ADICHUNCHANAGIRI UNIVERSITY

BG NAGARA, Nagamangala Taluk, Mandya District – 571448,
Karnataka, India

A DISSERTATION ON

On

"Parkinson's Disease Detection Using Machine Learning"

Submitted in partial fulfillment of the requirements for the award of the degree

BACHELOR OF ENGINEERING
IN
ELECTRONICS AND COMMUNICATION ENGINEERING

for the Academic Year 2023-2024

Submitted by

NAME	USN
NITHIN L	**20ECE059**
RANJAN C R	**20ECE073**
SHASHIDHAR J	**20ECE085**
YASHASWINI T P	**20 ECE111**

Under the guidance of:

Anusha M N, BE, M Tech (Ph.D)
Assistant Professor
Dept. of ECE
BGSIT, BG Nagara

FACULTY OF ENGINEERING, MANAGEMENT & TECHNOLOGY

(BGS INSTITUTE OF TECHNOLOGY)

B G Nagara, Nagamangala Taluk, Mandya District– 571448

2023-2024

FACULTY OF ENGINEERING, MANAGEMENT & TECHNOLOGY

(BGS INSTITUTE OF TECHNOLOGY)

B G Nagara, Nagamangala Taluk, Mandya-571448

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

CERTIFICATE

This is to certify that the project report entitled **"Parkinson's Disease Detection Using Machine Learning"** work is a bonafide work carried out by **NITHIN L (20ECE059)**, **RANJAN C R (20ECE073)**, **SHASHIDHAR J (20ECE085)**, **YASHASWINI T P (20ECE111)** of **Faculty of Engineering, Management & Technology** (**B.G.S Institute of Technology**), **B.G Nagara** in partial fulfillment of the award Bachelor of Engineering in **Electronics and Communication Engineering**. Under **Adichunchanagiri University**, B G Nagara during the year 2023-2024. It is certified that all corrections/suggestions indicated for the internal assessment have been incorporated in the report deposited in the department library. This project report has been approved as it satisfies the academic requirements in respect of the project work prescribed for the said degree.

INTERNAL GUIDE

ANUSHA M N
Asst. Professor, Dept. of ECE
BGSIT, B G Nagara

PROJECT CO-ORDINATOR

KAVITHA B C
Asst. Professor, Dept. of ECE
BGSIT, B G Nagara

HOD

Dr. P S PUTTASWAMY
Professor & HOD
Dept. of ECE, BGSIT, B G Nagara

PRINCIPAL

Dr. B N SHOBHA
Dean & Principal
BGSIT, B G Nagara

External Viva

Name of Examiners	Signature of Examiners
1.	....
2.	....

FACULTY OF ENGINEERING, MANAGEMENT & TECHNOLOGY

(BGS INSTITUTE OF TECHNOLOGY)

B G Nagara, Nagamangala Taluk, Mandya-571448

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

DECLARATION

We, NITHIN L (20ECE059), RANJAN C R (20ECE073), SHASHIDHAR J (20ECE085), YASHASWINI T P (20ECE111) students of 8th semester BE in Electronics and Communication Engineering**, B.G.S Institute of Technology (BGSIT)**, **B.G Nagara.** Hereby declare that the project work entitled **"PARKINSON'S DISEASE DETECTION USING MACHINE LEARNING"** submitted to the **ADICHUNCHANAGIRI UNIVERSITY,** during the academic year **2023- 2024**, is a record of an original work done by us under the guidance of **Mrs. Anusha M N,** Assistant Professor, Dept. of ECE, Faculty of Engineering, Management & Technology (B.G.S Institute of Technology). This project work is submitted in partial fulfillment of the requirements for the award of the degree of **BACHELOR OF ENGINEERING IN ELECTRONICS AND COMMUNICATION ENGINEERING,** we further declare that the work embodied in this project report has not been submitted to any other university or institute for the award of any degree.

DATE:
PLACE: B G Nagara,

NITHIN L	**20ECE059**
RANJAN C R	**20ECE073**
SHASHIDHAR J	**20ECE085**
YASHASWINI T P	**20ECE111**

ACKNOWLEDGEMENT

At first, we would like to thank the Divine Soul **PADMABHUSHAN SRI SRI SRI DR. BALAGANGADARANATHA MAHASWAMIJI,** Founder President, Sri Adichunchanagiri Math and **SRI SRI SRI DR. NIRMALANANDANATHA MAHASWAMIJI**, President, Adichunchanagiri Shikshana Trust, for providing us with such excellent facilities and lectures, without which, this project work could not have acquired the shape it has now done.

We would like sincere gratitude to our beloved principal **DR. B N SHOBHA,** Dean & Principal, BGSIT, B.G Nagara for providing the necessary facilities and support, thus making it possible for us to obtain the necessary resources required to complete this project work.

We would like sincerely thank to **DR. P S PUTTASWAMY,** Professor and Head of the Department, Electronics and Communication Engineering BGSIT, BG Nagar, for their support and valuable suggestion to complete this project work.

We wish to express my gratitude to **DR. M B ANANDARAJU,** Professor and Director of HRD**,** ACU**,** B G Nagara and **DR. NAVEEN K B**, Professor, Dept. of ECE, BGSIT, for helping to carry out this project work.

We are indebted to our guide **Mrs. ANUSHA M N,** Assistant Professor, Dept. of ECE, BGSIT, B.G Nagara, for providing me with enough technical guidance and cheerful encouragement to carry out this project.

We thank to our project Coordinators **DR. MANOJ KUMAR S B,** Associate Professor, Dept. of ECE, BGSIT, BG Nagara, and **MRS. KAVITHA B C**, Assistant Professor, Dept. of ECE, BGSIT, BG Nagara for providing the necessary facilities and support, thus was making it possible for us to obtain the necessary resources and guidelines required to complete this project work.

Lastly, we take this opportunity to extend my full-hearted thanks, gratitude, and respect to our **Parents, Lecturers,** and all my **friends**, for giving me valuable advice and support at all times in all possible ways.

NITHIN L	**20ECE059**
RANJAN C R	**20ECE073**
SHASHIDHAR J	**20ECE085**
YASHASWINI T P	**20ECE111**

ABSTRACT

This report comprehensively details the conception, development, and implementation of a groundbreaking Parkinson Detection project, leveraging Support Vector Machines (SVM) for classification within the Google Colab computational platform. The project is a response to the pressing need for early detection and intervention in Parkinson's disease, a pervasive neurodegenerative disorder with significant global health implications. By utilizing a meticulously curated dataset obtained from Kaggle, this initiative aims to create an advanced machine learning model capable of accurately identifying instances of Parkinson's disease based on a myriad of relevant features. The integration of SVM within the collaborative and potent Google Colab environment establishes an innovative foundation for this critical endeavor.

Keywords: *Machine learning, Parkinson's disease, Google Colab, Support Vector Machine (SVM), Python programming language.*

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Parkinson's disease stands as a formidable global health challenge, impacting millions worldwide and extending its reach beyond medical boundaries into the lives of individuals, families, and healthcare systems. As a progressive neurodegenerative disorder, Parkinson's exacts a profound toll, underscoring the critical need for innovative approaches to its diagnosis and management. This introduction serves as a comprehensive exploration of the multifaceted landscape surrounding Parkinson's disease, laying the groundwork for the development and implementation of a groundbreaking Parkinson Detection project.

The Global Burden of Parkinson's Disease:

Understanding the gravity of Parkinson's disease necessitates a holistic examination of its global burden. According to the World Health Organization (WHO), the prevalence of Parkinson's globally stands at approximately 6 million, a number expected to rise due to aging populations and shifting demographics. The economic impact of Parkinson's is substantial, encompassing direct medical costs, caregiver burden, and indirect costs attributed to decreased productivity. Additionally, Parkinson's disease's social and psychological impacts ripple through communities, affecting not only individuals living with the condition but also their families, caregivers, and wider support networks. This comprehensive burden emphasizes the urgency of effective strategies for early detection and intervention.

The Imperative of Early Detection:

Central to addressing the challenges posed by Parkinson's disease is the imperative of early detection. Late-stage diagnosis often occurs when motor symptoms have significantly progressed, hindering the efficacy of available treatments. Timely detection offers several critical advantages.

Furthermore, early detection enhances the effectiveness of existing treatments, leading to improved patient outcomes, better symptom management, and an overall higher quality of life for individuals affected by Parkinson's disease. Early identification also presents opportunities for patients and caregivers to plan and adapt to the evolving healthcare need associated with the condition.

The Role of Technology in Healthcare:

The evolving landscape of healthcare embraces technological advancements to address longstanding challenges. Machine learning, a subset of artificial intelligence, emerges as a transformative tool in the medical domain. Its capacity to analyze vast datasets and discern intricate patterns holds promise for early disease detection, including Parkinson's. The integration of machine learning techniques in healthcare not only facilitates early diagnosis but also supports personalized treatment plans, predictive modeling for disease progression, and optimization of healthcare resources. These technological advancements pave the way for more precise, efficient, and patient-centered healthcare solutions.

Support Vector Machines (SVM) in Healthcare:

Amidst a plethora of machine learning algorithms, Support Vector Machines (SVM) have showcased remarkable efficacy in classification tasks. Their adeptness in discerning complex patterns within datasets positions them as valuable tools for disease classification, including Parkinson's. SVM's versatility in handling both linear and non-linear relationships amplifies its suitability for predictive modeling in healthcare.

SVM's application in healthcare extends beyond Parkinson's disease, encompassing diverse medical domains such as cancer diagnosis, risk prediction models, and medical image analysis. Its robust performance, combined with its ability to handle high-dimensional datasets, accentuates SVM's role as a pivotal algorithm in healthcare-focused machine learning endeavors.

