Presenting

NEUROSKETCH

Early Detection for Elderly Wellness

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DESCRIPTION

Our project introduces a **seamless Parkinson's detection model** for patients aged 60 and above, integrating AI-powered **voice, spiral, and motor assessments** into routine check-ups. This **enhances diagnosis accuracy**, enabling early intervention crucial for improving outcomes, providing **timely support**, **potentially slowing disease progression**, and **enhancing quality of life.**

INNOVATIVE USE OF AI TOOLS:

We judiciously made use of AI tools by carefully selecting and optimizing algorithms tailored to each assessment method in our Parkinson's detection model.

VOICE DETECTION

We utilized **Support Vector Machine** (**SVM**) **models** with **22 key features** extracted from biomedical voice measurements, including fundamental frequency, variation in frequency and amplitudes. This enabled **accurate classification** of individuals as either healthy or having Parkinson's disease based on their **voice characteristics.**

SPIRAL TEST

AI analyzes **handwriting patterns** to detect Parkinson's tremors, while computer vision algorithms extract features such as **smoothness** for objective motor function assessment. Additionally, they extract **kinematic features** from spiral drawings, including **stroke characteristics** and velocity, significantly enhancing Parkinson's diagnosis accuracy.

MOTOR ASSESSMENTS

AI extracts subtle features from **hand and foot movements** indicative of Parkinson's symptoms, like **tremors and slowness.** Machine learning algorithms, such as **DNNs**, learn from these features to **classify movements** as Parkinson's-related or not, detecting patterns imperceptible to humans.

LEARNING EXPERIENCE:

Embarking on **mastering Support Vector Machine** (**SVM**) **models**, **data processing**, and handling unstructured audio files for classification, I engaged with a Skill Builder course and **Engaging in personal discussions, I sought insights from AI experts and medical professionals.** Overcoming challenges like Python decoding errors and complex research papers, **I grew significantly in understanding AI**. Moving forward, I aim to enhance Parkinson's detection by integrating new features into existing models

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IMPACT:

NeuroSketch revolutionizes Parkinson's care with **smartphone video clips** for **objective symptom** tracking. Using cutting-edge **computer vision**, it offers precise analysis of tremors and bradykinesia. **Accessible on any mobile device**, it enables early diagnosis and personalized treatment.

SCALABILITY:

NeuroSketch expands its reach via healthcare partnerships and app store presence, ensuring broad accessibility. Its cloud infrastructure allows for scalable growth while maintaining performance, ensuring financial viability.

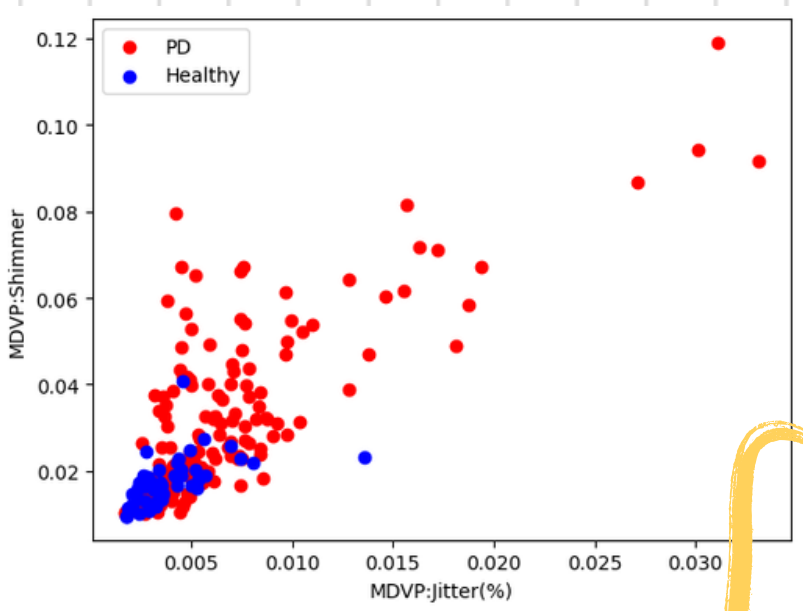
CERTIFICATIONS/RECOGNITIONS:

As an individual, I have received certifications in the field of AI, including completion of advanced AI courses and participation in **AI hackathons**. Notably, I was selected for the prestigious **1M1B AI Future Tech Imagination Internship program**, representing one of the **top 20 finalists nationwide**. These experiences have equipped me with the knowledge and skills necessary to tackle complex healthcare challenges using AI technology.

