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Identification of Parkinson Disease Patients Classification using Feed Forward Technique Based On Speech Signals

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Abstract: Parkinson's disease is a second most Neuro degenerative disease; it is affecting the central nervous system. The people enduring from this disease like passive movement, uncontrollable hand vibrations, imbalance, etc. We present a classification method and focused on speech signals to the identification of Parkinson disease. Because the speech signal is an earlier effect on the Parkinson disease. Here we are using feed forward technique for the classification. Feed forward technique is an artificial neural network which is connected from a unit not a cycle. The newly proposed technique is easy to identify diseased patients and non- diseased patients using speech signals. In that speech signals, certain vowel, words and numbers are used. In this work we provide a brief overview of the area of feed forward technique. We will also discuss speech signals and how it is involved in the technique. The experimental result suggests that the feed forward technique gives best classification accuracy using speech signals.

Keywords: Identification, feed forward, speech signals

I. INTRODUCTION

Parkinson disease peoples are suffering from many problems. One of the major problems is Parkinson's disease people are cannot walk their own, cannot stand like a normal person, cannot speak clearly and they depend on their relatives for the assistance [1]. The significant problem of the Parkinson disease like slowness, rigidity, and tremor during the motion. Speech will be affected very early stage of the disease. Parkinson disease which produces dopamine. Dopamine is a chemical substance and sending messages between brain and nerve cells. Dopamine has to play many roles in the brain and the brain circuits and one more think that dopamine is also affected neurological disorders. Group of condition of Parkinson disease is called motor system disorders [2], it occurs as a result of a slow and progressive loss of dopaminergic neurons. Some authors, they claim that, in the world, there are 25% of patients suffering from Parkinson disease in every year. It may be average 7 to 10 million people suffer the disease. In every year it will be increased by 1000 to 2,000. The ratio of male and female are equal. Respective to that men are 3 times more affected by the disease [3]. Parkinson disease will be affected after the age of 60.

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They identified that only 4% peoples suffering from Parkinson disease at the young age. The early effect of this disease includes shoulders and back pain, losing the balance; people have difficult to write anything and also difficult read and speech changes [4].

It is quite often that these effects are unavailable to identify. The earlier stages of the disease include muscle rigidity and it is also frequently affected. [5]. some other kind of problems is experienced by people such as, getting out of chairs and uncontrolled by their balance when walking. The other problems of this disease include reducing the voice, increased vocal tremor, difficulty starting and controlling movement and breathiness. The disease will be affect a person's speech signal and the person's cannot speak clearly. Also difficult clear the sounds [6]. Vocal impairments of Parkinson disease described that unable to produce normal vocal sounds (dysphonia) and difficult to pronouncing words (dysarthria) [7]. At the present, the disease will be identified early and give some medication and medical diagnosis, then the problem will be reduced in frequently. This disease will affect it is difficult to speak to another person. According to this paper, it focuses on patient's classification using feed forward based on the speech signals. This indicates that data into patient voice records. Here we are used to identify the Parkinson disease from the entire dataset and also identify non-diseased patients from the dataset. The objective of this paper is to identify the disease using speech signals. Speech signals such as vowels, words and sentences are used. Utilizing the speech signals we can recognize Parkinson disease from the beginning times. Later on we can give the Parkinson disease treatment from the beginning times.

II. RELATED WORK

In this paper they are using two methods one is Parkinson's disease and another one is Neurological disease using voice based classification. According to this paper, voice- based classification is the proper way to identify the diseases. Voice recordings further analyzed using MFCC. They characterize to identify the disease, gender and age. Here they are used voice- Cepstral analysis and used different motor speech disorders to identify the both diseases. There no need to separate Parkinson's disease from non-Parkinson's disease for the diagnostic purpose. In general the disorders are characterized by different history of symptoms. In the further experiments they are using the same data set. For the mathematical expression they have used the gradient descent approach. In that they are used SVM.

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It has been characterized by two methods according to the age group. With the average age of Parkinson's disease is 65 and the average age of Neurological disease is 51. Both gender and age have the acoustic speech disorders.

