Machine Learning Model for the Detection and Prediction of Parkinson's Disease based on Audio Signals

SYNOPSIS

Submitted in partial fulfillment of the requirement of the degree of

BACHELOR IN COMPUTER APPLICATION

In

Computer Science and Engineering

By

Kartikey Raghuvanshi [00718002020]

Saakshi Srivastava [01518002020]

Shubham Tiwari [02118002020]

Sanand Mishra [01718002020]

Under the supervision of

Ms. Ayasha Malik

Assistant Professor

Delhi Technical Campus

GREATER NOIDA

(Affiliated by Guru Gobind Singh Indraprastha University)

Machine Learning Model for the Detection and Prediction of Parkinson's Disease based on Audio Signals

Content

1. Problem statement

The main aim is to predict the prediction efficiency that would be beneficial for the patients who are suffering from Parkinson and the percentage of the disease will be reduced. Generally, in the first stage, Parkinson's can be cured by the proper treatment. So, it's important to identify the Parkinson's Disease at the early stage for the betterment of the patients.

1.1 Resting tremors: As most motor symptoms of Parkinson's Disease, rest tremor is often more pronounced unilaterally, and the upper limbs are usually more affected than the legs. Besides extremities, rest tremor also occurs in the tongue, lip or chin, but rarely involves the head. Other types like postural and kinetic tremor may also occur in Parkinson's Disease.

1.2 Rigidity (Stiffness): Stiffness and rigidity are common in Parkinson's disease. Rigidity is when your muscles feel tense and tighten up without you wanting them to. Muscle rigidity can happen in different parts of your body, including your arms, legs, neck, back, and even smaller facial muscles. Stiffness can occur on one or both sides of your body. When your muscles and joints are stiff, it can lead to pain and discomfort.

1.3 Bradykinesia (Slowness of movement): Bradykinesia means slowness of movement and speed (or progressive hesitations/halts) as movements are continued. It is one of the cardinal symptoms of Parkinson's disease. You must have bradykinesia plus at least either tremor or rigidity for a Parkinson's diagnosis to be considered.

1.4 Gait and balance problem: People with Parkinsonian gait usually take small, shuffling steps. They might have difficulty picking up their feet. Parkinsonian gait changes can be episodic or continuous. Episodic changes, such as freezing of gait, can come on suddenly and randomly.

Figure 1.1: Symptoms of Parkinsonism

2. Objective

The objective of this Machine Learning project is to build the detection of the disease by using the voice analysis of the people affected with Parkinson's disease. It is to recognize what is Parkinson’s sickness and to discover the early onset of the disorder. Parkinson's disease (PD) is a progressive neurodegenerative disorder that affects the central nervous system. It is characterized by the gradual loss of dopamine-producing neurons in the substantia nigra region of the brain. Dopamine is a neurotransmitter that plays a critical role in the regulation of movement, mood, and motivation, among other functions. As dopamine levels decline, individuals with Parkinson's disease experience a range of motor and non-motor symptoms. The objective of Parkinson's disease research is to better understand the underlying mechanisms of the disease, develop effective treatments, and ultimately find a cure. The goals of Parkinson's disease research can be broadly classified into four categories:

- **Early Detection and Diagnosis:** One of the major challenges in treating Parkinson's disease is the lack of reliable biomarkers for early detection and diagnosis. The objective of research in this area is to identify biomarkers that can accurately predict the onset of the disease, which would enable early intervention and better outcomes.

- **Disease Progression and Pathogenesis:** Parkinson's disease is a complex disorder that involves multiple pathways and mechanisms. The objective of research in this area is to identify the underlying causes of the disease and the factors that contribute to its progression. This includes investigating genetic, environmental, and lifestyle factors that may increase the risk of developing Parkinson's disease.

- **Treatment and Management:** While there is currently no cure for Parkinson's disease, there are a variety of treatments available that can help manage symptoms and improve quality of life. The objective of research in this area is to develop new and more effective treatments for Parkinson's disease. This includes investigating new drugs, gene therapies, and non-pharmacological interventions, such as exercise and nutrition.

- **Patient-centered research:** Finally, patient-centered research aims to improve the quality of life for individuals with Parkinson's disease and their caregivers. The objective of research in this area is to understand the needs and preferences of patients and caregivers, and to develop interventions that address their specific needs. This includes research on caregiver support, social isolation, and psychological well-being.

In summary, the objective of Parkinson’s disease research is to improve our understanding of the disease, develop new and better treatments, and ultimately find a cure. By pursuing these goals, we can improve the lives of millions of individuals living with Parkinson’s disease around the world.

3. Introduction

Parkinson's Disease creates neural system disorder for various people. The disease affects the people at different age groups around the world. Medical research works collaborate with computational intelligence techniques for predicting Parkinson symptoms. Parkinson's Disease has numerous types based on the human abnormalities. Mostly it disturbs the nature of neural activities and the body movements. Researches evolved in recent years use Machine Learning and Deep Learning approaches for finding early stages of Parkinson's Disease. The research works used different types of medical observations such as voice levels, handwriting variations, body movements, brain signal variations and protein aggregations. These kinds of observations are measured using various medical apparatuses. Due to the fact that Parkinson's Disease symptoms increase as the disease advances, more sensitive diagnostic techniques are needed for Parkinson's Disease diagnosis. For example, a person with Parkinson's disease has a lack of intensity and monotony in pitch and loudness as well as a lowered level of stress (dysphonia). Because capturing speech data is non-invasive and easy to accomplish with mobile devices, the spectrum of voice-related symptoms appears promise as a possible screening technique. Early signs of Parkinson's disease are mild, making it difficult to identify.

Parkinson's can have both motor and non-motor symptoms. The motor symptoms include slowness of movement, rigidity, balance problems, and tremors. If this disease continues, the patients may have difficulty walking and talking. The non-motor symptoms include anxiety, breathing problems, depression, loss of smell, and change in speech. If the above-mentioned symptoms are present in the person, then the details are stored in the records. It considers the speech features of the patient, and this data is used for predicting whether the patient has Parkinson's disease or not.

Neurodegenerative disorders are the results of progressive tearing and neuron loss in different areas of the nervous system. Neurons are functional units of the brain. They are contiguous rather than continuous. A good healthy-looking neuron as shown in fig 1 has extensions called dendrites or axons, a cell body, and a nucleus that contains our DNA. DNA is our genome and a hundred billion neurons contain our entire genome which is packaged into it. When a neuron gets sick, it loses its extension and hence its ability to communicate which is not good for it and its metabolism becomes low so it starts to accumulate junk and it tries to contain the junk in the little packages in little pockets. When things become worse and if the neuron is a cell culture it completely loses its extension, becomes round and full of vacuoles.