VOICE DETECTION

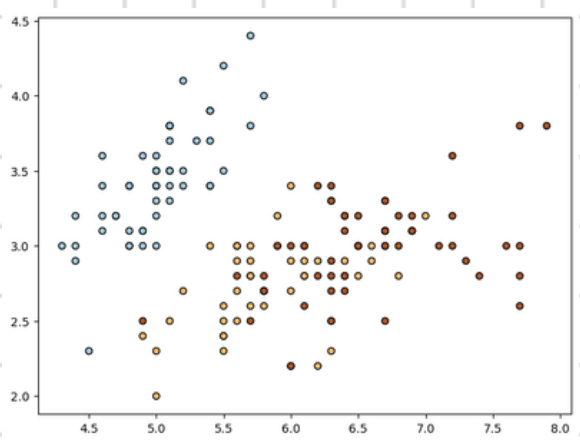
Parkinson's disease **affects voice and speech production** due to vocal fold stiffness, reduced loudness, and altered rhythm and pitch. Common symptoms include **voice tremors, reduced loudness, and monotone speech**. These changes can be **quantified using acoustic features** from speech recordings.

01



02

The Kaggle dataset comprises **22 voice features**, such as **fundamental frequency, jitter, shimmer**, etc., from recordings of 31 individuals, 23 with Parkinson's disease.



03

Data preprocessing

- Remove unnecessary columns
- Split data into features and target
- Split data into training and testing sets
- Scale the features using **StandardScaler**

04

Train Model

- Initialize **SVM model** with linear kernel
- Fit the model with the scaled training data

05

Predict Test Data

- Use the trained model to predict labels for test data

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Accuracy score of training data :  0.8846153846153846
Accuracy score of test data :  0.8717948717948718
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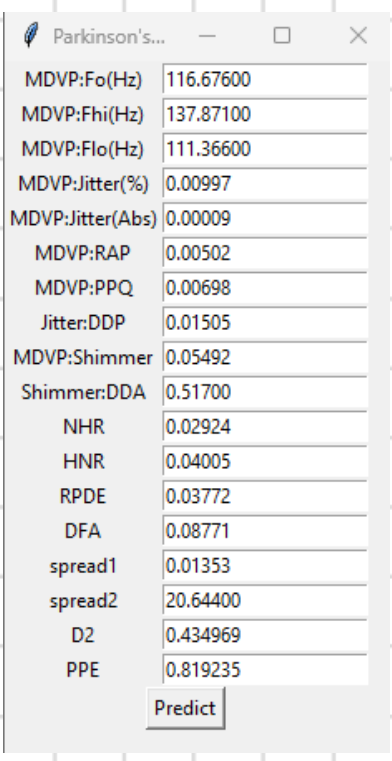
06

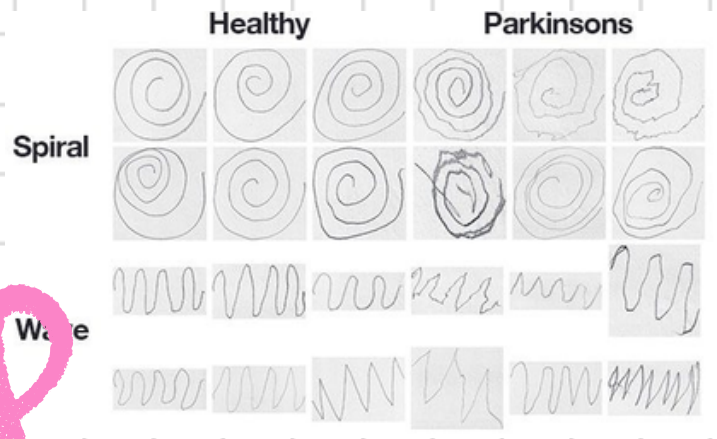
Evaluate Model

- Calculate accuracy score for training data
- Calculate accuracy score for test data



SPIRAL TEST

Parkinson's disease **affects handwriting,** often causing symptoms like tremors and stiffness, leading to **micrographia**. Recognizing these changes aids in early diagnosis and effective management.