They have taken speech samples approximately 48 kHz with 16- resolution. (**benba et. al., 2016).** This paper is proposing to use two methods one is MFCC and a second one is SVM to identify the Parkinson's disease. MFCC and SVM are voice print analysis. According to Parkinson's disease, patients are suffering from weakening of the voice. The data set is collected from authors and used acoustic analysis. Paper is focused on the measurement and assessment of voice to identify the Parkinson's disease. The sampling frequency is 44,100Hz. Voice recording are done through the standard microphone. According to that, the distance between microphones from the mouth was 15 cm and people to ask pronounce the vowels in comfort level. All sound records are saved in WAV format and are made in stereo- channel mode. The MFCC technique requires large area and processing time for classification. This technique also decided that correct diagnostic decision. The MFCC technique is first we have to collect some speech signals then convert it into a frame block, then pre-emphasize the signals then the hamming window for each frame, then transform each frame of N samples that is called fast furious transform and then analysis the filter bank then calculate the amplitude of filter bank and then filtering the speech signals. (**Achraf Benba et.al., 2015).** In this paper they are used three classifier method to identify the Parkinson's disease, i.e., linear classifier, Non-linear classifier, probabilistic classifier. Classifiers are using voice records. And UPDRS is also using this paper. UPDRS will detect PD accurately. It is an artificial intelligence and also efficiently minimizes the error. In this paper they are made up of improvement of accuracy and classifying the PD using voice records. For the original feature sets they are used Random Forest-Recursive feature Elimination. Here they are using support vector machine for calculation purpose. According to the proposed technique first they are collected some dataset, then identify the collection of required features from dataset in that required feature, feature reduction will occur then classify the model and then the model contains performance analysis. (**Mangal Sain..2017**). This paper is collecting some voice signal. This voice signal is to identify meaningful features and useful features. Here they are used, some dominant voice. Dominant voice has easily identified the Parkinson's disease. Here they are used, some time consuming process which is called as the clinical diagnosis and it is very expensive. Mainly it is used for Parkinson disease identification. Already they have collected some dominant voice which is from speech signals. It builds some predictive model with SVM for identification of Parkinson disease. In here SVM is used to distinguish Parkinson disease from healthy people. The methodology is used in this paper is first they have collected some voice recordings of healthy people and Parkinson disease patients then extract the factor analysis of the voice recordings then classifies with SVM then identifies diseased and non-diseased person's. Factor analysis collected some dominant features and it checks the performance of the model. SVM is used for the gradient descent approach and it is also used for calculation purpose. They are using some validation classifier such as accuracy, sensitivity, specificity. (**Spriha Chandrayan..2017**). In this paper with ELM to identify the PD using speech signals. In this method is to identify disease subjects and healthy subjects of PD. Using classification method such as support vector machine and artificial neural network is also compared with ELM method. Here they used some speech sound which is called as a formation. It is creating sound for vibration and vocal cords. The ELM classification method is very fast for training the dataset. ELM is very good concept of hidden layers. The proposed method is calculating output weights mathematically. Normal vocal sound is helpful for diagnosis and speech impairments. From the result, it concluded that ELM is superior to neural network compared with SVM. (**Aarushi Agarwal...2016**). This paper evaluates new technology is used to identify the Parkinson's disease i.e. STT (speech to test). STT is a system based where methodology and technologies are used. STT means using computer and computerized devices to identify the spoken language. STT is also called as automatic speech recognition. This system allows to identify the person speak into a microphone and convert it into written test. It cannot understand the 100% speech. In this paper they study the Google STT conversion. They have used voxtester method to identify the Parkinson's disease when speech changes. Voxtester means it's a large clinical trial its control the panels of assessing PD. In this paper they are considered three types of people, first one is a young, healthy person (YHC), second one is a healthy elderly person (HEC), and the last one is a Parkinson disease patient group. In this paper they are compared with three types of people because which people has the more effectiveness. The important part of this paper is Google speech recognition technologies are used. In this paper they recommendation to ignore the short words that is less than four characters and also decided to ignore the accents. (**Giovanni dimauro..2017).** This paper proposes machine learning approaches are used. Machine learning based approaches are identified PD uses gait data and voice data. There are two feature sets one is an original feature test and another one is PCA based feature sets. For performance metrics they have used some classification approaches. Which is known as non- linear classification and it is also classifies the decision trees. Here they are used in some parameters such as accuracy, sensitivity, specificity, positive and negative predictive value. The sensitivity will be calculating the sum of true positive and false negative value. The specificity will be calculating the sum of true negative and false positive values. The two predictive values are identified the absents of disease. Both performances are given the positive test result and a negative test result. Here the proposed method is defined first we have to collect some voice data from public databases. In that, data to prepare the building of models. In the two methods they implement two different classification techniques and compare the performance then identify the result**. (Satyabrata Aich..2018).** This paper focuses on automating native speech signals using CNN. CNN is one dimensional signal processing. In this technique they identified the PD. In this paper they used raw speech signal. Raw speech signal is a deep neural network (DNN).

DNN is a deep learning method which has one or more layer. They are using some recorded data. Using the recorded samples it will be performed feature extraction method.

According to that, classification is to identify diseased and non-diseased patients. The goal of this paper is performing the adaptation of CNN. CNN has used for image processing task and relatively large training sets, but in this paper CNN is used for raw speech signals. In the dataset may have many changes such as the entire record will be processed and it applies high level mechanism. This is the major changes in the dataset. Here they are presented full network topology and it says that input layer is the raw signals. Another layer is conventional layer and it receives input layer neuron. ReLU is used in this network. The last layer is the classification layer which used seven layers and it's used in the softmax function. Softmax is used for decision making. (**Alex Frid..2016**). This paper focus on a new technique to identify the Parkinson's disease. PCA is used in this paper and one more method is also used to predict PD progression, i.e. Support Vector Regression (SVR). Hybrid intelligent system is assisting the medical field for detects the PD. Where PCA is the dimensionality reduction, EM is the K- means clustering and SVR are the machine learning technique. The dataset, which has traditional measures and nonlinear dynamical system. Subject of the data set was recorded formation of sustained vowels. Here they are used EM clustering it is also called as k-means clustering; it is an algorithm for estimation of density. EM algorithm is for constructing statistical model of the data. EM algorithm is used for removing the clustering problem. PCA is a technique which is used for transferring from related variable to uncontrolled variables. ANFIS is a predictive technique which is also used in this paper. FIS is a tool which can be used for application such as forecasting. Here ANN performs operations in FIS. SVM is the powerful machine learning technique, it is becoming increasingly popular. (**Mehrbakhsh Nilashi..2016).** This paper they are focused on vocal signal analysis to identify the PD. They have used two methods front vowels and back vowels. These two vowels are the vertical position of the tongue. Vowels are characterized by acoustic energy. The vowels I and U are positioned high in mouth and A is positioned low in the mouth. There are two types of vowel articulation F1 and F2 which is used to identify VSA. VSA is constructed by Euclidean distance and it is a study of the production of speech. Here Parkinson stage is evaluated by UPDRS. VSA is difficult for phonation because it cannot clear the sounds and speech. To evaluate the phonation the VAI can be used. VAI is represents sense of hearing and open the configuration of vocal tracks. Inter speaker variability is the technique to minimize the effects of VAI. Here the acquisition and analysis phase are working partially. The removing formats are calculated using VSA and VAI formats. This analysis is correlated between vocal articulations with Parkinson disease. (**Domenico Mirarchi..2017).**

III. PROPOSED METHOD

In the dataset, it will consider sentence, words, vowels, etc., and also it considers numbers; starts from 0 to 10. Here we have used a different type of method to identify the Parkinson disease. Training model is created for the feature extracted data, and then the simulation and the classification are based on the performance of the classifiers used. Classifiers are used to differentiate between disease peoples and non- disease people. Then normal and Parkinson's disease patients are identified. The flow of the method is shown in the figure 1. The obtained results are summarized.

