# DIAGNOSIS AND TREATMENT SUGGESTION FOR PARKINSON DISEASES USING ML MODEL


**Internal Guide**

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# PROBLEM STATEMENT

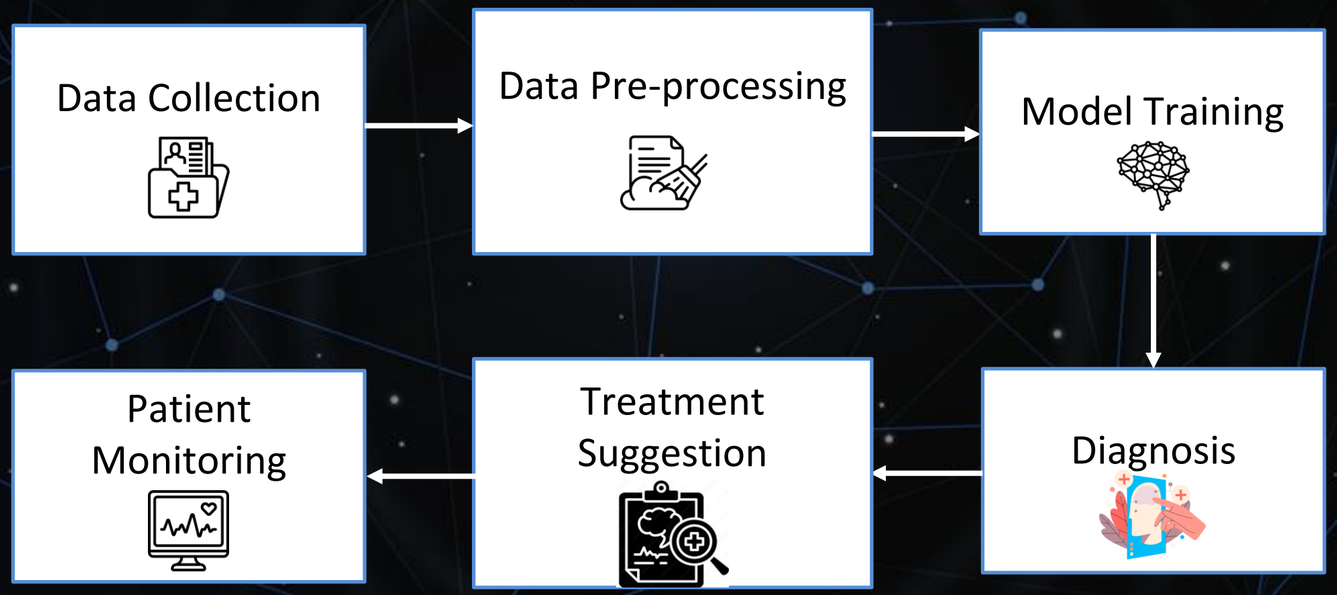
- Parkinson's disease is a progressive neurodegenerative disorder that affects millions of people worldwide. Early diagnosis and accurate prediction are crucial for timely intervention and effective treatment.
- However, traditional diagnostic methods often require multiple clinical visits and can be challenging, especially in the early stages of the disease.
- Additionally, there is a need for a more precise and tailored approach to treatment, considering the diverse manifestations of the disease and individual patient characteristics.

# OBJECTIVES

- Develop a machine learning model to diagnose Parkinson's disease at an early stage using patient data, including voice recordings, motor skills assessments, and demographic information.
- The model aims to improve diagnostic accuracy, reduce the need for frequent clinical visits, and provide personalized treatment suggestions based on the patient's specific condition.

