PCET's
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PREDICTING THE SEVERITY OF PARKINSON'S DISEASE USING DEEP LEARNING

PD Health

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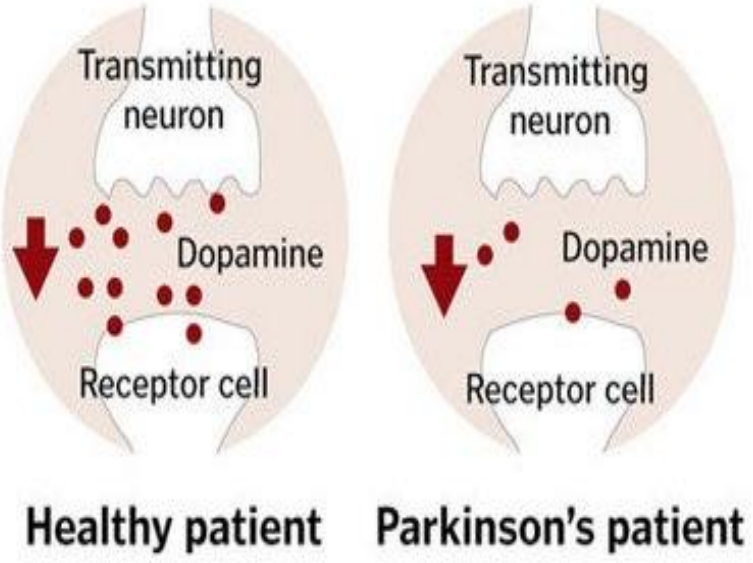
Objectives

- To Predict Severity Of Parkinson's Disease Using Deep Learning.
- To Introduce simpler way to predict Parkinson’s disease.
- To detect parkinson’s disease by processing the voice recordings of Patient using Machine learning.

… Before that let’s understand what is Parkinson’s disease.

What is Parkinson's Disease(PD) ?



Parkinson's signs and symptoms may include:

- Tremor.
- Slowed movement (bradykinesia).
- Rigid muscles.
- Impaired posture and balance.
- Loss of automatic movements.
- Speech changes.
- Writing changes.

Curated Research so far..

Out of around 15 research papers we will brief about the 3 most critical research done on this so far.

- In a paper by Srishti Grover, Saloni Bhartia, Akshama, Abhilasha Yadav, Seeja K DNN model was implemented on the static dataset and patients were classified in two categories “severe” or “non-severe” in the view of the estimation of motor and total UPDRS values.

- Elmehdi BENMALEK, Jamal ELMHAMDI, Abdelilah JILBAB have mapped the extracted features to UPDRS using neural network and least square regressions.

- Meysam Asgari, Izhak Shafran [7] have done a computational approach for computing various features by performing 3 tasks and then calculated UPDRS value for severity prediction of PD. Mehrbakhsh Nilashi, Othman Ibrahim & Ali Ahani

DATA OVERVIEW

- Dataset is in ASCII-CSV format which is composed of 5,876 instances as rows and 22 columns including 16 voice parameters. (Refer Table. 1).

1.Jitter(%)	2.Jitter(ABS)	3.Jitter:RAP	4.Jitter:PPQ5
5.Jitter:DDP	6.Shimmer	7.Shimmer(Db)	8.Shimmer:APQ3
9.Shimmer:APQ5	10.Shimmer:APQ11	11.Shimmer:DDA	12.NHR
13.HNR	14.RPDE	15.DFA	16.PPE