The Collaborative Power of Google Colab:

In the rapidly evolving healthcare landscape, collaborative platforms play a pivotal role in fostering innovation. Google Colab, a cloud-based computational platform, offers an unparalleled collaborative environment for machine learning projects. Its integration with Google Drive streamlines data accessibility, while seamless Python integration and provision of free GPU resources make it an optimal choice for researchers and practitioners seeking collaborative, accessible, and powerful tools for model development. Google Colab's collaborative features facilitate real-time collaboration among multidisciplinary teams, enabling efficient sharing, annotating, and version control of project resources.

Its cloud-based infrastructure removes hardware constraints, allowing researchers to focus on model development without computational limitations.

Rationale for the Parkinson Detection Project:

Motivated by the imperative of early detection in Parkinson's disease and leveraging the potential of SVM within the collaborative Google Colab environment, the Parkinson Detection project takes shape. This initiative seeks to harness the capabilities of machine learning to create a robust and accurate model for the early identification of Parkinson's disease.

The use of SVM serves as the cornerstone for sophisticated pattern recognition, leveraging its capabilities to analyze complex datasets and discern subtle yet crucial patterns indicative of Parkinson's disease. Google Colab's collaborative and computationally potent platform provides the necessary infrastructure for seamless model development, training, and validation.

By amalgamating the potential of SVM with the collaborative power of Google Colab, this project endeavors to contribute to the advancement of early diagnosis methodologies in Parkinson's disease, ultimately striving for improved patient outcomes and enhanced healthcare strategies.