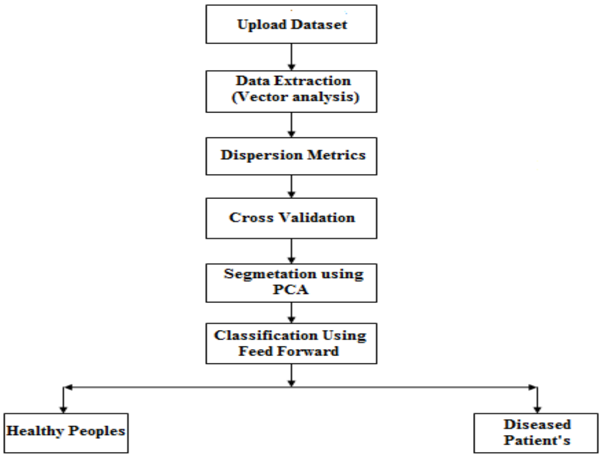

Figure 1: Proposed architecture

Now consider the feed forward technique, one of the most important of technique for the classification.

3.1 Feed forward

A Feed forward neural network is an artificial neural network which is connected from a unit not a cycle. A Feed forward algorithm is used for classification. Feed forward has three layers Input layer, hidden layer and output layer. Information is passed through the input layer, then through the hidden layer and finally it through the output layer. Feed forward is finally used supervised learning.

The layers of feed forward:

There are 3 layers in feed forward. They are

1) Input layer.
2) Hidden Layers.
3) Output layer.

1) Input layer

This is to accept the input data and pass these data to the hidden layers. Each node in the input layer is connected to each of the hidden layers.

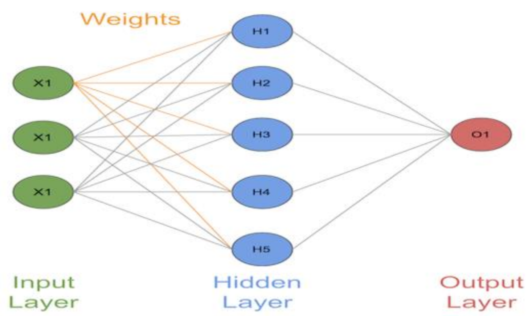

Figure 2: Architecture of Feed forward
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https://www.google.com/url?sa=i&source=images&cd=&cad=rja&uact=8&ved=2ahUKEwjsiI2sop_hAhXOc98KHSmbBNoQjRx6BAgBEAU&url=https%3A%2F%2Fmedium.com%2Fcoinmonks%2Fneural-network-from-scratch-tumour-diagnosis-354abbcb2f3b&psig=AOvVaw3bxpMP6EVRKhp5i6O-zPwP&ust=1553670871236960

2) Hidden layer

Which accept the input from the previous layer and then reconstruct the input using a tied weight and pass to the next layer (output layer or the next hidden layer).

In this only some of the hidden layers or nodes active at the same time. Its working is based on encoding and decoding.

3) Output layer

This will accept, classify the data based on the feature learned by the previous layer.
Here in this neural network, we are included several layers for the better feature learning and the classification of the new input data. We trained the same number which we have used for CNN.

3.1.1 Equation- Feed forward

This network computes a function g on fixed size input y such that

$$g(y) \approx x$$

For training pairs **(y, x)**

Computing F on variable length input

$$Yk = \{y1 \ldots yk\} \text{ such that}$$

$$F(Yk) \approx Xk$$

For training pairs

$$(Yn, Xn) \text{ for all } 1 \leq K \leq n$$

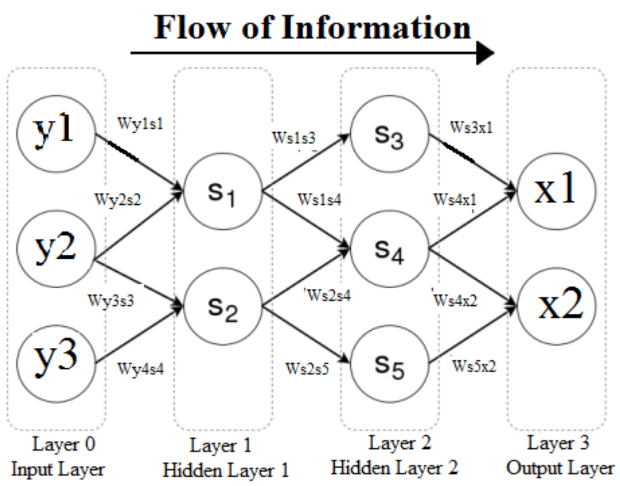

Figure 3: Information flows from input layer to output layer.

Single perceptron model

The simplest type of network is known as a single perceptron model. This model is a feed forward neural network. This model has only one input layer and one output layer because the feed forward has no hidden units. Output layer can be calculated using sum of product of the weights with corresponding input units and bias. Here the output values are o or 1.

In general, the activation function can use other than step function **g(x)**

Then the function **f(y) =y**, the sigmoid function

$$\sigma(y) = (1+e^{-y})^{-1}$$

A perceptron with activation function f(x) has an output

$$O = g(\vec{w} \cdot \vec{y} + b)$$

Not every activation function yields a linear classifier.

Error function

Error function can be calculated as

$$Y = \{(\vec{f_1}, x_1), \ldots\ldots\ldots, (\vec{f_N}, x_N)\} \text{ as}$$

$$E(Y) = 1/2N\ \Sigma(O_i - X_i) = 1/2N\ \Sigma(g(\vec{w} \cdot \vec{y} + b) - X_i)^2$$

Where N is represented as input and output pairs

Delta Rule

According to error function the delta rule can be identified as

$$\vec{Wi+1} = \vec{Wi} - \alpha\ \partial E(Y)/\partial \vec{Wi}$$

$$bi+1 = bi - \alpha\ \partial E(Y)/\partial \vec{bi}$$

Where $\vec{Wi}$ and $\vec{bi}$ are the values of $\vec{W}$ and **b** after the i^{th} iteration gradient descent.

