

EARLY DETECTION OF PARKINSON'S DISEASE

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Abstract - Parkinson's Disease (PD) is a progressive neurological disorder that affects movement, speech, balance, and coordination. Early diagnosis of Parkinson's Disease is essential for improving patient care and reducing disease progression. Traditional diagnostic methods rely heavily on clinical expertise and medical imaging, which are often expensive and time-consuming. This research proposes a Machine Learning-based system for the early detection of Parkinson's Disease using biomedical voice measurements and patient health parameters. The proposed system applies data preprocessing, feature extraction, and classification techniques to identify Parkinson's symptoms efficiently. Machine Learning algorithms such as Support Vector Machine (SVM), Random Forest, Decision Tree, and K-Nearest Neighbor (KNN) are implemented and evaluated for prediction accuracy

Key Words: Parkinson's Disease, Machine Learning, SVM, Random Forest, Healthcare Analytics, Disease Prediction.

1. INTRODUCTION

Parkinson's Disease is a neurodegenerative disorder that mainly affects body movement, speech, muscle coordination, and balance. The disease occurs due to the degeneration of dopamine-producing neurons in the brain. Early-stage diagnosis is difficult because symptoms develop gradually and vary among patients.

2. Body of Paper

The proposed "Early Detection of Parkinson's Disease Using Machine Learning (ML)" system is developed to provide intelligent and automated disease prediction using biomedical healthcare data. The body of the paper presents the methodology, implementation, and performance analysis of the proposed healthcare prediction system. The system integrates Artificial Intelligence (AI), Machine Learning, healthcare analytics, and biomedical voice analysis to improve early-stage Parkinson's Disease diagnosis.

Test Case No.	1
Name of Test	Dataset Preprocessing
Test Case Description	Verify whether healthcare datasets are cleaned and preprocessed successfully
Sample Input	Biomedical Healthcare Dataset
Expected Output	Cleaned and normalized dataset
Actual Output	As <u>expected</u>
Remarks	Pass

Table-1: Test Case for Dataset Preprocessing

Review	Work Done	Description
Review 1	Requirement Analysis	Analyzed project objectives, healthcare requirements, and system feasibility.
Review 2	Literature Survey	Studied previous Machine Learning healthcare systems and Parkinson's Disease prediction research papers.
Review 3	System Design	Designed system architecture, workflow diagrams, dataset structure, and healthcare interfaces.
Review 4	Project Implementation	Developed frontend, Machine Learning models, dataset preprocessing modules, and deployment configuration.
Review 5	Testing Phase	Tested all modules, validated outputs, fixed errors, and ensured system reliability.

Table -2: Phase Description

Traditional diagnosis methods mainly depend on neurological observation, medical imaging, and physician expertise. These methods are often time-consuming, expensive, and less effective during the early stages of disease detection. Learning techniques are becoming increasingly important for improving diagnostic accuracy and healthcare efficiency.

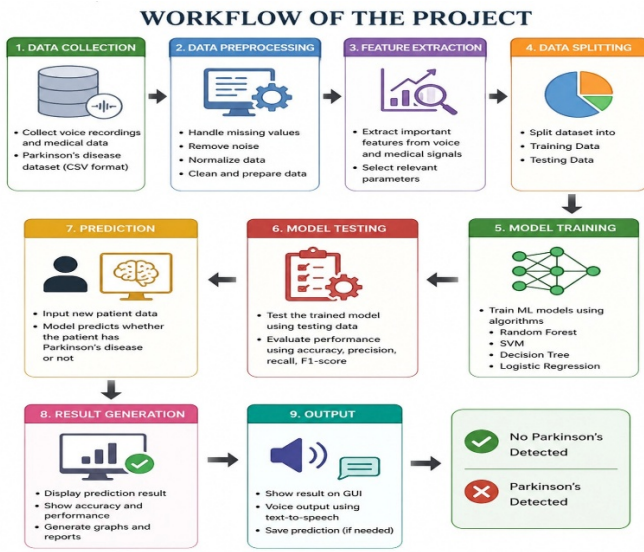
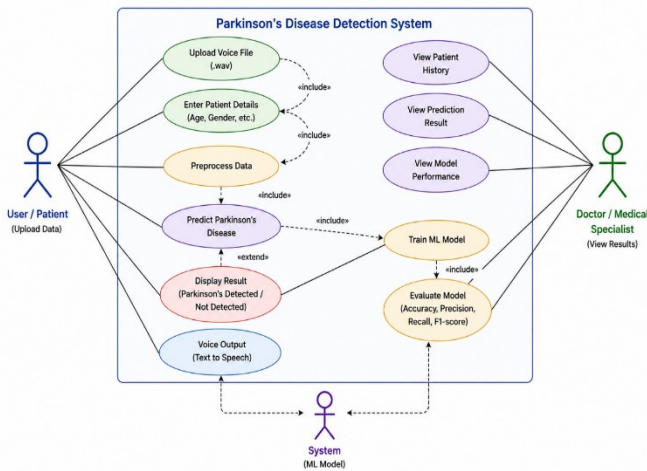


Fig -1: Work Flow

Use Case Diagram



4. CONCLUSIONS

The proposed “Early Detection of Parkinson’s Disease Using Machine Learning” system successfully demonstrates the integration of Artificial Intelligence, Machine Learning, and healthcare analytics for intelligent disease prediction.

The system provides accurate early-stage Parkinson’s Disease detection using biomedical voice measurements and patient healthcare data. Machine Learning algorithms such as Random Forest and Support Vector Machine achieved high prediction accuracy and reliable classification performance.

The proposed system reduces manual diagnostic complexity, improves healthcare efficiency, and supports doctors in faster

clinical decision-making. The developed platform also provides cost-effective and scalable healthcare support suitable for modern healthcare applications.

3. LITERATURE SURVEY

- Kumar and Rao** compared multiple Machine Learning algorithms such as Decision Tree, K-Nearest Neighbor, and Random Forest for Parkinson’s Disease prediction. The study demonstrated that ensemble learning techniques improved classification reliability and prediction accuracy.
- Sharma et al.** proposed a Machine Learning-based Parkinson’s Disease detection system using biomedical voice measurements. The system utilized Support Vector Machine and Random Forest algorithms for disease classification and achieved high prediction accuracy
- Ahmed and Verma** developed a Deep Learning-based system using speech signal analysis for Parkinson’s Disease prediction. Their research showed that voice biomarkers such as jitter, shimmer, and vocal frequency variations could effectively identify Parkinson’s symptoms.
- Kumar and Rao** compared multiple Machine Learning algorithms such as Decision Tree, K-Nearest Neighbor, and Random Forest for Parkinson’s Disease prediction. The study demonstrated that ensemble learning techniques improved classification reliability and prediction accuracy.

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