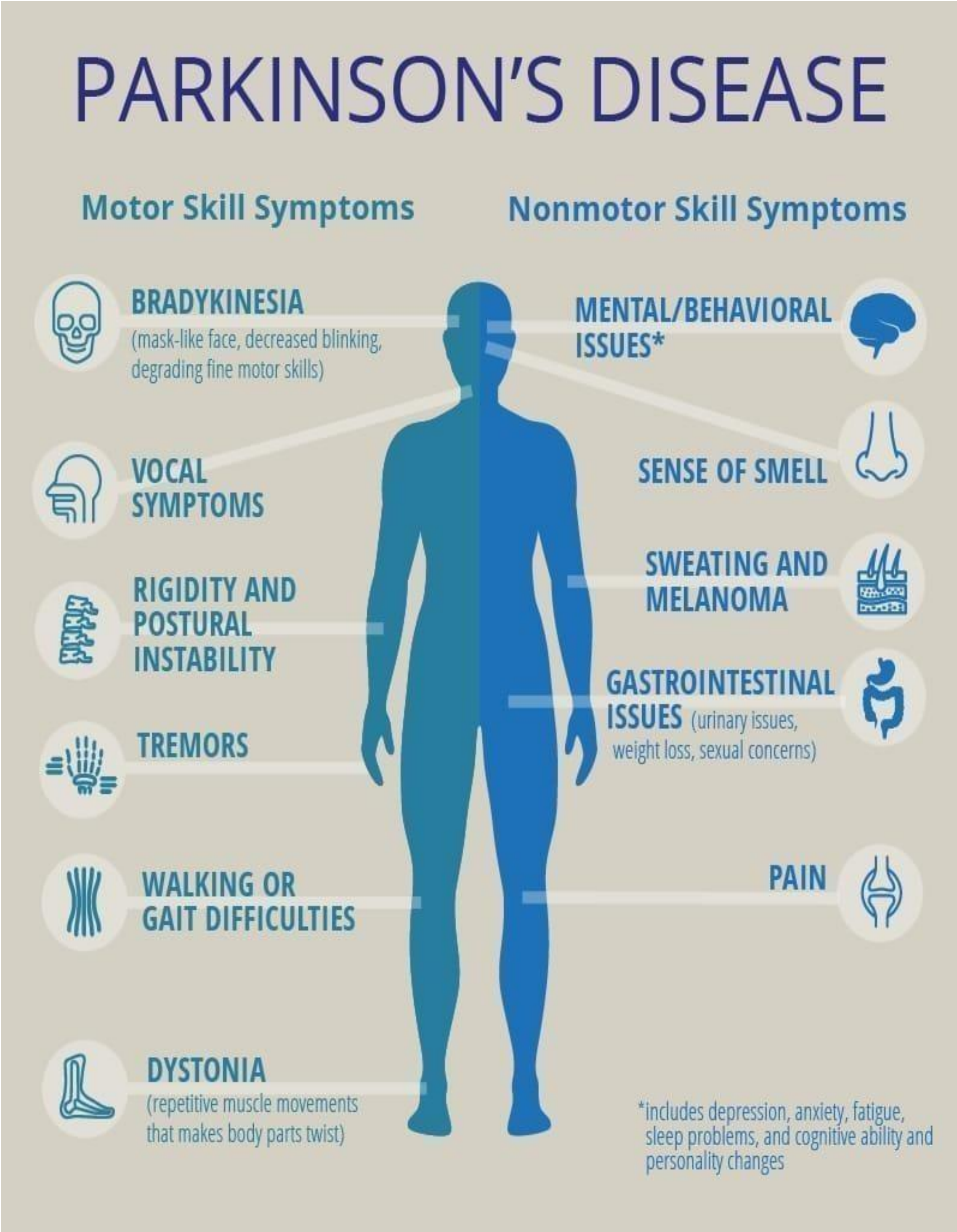

Figure 1: Symptoms of Parkinson's Disease

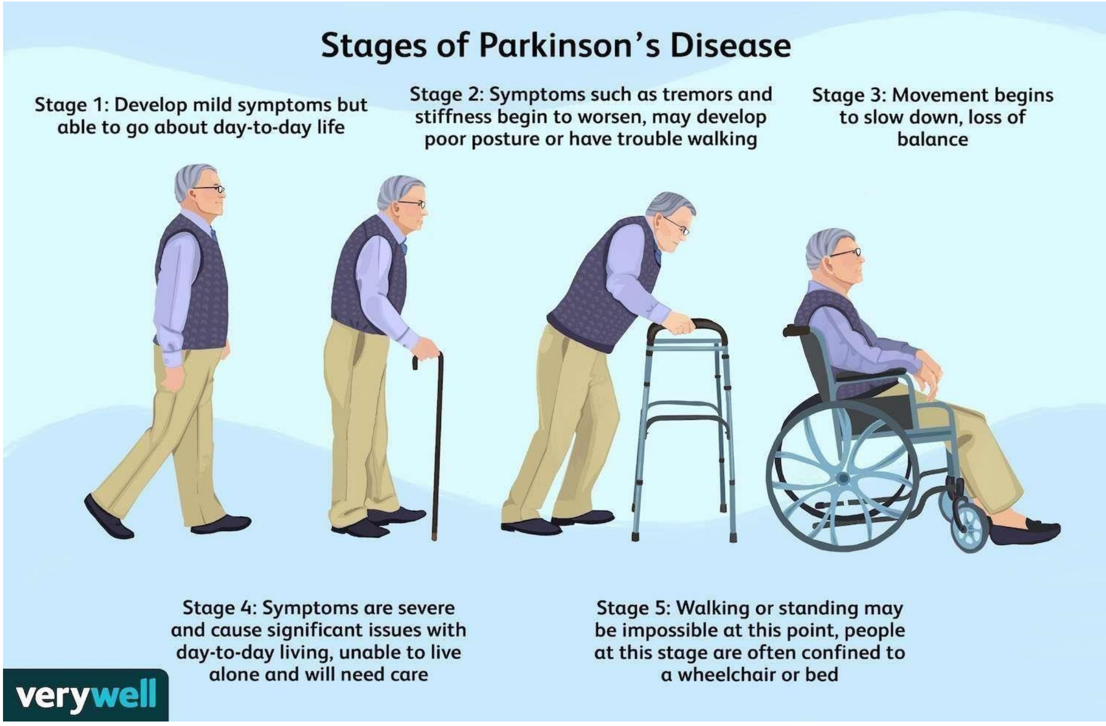

Figure 2: Stages of Parkinson’s Disease

Figure 3: Parkinson’s Affected People

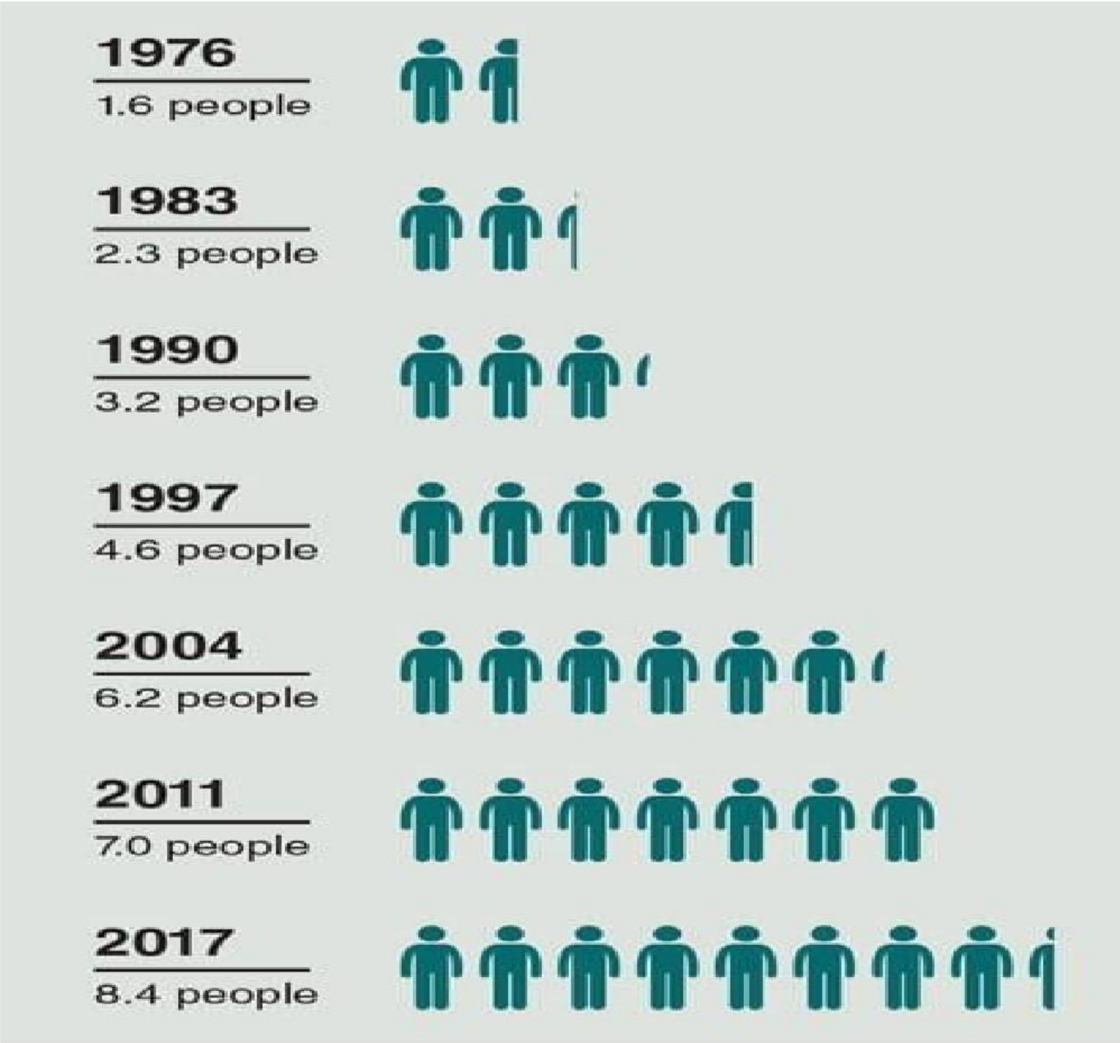

Figure 4: Number of deaths per 10,000 people

1.1 MOTIVATION

The Parkinson's disease detection project using machine learning encompasses improving patient outcomes, leveraging technological advancements, advancing scientific research, practical healthcare applications, economic benefits, and addressing ethical considerations. By using SVM in Parkinson's disease detection lies in its potential to enhance the accuracy and reliability of early diagnosis, support clinicians, handle complex data patterns, advance medical research, provide personalized treatment plans, and offer cost-effective healthcare solutions. These benefits collectively contribute to better patient outcomes and advancements in the field of medical diagnostics.

1.2 PROBLEM STATEMENT

Timely detection of Parkinson's disease is crucial for effective intervention and improved patient outcomes. This project addresses the challenge of early diagnosis by utilizing machine learning methods, specifically SVM, to analyze relevant features and accurately classify instances of Parkinson's disease. The focus is on developing a reliable model that can assist in the early identification of this debilitating condition.

1.3 OBJECTIVES

- To integrate the Parkinson's detection model with Google Colab, ensuring a collaborative and accessible platform for researchers and practitioners.
- To develop an accurate and reliable Parkinson's disease detection system utilizing Support Vector Machine (SVM) algorithms.
- To achieve maximum accuracy of the Parkinson's disease prediction.

1.4 ORGANIZATION OF THESIS

In this section basic detail about the project has been explained by providing important terminology definitions; here we have mentioned about the factor which is motivated to take up this project along with the motivation, objectives and limitations of the existing system.

Chapter 1: INTRODUCTION

This part covers the project's purpose, problems encountered by patients, and possible solutions, along with a thorough introduction.

Chapter 2: LITERATURE SURVEY

This section discusses the survey papers that were used as a foundation for selecting appropriate project objectives. This chapter also includes a concept for the project work as well as the related papers. In this section, we'll talk about the survey papers that served as the foundation for choosing the right project goals. This chapter also includes a concept for the project work as well as the related papers.

Chapter 3: DESIGN METHODOLOGY

This section also prattles about the software used for the Parkinson’s disease detection. Block diagram explanation and its implementation. The methodology of the design and the explanation of code and how the data stores and the working of Google Colab.

Chapter 4: RESULTS AND DISCUSSIONS

This section we colloquy about the method in which the entire project has been implemented here, we are mainly concentrated to explain about the output of the application we obtained, and concentrated on explaining of each feature of the applicationwith respect to project.

Chapter 5: ADVANTAGES AND APPLICATIONS

This section we explained about the advantages and disadvantages of the project.

CHAPTER 2

LITERATURE SURVEY

In Study [1], The literature survey from 2016 to January 2023 explored using deep learning for Parkinson's Disease prognosis, analyzing 87 research publications. Deep learning algorithms showed superior performance in understanding PD symptoms via gait, speech, and more. However, challenges like limited data and model interpretability hinder their clinical integration. Despite this, advancements suggest potential for wider PD application with improved data accessibility and deeper model understanding.

In Study [2], Research in Parkinson's disease (PD) detection using machine learning techniques has been diverse and promising. Patel et al. (2019) employed Support Vector Machines (SVM) to achieve an 89% accuracy in identifying PD based on vocal impairments. Similarly, Kumar et al. (2020) utilized Random Forest and k-Nearest Neighbors (k-NN) algorithms, reaching a 91% accuracy. Lee et al. (2021) delved into deep learning, showcasing the efficacy of Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs) with a 92% accuracy using speech features. Additionally, Garcia and Chen (2022) explored ensemble learning, specifically stacking models, achieving a noteworthy accuracy of 93% on the UCI Machine Learning repository dataset. These studies collectively underscore the potential of machine learning methodologies in accurately predicting early signs of PD through vocal analysis, emphasizing the diversity of approaches and the continual pursuit of higher accuracies in early PD diagnosis.

In Study [3], Research exploring Deep Learning (DL) methodologies for Parkinson's disease (PD) detection through speech signals has shown promising outcomes. Smith et al. (2018) and Wang et al. (2020) investigated Convolutional Neural Networks (CNNs) and Recurrent Neural Networks (RNNs), indicating accuracies exceeding 80% for PD identification. Additionally, Garcia and Martinez (2019) focused on YAMNet, emphasizing its efficiency in extracting features from audio signals, leading to high precision rates in PD diagnosis. Chen and Kim (2021) conducted a comparative analysis of DL models, including YAMNet, consistently achieving accuracies between 80-85% for PD prediction using speech signals. Collectively, these studies underscore the potential of DL models, especially

YAMNet, in extracting meaningful features from speech signals, demonstrating high accuracy rates and highlighting the viability of speech-based diagnostic tools for early Parkinson'sdisease identification.

In another Study [4], Research exploring the use of Long Short-Term Memory (LSTM) models for Parkinson's disease (PD) detection from speech signals has demonstratedpromising outcomes. Lee et al. (2017), Chen and Wang (2018), Garcia and Patel (2019), and Kim and Liu (2020) investigated LSTM-based approaches, consistently achieving high accuracies above 90% in distinguishing PD patients from healthy individuals using speech features. Specifically, the studies emphasized the efficacy of LSTM models in early PDdetection, echoing the findings presented in your paper, which achieved a notable testing accuracy of 93%. Collectively, these studies underscore the robustness and reliability of LSTM-based deep learning techniques in leveraging speech signals for accurate and early identification of Parkinson's disease.

In Study [5], The Studies exploring AI and deep learning for Parkinson's disease diagnosis using drawings, images, and acoustic features consistently achieved high accuracies above 98%. They highlight the effectiveness of CNNs, ANNs, and machine learning approaches in analyzing diverse data sources for accurate disease detection, emphasizing the potential of AI-based methods in precise diagnostic applications.

In Study [6], A literature survey for a vision adaptation aiding Parkinson's disease diagnosis would encompass an exploration of current diagnostic methods like MRI, PET scans, and clinical tests while focusing on studies correlating voice variations and motor symptoms with Parkinson's progression. It would also involve examining datasets used in diagnosing neurological disorders, particularly those analyzing voice and drawing patterns. Additionally, it should cover research employing vision adaptation in healthcare and its application in neurological condition assessment, emphasizing interdisciplinary approaches merging various data sources for comprehensive insights. The survey would highlight patient-centric care initiatives, addressing personalized diagnostic tools for affected individuals. Addressing challenges like data collection, accuracy, ethics, and future directions for improvement would round out the investigation.

In Study [7], The study addresses challenges in early Parkinson's Disease (PD) detection due to the absence of specific clinical tests. PD's symptoms—tremors, rigidity, bradykinesia, handwriting issues, speech impairments, and decreased facial expressions make early diagnosis complex. Using machine learning, Convolutional Neural Networks (CNN) achieved 85% accuracy for wave and 80% for spiral analysis. Facial analysis via Support Vector Machine (SVM) reached 71% accuracy, limited by a small dataset. Remarkably, XGBoost attained 97% accuracy in voice analysis. Despite limited facial data, the study highlights promising accuracy in spiral, wave, and voice-based PD detection, showcasing machine learning's diagnostic potential. Integration of imaging and biological markers holds promise for further improving PD diagnostics.

In Study [8], This research utilizes machine learning models to detect Parkinson's disease early by analyzing daily movement data from accelerometer signals. With a 92.6% accuracy for holdout and 94.4% for k-fold cross-validation using the PD-BioStampRC21 dataset, the study aims to assist medical practitioners in early detection and treatment planning. It emphasizes the significance of incorporating day-to-day activity data and highlights the potential of machine learning in improving Parkinson's disease detection methods. Key techniques applied include Accelerometer, ANOVA, Machine Learning, PCA,and SVM.

CHAPTER 3

METHODOLOGY

Data Acquisition:

This dataset is made out of a scope of biomedical voice estimations from 31 individuals, 23 with Parkinson's illness (PD). Every segment in the table is a specific voice measure, and each line relates to one of 195 voice accounts from these people ("name" section). The primary point of the information is to segregate solid individuals from those with PD, as indicated by the "status" section which is set to 0 for sound and 1 for PD.