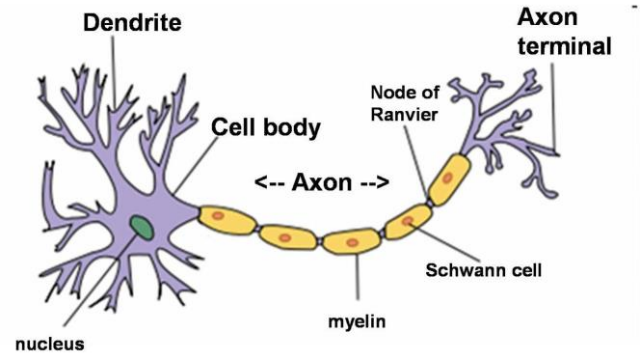


Figure 3.1: Structure of Neuron

3.1 Feasibility study

A feasibility study of Parkinson's disease would assess the practicality and viability of conducting research into the disease. This would involve evaluating the available resources, potential risks and benefits, and the likelihood of success.

3.1.1 Problem identification: The first step in conducting a feasibility study of Parkinson's disease would be to assess the existing knowledge of the disease and identify any gaps in our understanding. This would involve a review of the current literature, as well as consultation with experts in the field.

3.1.2 Use of machine learning: Next, the feasibility study would assess the availability of funding, resources, and infrastructure required to conduct research into Parkinson's disease. This would include evaluating the availability of research facilities, funding sources, and research personnel.
The study would also evaluate the potential risks and benefits of conducting research into Parkinson's disease. This would involve assessing the potential risks to research participants, as well as the potential benefits to individuals with the disease and society.

Finally, the feasibility study would assess the likelihood of success in conducting research into Parkinson's disease. This would involve evaluating the potential impact of the research on our understanding of the disease and the development of new treatments.
Overall, a feasibility study of Parkinson's disease would provide important information to guide the planning and execution of research into this debilitating condition.

3.2 Need and Significance

Parkinson's disease (PD) is a significant health issue that affects millions of individuals worldwide. The disease is characterized by the progressive loss of dopaminergic neurons in the brain, leading to a range of motor and non-motor symptoms, including tremors, rigidity, and difficulty with movement.

- **Early detection:** The need for Parkinson's disease research is significant because the disease has a major impact on individuals and their families, as well as on society as a whole. PD is associated with significant disability and reduced quality of life, and it is also a major economic burden, with estimated annual costs exceeding $25 billion in the United States alone.

- **Time and Cost:** Research into Parkinson's disease is essential to better understand the underlying mechanisms of the disease, identify new treatments, and ultimately find a cure. This research has already led to significant advances in our understanding of PD, including the identification of genetic and environmental risk factors and the development of new treatments.

- **Personalized treatment:** There is a need for personalized treatment options that can be tailored to the individual needs of each person with Parkinson's disease.

- **Improved communication:** Improved communication between healthcare providers, patients, and caregivers is essential to ensure that individuals with Parkinson's disease receive the best possible care.

- **Patient education:** There is a need for patient education programs that provide information on the disease, its symptoms, and available treatments.

- **Research:** Ongoing research is essential to improve our understanding of Parkinson's disease and develop new treatments.

Parkinson's disease research is also significant because it has broader implications for our understanding of the brain and its functions. By studying the neural circuits and mechanisms involved in PD, researchers can gain insights into other neurological disorders, such as Alzheimer's disease and Huntington's disease. In summary, Parkinson's disease research is essential to improve the lives of individuals with the disease and their families, reduce the economic burden of the disease, and advance our understanding of the brain and neurological disorders.

3.3 Intended User

The intended users for Parkinson’s disease research are healthcare professionals, researchers, individuals with Parkinson’s disease, and their families and caregivers. Healthcare professionals rely on the latest research to provide the best possible care to their patients with Parkinson’s disease. Researches need access to the latest findings to advance our understanding of the disease and develop new treatments. Individuals with Parkinson’s disease and their families and caregivers need information and support to manage the disease and improve their quality of life. Overall, the intended users for Parkinson’s disease research are those who are involved in the care and management of individuals with the disease, as well as those who are working towards finding a cure.

4. Literature review

Technology has made a considerable impact on the way of living in recent years and will continue to do so with the increasing use of computers, controlled equipment, and the growth of information technology in general. Really in the last two decades, technology has become far more advanced and far more widely used throughout all types of industry. In this section, we consider and examine the work done by other scholars and researchers who have broached our particular topic which is shown in table 1.

Table 1: Summary of literature review

S.No.	Year	Name	Contribution
1	2011	Heisters D. [9]	Parkinson's is an incurable neurological condition causing slowness of movement, tremor and muscle stiffness, with medication being the main form of management; ongoing research is focused on finding a cure and developing new treatments.
2	2012	A. Ozcift [1]	A new classification model based on support vector machine and rotation forest ensemble classifiers has been developed to improve Parkinson's disease diagnosis, achieving up to 97% accuracy in the best-performing classifier.
3	2012	Dr. R. Geetha Ramani et al. [6]	This paper focuses on classifying the severity of Parkinson's disease using data mining techniques and biomedical voice measures, achieving 100% accuracy with the Random Tree classification algorithm and ReliefF algorithm.
4	2013	Farhad Soleimanian Gharehehopogh et al. [8]	This paper uses two types of artificial neural networks (MLP and RBF) to classify Parkinson's disease with high accuracy, which can assist neurologists in making better decisions
5	2016	Dragana Miljkovic et al. [7]	This paper discusses the potential of machine learning methods in detecting and classifying tremors, gait patterns, and vocal impairment in Parkinson's disease patients.
6	2016	Arvind kumar tiwari [3]	This paper uses feature selection algorithms to predict Parkinson's disease with a 90.3% overall accuracy using random forest with 20 selected features.
7	2018	Dr. Anupam bhatia et al. [5]	This project aims to detect Parkinson's Disease through data mining and statistical analysis of common symptoms such as gait, tremors, and micro-graphia, with the goal of finding the most accurate classification algorithm.
8	2018	M. Abdar et al. [10]	This study compares the accuracy of SVM and Bayesian networks in diagnosing Parkinson's disease using PD data from UCI and found SVM with polynomial kernel

			function and C parameter to have the best performance with an average accuracy of 99.18%. The ten important factors involved in the SVM algorithm were also identified.
9	2019	Carlo Ricciardi et al. [4]	Gait analysis can be used to differentiate Parkinson's disease and Progressive Supranuclear Palsy, with data mining providing insight into subtle differences between the two conditions.
10	2020	Anila M et al. [2]	The paper presents a novel approach to diagnose Parkinson's disease using artificial neural network models, achieving high accuracy rates.