# PROPOSED SYSTEM

# Conceptual diagram of Diagnosis and Treatment Suggestion for Parkinson Diseases Using ML Model

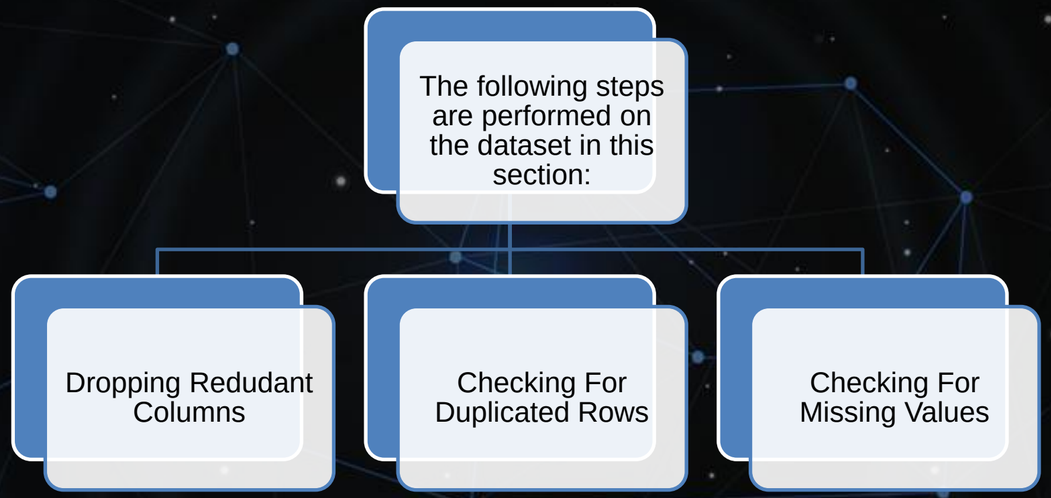


# Status of Phase - I

# Data Collection

- Dataset Used – Parkinson Disease Dataset
- Dataset Source - UCI Machine Learning Repository
- Dataset Hosting URL - https://archive.ics.uci.edu/ml/machine-learning-databases/parkinsons/parkinsons.data