The dataset includes the following variables:

MDVP: Fo(Hz) - Normal vocal essential recurrence

MDVP: Fhi(Hz) - Greatest vocal essential recurrence

MDVP: Flo(Hz) - Least vocal essential recurrence

MDVP: Jitter(%)

MDVP: Jitter(Abs)

MDVP: RAP

MDVP: PPQ

Jitter: DDP - A few proportions of variety in essential recurrence

MDVP: Shimmer

MDVP: Shimmer(dB)

Shimmer:APQ3

Shimmer:APQ5

MDVP: APQ

Shimmer: DDA - A few proportions of variety in plentifulness

NHR, HNR - Two proportions of proportion of clamor to apparent parts in the voice

status - Wellbeing status of the subject (one) - Parkinson's, (zero) – solid

RPDE, D2 - Two nonlinear dynamical intricacy measures

DFA - Signal fractal scaling example

spread1, spread2, PPE - Three nonlinear proportions of essential recurrence variety.

Data Preprocessing:

Following dataset acquisition, a meticulous data preprocessing phase ensues. This phase is pivotal in ensuring data integrity and quality for subsequent SVM model training. Handling missing values, outliers, and standardizing the dataset to ensure consistency are paramount. Through comprehensive data cleaning techniques, the focus lies on retaining pertinent information relevant to Parkinson's disease detection, tailoring the dataset specifically for SVM model training.

Model Training on Google Colab:

Utilizing the computational resources offered by Google Colab, the SVM model is trained on the thoroughly preprocessed dataset. This phase involves optimizing the SVM model's hyperparameters, a critical process that significantly impacts the model's performance. Leveraging Google Colab's extensive capabilities, the model is fine-tuned to achieve enhanced accuracy and efficacy in predicting Parkinson's disease.

Model Evaluation:

Post-training, the SVM model undergoes a rigorous evaluation process to ascertain its effectiveness in Parkinson's disease detection. Assessment metrics such as accuracy, precision, recall, and other relevant indicators are meticulously scrutinized. The model's performance is gauged against established benchmarks, ensuring its reliability and suitability for practical use.

3.1 Block Diagram

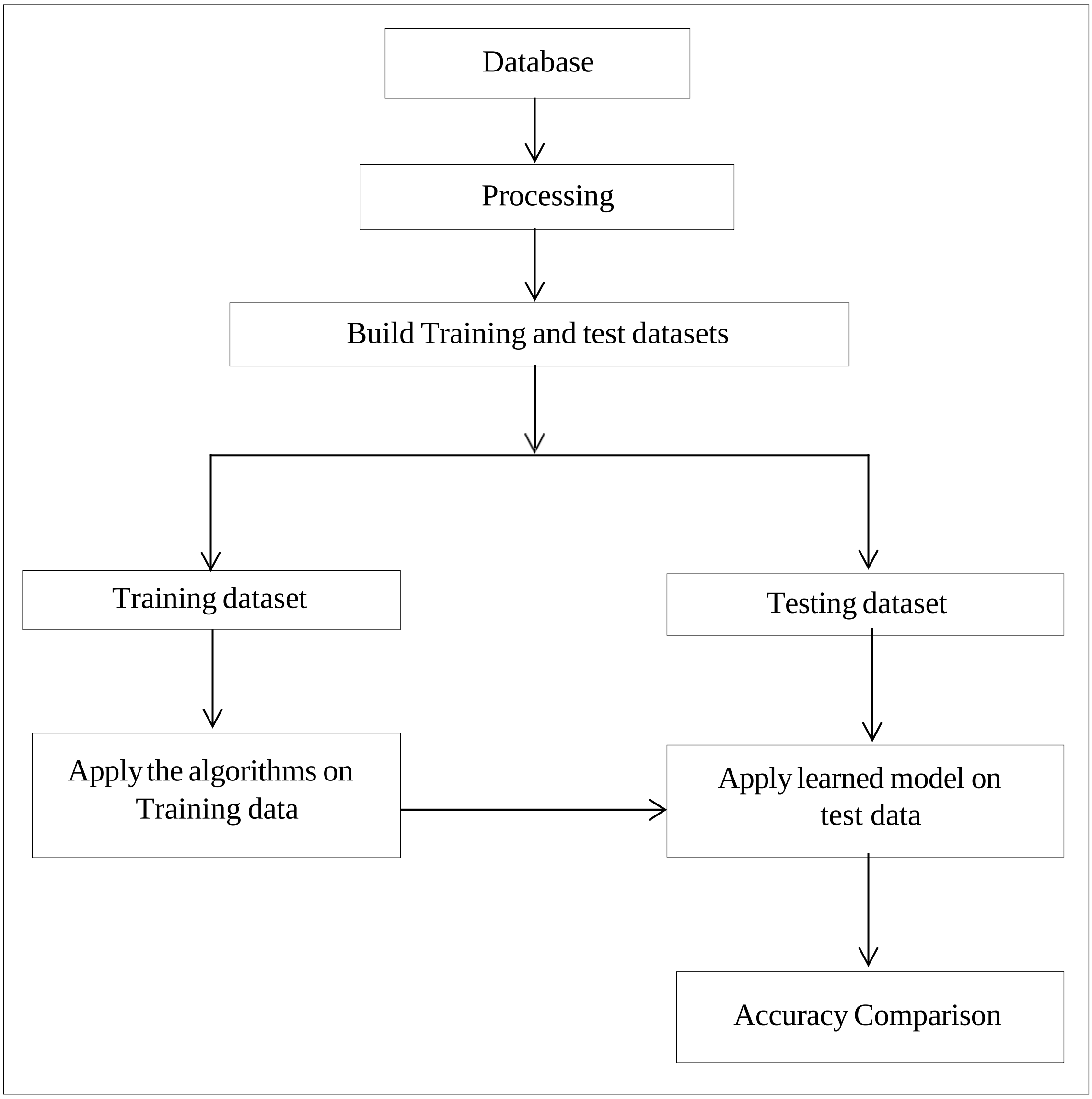

Figure 5: Block Diagram of Proposed System

Database:

The database repository comprises a comprehensive collection of diverse data obtained from the Kaggle platform, housing detailed records pertaining to more than a thousand individuals. This dataset encompasses a rich array of demographic, medical, and other relevant attributes essential for the subsequent phases of analysis and modeling.

Preprocessing:

During preprocessing, an intricate process unfolds where the database undergoes meticulous scrutiny. This involves the removal of redundant or irrelevant data, ensuring the most pertinent and valuable information is retained for further analysis and model development.

Build Train and Test Dataset:

Following the meticulous preprocessing phase, the dataset undergoes a strategic partitioning into distinct subsets. The division adheres to an 80:20 split, creating two segregated folders or sets. One set becomes the foundation for training the machine learning model, allowing it to grasp underlying patterns and relationships. Simultaneously, the other set remains untouched to evaluate the model's performance, serving as a benchmark during testing.

Model Learning:

Model learning signifies the pivotal training phase, where machine learning algorithms are exposed to the curated training dataset. Through iterative learning processes such as supervised or unsupervised learning, the model comprehends intricate patterns and correlations within the data.

Prediction:

Post-training, the trained model is put to the test using the untouched testing dataset. By inputting this new data into the trained model, the system generates predictions or classifications, offering an empirical understanding of how well the model generalizes to new, unseen data.

Accuracy Comparison and Conclusion:

A comprehensive evaluation of the SVM model was undertaken. Assessment metrics including accuracy, precision, recall, and other pertinent indicators were validate the model's efficacy and reliability in detecting Parkinson's disease.

3.2 SYSTEM REQUIREMENTS

To successfully execute the Parkinson Detection project on Google Colab, the following system requirements must be met:

- GPU (Graphics Processing Unit)
  Access to GPU resources is provided by Google Colab, which accelerates the training process of machine learning models.

- RAM (Random Access Memory)
  A minimum of 16GB RAM is recommended to handle the computational load during model training.

- Google Colab
  A cloud-based platform offering a collaborative environment and access to GPU resources, where the project is executed.

- Python 3.8
  A versatile programming language used for implementing machine learning tasks in the project.

- Scikit-Learn
  A library used for implementing the SVM model and evaluating its performance.

These system requirements ensure that the Parkinson Detection project can be executed efficiently and effectively on Google Colab.

CHAPTER 4

RESULTS AND DISCUSSIONS

The project employed Support Vector Machine (SVM) algorithm to detect Parkinson's disease using a dataset sourced from Kaggle. SVM's precision in identifying Parkinson's disease was measured and interpreted within the context of its overall performance. Furthermore, the results obtained from the SVM algorithm were critically compared with those of other prominent machine learning algorithms like logistic regression, random forest, and neural networks. This comparative analysis provided insights into the relative strengths and weaknesses of SVM in relation to its counterparts.