The weight delta $\Delta\vec{W} = \vec{Wi+1} - \vec{Wi}$ and bias **Δb=bi+1-bi** are calculated using the delta rule.
Therefore; partial derivatives

$$\partial E(Y)/\partial \vec{Wi} \text{ and } \partial E(Y)/\partial \vec{bi}$$

Weight vector

$$\Delta\vec{W} = 1/N\ \Sigma\alpha(Xi-Oi)\ f'(hi)\vec{fi}$$

$$\Delta b = 1/N\ \Sigma\alpha(Xi-Oi)f'(hi)$$

Where $Oi = g(\vec{W} \cdot \vec{y} + b)$

$$hi = \vec{W} \cdot \vec{y} + b$$

3.2 Based on the speech signals

In this experiment we use different types of voice records such as jitter, shimmer, mean pitch, medium pitch and maximum pitch, etc. Consider 26 attributes are generated from the dataset.

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	Attribute							
	Jitter(Local)	Jitter(Local, Absolute)	Jitter(PPq5)	Shimmer (Local, Absolute)	Shimmer (apq5)	Medium pitch	Mean pitch	Maximum pitch
Values	1.488	0.000090213	0.794	0.779	4.609	166.533	164.781	142.229
	0.728	0.000037698	0.376	0.642	3.18	195.252	193.289	159.515
	1.22	0.000074041	0.67	0.875	5.166	158.689	164.768	146.445
	2.502	0.000122824	1.634	1.273	8.771	201.997	203.471	182.713
	3.509	0.000166927	1.539	1.04	4.927	211.887	208.44	182.821
	2.47	0.000126412	1.341	1.256	7.076	195.952	195.222	186.593
	1.583	0.000082305	0.864	1.07	5.158	195.535	192.316	177.299
	1.92	0.000098625	1.031	1.108	4.611	196.745	194.284	181.465
	2.257	0.000119196	1.53	0.877	4.239	191.345	185.423	86.139
	1.594	0.00008504	0.951	0.823	3.826	190.838	187.775	166.895

Table 1: It represents the values of each attribute (dataset) and it is collected from each patient

Here the values are represented as speech signals. They also collected men and women's voice records respectively. Binary attributes are represented 0's and 1's. 0 is represented as non-diseased patients and 1 is represented as diseased patients.

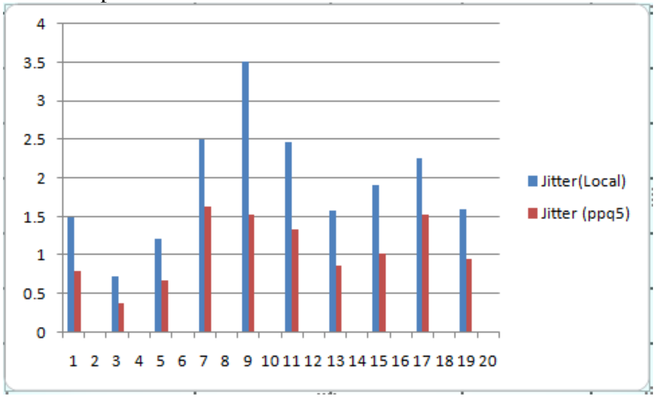

Figure 4: It represents the jitter (Local, ppq5) attribute values

Jitter percent is also known as jitter factor. Jitter can be calculated using Boken and Orlikff equation

$$[\Sigma|X_i-X_{i-1}|/(n-1)\ /[\Sigma(X_i)\ /(n)]*100$$

For the normal waveform of jitter percent is 0.509% and dysphonic waveform of jitter percent is 4.673%. This can be considered as dysphonic waveform is greater than normal wave form.

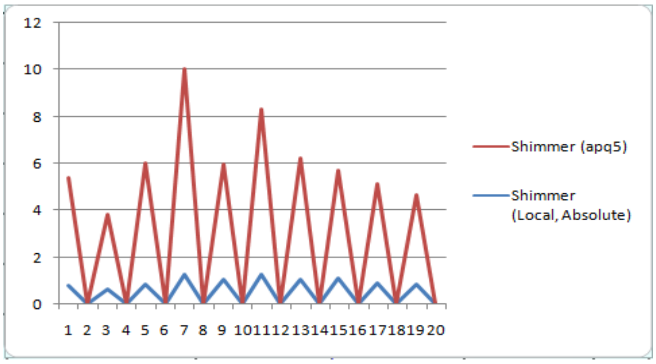

Figure 5: It represents the shimmer (Local, Absolute), apq5) attribute values

Shimmer is also called amplitude perturbation. It refers the intensity of the amplitude. Shimmer can be calculated using Boken and Orlikff equation i.e.

$$[\Sigma|20\log(Y_i/Y_{i-1})|]\ /n-1$$

For the normal waveform of shimmer is 0.102dB. For the dysphonic waveform of shimmer is 2.005dB. Therefore dysphonic waveform is greater than normal waveform. Quality factor A can be calculated as maximal and minimal sound pressure i.e. amplitude.

3.3 Algorithm

The proposed method which is implemented in this paper has these steps:

Step1: In this step we insert the input dataset which has the details about speech signals. Based on the speech signals we identify the Parkinson disease

Step2: In the second step dataset is converted into a vector analysis i.e. data extraction.

Step3: in this step Dispersion matrix is created. Depression matrix is nothing but read the data from the data source and created in a matrix form.

.Step4: In this step cross validation done. Once the matrix is created, it will be cross validating the matrix.

Step5: In this step segmentation using PCA is done. PCA is principle component analysis on that basis there are four parameter values are used. We calculate each row in the database using the four parameters values. That's why PCA is used here. Segmentation is nothing but separate, separately calculating the values. Step6: In this step classification using feed forward is done based on speech signals. Feed forward technique is used to identify the diseased patients and non-diseased patients.

