkinson's disease. The most widely used algorithms are the support vector machine (SVM) and random forest after extractingthe features from the image preprocessing pipeline.A hybrid attention mechanism that can extract features from input images at various scales and a hybrid attention module integrated with the skip connection in the U-Net model are features of the residual U-Net model. Using a convolutional autoencoder system, multi-modal data fusion for disease prediction is performed on PET images.

## III. PROPOSEDSYSTEM

The study focuses on using a deep learning-based technique to extract characteristics from the segmented region of medical brain MRI images in order to identify and categorize aberrant and normal brain cells across a sizable database.The suggested method uses MRI scans to extract texture and shape characteristics from the brain region, and then uses a neural network as a multi-class classifier to identify different stages of Parkinson's disease.The suggested method is being used, and it should provide greater accuracy than traditional methods. Thestep-by-stepprocessoftheprojectareasfollows:

• To gather and preprocess pertinent data from a range of sources on lifestyle, health, and demographic variables.

The process involves choosing suitable machine learning algorithms to create aParkinson'sprediction model.

• Using the gathered data to train and test the model in order to assess its correctness and performance.

• To enhance the model's predictive power by fine-tuning the hyper-parameters and feature selection.

• To put the model to practical use in clinical settings to help prevent and detect Parkinson's disease early.Overall, the project aims to leverage the power of machine learning to create a predictive model that can help healthcare professionals identify individuals at risk of developing aParkinson, leading to earlier intervention and improved health outcomes.

### *A.ModulesDescription*

- IMAGEACQUISITION-An MRI can be used to assess brain health and forecast anomalies and cerebral activity. The objective of this work was to analyze and identify normal and Parkinson's class MRI signal patterns using an Automatic Diagnostic Tool (ADT). In this module, we can enter data from MRI images. An assortment of MRI scans from young patients with incurable Parkinson's disease can be found in this Kaggle dataset. Subjects were examined for a maximum of several days following the discontinuation of anti-Parkinson treatment in order to characterize their data and assess if they warranted surgical intervention.

- PREPROCESSING-The process of data preparation, an essentialcomponentof the data mining procedure, is called data preparation.

To ensure or improve performance, data may be transformed or erased before use. Rubbish in, garbage out is especially true for projects employing data and AI. The methods used to collect data are usually not well managed, leadingtowildlyinaccurate figures, impossibledata combinations, incorrectdata, etc. Improperlyexaminingtheseissuescouldleadtoinaccuratepositiveoutcomesfromdataanalysis.Therefore, every investigation requires a thorough examination of the data's presentation or overall caliber. Data preparation is often the most critical part of a machine learning project. Theinitial EEG recordings are separated in the previous stage by a continuous time window, without ever crossing over.

- FEATURE EXTRACTION- Pre-processed data can be used to discover temporal or frequency-specific characteristics in this module. It includes "mean," "varieties," "kurtosis," "skewness," and other attributes that will be used for classification in the future.The automated feature was introduced to make it easier to manage groups. Picking and combining variables into features reduces the amount of extraction by employing specialized algorithms or deep networks to extract features automatically from signals or pictures. The procedure of feature extraction is a part of the dimensionality reduction procedure, in which a preliminary set of the raw data is sorted into distinct elements.

- MODEL TRAINING - A variety of comment operations must be performed on the outputs of a training Deep CNN in order to get the offer boosted again for the test MRI scan image when diagnosing Parkinson's disease. Multiple hidden layers are included in a CNN. Convolution, pooling, and fully connected layers are common in a network's hidden layers. The outcome of a convolutional layer's operation on the input is passed on to the following layer. The behavior of a single neuron is simulated by convolution. In convolutional networks, the output of a neural cluster can be combined with a nerve cell at a higher level using either local or global pooling layers. The mean value from each neural cell in the preceding layers is used in mean pooling. The fully connected layers allow each neuron in one layer to communicate with every other neuron in the rest of the structure. The classic multi-layered feed-forward neural network and the CNN are conceptually identical. CNNs are unquestionably better than traditional classifiers for the study of high-dimensional data A parameter-sharing strategy is employed by convolutional layers of CNNs to control and reduce the total number of parameters. The network's variable and computation count, as well as the representation's various studies have demonstrated, are gradually reduced through the use of a pooling layer, providingthenetwork more fitting control.

Setting up the CNN Model

- CLASSIFICATION - In the testing phase, the user can input the brain image and extract the features, matching them to the model file, and identifying the disease specifics. And provide the diagnostic information based on the predicted ailments.