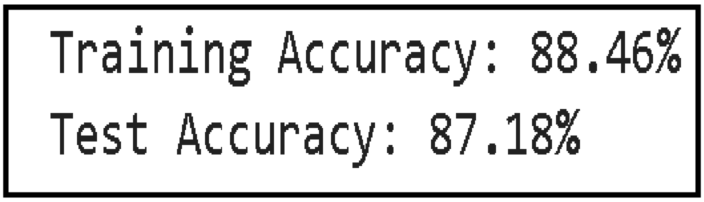

Figure 6: Accuracy Comparison

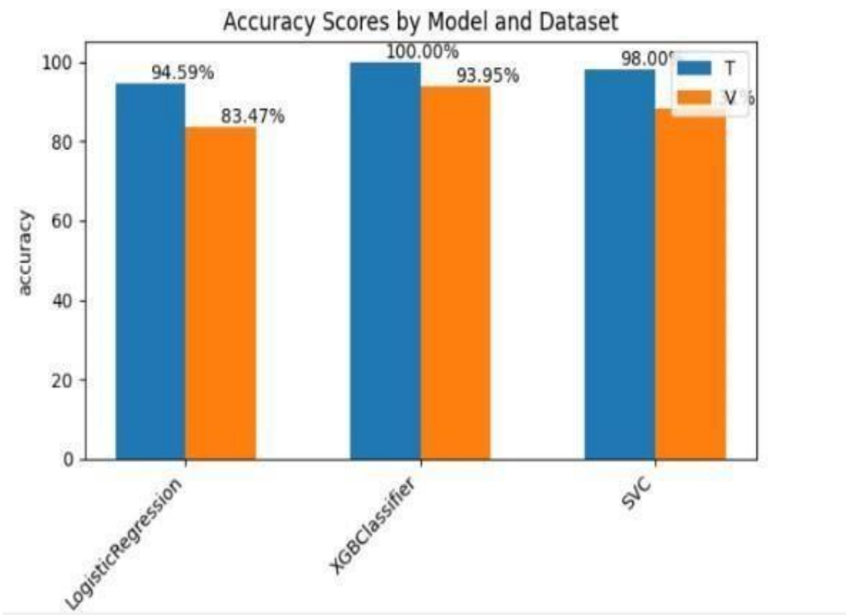

Figure 7: Performance metrices of the models

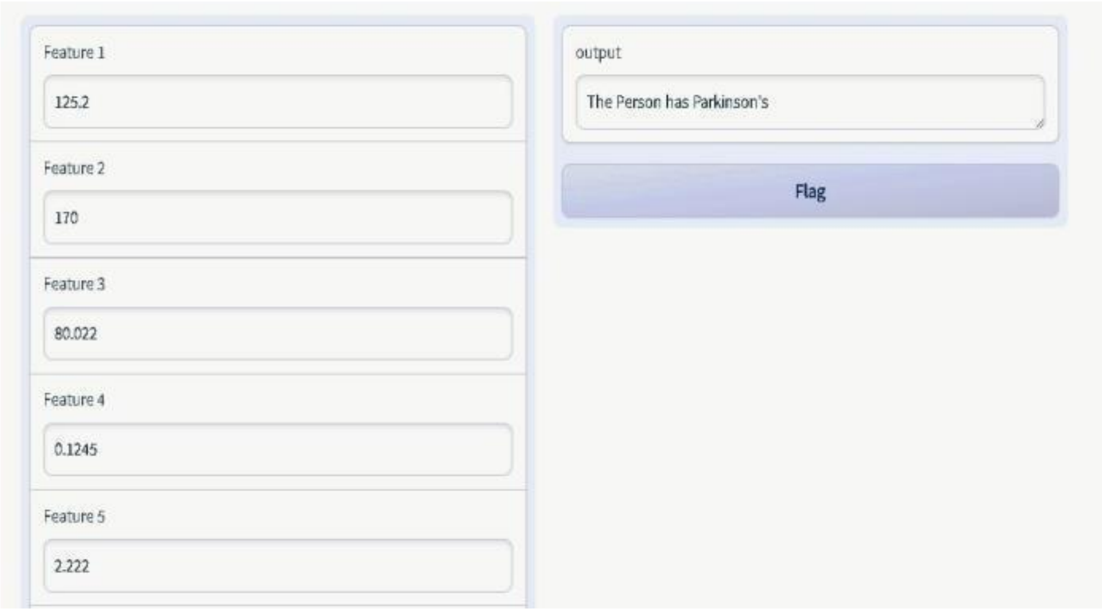

Figure 8: Output indicating the person has Parkinson's Disease

Figure 9: Output indicating the person has Parkinson's Disease

The provided images show the results of a Parkinson's disease detection model implemented using Gradio for the user interface and various machine learning models for classification.

The Fig 6 shows the model has a training accuracy of 88.46% and a test accuracy of 87.18%. Thisindicates that the model performs similarly well on both the training and test datasets, suggesting agood generalization to unseen data. The small gap between training and test accuracy implies that there is minimal overfitting, and the model is likely well-tuned.

The Fig 7 shows the performance metrics of the models. The Fig 8 and 9 display the Gradio interface with input features and corresponding predictions, where one test case indicates that the person have Parkinson's disease, and the other indicates that the person does not have Parkinson's disease.

CHAPTER 5

ADVANTAGES AND APPLICATIONS

5.1 ADVANTAGES

- **Early Diagnosis**

  Early detection allows for prompt medical intervention, potentially slowing disease progression and improving quality of life.

- **Contributions to Research**

  The use of SVM machine learning algorithm in detecting Parkinson's disease contributes to medical research by uncovering new biomarkers and patterns and also promotes collaboration between fields such as neurology, data science, and computer science, leading to innovative solutions.

- **Improved patient outcomes**

  Machine learning model can facilitate continuous monitoring of disease progression, aiding in the adjustment of treatment strategies helps to improve the patient health.

- **Remote Monitoring Potential**

  Enables remote monitoring and diagnosis, making advanced medical care accessible to patients in remote or underserved areas.

- **Cost and time savings**

  Early and accurate diagnosis can prevent unnecessary tests and treatments, reducingoverall healthcare costs.

5.2 APPLICATIONS

- **Hospitals**

  Enhances the accuracy and speed of diagnosing Parkinson's disease, assisting neurologists and other healthcare professionals in making informed decisions and facilitates continuous monitoring of patients' symptoms and disease progression, enabling timely adjustments to treatment plans.

- **Research Centers**

  Supports large-scale analysis of clinical and experimental data, helping researchers uncover novel insights and correlations.

- **Pharmaceutical Industry**

  Accelerates the process of drug discovery and development by identifying patient subgroups and predicting responses to treatments. Enhances the efficiency of clinical trials by accurately identifying eligible participants and monitoring their progress more effectively.

- **Digital Health Platforms**

  Provides tools for remote diagnosis and monitoring of Parkinson's disease, makingadvanced care accessible to patients regardless of their location.
  Engages patients through user-friendly applications that track symptoms and providefeedback, promoting active participation in their own care.

CONCLUSION AND FUTURE SCOPE

CONCLUSION

The Parkinson Detection project represents a pioneering effort in harnessing machine learning, particularly Support Vector Machines (SVM), for early Parkinson's disease identification. Leveraging the computational prowess offered by Google Colab, this project targets the creation of an efficient and dependable tool to aid healthcare professionals in the diagnosis and management of Parkinson's disease. With the dataset obtained from Kaggle, rich in essential features and labeled instances, this initiative underscores the potential of advanced algorithms in healthcare.

Through meticulous preprocessing techniques, the dataset's refinement ensures data quality and suitability for SVM model training. The utilization of Google Colab's computational resources enables not only the training of the SVM model but also the fine-tuning of hyperparameters, optimizing the model's performance for accurate disease prediction.

This project serves as a beacon of innovation, illustrating the synergy between technological advancements and healthcare solutions. By amalgamating data-driven methodologies with medical expertise, it pioneers a path toward enhanced diagnostic precision and disease management. The convergence of machine learning and healthcare underscores a promising future where technology acts as a catalyst for improved patient care.

As this endeavor progresses, it not only signifies a significant leap in disease detection but also emphasizes the promising intersection of technology and healthcare. It promises not just improved diagnostic tools but also potential advancements in treatment strategies, ultimately aiming to enhance the quality of life for individuals affected by Parkinson's disease.

FUTURE SCOPE

The future scope of using the SVM algorithm on Google Colab for Parkinson's disease detection is vast and promising. It encompasses advancements in model performance, data integration, real-time monitoring, personalization, scalability, interdisciplinary collaboration, ethical considerations, and education. These developments can significantly enhance the early diagnosis, treatment, and overall management of Parkinson's disease, leading to improved patient outcomes and advancing medical research.

REFERENCES

[1] V. Skaramagkas, A. Pentari, Z. Kefalopoulou and M. Tsiknakis, "Multi-Modal Deep Learning Diagnosis of Parkinson’s Disease—A Systematic Review," in IEEE Transactions on Neural Systems and Rehabilitation Engineering, vol. 31,pp. 2399-2423, 2023, doi: 10.1109/TNSRE.2023.3277749.

[2] A. Hussain and A. Sharma, "Machine Learning Techniques for Voice-based Early Detection of Parkinson's Disease," 2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), Greater Noida, India, 2022, pp. 1436-1439, doi: 10.1109/ICACITE53722.2022.9823467.

[3] S. A. Kumar, S. Sasikala, A. K B, S. J and K. V, "Parkinson’s Speech Detection Using YAMNet," 2023 2nd International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA), Coimbatore, India, 2023, pp. 1-5, doi: 10.1109/ICAECA56562.2023.10200704.

[4] J. Naanoue, R. Ayoub, F. E. Sayyadi, L. Hamawy, A. Hage-Diab and F. Sbeity, "Parkinson's disease detection from speech analysis using deep learning," 2023 Seventh International Conference on Advances in Biomedical Engineering (ICABME), Beirut, Lebanon, 2023, pp. 102-105, doi: 10.1109/ICABME59496.2023.10293142.

[5] S. Fiza, A. Kumar, J. Yadav, S. Reddy, T. K. Sidda and K. Sai, "Classification of Parkinson's Disease using CNN and ANN with the aid of Drawing and Acoustic Feature," 2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), Greater Noida, India,2022, pp. 513-517, doi: 10.1109/ICACITE53722.2022.9823915.

[6] T. P. Rani, K. S. B and T. G. Prasanth, "A Voice and Spiral Drawing Dataset for Parkinson's Disease Detection and Mobile Application," 2022 International Conference on Communication, Computing and Internet of Things (IC3IoT), Chennai, India, 2022, pp. 1-5, doi: 10.1109/IC3IOT53935.2022.9767968.

[7] K. H. Moustafa, H. Metawie, S. Saadoun, N. Sameh, R. Ibrahim and A. Abdelsayed, "Easy Park: Mobile Application for Parkinson's Disease Detection and Severity Level," 2023 International Mobile, Intelligent, Cairo, Egypt, 2023, pp. 1-8, doi: 10.1109/MIUCC58832.2023.10278311.