5. Proposed methodology in brief

5.1 Functional requirements

Functional requirements are essential in Parkinson's disease applications to ensure that the developed system meets the needs of the intended users and stakeholders. Here are some functional requirements that are important in Parkinson's disease applications:

5.1.1. Data collection

Data collection in Parkinson's disease is an essential component of research into the disease, as it helps to identify risk factors, track disease progression, and evaluate the effectiveness of treatments. There are several methods for collecting data in Parkinson's disease, including:

- **Clinical assessments:** Neurologists and other healthcare professionals can perform clinical assessments to evaluate a patient's motor symptoms, cognitive function, and quality of life.

- **Imaging techniques:** Brain imaging techniques, such as MRI and PET scans, can provide valuable information about changes in the brain associated with Parkinson's disease.

- **Wearable technology:** Wearable devices, such as accelerometers and gyroscopes, can provide continuous data on an individual's motor function, gait, and balance.

- **Self-reported data:** Individuals with Parkinson's disease can provide self-reported data on their symptoms, quality of life, and medication use through questionnaires or mobile apps.

- **Biomedical samples:** Biological samples, such as blood and cerebrospinal fluid, can be collected to identify biomarkers and better understand the underlying mechanisms of Parkinson's disease.

Effective data collection in Parkinson's disease research requires standardized protocols and tools to ensure consistency and accuracy of the collected data. Additionally, data privacy and confidentiality must be maintained to protect the individuals participating in the research.

5.1.2. Data processing and analysis

Data processing and analysis are important steps in developing machine learning models for Parkinson's disease research. The choice of model and training process depends on the type of data and the research question. There are several machine learning models that can be used in Parkinson's disease research, including decision trees, random forests, support vector machines, and neural networks. The choice of model will depend on the complexity of the data and the desired level of accuracy. Once a model is selected, the training process involves using a dataset to teach the model to recognize patterns in the data. The training dataset is divided into a training set and a validation set. The model is trained using the training set, and its performance is evaluated on the validation set. This process is repeated until the model's performance reaches a satisfactory level.

It is essential to use high-quality data for training and validation to ensure the accuracy and reliability of the model. Additionally, overfitting should be avoided by using techniques such as regularization and early stopping. Once the model is trained, it can be used to predict outcomes or identify patterns in new data. The model's performance should be evaluated using independent datasets to ensure that it can generalize to new data.

5.1.3. User interface

The system should have an intuitive and user-friendly interface that allows users to interact with the system and visualize the results.

5.1.4. Data storage and management

The system should be able to store and manage the collected data securely and ensure data privacy and confidentiality.

5.1.5. Integration with existing system

The system should be able to integrate with existing healthcare systems, such as electronic health records and telemedicine platforms, to ensure interoperability and continuity of care.

5.1.6. Model deployment and testing

Model deployment and testing are crucial steps in Parkinson's disease research to ensure that the developed models can be used effectively in clinical practice. The process of model deployment involves integrating the trained model into a software application or system that can be used by clinicians and patients. Once the model is deployed, it should be tested rigorously to ensure that it performs as expected in real-world scenarios. This testing process involves evaluating the model's performance on new data that was not used during training or validation. The testing data should be representative of the population that the model will be applied to. During the testing process, it is essential to evaluate the model's accuracy, sensitivity, specificity, and other performance metrics to ensure that it meets the required standards for clinical use. If the model does not perform well, further training may be necessary. It is important to consider ethical considerations and potential biases during the model deployment and testing process. The model should be designed to be fair and unbiased, and the testing data should be diverse and representative of the population.

5.1.7. Performance and scalability

The system should be able to handle large volumes of data and provide real-time predictions and feedback to users. Overall, functional requirements are critical in Parkinson's disease applications to ensure that the developed system can meet the needs of the intended users and stakeholders and provide accurate, timely, and personalized care to patients.

5.2 Non-functional requirements

Non-functional requirements in Parkinson's disease refer to the qualities that the system or application should possess to meet the user's needs beyond its functional aspects. Non-functional requirements are equally important as functional requirements in Parkinson's disease since they ensure that the system or application performs optimally, efficiently, and safely while providing a positive user experience.
Some examples of non-functional requirements in Parkinson's disease include:

- **Usability:** The system or application should be easy to use and navigate, even for users who may have motor or cognitive impairments due to Parkinson's disease.

- **Performance:** Performance is a crucial factor in Parkinson's disease machine learning projects, as it determines the effectiveness of the developed models in accurately predicting disease symptoms or progression. Performance can be measured using various metrics, such as accuracy, precision, recall, and F1 score, depending on the specific problem and the desired outcome.

- To achieve high performance in Parkinson's disease machine learning projects, it is essential to use appropriate feature selection techniques, algorithm selection, and hyperparameter tuning during model development. The selected features should capture the relevant information in the data and avoid noise and irrelevant information that can degrade performance. The choice of algorithm should also be based on sound scientific principles and domain knowledge to ensure that it is appropriate for the specific problem and the available data. Hyperparameter tuning can further optimize the algorithm's performance and generalization ability. It is also essential to evaluate the model's performance using appropriate evaluation techniques, such as cross-validation and testing on new data. Cross-validation can ensure that the model can generalize well to new data and avoid overfitting, while testing on new data can reveal any performance changes over time.

- **Security:** The system or application should ensure that patient data is secure and protected from unauthorized access.

- **Reliability:** Reliability is a critical factor in Parkinson's disease machine learning projects, as it ensures that the developed models can provide consistent and accurate results. A reliable model should produce consistent predictions when presented with the same input data, and its performance should be stable over time. Several factors can affect the reliability of a Parkinson's disease machine learning model, including the quality and quantity of the training data, the choice of features and algorithms, and the model's hyperparameters. It is essential to use high-quality and representative training data to ensure that the model can generalize well to new data. The choice of features and algorithms should also be based on sound scientific principles and domain knowledge to ensure that they capture the relevant information in the data. Hyperparameters tuning is also critical in improving the reliability of the model, as they control the model's complexity and generalization ability. Overfitting and underfitting should be avoided by selecting appropriate values for the hyperparameters during model training and validation. It is also essential to evaluate the model's reliability through cross-validation and testing on new data. Cross-validation ensures that the model can generalize well to new data, while testing on new data can reveal any performance changes over time.

- **Accessibility:** The system or application should be accessible to users with disabilities and meet accessibility standards.

- **Compatibility:** The system or application should be compatible with different devices and operating systems to ensure widespread use.

- **Scalability:** The system or application should be able to handle large amounts of data and users as the need arises.