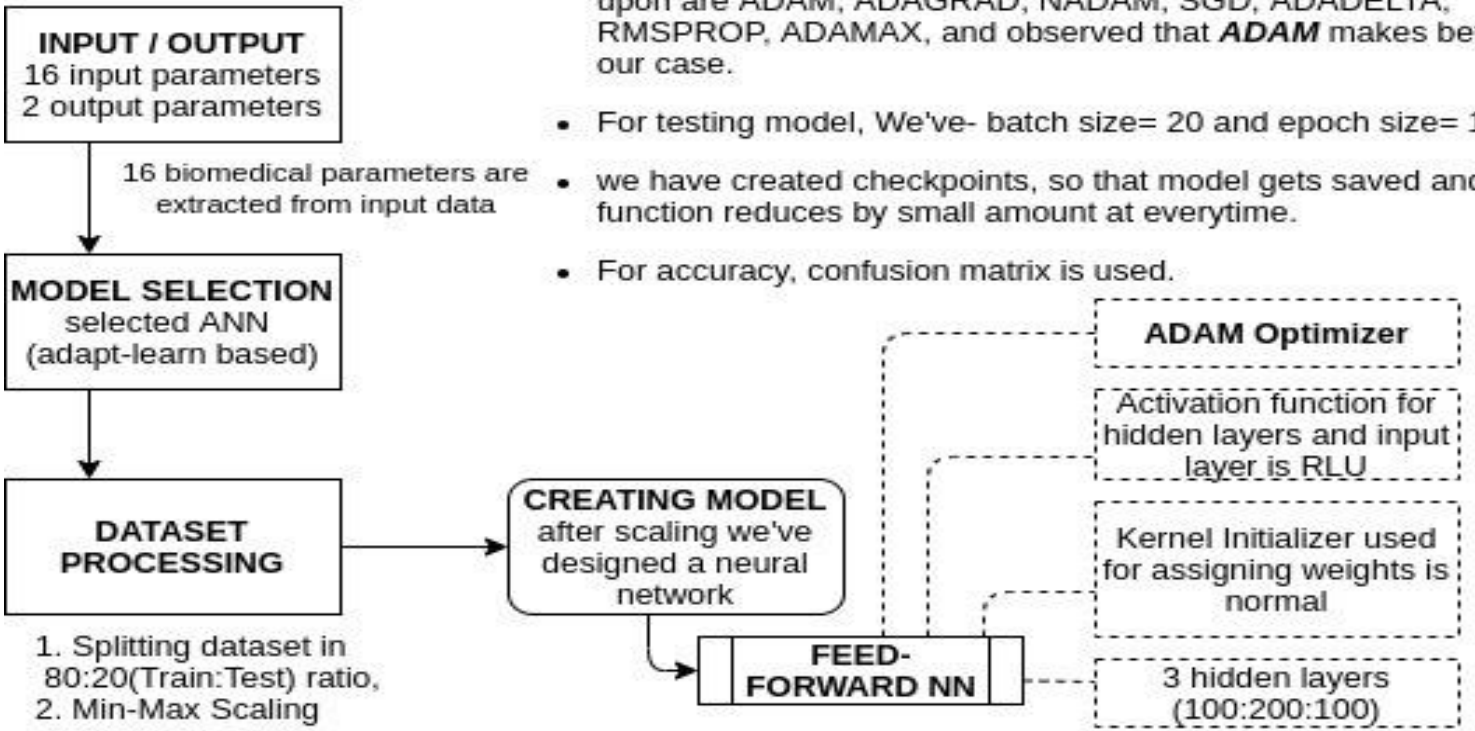
Table 1: Input Attribute Information

- Among all mentioned parameters, 1-13 are Linear parameters where as14-16 belongs to non-linear parameters. The most important purpose of the statistics is to predict the motor and whole UPDRS rankings('MOTOR_UPDRS' and 'TOTAL_UPDRS') from the 16 voice measures.

Metric	**Severe**	**Non-Severe**	**Scaling Range**
Total-UPDRS	Above 25	0-25	0-176
Motor-UPDRS	Above 20	0-20	0-108