# Data Pre-Processing

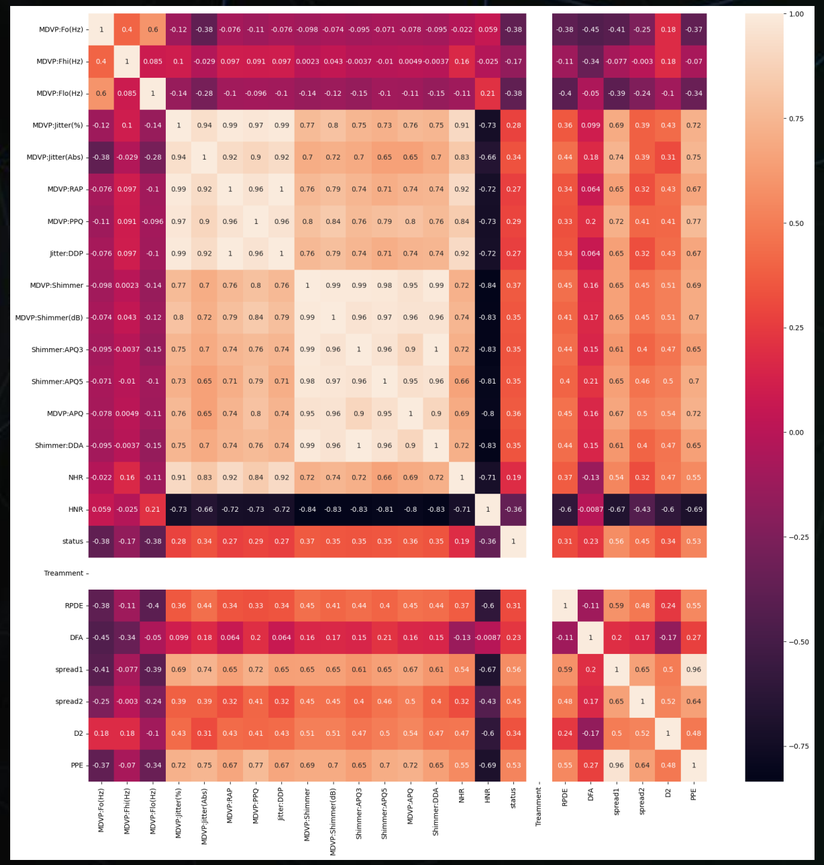



| | name | MDVP:Fo(Hz) | MDVP:Fhi(Hz) | MDVP:Flo(Hz) | MDVP:Jitter(%) | MDVP:Jitter(Abs) | MDVP:RAP | MDVP:PPQ | Jitter:DDP | MDVP:Shimmer | ... |
|---|---|---|---|---|---|---|---|---|---|---|---|
| 0 | phon_R01_S01_1 | 119.992 | 157.302 | 74.997 | 0.00784 | 0.00007 | 0.00370 | 0.00554 | 0.01109 | 0.04374 | ... |
| 1 | phon_R01_S01_2 | 122.400 | 148.650 | 113.819 | 0.00968 | 0.00008 | 0.00465 | 0.00696 | 0.01394 | 0.06134 | ... |
| 2 | phon_R01_S01_3 | 116.682 | 131.111 | 111.555 | 0.01050 | 0.00009 | 0.00544 | 0.00781 | 0.01633 | 0.05233 | ... |
| 3 | phon_R01_S01_4 | 116.676 | 137.871 | 111.366 | 0.00997 | 0.00009 | 0.00502 | 0.00698 | 0.01505 | 0.05492 | ... |
| 4 | phon_R01_S01_5 | 116.014 | 141.781 | 110.655 | 0.01284 | 0.00011 | 0.00655 | 0.00908 | 0.01966 | 0.06425 | ... |

# Exploratry Data Analysis

Feature Engineering - Researchers have explored various feature engineering techniques to extract meaningful information from the data Collected from the Hospitals.

Visualization - It can provide insights into the underlying patterns and relationships. Techniques such as scatter plots, histograms, and heat maps have been used to explore the characteristics of PD data.



# Model Training and Evaluation

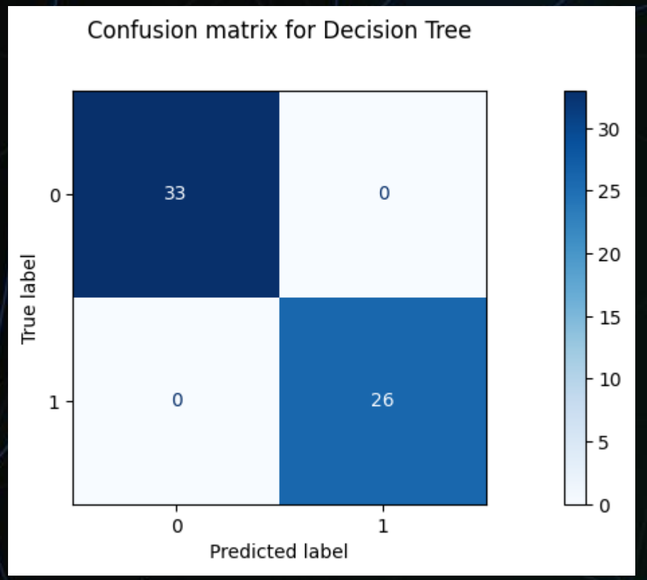
Model Selection - Various ML algorithms have been applied to detect PD, including Decision Trees, Random Forests, Support Vector Machines, and Deep Learning models.

Model Evaluation: Metrics such as accuracy, precision, recall, F1-score, and ROC curves are used to evaluate the performance of the trained models.

# Decision Tree Classifiers

Decision Tree create a tree-like ecision Tree Classifiers are a popular ML algorithm often used in Parkinson's Disease (PD) diagnosis. They model where each internal node represents a test on an attribute, and each leaf node represents a class label (in this case, PD or non-PD).

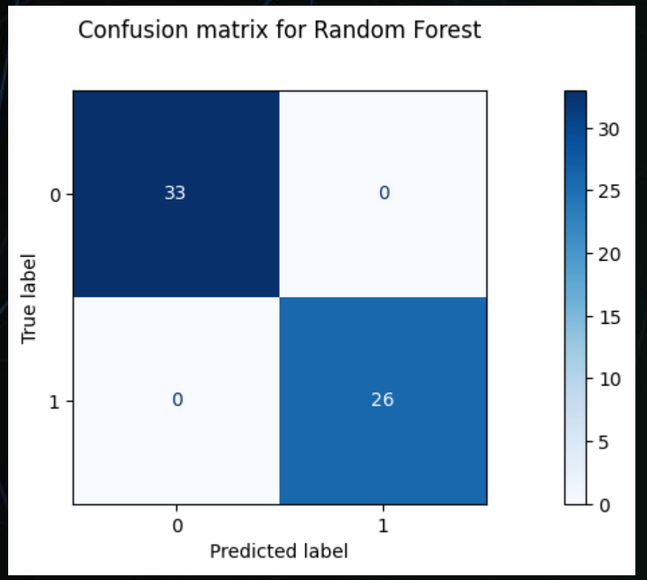
Divide the data into training and testing sets to evaluate the model's performance and Calculate metrics like accuracy, precision, recall, F1-score, and AUC-ROC to assess the model's ability to correctly classify Parkinson's Disease cases.