- **Accuracy:** Accuracy is a critical metric in Parkinson's disease machine learning projects, as it measures how well the model can predict outcomes or identify patterns in the data. High accuracy means that the model is making correct predictions with a high degree of confidence, while low accuracy indicates that the model is making incorrect predictions. However, accuracy alone may not be sufficient to evaluate the effectiveness of a Parkinson's disease machine learning model. Other metrics such as sensitivity, specificity, precision, and area under the receiver operating characteristic (ROC) curve should also be considered. These metrics provide a more comprehensive understanding of the model's performance, especially when dealing with imbalanced data, where the number of positive and negative samples is uneven. Additionally, the clinical relevance of the model's predictions should be evaluated. For example, a model that accurately predicts the onset of Parkinson's disease but does not provide any information on disease progression may not be useful in clinical practice. It is essential to ensure that the training, validation, and testing data used in the model development process are of high quality and representative of the population that the model will be applied to. Overfitting should be avoided, and techniques such as cross-validation and regularization should be used to improve the model's generalizability.

Overall, non-functional requirements in Parkinson's disease are essential in ensuring that the system or application meets the user's needs while providing a positive user experience.

5.3 Hardware requirements

This guide outlines the minimum hardware requirements for deploying our project. Requirements may vary based on utilization and observing the performance of pilot projects is recommended before scaling out.

- OS: Window7
- Installed RAM: 4 GB
- Processor: Intel i3 or above
- System type: 64-bit operating system

5.4 Software requirements

This guide outlines the minimum software requirements for deploying our project. Requirements may vary based on utilization and observing the performance of pilot projects is recommended before scaling out.

- **HTML**

HTML stands for Hypertext Markup Language.HTML is used to create web pages and web applications.HTML is a widely used language on the web. We can create a static website by HTML only. Technically, HTML is a Markup language rather than a programming language.

- **CSS**

Cascading Style Sheets is a style sheet language used for describing the presentation of a document written in a markup language such as HTML. CSS is a cornerstone technology of the World Wide Web, alongside HTML and JavaScript.

- **Bootstrap**

Bootstrap is a free, open-source front-end development framework for the creation of websites and web apps. Designed to enable responsive development of mobile-first websites, Bootstrap provides a collection of syntax for template designs.

- **JS**

JavaScript, often abbreviated JS, is a programming language that is one of the core technologies of the World Wide Web, alongside HTML and CSS. Over 97% of websites use JavaScript on the client side for web page behaviour, often incorporating third-party libraries.

- **Python**

Python is an interpreted, object-oriented, high-level programming language with dynamic semantics. Its high-level built-in data structures, combined with dynamic typing and dynamic binding, make it very attractive for Rapid Application Development, as well as for use as a scripting or glue language to connect existing components together.

- **PIP-** PIP is the package management system used to install and manage software packages returned in Python.

- **Numpy-** Numpy is the general-purpose array processing package. It provides a high-performance multidimensional array object and tool for working with these arrays. It is a fundamental package for scientific computing with Python. It contains various features including these important ones:
    - A powerful n-dimensional array object
    - Sophisticated functions
    - Tools for integrating C/C++ and Fortran code
    - Useful liner algebra Fourier transform and random number capabilities

- **Matplotlib –** For Creating creative interactive visuals, a Matplotlib named Python Library is used. Matplotlib makes simple things easy and hard things possible. Produce publication-quality plots. Create interactive characters that can zoom, pan, and update.
- **Jupyter Notebook-** Anaconda distribution come with 1500 packages selected from PYPI as well as the condom package with virtual environment manager. Hit also include a GUI, Anaconda navigator, as a graphical alternative to the command line interface (CLI). A Jupiter notebook document is a GSON document, following a versioned schema, end containing an ordered list of input output cells which can contain code, text mathematics, plots and rich media, usually ending with the ".ipynb" extension.

- **Seaborn-** Seaborn is a Python data visualization library based on matplotlib. It provides a high-level interface for drawing attractive and informative statistical graphics. For a brief introduction to the ideas behind the library, you can read the introductory notes or the paper.

- **Pandas-** Pandas is a Python library used for working with data sets. It has functions for analyzing, cleaning, exploring, and manipulating data. The name "Pandas" has a reference to both "Panel Data", and "Python Data Analysis" and was created by Wes McKinney in 2008.

- **Sklearn-** Scikit-learn is an open source data analysis library, and the gold standard for Machine Learning (ML) in the Python ecosystem. Key concepts and features include: Algorithmic decision-making methods, including: Classification: identifying and categorizing data based on patterns.

- **Flask**
  Flask is a lightweight Python web framework that provides useful tools and features for creating web applications in the Python Language. It gives developers flexibility and is an accessible framework for new developers because you can build a web application quickly using only a single Python file. Flask is also extensible and doesn't force a particular directory structure or require complicated boilerplate code before getting started.