IV. EXPERIMENTAL SETTINGS

From this experimentation, we conducted one set of experiment. In which this experiment set contains three different trials. In the first trial, we used 40% of non-diseased patients and 60% of diseased patients. For the second trial, we used 60% of non-diseased patients and 40% of diseased patients. For third trial, we used 50% of non-diseased patients and 50% diseased patients. In each trial are rearranged between non-diseased patients and diseased patients. Data is collected from UCI Machine Learning Repository [18] and it is an XLS format. It contains TRUST MC-1500 microphone for the collection of audio records. The frequency of microphone is set between 50Hz to 13 kHz. The distance between mouth and the microphone is 10cm. [19]. 40 individual records are collected from the dataset. In each individual consists of 26 records. With that, the dataset is using 1040 audio records from the individual records. Diseased and non- diseased patient ratios are perspective. Men and women's voice records are also collected in this dataset. The subject ID of the dataset is a unique patient identifier from values of 1 to 40. Binary attributes representing 0's and 1's. 1 is represented as an individual suffering from Parkinson disease and 0 is represented as healthy people.

To find the efficiency we use precision, recall and F-measure as metrics. In order to check robustness and study to behavior of different attributes We have conducted experiment on dataset which has 1040 audio records across 40 individuals.. We analyzing the outcomes got from the dataset. The F- measured values are stated in table 2.

V. EXPERIMENTAL RESULT

Module-wise experimental result is shown below.

A. Data Extraction

Data extraction is the process of retrieving data from a data source. The data source is used for data processing and data storage. Data extraction is nothing but convert to vector analysis.

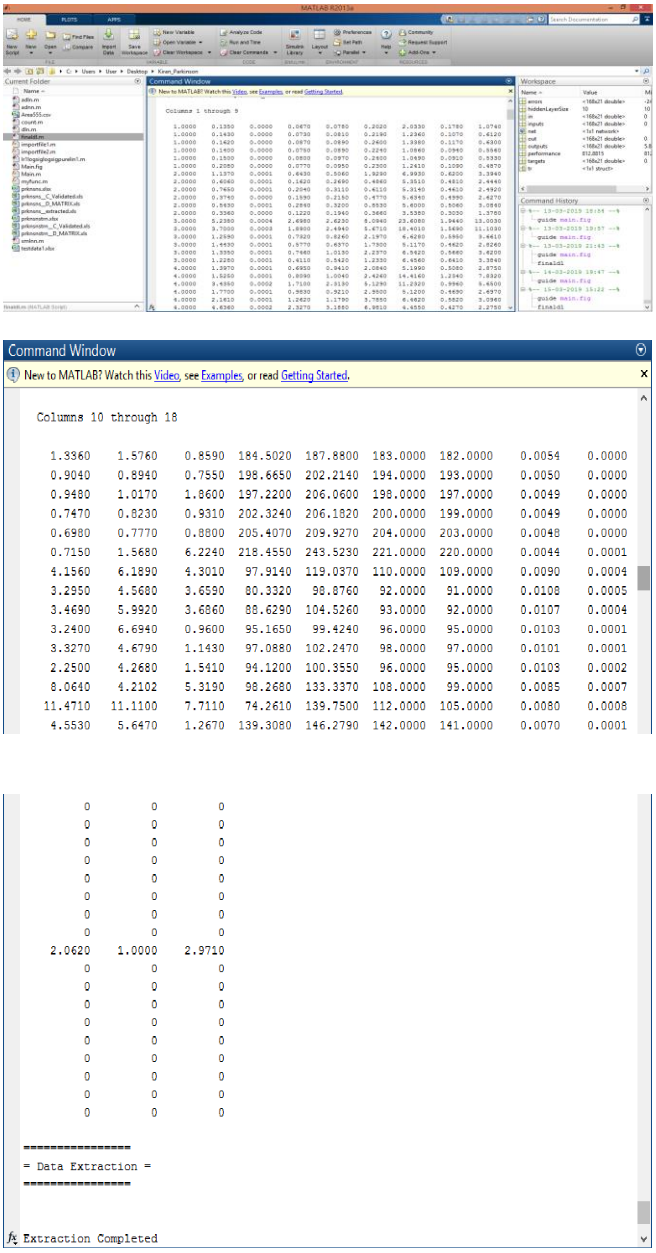

Figure 6: It represents the Data extraction.

B. Dispersion matrix

All the data cannot be taken to the classification, using dispersion matrix it reduces the collection of data and also it will collect the selected values from the matrix.

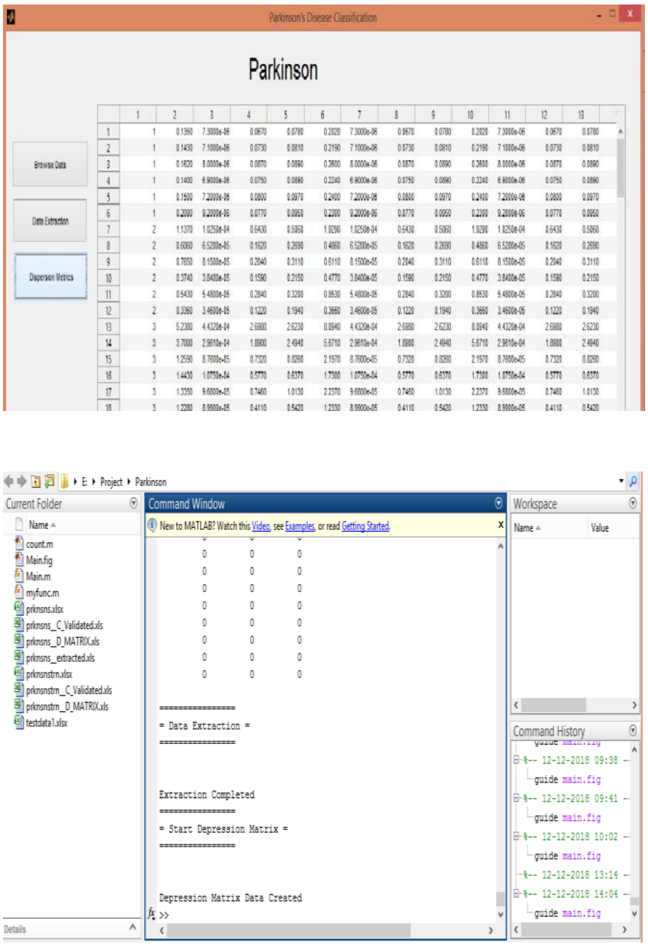

Figure 7: It shows the dispersion matrix data is created.