01

02

1. Sketch Input: The user interacts with the application by drawing a spiral sketch on the canvas provided.
2. Submit Sketch: Upon completing the sketch, the user clicks the "Submit Sketch" button to initiate the prediction process.

03

Preprocessing:

The drawn sketch undergoes preprocessing steps, including conversion to the appropriate format and normalization.

04

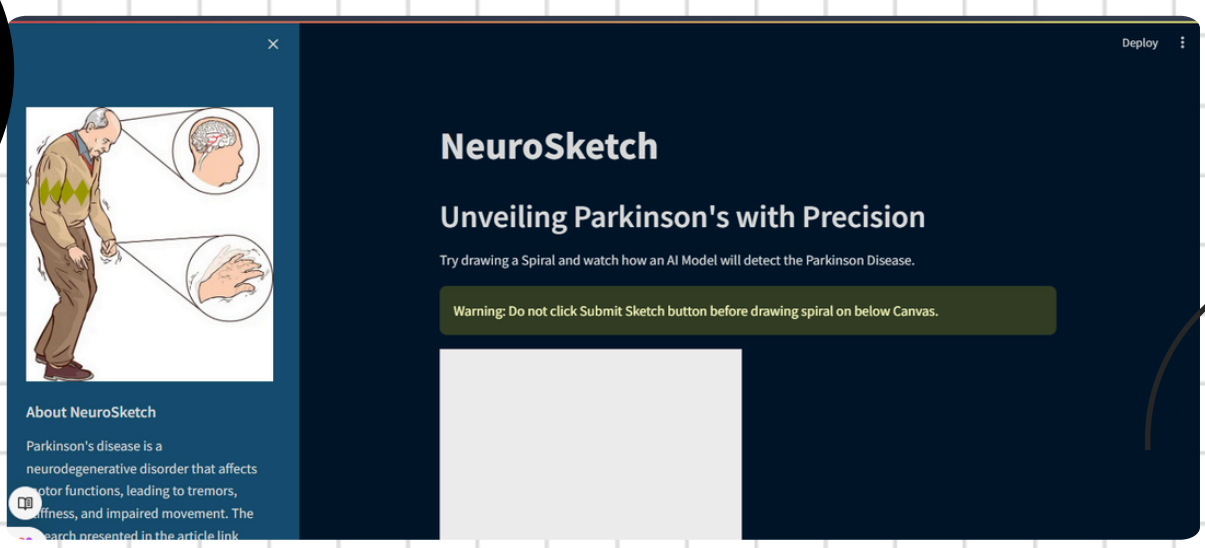
Classification:

- The preprocessed sketch is input into the **trained AI model for classification.** Using learned patterns and features, the model analyzes the sketch data to predict if it indicates Parkinson's disease.

05

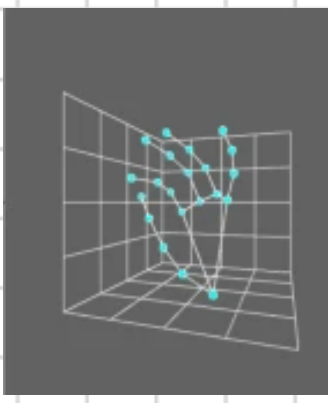
Prediction and Display:

The AI model processes the preprocessed sketch to predict whether it indicates Parkinson's disease, generating an output that includes the detected class (Parkinson's or healthy) and a **confidence score**. This result is then displayed to the user, providing information on the prediction outcome and confidence level.



MOTOR ASSESSMENTS

A **webcam-based** system tracks hand movements during a finger-tapping task. It uses AI to **analyze thumb, wrist, and index finger angles.** By removing noise, it calculates motor function features and severity scores. Participant images are published with consent.