- ALGORITHM DETAILS - The ImageNet Large-Scale Visual Recognition Challenge (ILSVRC) is an annual competition that showcases and tests advanced computer vision techniques. The paper titled "VERY DEEP CONVOLUTIONAL NETWORKS FOR LARGE" was presented by Karen Simonyan and Andrew Zisserman from the Visual Geometry Group, Department of Engineering Science, University of Oxford, in the 2014 ImageNet challenge.

Object detection and classification were won by scale image recognition.A convolutional neural network is also known as a ConvNet, a type of artificial neural network. There are various hidden layers in a convolutional neural network, The VGG16 is a type of CNN (Convolutional Neural Network) that is widely regarded as one of the most advanced computer vision models to date. An architecture with very small (3 3) convolution filters was used by the creators of this model to evaluate the networks and increase their depth. 138 trainable parameters were created by pushing the depth to 16–19 weight layers.VGG16 is object detection and classification algorithm which is able to classify 1000 images of1000 different categories with 94.7% accuracy. It is one of the popular algorithms for image classification and is easy to use with transferlearning.

The16 in VGG16 refers to16layers that have weights. In VGG16 there are thirteen convolutional layers, five Max Pooling layers, and three Dense layers which sum up to 21 layers but it has only sixteen weight layers i.e., learnable parameters layer.

VGG16 takes input tensor size as 224, 244 with 3 RGB channel.

Most unique thing about VGG16is that instead of having a large number of hyper-parameters they focused on having convolution layers of 3x3 filter with stride 1 and alwaysused the same padding and maxpool layer of 2x2 filter of stride 2.

The convolution and max pool layers are consistently arranged throughout the whole architecture.

Conv-1 Layer has 64 number of filters, Conv-2 has 128 filters, Conv-3 has 256 filters, Conv 4 and Conv 5 has 512 filters.

Three Fully-Connected (FC) layers follow a stack of convolutional layers: the first two have 4096channels each, the third performs 1000-way ILSVRC classification and thus contains 1000 channels (one for each class). The final layer is a soft-max one.

The strong performance on the ImageNet dataset and its relative simplicity make the VGG 16 architecture a popular choice for many computer vision applications. The architecture was originally developed for image classification, but has since been adapted for other tasks.

Object detection and semantic classification. To create a fully convolutional network for semantic segmentation, the fully connected layers can be removed and replaced with convolutional layers.

- Step1(b): ReLU Layer

**Step: 2** Pooling

Pooling is a type of downsampling that minimizes computation and dimensions while reducing over-fitting because there are fewer parameters and the model can withstand distortion and variance.

**Step:3** Flattening

Flattening is used to put pooling output into one dimension matrix before further processing.

**Step:4** Fully Connected Layer

When the flattened output is given into a neural network that further classifies and recognizes images, a completely linked layer is created. Additionally, by implementing a multiclass classifier, we may more accurately forecast illnesses in leaf image data.

## IV. IMPLEMENTATION

This process requires a dataset to be loaded into the system. A convolution neural network algorithm is used to develop disease prediction. Based on the collected data, we train and test the model to determine its accuracy and performance. The output of this process will be to check whether the uploaded image is affected by Parkinson's disease or not, and also to classify the type of Parkinson's disease.

## V. EXPERIMENTALRESULTS

After continuous training for epchos, the result is obtained, it is confirmed. Once the training is completed, we can start testing the system.

We had trained upto 50 epoches with an accuracy of 97%.

## Conclusion

In conclusion, Parkinson disease analysis using machine learning techniques has shown great potential in the early detection and prediction of Parkinson disease. With the increasing prevalence of these diseases worldwide, there is a growing need for more effective and efficient screening methods. Machine learning-based approaches can not only improve the accuracy and speed of diagnosis but also reduce the burden on health care systems and improve patient outcomes. The proposed system using CNN algorithms for retinal image segmentation, diabetic and glaucoma classification can help healthcare providers to make more informed decisions and provide personalized treatment plans. The combination of deep learning algorithms and retinal imaging has the potential to revolutionize the way we diagnose and manage these diseases, leading to better patient outcomes and a reduction in the overall healthcare burden. With the help of deep learning algorithms, medical professionals can process complex retinal images more efficiently, which can result in faster and more accurate diagnosis. Moreover, these approaches can help overcome the challenges associated with subjective interpretations of medical images. Human error and inter-observer variability can lead to inconsistencies in the interpretation of medical images, which can have a significant impact on patient outcomes. By leveraging machine learning algorithms, we can obtain more objective and standardized results that can help improve the quality of care.

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