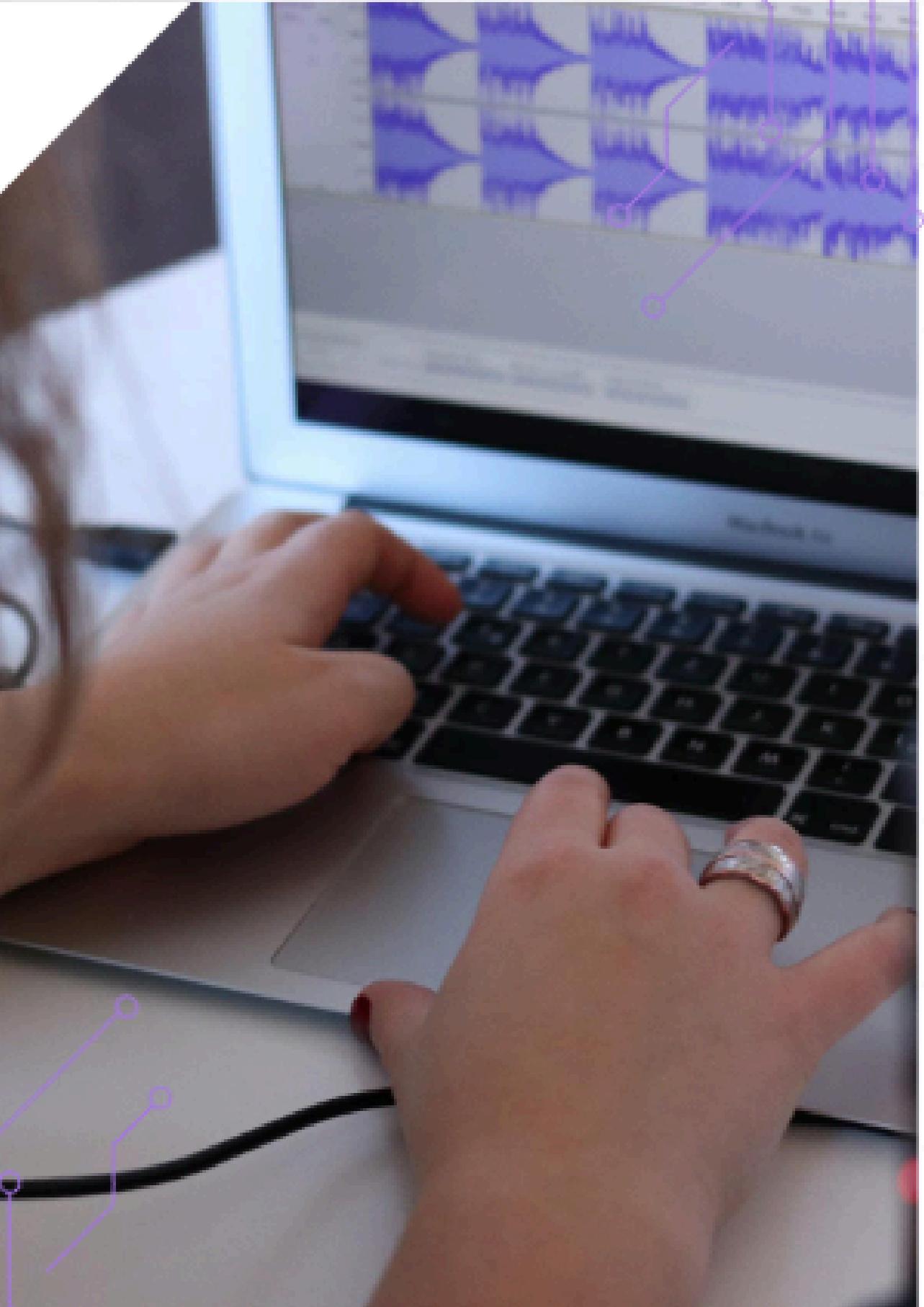


PARKINSON'S VOICE-BASED RISK PREDICTOR

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MOTIVATION / PROBLEM STATEMENT

01 PARKINSON'S AFFECTS MILLIONS GLOBALLY

This highlights the widespread impact of Parkinson's disease on the population.

02 EARLY DETECTION LEADS TO BETTER OUTCOMES

Identifying the disease in its early stages can significantly improve treatment success.

03 VOCAL BIOMARKERS OFFER A NON-INVASIVE PROMISE

Using voice analysis as a diagnostic tool could revolutionize current methods.

04 EXISTING DIAGNOSIS METHODS ARE OFTEN EXPENSIVE OR SUBJECTIVE

Current diagnostic approaches can be cost-prohibitive and reliant on subjective assessments.