[8] L. Igene, A. Alim, M. H. Imtiaz and S. Schuckers, "A Machine Learning Model for Early Prediction of Parkinson's Disease from Wearable Sensors," 2023 IEEE 13th Annual Computing and Communication Workshop and Conference (CCWC), Las Vegas, NV, USA, 2023, pp. 0734-0737, doi: 10.1109/CCWC57344.2023.10099230.

[9] R. Erika, C. Maremmani, and F. Cavallo." How wearable sensors can support Parkinson's disease diagnosis and treatment: a systematic review." Frontiers in Neuroscience 11 (2017): 555.

[10] L. Luca, et al." Wearable sensors for Parkinson's disease: which data are worth collecting for training symptom detection models." NPJ digital medicine 1, no. 1 (2018): 1-8.

[11] J. L. Adams, et al." A real-world study of wearable sensors in Parkinson's disease." NJ Parkinson's Disease 7, no. 1 (2021): 1-8.

[12] N. Richard, and S. Przedborski, eds. Parkinson's disease: molecular and therapeutic insights from model systems. Elsevier, 2011.

PUBLICATION DETAILS

INTERNATIONAL JOURNAL

Paper Title: Parkinson ’s disease Detection using Machine Learning
Published In: IJSREM
Volume: 08
Issue: 07
Published Year: 2024
ISSN: 2582-3930

IJSREM e-Journal

IJSREM

ISSN: 2582-3930

Impact Factor: 8.448

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING & MANAGEMENT

An Open Access Scholarly Journal || Index in major Databases & Metadata

CERTIFICATE OF PUBLICATION

International Journal of Scientific Research in Engineering & Management is hereby awarding this certificate to

Anusha M N

in recognization to the publication of paper titled

Parkinson’s Disease Detection using Machine Learning

published in IJSREM Journal on Volume 08 Issue 07 July, 2024

Editor-in-Chief
IJSREM Journal

www.ijsrem.com

e-mail: editor@ijsrem.com

ISSN: 2582-3930
Impact Factor: 8.448

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING & MANAGEMENT
An Open Access Scholarly Journal || Index in major Databases & Metadata

CERTIFICATE OF PUBLICATION

International Journal of Scientific Research in Engineering & Management is hereby awarding this certificate to

Nithin L

in recognization to the publication of paper titled

Parkinson's Disease Detection using Machine Learning

published in IJSREM Journal on Volume 08 Issue 07 July, 2024

Editor-in-Chief
IJSREM Journal

www.ijsrem.com

e-mail: editor@ijsrem.com

ISSN: 2582-3930
Impact Factor: 8.448

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING & MANAGEMENT
An Open Access Scholarly Journal || Index in major Databases & Metadata

CERTIFICATE OF PUBLICATION

International Journal of Scientific Research in Engineering & Management is hereby awarding this certificate to

Ranjan C R

in recognization to the publication of paper titled

Parkinson's Disease Detection using Machine Learning

published in IJSREM Journal on Volume 08 Issue 07 July, 2024

Editor-in-Chief
IJSREM Journal

www.ijsrem.com

e-mail: editor@ijsrem.com

ISSN: 2582-3930
Impact Factor: 8.448

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING & MANAGEMENT
An Open Access Scholarly Journal || Index in major Databases & Metadata

CERTIFICATE OF PUBLICATION

International Journal of Scientific Research in Engineering & Management is hereby awarding this certificate to

Shashidhar J

in recognization to the publication of paper titled

Parkinson's Disease Detection using Machine Learning

published in IJSREM Journal on Volume 08 Issue 07 July, 2024

Editor-in-Chief
IJSREM Journal

www.ijsrem.com

e-mail: editor@ijsrem.com

ISSN: 2582-3930
Impact Factor: 8.448

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING & MANAGEMENT
An Open Access Scholarly Journal || Index in major Databases & Metadata

CERTIFICATE OF PUBLICATION

International Journal of Scientific Research in Engineering & Management is hereby awarding this certificate to

Yashaswini T P

in recognization to the publication of paper titled

Parkinson's Disease Detection using Machine Learning

published in IJSREM Journal on Volume 08 Issue 07 July, 2024

Editor-in-Chief
IJSREM Journal

www.ijsrem.com

e-mail: editor@ijsrem.com

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 08 ISSUE: 07 | JULY - 2024 SJIF RATING: 8.448 ISSN: 2582-3930

Parkinson's Disease Detection using Machine Learning

1st Nithin L
Student
Dept. of ECE
BGS Institute of Technology
BG Nagara, Karnataka, India
nithinl2001@gmail.com

2nd Anusha M N
Assistant Professor
Dept. of ECE
BGS Institute of Technology
BG Nagara, Karnataka, India
anushamn23@gmail.com

3rd Ranjan C R
Student
Dept. of ECE
BGS Institute of Technology
Nagamangala, India
ranjancrgowda@gmail.com

4th Shashidhar J
Student
Dept.of ECE
BGS Institute of Technology
Nagamangala, India
shashidharj194@gmail.com

5th Yashaswini T P
Student
Dept. of ECE
BGS Institute of Technology
Nagamangala, India
yashaswinitp28@gmail.com

***Abstract*— The early identification of neurodegenerative issues, especially Parkinson's sickness, presents huge difficulties in clinical practice. his paper gives a top to bottom record of the distinguishing proof of an original Parkinson Identification project that utilizations Support Vector Machines (SVM) in the Google Colab processing climate for order. The drive is a response to the earnest requirement for Parkinson's infection early determination and treatment, a neurological sickness that influences a huge number of individuals overall and has serious wellbeing outcomes. The objective of this venture is to foster a high-level AI model that can accurately identify instances of Parkinson's illness in light of a large number of relevant factors by utilizing a painstakingly chosen dataset that was obtained from Kaggle.**

Keywords*— *Machine learning, Parkinson's disease, Google Colab, Support Vector Machine (SVM), Python programming language.

I. INTRODUCTION

Parkinson's disease stands as a formidable global health challenge, impacting millions of people worldwide and extending its reach beyond medical boundaries into the lives of individuals, families, and healthcare systems. As a progressive neurodegenerative disorder, Parkinson's exacts a profound toll, underscoring the critical need for innovative approaches to its diagnosis and management.

Early detection is pivotal in tackling Parkinson's disease, as late-stage diagnosis limits treatment efficacy. Timely identification provides crucial benefits, including improved patient outcomes, enhanced symptom management, and a better quality of life.

The Parkinson Detection project, driven by the urgency of early detection, harnesses SVM within the collaborative Google Colab environment. This initiative aims to develop a robust model for early Parkinson's identification using machine learning. SVM is pivotal for its intricate pattern recognition capabilities, crucial for discerning subtle disease indicators within complex datasets. Leveraging Google Colab's collaborative and computational prowess, the project facilitates seamless model development, training, and validation. By amalgamating SVM's potential with Google Colab's collaborative power, the project aims to advance Parkinson's early diagnosis methodologies, leading to improved patient outcomes and refined healthcare strategies.

Fig.1. Symptoms of Parkinson's Disease

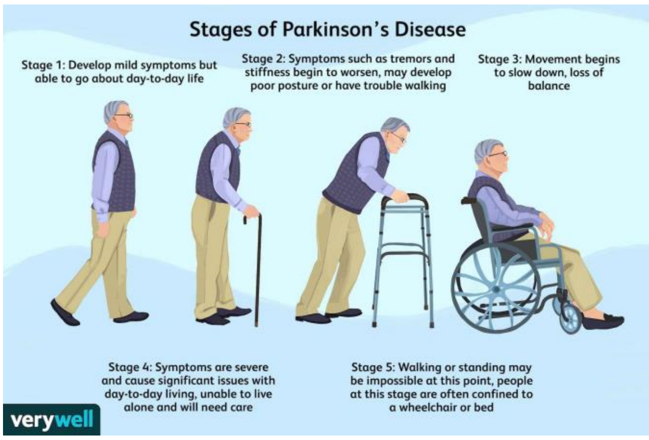

Fig.2. Stages of Parkinson's Disease

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH IN ENGINEERING AND MANAGEMENT (IJSREM)
VOLUME: 08 ISSUE: 07 | JULY - 2024 SJIF RATING: 8.448 ISSN: 2582-3930

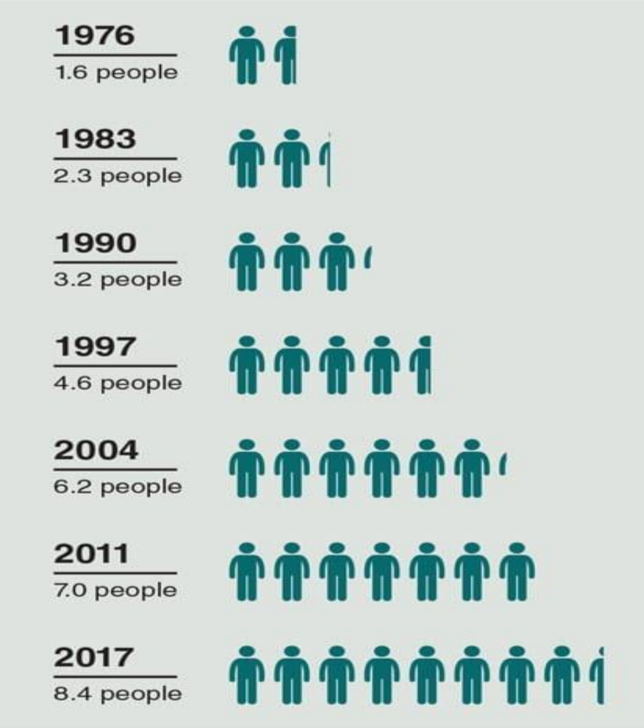

Fig.3. Number of deaths for 10,000 people

II. PROBLEM STATEMENT

Timely detection of Parkinson's disease is crucial for effective intervention and im- proved patient outcomes. This project addresses the challenge of early diagnosis by utilizing machine learning methods, specifically SVM, to analyze relevant features and accurately classify instances of Parkinson's disease. The focus is on developing a reliable model that can assist in the early identification of this debilitating condition.