6. Diagram

6.1 Class diagram

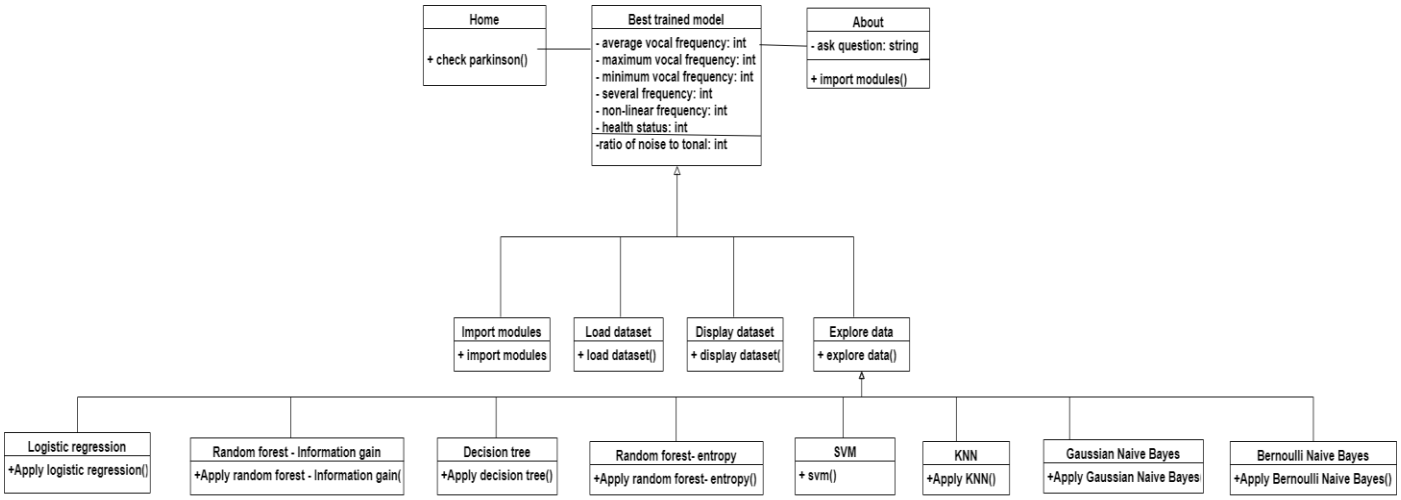


Figure 6.1: Class Diagram

6.2 Use case diagram

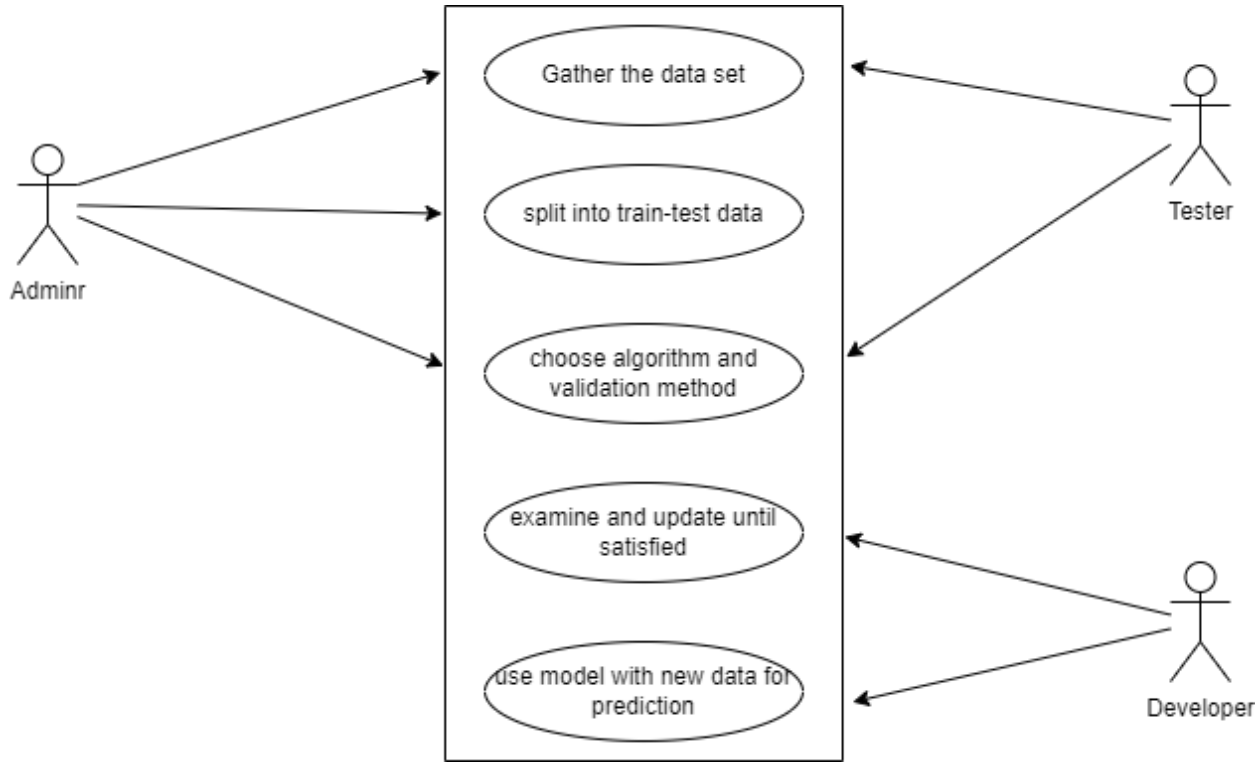


Figure 6.2: Use Case Diagram

6.3 Data flow diagram

6.3.1 DFD Level 0

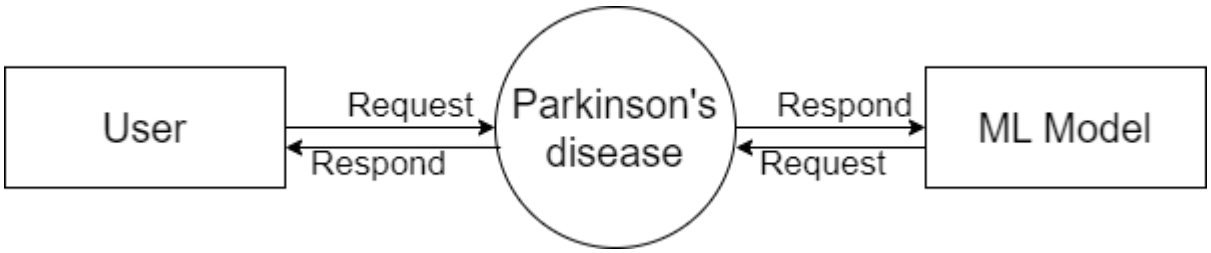


Figure 6.3: DFD level 0

6.3.2 DFD Level 1

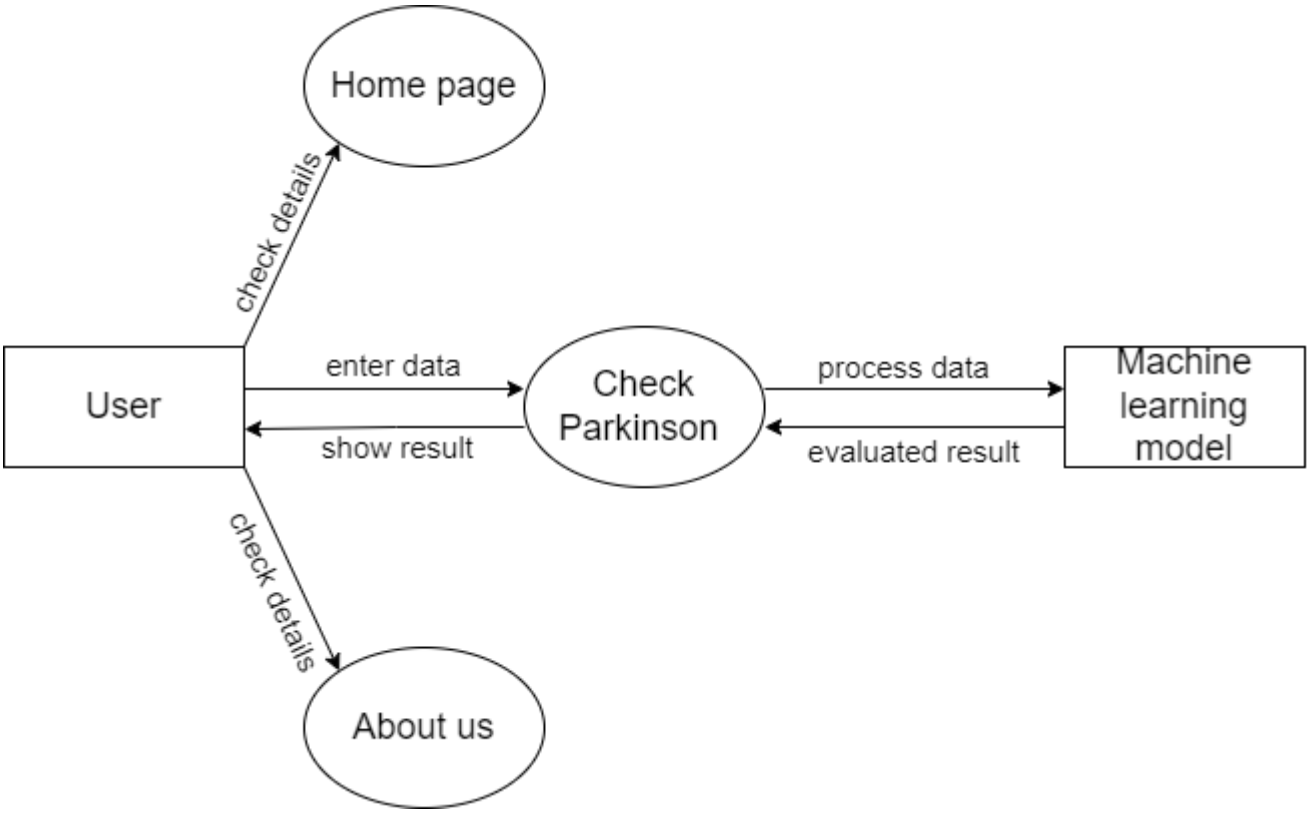


Figure 6.4: DFD level 1