# Random Forest Classifier

Random Forest Classifier is a powerful machine learning algorithm that has been successfully applied to various medical domains, including Parkinson's Disease (PD) diagnosis and treatment planning. Its ability to handle large datasets, handle both numerical and categorical features, and provide feature importance measures makes it well-suited for this application.

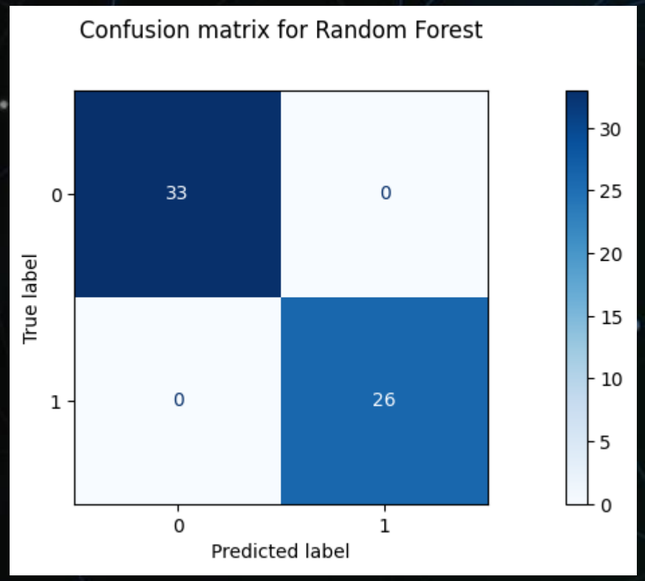
Random Forest provides a feature importance score for each feature, indicating its contribution to the model's accuracy. The trained Random Forest model is used to predict the likelihood of PD in new patients based on their input features. Based on the diagnosis and the patient's specific characteristics, the model can suggest appropriate treatment options, such as medication, therapy, or surgical interventions.



# CURRENT PROGRESS

Random Forest Classifier was found to be the best performing Classifier with:

- Accuracy - 0.996102
- F1 Score - 0.961538
- R2 Score - 0.862471



# Result of Implementation

| | Metric | DT | RF | LR | SVM | NB | KNN | XGB |
|---|---|---|---|---|---|---|---|---|
| 0 | Accuracy | 0.932203 | 0.966102 | 0.830508 | 0.966102 | 0.762712 | 0.966102 | 0.915254 |
| 1 | F1-Score | 0.920000 | 0.961538 | 0.782609 | 0.960000 | 0.650000 | 0.960000 | 0.909091 |
| 2 | Recall | 0.884615 | 0.961538 | 0.692308 | 0.923077 | 0.500000 | 0.923077 | 0.961538 |
| 3 | Precision | 0.958333 | 0.961538 | 0.900000 | 1.000000 | 0.928571 | 1.000000 | 0.862069 |
| 4 | R2-Score | 0.724942 | 0.862471 | 0.312354 | 0.862471 | 0.037296 | 0.862471 | 0.656177 |

# Train and Test Set Result

For Test Set

Accuracy : 0.9152542372881356

Precision : 0.8620689655172413

Recall : 0.9615384615384616

R2 Score : 0.6561771561771561

For Train Set

Accuracy : 1.0

Precision : 1.0

Recall : 1.0

R2 Score : 1.0

# SCOPE OF THE WORK REMAINING

- Completion of Designing Random Forest Model
- Completion of Testing and Training the Model
- Integration of Treatment Suggestion Data with the model
- Application Development
- Performance Analysis

# Current Work Status

- Finalized the Proposed System Architecture
- Trained the Model with the Gathered Data Set
- Analyse the  best Model for Prediction
- Splitted the Train and Test Data for Training the model

# observations

- Average Training accuracy of 87.86
- Average Training accuracy of 89.48%

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# THANK YOU!