0.078	0.135	7.3E-06	0.067	0.078	0.202	7.3E-06
0.081	0.143	7.1E-06	0.073	0.081	0.219	7.1E-06
0.089	0.162	0.000008	0.087	0.089	0.26	0.000008
0.089	0.14	6.9E-06	0.075	0.089	0.224	6.9E-06
0.097	0.15	7.2E-06	0.08	0.097	0.24	7.2E-06
0.095	0.208	9.2E-06	0.077	0.095	0.23	9.2E-06
0.506	1.137	0.000103	0.643	0.506	1.929	0.000103
0.269	0.606	6.52E-05	0.162	0.269	0.486	6.52E-05
0.311	0.765	8.15E-05	0.204	0.311	0.611	8.15E-05
0.215	0.374	3.84E-05	0.159	0.215	0.477	3.84E-05
0.32	0.543	5.48E-05	0.284	0.32	0.853	5.48E-05
0.194	0.336	3.46E-05	0.122	0.194	0.366	3.46E-05
2.623	5.238	0.000443	2.698	2.623	8.094	0.000443
2.494	3.7	0.000296	1.89	2.494	5.671	0.000296

Figure 8: The result of the dispersion matrix.

C. Cross validation

After the dispersion matrix, when the matrix created it will be cross validate the matrix.

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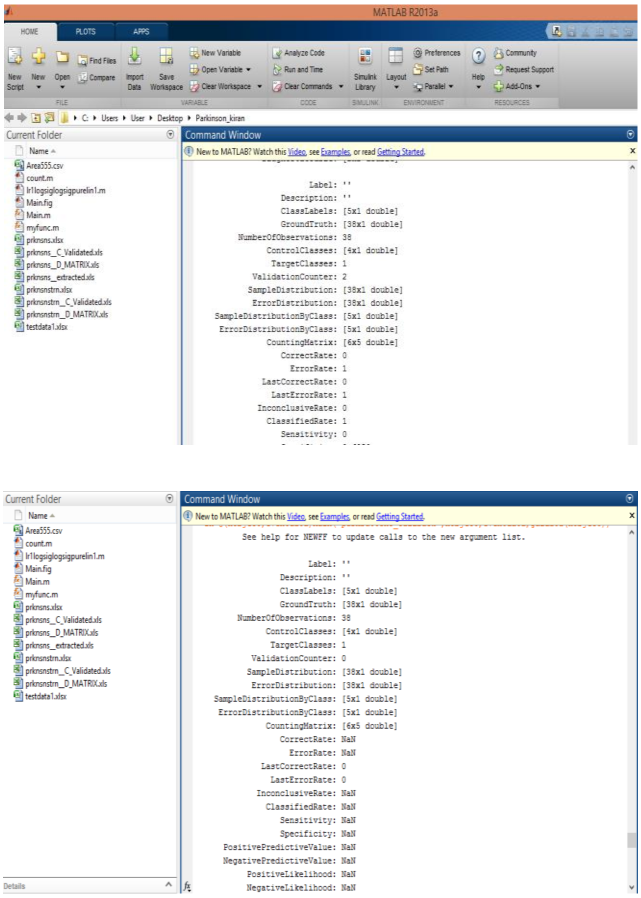

Figure 9: It shows the cross validation of the matrix.

1	0.135	7.3E-06	0.067	0.078	0.202	7.3E-06
1	0.143	7.1E-06	0.073	0.081	0.219	7.1E-06
1	0.162	0.000008	0.087	0.089	0.26	0.000008
1	0.14	6.9E-06	0.075	0.089	0.224	6.9E-06
1	0.15	7.2E-06	0.08	0.097	0.24	7.2E-06
1	0.208	9.2E-06	0.077	0.095	0.23	9.2E-06
2	1.137	0.000103	0.643	0.506	1.929	0.000103
2	0.606	6.52E-05	0.162	0.269	0.486	6.52E-05
2	0.765	8.15E-05	0.204	0.311	0.611	8.15E-05
2	0.374	3.84E-05	0.159	0.215	0.477	3.84E-05
2	0.543	5.48E-05	0.284	0.32	0.853	5.48E-05
2	0.336	3.46E-05	0.122	0.194	0.366	3.46E-05
3	5.238	0.000443	2.698	2.623	8.094	0.000443
3	3.7	0.000296	1.89	2.494	5.671	0.000296

Figure 10: The result of the cross validation.

D. Segmentation using PCA

There are four parameters are used. In those four parameters values are calculated separately using PCA.

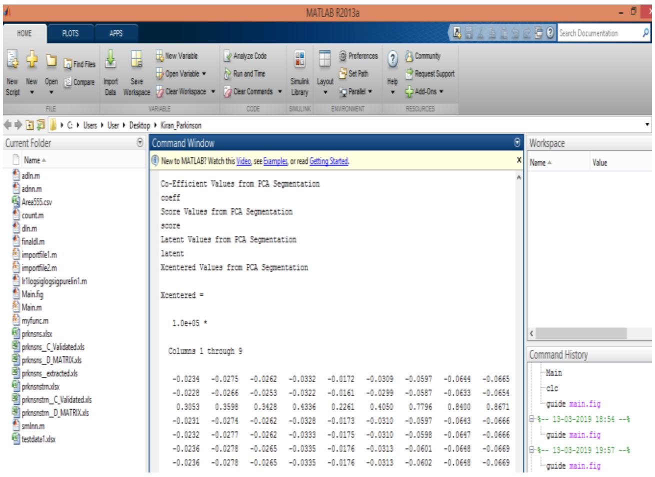

Figure 11: It represents the calculation of the segmented data.