6.3.3 DFD level 2 of a home page

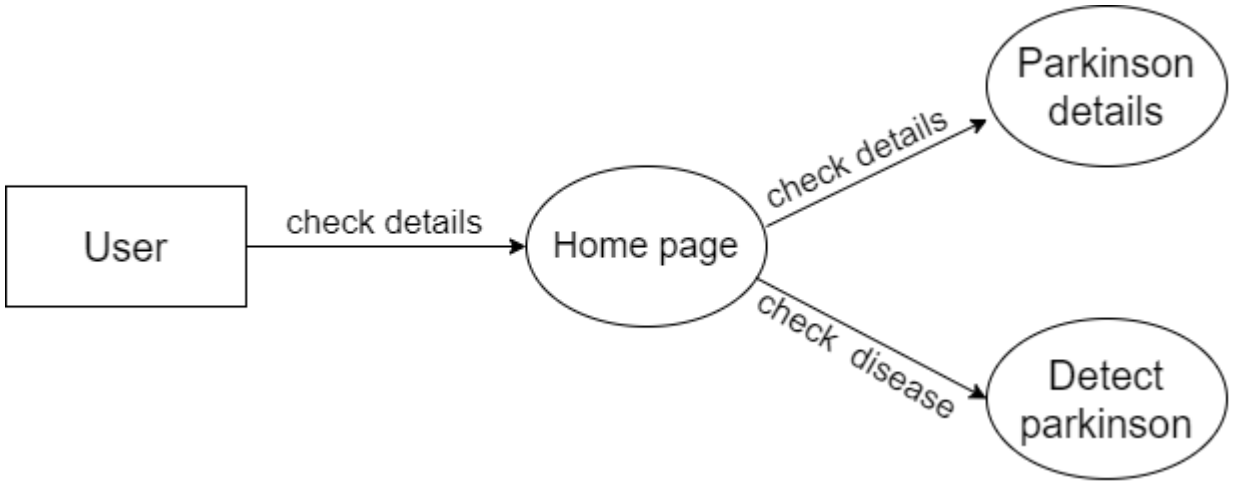


Figure 6.5: DFD level 2 of a home page

6.3.4 DFD level 2 of about

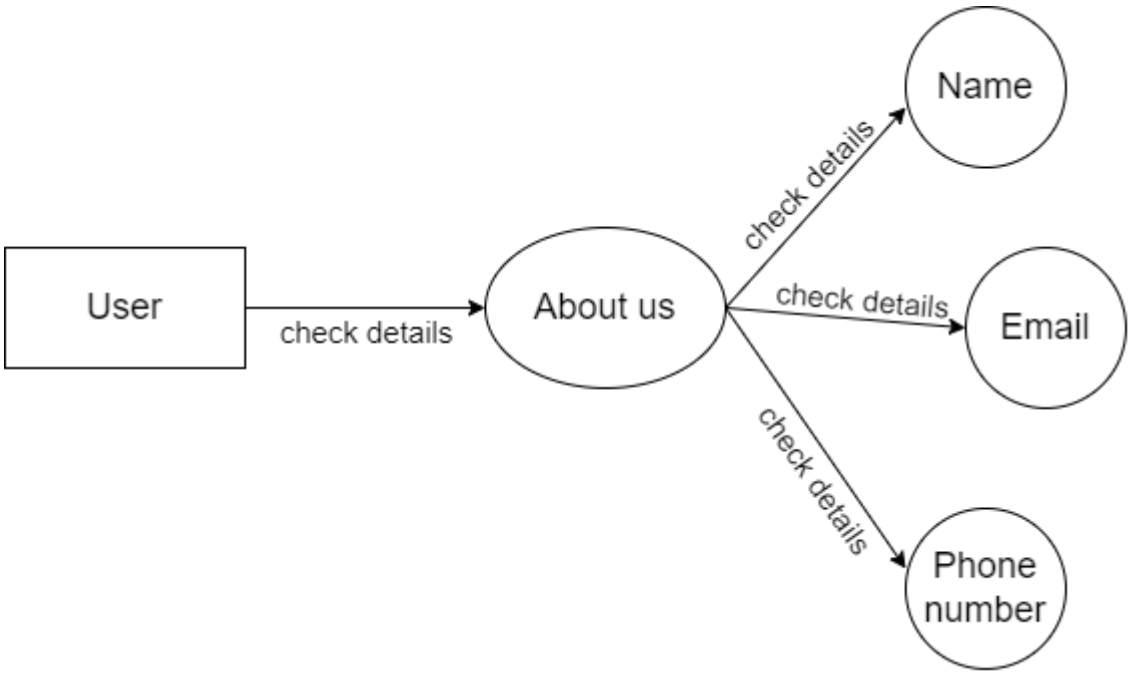


Figure 6.6: DFD level 2 of about

6.3.5 DFD level 2 of check Parkinson disease

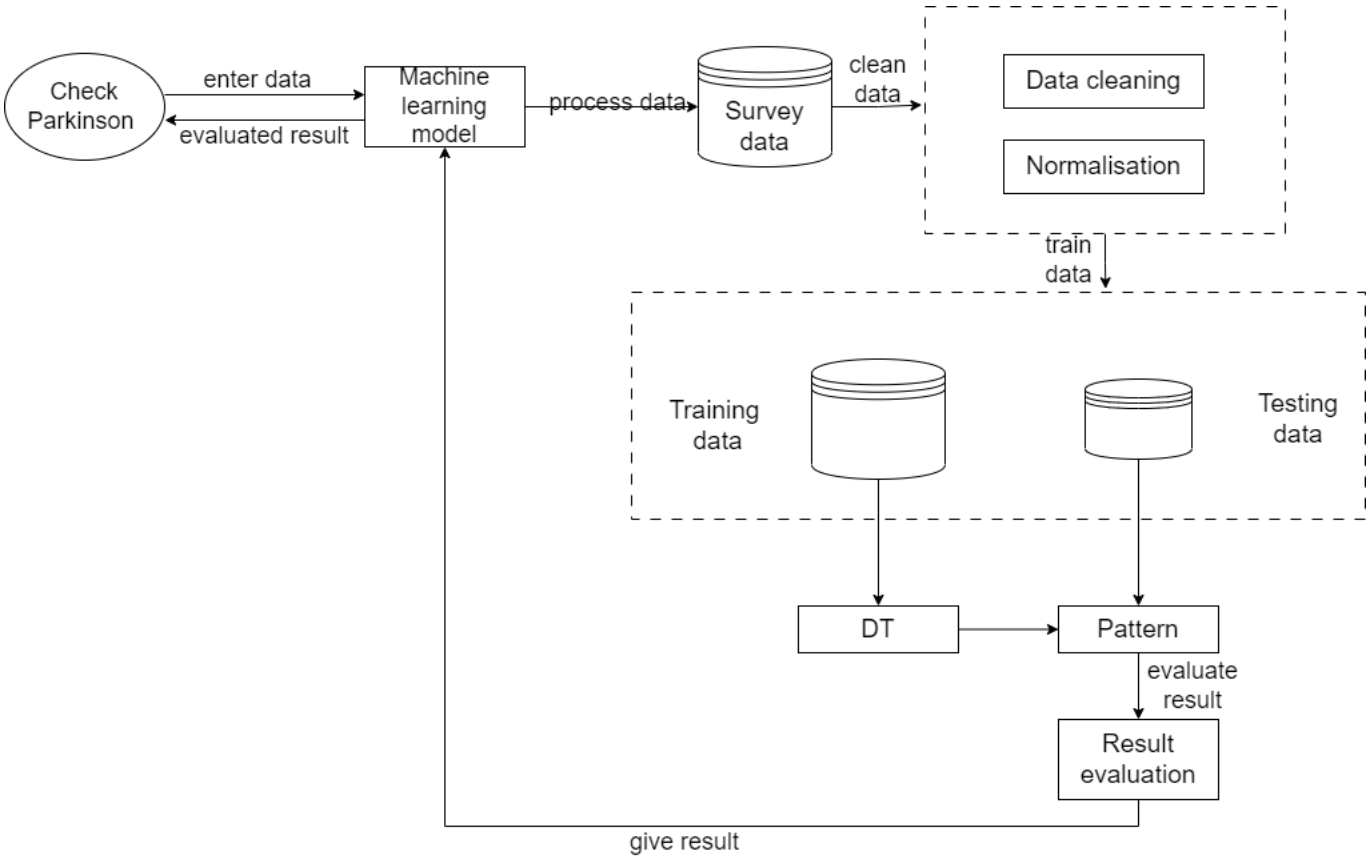


Figure 6.7: DFD level 2 of check Parkinson disease

6.5 Gantt chart

Tasks	Start Date	End Date	Duration
Project Title	February	February	4
Project planning	February	February	4
Resource & info collection	February	March	15
Synopsis and PPT work	March	April	20
Synopsis submission & presentation 1	March	March	1
Training ML model	March	April	15
Report and presentation work	April	May	20
Project presentation 2	May	May	1
Website making and connecting model			
Completing final report			
Research paper			
Internal presentation			