III. LITERATURE SURVEY

In study [1] From 2016 to January 2023, the writing review scrutinized the use of deep learning for Parkinson's Disease diagnosis across 87 research publications. Deep learning algorithms demonstrated strong performance in symptom interpretation through gait analysis, speech recognition, and beyond.

In Study [2], Exploration in Parkinson's sickness (PD) location utilizing AI procedures has been different and promising. Lee dug into profound picking up, exhibiting the viability of Convolutional Brain Organizations (CNNs) and Repetitive Brain Organizations (RNNs) with a 92% precision utilizing discourse highlights.

In Study [3], The relative examination of DL models, including YAMNet, reliably accomplishing correctness between 80-85% for PD expectation utilizing discourse signals. These examinations highlight the capability of DL models, particularly YAMNet, in separating significant elements from discourse signals, showing high precision rates and featuring the suitability of discourse based symptomatic devices for early Parkinson's illness distinguishing proof.

In another review [4], LSTM-based approaches, reliably accomplishing high exactness above 90% in distinctive PD patients from solid people utilizing discourse highlights. In particular, the examinations stressed the viability of LSTM models in early PD location, repeating the discoveries introduced in your paper, which accomplished an eminent testing precision of 93%.

In study [5], The authors investigating artificial intelligence and profound learning for Parkinson's illness conclusion utilizing drawings, pictures, and acoustic elements reliably accomplished high exact nesses above 98%. They feature the viability of ANNs approaches in dissecting different information hotspots for exact sickness discovery, stressing the capability of man-made intelligence-based strategies in exact demonstrative applications.

In Review [6], A writing overview for a dream transformation supporting Parkinson's illness finding would envelop an investigation of current demonstrative strategies like X-ray, PET outputs, and clinical tests while zeroing in on examinations connecting voice varieties and engine side effects with Parkinson's movement. It would likewise include looking at datasets utilized in diagnosing neurological problems, especially those breaking down voice and drawing designs.

In Study [7], With a 92.6% exactness for holdout and 94.4% for k-crease cross-approval utilizing the PD-BioStampRC21 dataset, the review help clinical professionals in early location and treatment arranging. It underscores the meaning of consolidating everyday action information and features the capability of AI in further developing Parkinson's illness identification strategies. Key procedures applied incorporate Accelerometer, ANOVA and PCA.

IV. METHADOLOGY

Data Set Information**:** This dataset is made out of a scope of biomedical voice estimations from 31 individuals, 23 with Parkinson's illness (PD). Every segment in the table is a specific voice measure, and each line relates to one of 195 voice accounts from these people ("name" section). The primary point of the information is to segregate solid individuals from those with PD, as indicated by the "status" section which is set to 0 for sound and 1 for PD.

The dataset includes the following variables:

MDVP:Fo(Hz) - Normal vocal essential recurrence

MDVP:Fhi(Hz) - Greatest vocal essential recurrence

MDVP:Flo(Hz) - Least vocal essential recurrence

MDVP:Jitter(%) , MDVP:Jitter(Abs) , MDVP:RAP , MDVP:PPQ , Jitter:DDP - A few proportions of variety in essential recurrence

MDVP:Shimmer , MDVP:Shimmer(dB) , Shimmer:APQ3 , Shimmer:APQ5 , MDVP:APQ , Shimmer:DDA - A few proportions of variety in plentifulness

NHR, HNR - Two proportions of proportion of clamor to apparent parts in the voice

status - Wellbeing status of the subject (one) - Parkinson's, (zero) – solid

RPDE, D2 - Two nonlinear dynamical intricacy measures

DFA - Signal fractal scaling example

spread1, spread2, PPE - Three nonlinear proportions of essential recurrence variety.

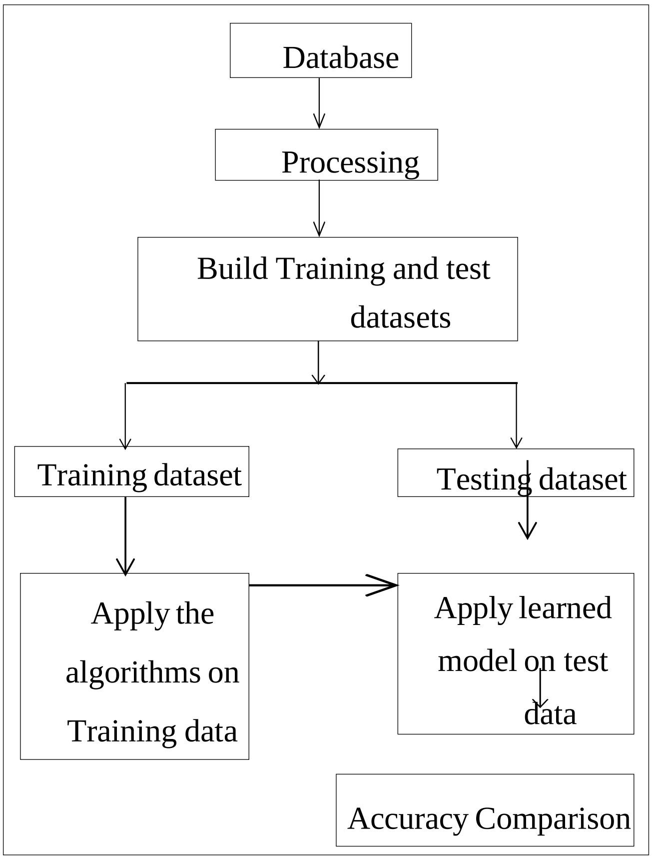

Fig.4. Block Diagram of Proposed System

Preprocessing: During the preprocessing stage, a meticulous process unfolds where the dataset undergoes thorough examination. This involves the identification and removal of redundant or irrelevant information, ensuring that only the most relevant and significant data is retained for further analysis and model development. By refining the dataset in this manner, it becomes more streamlined and optimized for subsequent stages, laying a solid foundation for accurate and effective model training.

Construct Train and Test Dataset: Following the rigorous preprocessing stage, the dataset undergoes essential partitioning into distinct subsets. This division adheres to an 80:20 split, resulting in two separate envelopes or sets. One set serves as the foundation for training the AI model, allowing it to grasp fundamental patterns and relationships within the data. Concurrently, the other set remains pristine to evaluate the model's performance, serving as a benchmark during testing. This division ensures that the model is trained on a representative sample of the data while also providing a means to assess its generalization capabilities.

Model Learning: Model learning constitutes the pivotal training stage, where AI algorithms are exposed to the prepared training dataset. Through iterative learning experiences, such as supervised or unsupervised learning, the model unravels complex patterns and relationships within the data. This stage empowers the model to make informed predictions and classifications based on the insights it has gleaned from the training data. By iteratively adjusting its parameters and optimizing its performance, the model becomes increasingly adept at capturing the underlying structure of the data, enhancing its predictive capabilities.

Prediction: Post-training, the trained model undergoes scrutiny using the pristine testing dataset. By inputting this new data into the trained model, the system generates forecasts or classifications, providing an observational understanding of how well the model generalizes to new, unseen data. This process allows for the assessment of the model's performance in real-world scenarios, gauging its ability to make accurate predictions on unseen instances. Through this predictive analysis, stakeholders can gain valuable insights into the model's reliability and effectiveness in practical applications.

Accuracy Comparison and Conclusion: The SVM model undergoes a thorough evaluation, scrutinizing metrics like accuracy, precision, and recall to validate its effectiveness in Parkinson's disease detection. Comparison with ground truth labels enables stakeholders to gauge the model's performance against actual outcomes, facilitating informed decisions for real-world deployment. Insights from this analysis drive potential enhancements, ensuring continuous improvement in predictive accuracy. In conclusion, the SVM model shows promise for early Parkinson's diagnosis and intervention, with ongoing research poised to bolster its capabilities and widen its application in clinical practice.

V. RESULTS AND DISCUSSION

The project employed Support Vector Machine (SVM) algorithm to detect Parkinson's disease using a dataset sourced from Kaggle. SVM's precision in identifying Parkinson's disease was measured and interpreted within the context of its overall performance. Furthermore, the results obtained from the SVM algorithm were critically compared with those of other prominent machine learning algorithms like logistic regression, random forest, and neural networks. This comparative analysis provided insights into the relative strengths and weaknesses of SVM in relation to its counterparts.

The project also delved into the identification of key features identified by the SVM algorithm that contribute significantly to the detection of Parkinson's disease. Understanding these features not only enhances the interpretability of the model but also provides valuable insights into the underlying factors indicative of the disease. To ensure the robustness of the model, cross-validation techniques were employed, and the results were presented to demonstrate that the performance of the SVM.