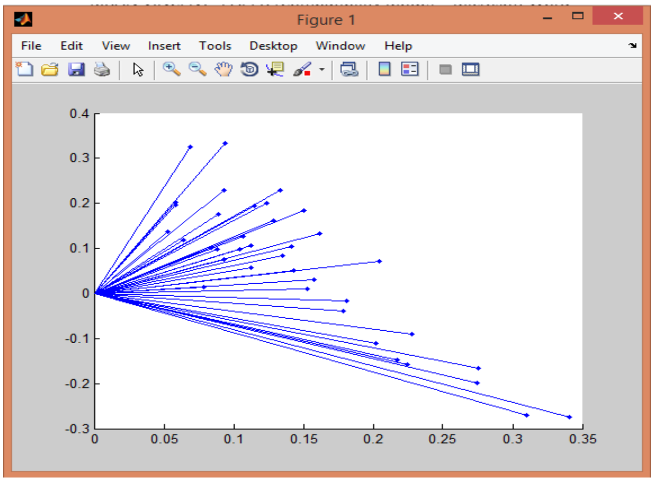

Figure 12: This graph represents after calculation of the segmented data.

28	45	45	42	47	47	53
88.2	128.1	134.2	139	150.8	151.2	154.85
32903.94	38769.62	36940.93	46726.34	24373.34	43644.3	83984.23
62.55	56.15	41.136	79.06	38.2	39.421	59.52
48.47	19.4	41.86	32.03	15.75	40.13	44.6
9.28	9.17	8.95	9.45	8.4	8.9	10.4
6.53	9.08	9.3	8.52	5.83	8.9	10.048
1.410072	2.281389	3.262349	1.758158	3.947644	3.835519	2.601647
1.819682	6.603093	3.205925	4.339682	9.574603	3.767755	3.471973
1.290489	2.89433	0.982704	2.468311	2.425397	0.982332	1.334529
9.50431	13.96947	14.99441	14.70899	17.95238	16.98876	14.88942
13.50689	14.10793	14.43011	16.31455	25.86621	16.98876	15.41103
1.421133	1.009912	0.962366	1.109155	1.440823	1	1.035032
0.00967	0.01693	0.038673	0.013792	0.024054	0.047247	0.026973

Figure 13: The result of the segmented data.

E. Classification using Feed Forward

After the segmentation, we got segmented value. To that segmented value and trained dataset are compared. If the values are similar then it is diseased and if the values are non- similar then it is non-diseased.

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28	45	45	42	47	47	53	1
88.2	128.1	134.2	139	150.8	151.2	154.85	1
32903.94	38769.62	36940.93	46726.34	24373.34	43644.3	83984.23	1
62.55	56.15	41.136	79.06	38.2	39.421	59.52	0
48.47	19.4	41.86	32.03	15.75	40.13	44.6	0
9.28	9.17	8.95	9.45	8.4	8.9	10.4	1
6.53	9.08	9.3	8.52	5.83	8.9	10.048	1
1.410072	2.281389	3.262349	1.758158	3.947644	3.835519	2.601647	1
1.819682	6.603093	3.205925	4.339682	9.574603	3.767755	3.471973	1
1.290489	2.89433	0.982704	2.468311	2.425397	0.982332	1.334529	1
9.50431	13.96947	14.99441	14.70899	17.95238	16.98876	14.88942	1
13.50689	14.10793	14.43011	16.31455	25.86621	16.98876	15.41103	1
1.421133	1.009912	0.962366	1.109155	1.440823	1	1.035032	1
0.00967	0.01693	0.038673	0.013792	0.024054	0.047247	0.026973	0

Figure 14: The classification details about the patients who have the Parkinson disease. ('0' represents healthy peoples '1' represents diseased patients)

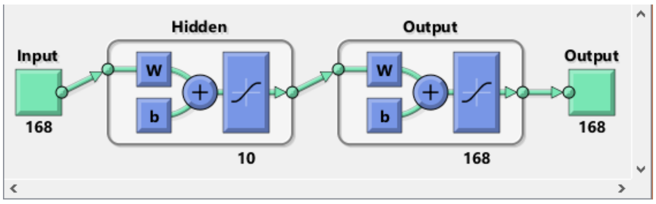

Figure 15: It represents the pattern reorganization of neural network trainer.

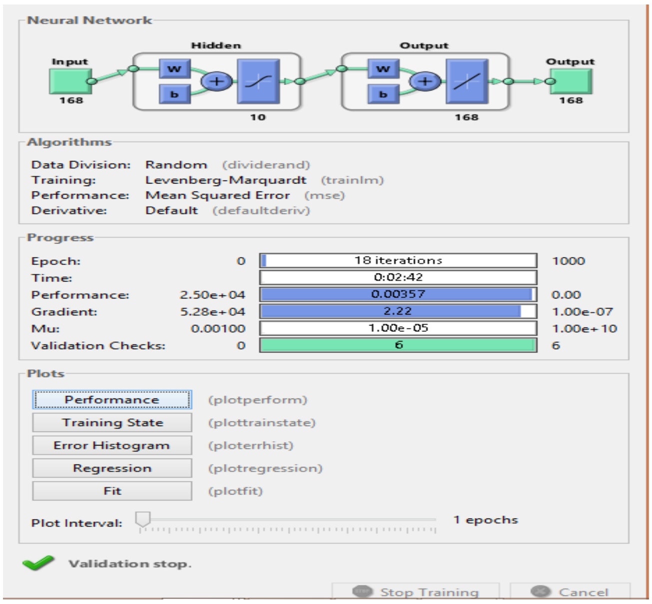

Figure 16: It represents the neural network training.