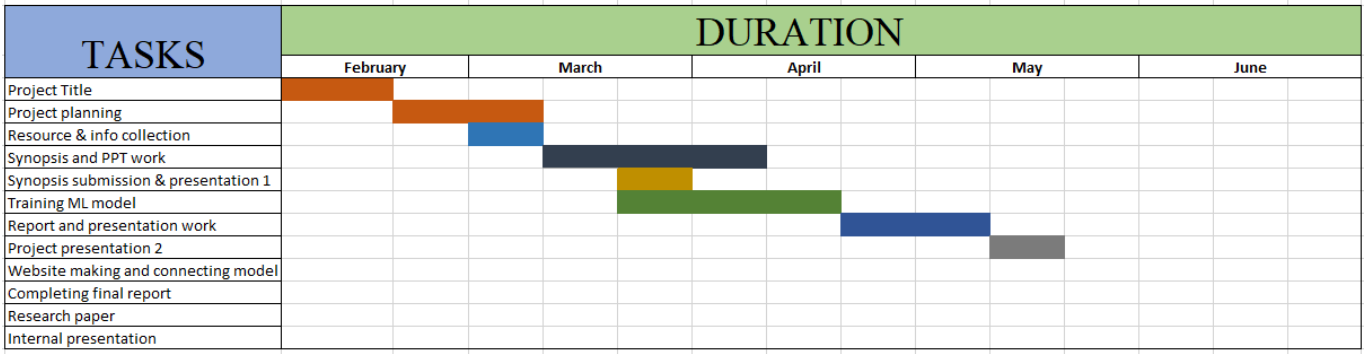
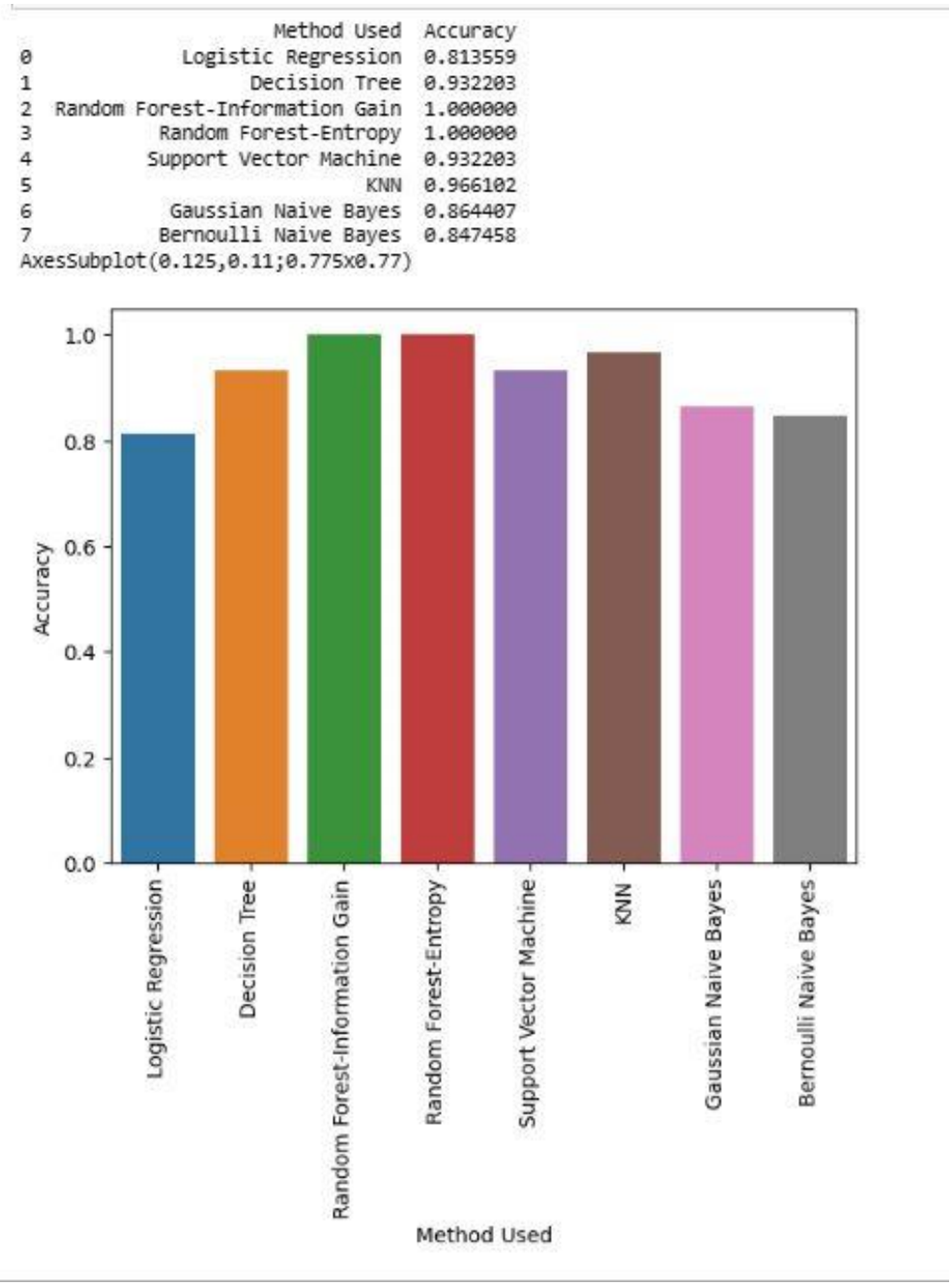


Figure 6.7: Gantt chart

7. Snap of running project

Parkinson’s is a totally grave disease and has no cure till date. since it impacts the actions of the parts of the body, the speech additionally stands affected. here, the model tries to offer a way of detecting Parkinson’s ailment so one can bring about a quick action to reduce or even put off it from affecting the whole body. It aims to make this method of expertise a case of Parkinson’s on the earliest via each, the affected person as well as scientific experts. Even today prediction of Parkinson's Disease is one of the most difficult tasks for research engineers and doctors. In this project, using Machine Learning algorithms for the prediction of Parkinson's disease we found the Support Vector Machine Classifier model with the best accuracy score is 88.40%.



	Method Used	Accuracy
0	Logistic Regression	0.813559
1	Decision Tree	0.932203
2	Random Forest-Information Gain	1.000000
3	Random Forest-Entropy	1.000000
4	Support Vector Machine	0.932203
5	KNN	0.966102
6	Gaussian Naive Bayes	0.864407
7	Bernoulli Naive Bayes	0.847458

AxesSubplot(0.125,0.11;0.775x0.77)

Figure 7.1: ML model result

8. Reference

[1] Heisters. D, "Parkinson's: symptoms, treatments and research". British Journal of Nursing, 20(9), 548–554. doi:10.12968/bjon.2011.20.9.548, 2011.

[2] Ozcift, "SVM feature selection based rotation forest ensemble classifiers to improve computer-aided diagnosis of Parkinson disease" Journal of medical systems, vol-36, no. 4, pp. 2141-2147, 2012.

[3] Dr. R. Geetha Ramani, G. Sivagami, Shomona Graciajacob "Feature Relevance Analysis and Classification of Parkinson's Disease Tele Monitoring data Through Data Mining" International Journal of Advanced Research in Computer Science and Software Engineering, vol-2, Issue 3, March 2012.

[4] Farhad Soleimanian Gharehehopogh, Peymen Mohammadi, "A Case Study of Parkinson's Disease Diagnosis Using Artificial Neural Networks" International Journal of Computer Applications, Vol-73, No.19, July 2013.

[5] Dragana Miljkovic et al, "Machine Learning and Data Mining Methods for Managing Parkinson's Disease" LNAI 9605, pp. 209-220, 2016.

[6] Arvind Kumar Tiwari, "Machine Learning based Approaches for Prediction of Parkinson's Disease" Machine Learning and Applications: An International Journal (MLAU) vol. 3, June 2016.

[7] Dr. Anupam Bhatia and Raunak Sulekh, "Predictive Model for Parkinson's Disease through Naive Bayes Classification" International Journal of Computer Science & Communication vol-9, Dec. 2017, pp. 194- 202, Sept 2017 - March 2018

[8] M. Abdar and M. Zomorodi-Moghadam, "Impact of Patients' Gender on Parkinson's disease using Classification Algorithms" Journal of AI and Data Mining, vol-6, 2018.

[9] Carlo Ricciardi, et al, "Using gait analysis' parameters to classify Parkinsonism: A data mining approach" Computer Methods and Programs in Biomedicine vol. 180, Oct. 2019.

[10] Anila M Department of CS1, Dr G Pradeepini Department of CSE, "DIAGNOSIS OF PARKINSON'S DISEASE USING ARTIFICIAL NEURAL NETWORK", JCR, 7(19): 7260-7269, 2020.