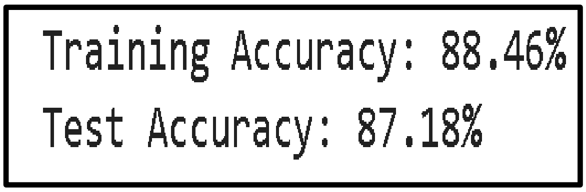

Fig.5. Accuracy Comparison

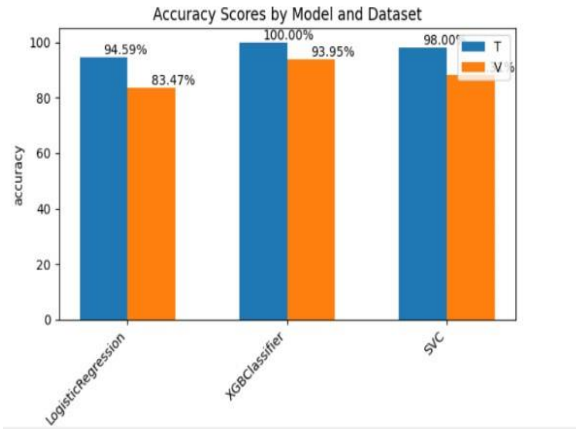

Fig.6. Performance metrices of the models

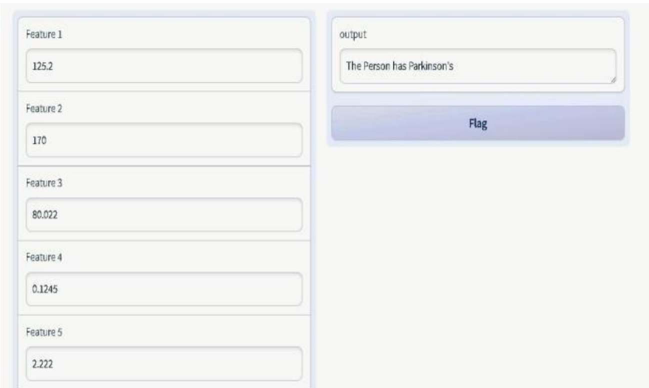

Fig.7. Output indicating the person has Parkinson's Disease

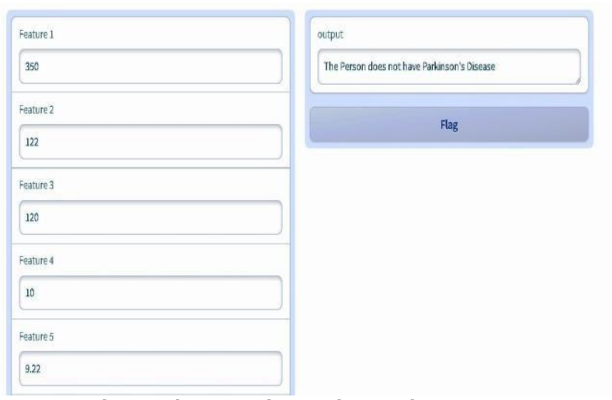

Fig.8. Output indicating the person does not have Parkinson's Disease

The provided images show the results of a Parkinson's disease detection model im- plemented using Gradio for the user interface and various machine learning models for classification. The first image shows the model has a training accuracy of 88.46% and a test accuracy of 87.18%. This indicates that the model performs similarly well on both the training and test datasets, suggesting a good generalization to unseen data. The small gap between training and test accuracy implies that there is minimal overfitting, and the model is likely well-tuned. The third image shows the performance metrics of the models. The third and fourth images display the Gradio interface with input features and corresponding predictions, where one test case indicates that the person have Parkinson's disease, and the other indicates that the person does not have Parkinson's disease.

VI. CONCLUSION

The Parkinson Location project addresses a spearheading exertion in tackling AI, especially Support Vector Machines (SVM), for early Parkinson's sickness distinguishing proof. Utilizing the computational ability presented by Google Colab, this undertaking focuses on the formation of a proficient and trustworthy apparatus to help medical services experts in the finding and the board of Parkinson's sickness. With the dataset got from Kaggle, wealthy in fundamental elements and named examples, this drive highlights the capability of cutting-edge calculations in medical services. Through fastidious preprocessing methods, the dataset's refinement guarantees information quality and appropriateness for SVM model preparation. The use of Google Colab's computational assets empowers the preparation of the SVM model as well as the calibrating of hyperparameters, improving the model's exhibition for precise illness expectation.

The SVM model is rigorously evaluated using metrics such as accuracy, precision, and recall to determine its effectiveness in detecting Parkinson's disease. By comparing the model's predictions with actual results, stakeholders can assess its performance and make informed decisions about its real-world application. This evaluation provides valuable insights that guide potential improvements, ensuring the model's predictive accuracy continues to improve. In summary, the SVM model demonstrates significant potential for early diagnosis and intervention in Parkinson's disease. Continued research will enhance its capabilities and expand its use in clinical settings.

REFERENCES

[1] V. Skaramagkas, A. Pentari, Z. Kefalopoulou and M. Tsiknakis, "Multi-Modal Deep Learning Diagnosis of Parkinson's Disease—A Systematic Review," in IEEE Transactions on Neural Systems and Rehabilitation Engineering, vol. 31, pp. 2399- 2423, 2023, doi: 10.1109/TNSRE.2023.3277749.

[2] A. Hussain and A. Sharma, "Machine Learning Techniques for Voice-based Early Detection of Parkinson's Disease," 2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), Greater Noida, India, 2022, pp. 1436-1439, doi: 10.1109/ICACITE53722.2022.9823467.

[3] S. A. Kumar, S. Sasikala, A. K B, S. J and K. V, "Parkinson's Speech Detection Using YAMNet," 2023 2nd International Conference on Advancements in Electrical, Electronics, Communication, Computing and Automation (ICAECA), Coimbatore, India, 2023, pp. 1-5, doi: 10.1109/ICAECA56562.2023.10200704.

[4] J. Naanoue, R. Ayoub, F. E. Sayyadi, L. Hamawy, A. Hage-Diab and F. Sbeity, "Parkinson's disease detection from speech analysis using deep learning," 2023 Seventh International Conference on Advances in Biomedical Engineering (ICABME), Beirut, Lebanon, 2023, pp. 102-105, doi: 10.1109/ICABME59496.2023.10293142.

[5] S. Fiza, A. Kumar, J. Yadav, S. Reddy, T. K. Sidda and K. Sai, "Classification of Parkinson's Disease using CNN and ANN with the aid of Drawing and Acoustic Feature," 2022 2nd International Conference on Advance Computing and Innovative Technologies in Engineering (ICACITE), Greater Noida, India, 2022, pp. 513-517, doi: 10.1109/ICACITE53722.2022.9823915.

[6] T. P. Rani, K. S. B and T. G. Prasanth, "A Voice and Spiral Drawing Dataset for Parkinson's Disease Detection and Mobile Application," 2022 International Conference on Communication, Computing and Internet of Things (IC3IoT), Chennai, India, 2022, pp. 1-5, doi: 10.1109/IC3IOT53935.2022.9767968.

[7] K. H. Moustafa, H. Metawie, S. Saadoun, N. Sameh, R. Ibrahim and A. Abdelsayed, "Easy Park: Mobile Application for Parkinson's Disease Detection and Severity Level," 2023 International Mobile, Intelligent, and Ubiquitous Computing Conference (MIUCC), Cairo, Egypt, 2023, pp. 1-8, doi: 10.1109/MIUCC58832.2023.10278311.

[8] L. Igene, A. Alim, M. H. Imtiaz and S. Schuckers, "A Machine Learning Model for Early Prediction of Parkinson's Disease from Wearable Sensors," 2023 IEEE 13th Annual Computing and Communication Workshop and Conference (CCWC), Las Vegas, NV, USA, 2023, pp. 0734-0737, doi: 10.1109/CCWC57344.2023.10099230.

[9] R. Erika, C. Maremmani, and F. Cavallo." How wearable sensors can support Parkinson's disease diagnosis and treatment: a systematic review." Frontiers in Neuroscience 11 (2017): 555.

[10] L. Luca, et al." Wearable sensors for Parkinson's disease: which data are worth collecting for training symptom detection models." NPJ digital medicine 1, no. 1 (2018): 1-8.

[11] J. L. Adams, et al." A real-world study of wearable sensors in Parkinson's disease." NJ Parkinson's Disease 7, no. 1 (2021): 1-8.

[12] N. Richard, and S. Przedborski, eds. Parkinson's disease: molecular and therapeutic insights from model systems. Elsevier, 2011.

[13] B., Shubham, et al." A survey of machine learning based approaches for Parkinson disease prediction." Int. J. Compute. Sci. Inf. Technol 6, no. 2 (2015): 1648-1655.

[14] S., Lotfi, T. Mourad, and A. Cherif." Voice disorders identification using multilayer neural network." pathology 2, no. 7 (2010): 8.

[15] S. Mohammad, D.T. Far, and E. Tahami." Speech analysis for diagnosing Parkinson's disease using genetic algorithm and support vector machine." Journal of Biomedical Science and Engineering 2014 (2014).

[16] F.J.M. Shamrat, M. Asaduzzaman, A.S. Rahman, R.T.H. Tusher, Z. Tasnim" A comparative analysis of Parkinson disease prediction using machine learning approaches." International Journal of Scientific and Technology Research 8(11) (2019) 2576-2580.

[17] Z. K. Senturk," Early diagnosis of Parkinson's disease using machine learning algorithms." Medical hypotheses 138 (2020): 109603.

[18] B., Minja, et al" Artificial intelligence for assisting diagnostics and assessment of Parkinson's disease—A review." Clinical neurology and neurosurgery 184 (2019): 105442.

PROJECT GUIDE PROFILE

Mrs.Anusha M N, received B.E in Electronics and Communication Engineering from VTU, Karnataka, India. She holds MTech degree in Digital Electronics and Communication systems from VTU, Karnataka, India. Currently she is working as an Assistant Professor in the ECE department at BGS Institute of Technology, Adichunchanagiri University (ACU), India. She has 10 years of experience in teaching and research. She has authored more than 15 publications. Her research areas are image processing, medical image analysis using machine learning. She is an active member of professional bodies such as AMIE, ISTE.

CONTACT DETAILS OF THE PROJECT TEAM

Name	NITHIN L	
Phone no	7019050006	
Mail ID	nithinl2001@gmail.com	
Address	Nithin L S/0 Lokesh V, D group ext., K R S agrahara, Kunigal, Tumakuru, Karnataka-572130.	

Name	RANJAN C R	
Phone no	6362831626	
Mail ID	ranjancrgowda@gmail.com	
Address	#149, Chikkarasanahalli, Channarayapatna, Hassan, Karnataka 57311	

Name	SHASHIDHAR J	
Phone no	9108524289	
Mail ID	shashidharj194@gmail.com	
Address	Santemavathuru, Kasaba hobli, Kunigal Tq, Tumkur dist., Karnataka - 572130	

Name	YASHASWINI T P	
Phone no	7411235445	
Mail ID	yashaswinitp28@gmail.com	
Address	Thittanahosahalli, Nagamangala (T), Mandya, Karnataka 571418	