Table 2: Severity and Scale range of output classes

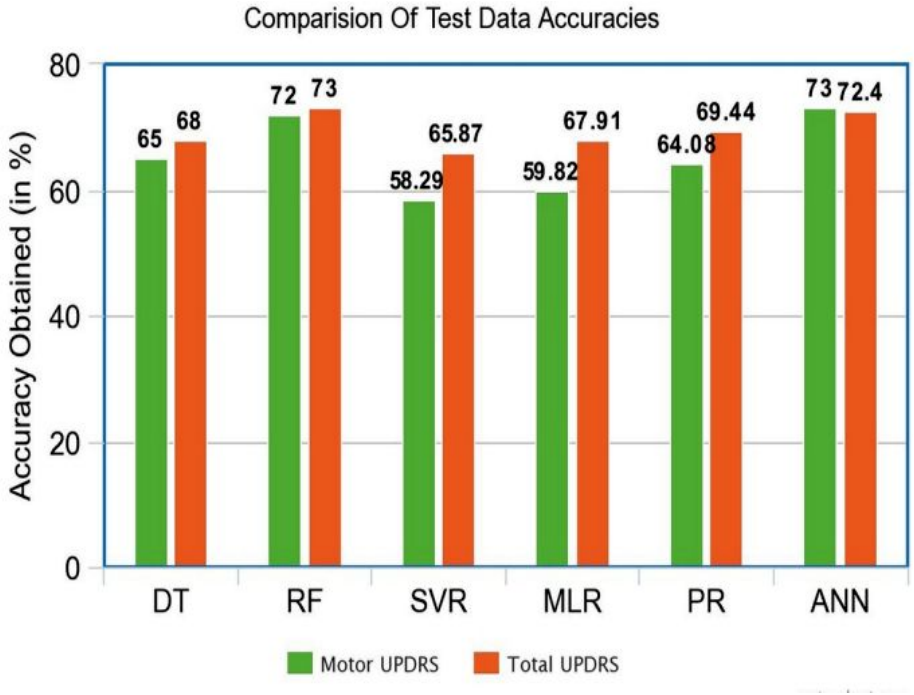
ALGORITHM AND WORKFLOW



- The different types of optimizers that we have tested the model upon are ADAM, ADAGRAD, NADAM, SGD, ADADELTA, RMSPROP, ADAMAX, and observed that ***ADAM*** makes better in our case.
- For testing model, We've- batch size= 20 and epoch size= 1000.
- we have created checkpoints, so that model gets saved and loss function reduces by small amount at everytime.
- For accuracy, confusion matrix is used.

Suitable Models & Their Accuracy Comparison

- Multiple Linear Regression
- Polynomial Regression
- Support Vector Regression
- Decision Tree
- Random Forest
- Feed forward neural Network



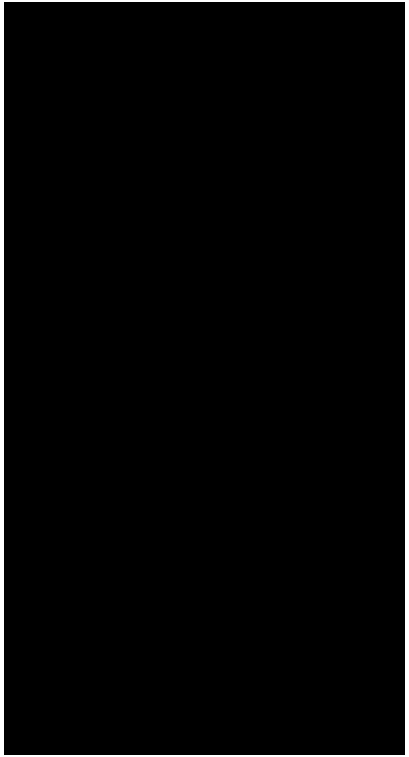
How it Works ?

PD Health

We have developed an Android app- ‘PD Health’ to test the severity of PD. It uses users voice as an input parameter.

It is powered by Firebase, Python and Machine Learning.

App is ready with all functionalities and is working as expected. It’s real time demonstration is shown in the attached video.



Advantages over Conventional Methods :

- Easiest way of **Self diagnosing**.
- **No need of any Medical Expertise** or knowledge, operable by Patients themselves.
- Patients can check PD severity using an Android phone at their **convenient time and place**.
- Result is displayed within a second, so **No need of Waiting** for Report.
- It is almost at **no cost,** it only requires an active internet connection.

CONCLUSION

We have implemented an ANN which is the feed-forward neural network. It is found to be providing exceptional results in predicting the severity of Parkinson's disease when compared with other regression models. The model seems to use its capabilities to adapt and learn to its full potential. It can analyze the nonlinear patterns within the dataset with great ease. With the use of Ann, we have also taken into consideration all the problems that might come in future modifications which other models do not provide very efficiently. It also allows greater flexibility in training and testing phase cases when there is an abundant change in the dataset due to which other models collapse but Ann seems to have a better handling mechanism for this as it provides humans like understanding behavior.

Thank You!

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