01

02

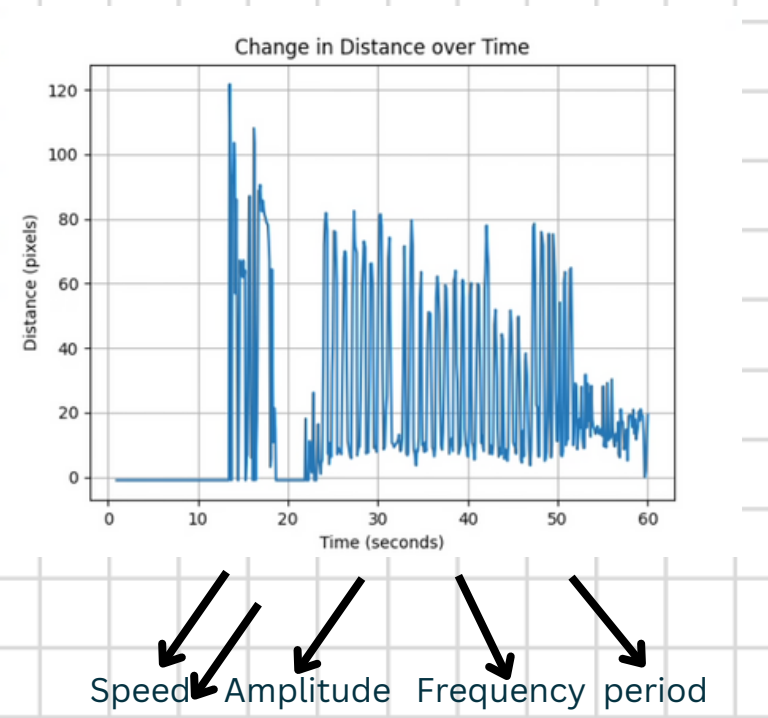
We analyzed **47 finger-tapping features**, along with **18 wrist movement features**, correlating them with severity scores. **22 features showed significant correlation**, suggesting their potential as digital biomarkers. The top 10 features capture critical aspects of **speed, amplitude, and rhythm,** aligning with Parkinson's severity scoring guidelines.

03

- Calculate Finger-Tapping Angle
- Compute Finger-Tapping Speed
- Determine Finger-Tapping Acceleration
- Detect Peaks in Finger-Tapping Angles

04

We utilized a **LightGBM regressor** to predict Parkinson's disease symptom severity based on finger-tapping video features.



Speed Amplitude Frequency period

05

Evaluate Model

- Employ **Leave-One-Patient-Out Cross-Validation** (LOPO-CV)
- Evaluate using **MAE, MSE, Classification Accuracy**, etc.

06

Overall, the program did a decent job at guessing how bad Parkinson's disease is in people.

BUSINESS CANVA

KEY PARTNERS

- Healthcare Providers
- Technology Partners
- Device Manufacturers
- Research Institutions
- Regulatory Bodies

KEY ACTIVITIES:

- AI Development and Maintenance
- Data Collection and Analysis
- Partnership Management
- Training and Support
- Marketing and Outreach

KEY RESOURCES:

- AI Algorithms and Software
- Human Resources (AI specialists, developers)
- Financial Resources
- Intellectual Property

REVENUE STREAMS:

- Subscription Model
- One-time Purchase
- Licensing Technology
- Grants and Funding

VALUE PROPOSITIONS:

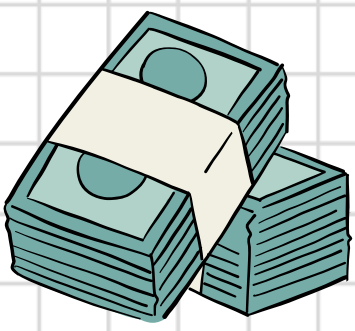
- Early Detection of Parkinson's
- Accessibility in Routine Check-ups
- High Diagnostic Accuracy
- Convenient Tools (voice detection, spiral tests)
- Cost-effective Diagnosis

CUSTOMER RELATIONSHIPS:

- Personal Assistance
- Automated Services
- Community Building

CHANNELS:

- Direct Sales to Healthcare Providers
- Online Platform/App
- Medical Conferences and Events
- Partnerships with Healthcare Organizations



CUSTOMER SEGMENTS:

- Healthcare Providers (hospitals, clinics)
- Patients (aged 60+)
- Caregivers

COST STRUCTURE:

- Research and Development
- Operational Costs (data storage, server maintenance)
- Marketing and Sales
- Partnership Management