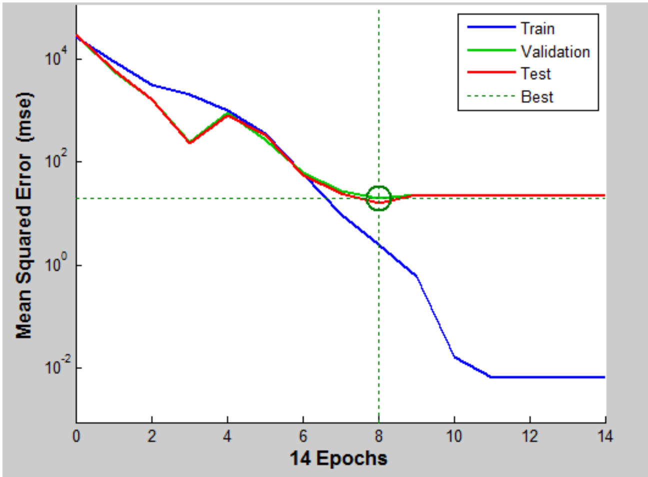

Figure 17: The performance graph.

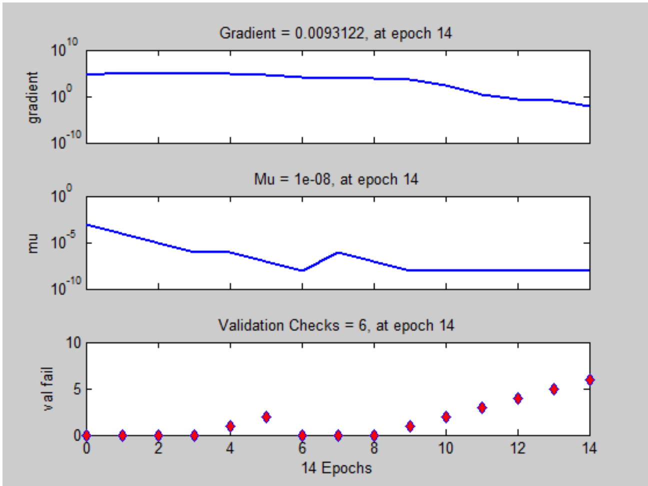

Figure 18: This graph represents the training state.

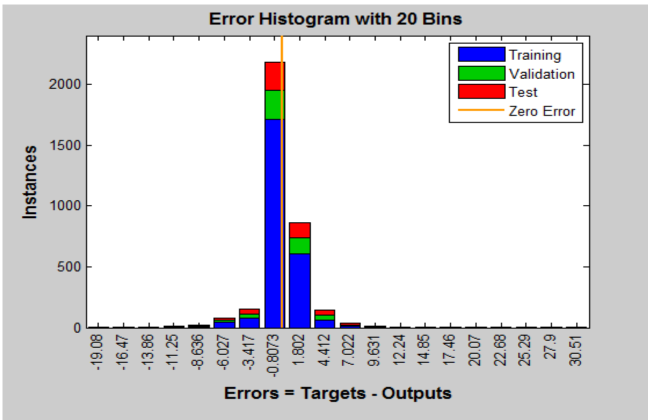

Figure 19: This graph represents the error histogram.

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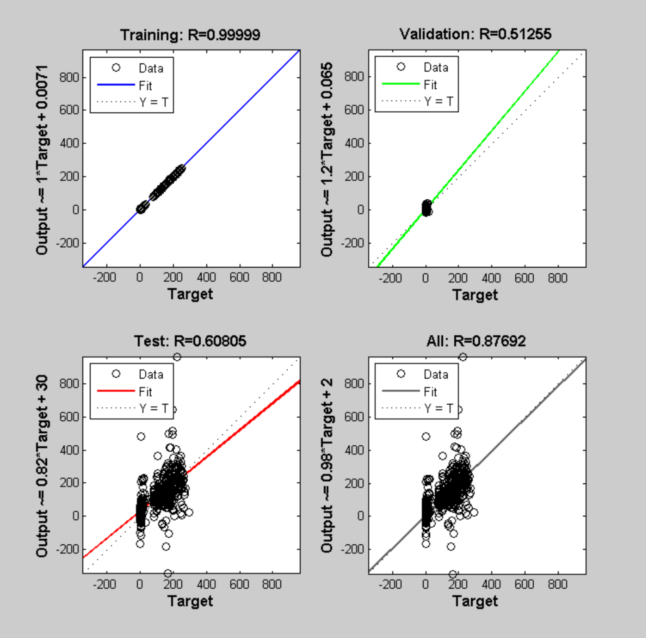

Figure 20: It represents the regression graph.

VI. CONCLUSION

The technique works well on the dataset. In 40% non-diseased patients and 60% of diseased patients trail we got most noteworthy F-measure from the dataset. It demonstrates that the technique works well on standard dataset. The experiment demonstrates the effectiveness of the technique.

Dataset	Max F-Measure		
	Non-diseased/Diseased patients		
Ratio	40:60	60:40	50:50
Dataset	75.87	75.37	73.87

Table 2: Maximum F – Measure table obtained from the Technique

In this paper, we study classification using feed forward based on the speech signals is the valued representation of Parkinson disease. Broad investigations were completed on the dataset. In this technique we identify the maximum F-measure value that shown in the table 2. The technique works well on the dataset. In 40% non-diseased patients and 60% diseased patients we got a most amazing F-measure from the dataset. From this experiment the feed forward technique with the basic concepts of digital image processing leads to a better outcome with more accurate result. A feed forward technique is introduced in this paper. In addition to this, it is used for based on the speech signals. Feed forward technique classifies the diseased patients and non- diseased patients. From this experiment we check the efficiency from the respective dataset. The Proposed method gives the best efficiency and robustness and the experiment is carried out on the speech dataset. The details result is shown in the respective chapter. The outcome of the experiment is carried out by considering precision, recall and F-measure metrics.

FUTURE WORK

In future work, we focused on different techniques to predict the Parkinson disease using different datasets. In this research, we using binary attribute (1- diseased patients, 0-non-diseased patients) for patient's classification. In the future, we will use different types of attributes for patient's classification and also identify the various stages of Parkinson disease.

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