PROJECT OBJECTIVE



- Create a Streamlit app that accepts voice input (CSV)
- Extracts vocal features
- Predicts Parkinson's risk using AI
- Provides SHAP-based explanations

DEVICE DESCRIPTION

TYPE: SOFTWARE AS A MEDICAL DEVICE (SAMD)

01

A standalone AI-based application that analyzes clinical voice data to support diagnostic decisions, without relying on dedicated medical hardware.

FUNCTION: AI SUPPORT FOR EARLY PARKINSON'S DETECTION

02

The system identifies subtle vocal changes associated with Parkinson's, enabling earlier intervention through machine learning-based risk predictions.

INPUT: 22 VOCAL BIOMARKERS

03

Acoustic features such as jitter, shimmer, and harmonic-to-noise ratio (HNR) are extracted from voice recordings to represent neurological symptoms.

OUTPUT: RISK SCORE + SHAP EXPLAINABILITY

04

The model outputs a Parkinson's risk probability along with SHAP-based visual explanations, promoting transparency and clinician trust.

USER: LICENSED CLINICIANS

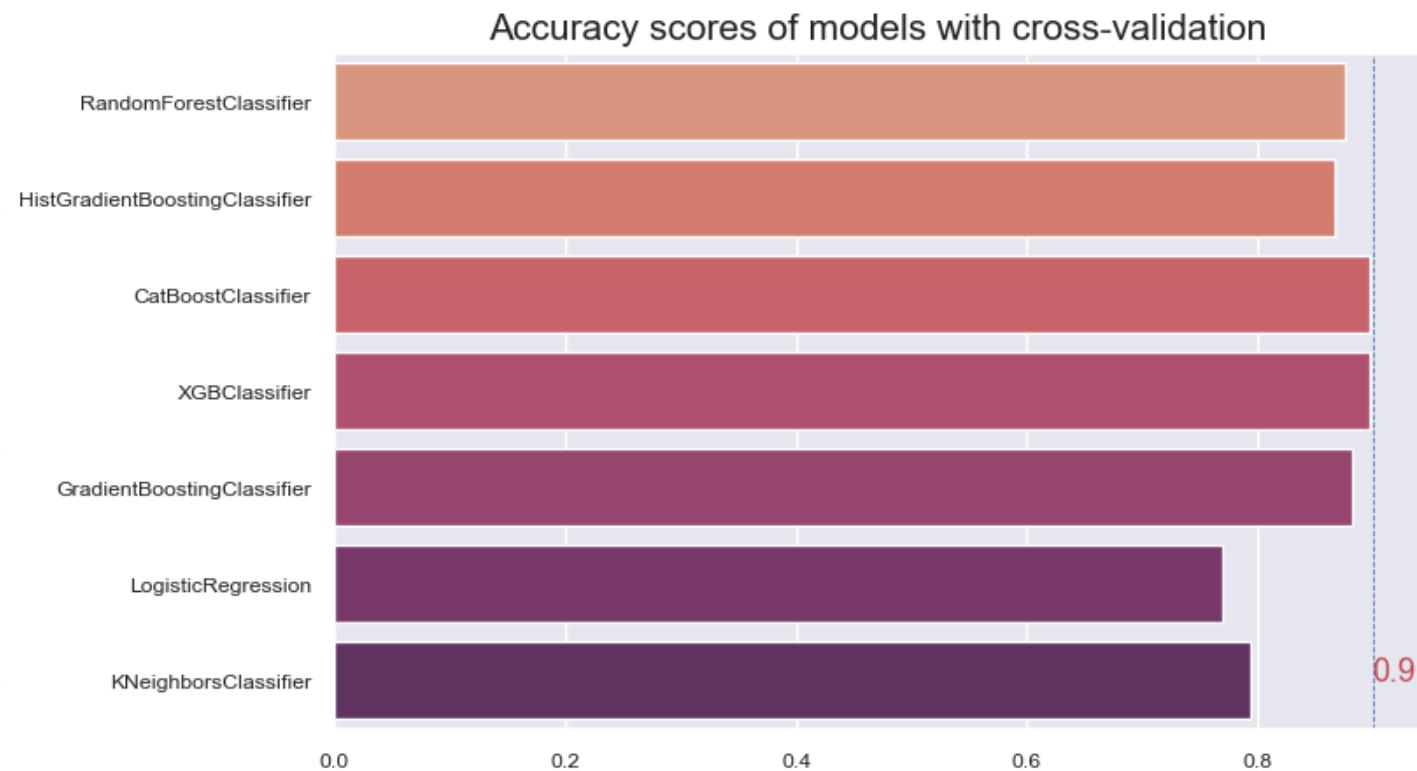
05

- Intended for use by healthcare professionals to assist
- Neurologists
- ENT specialists etc.

DATASET & FEATURES

Recordings	Patients	Acoustic Features
UCI Parkinson's dataset	195 75.4% PD, 24.6% healthy	22 features (Jitter, Shimmer, HNR, etc.)

MODEL DEVELOPMENT



90% +

XGBOOST ACCURACY

The XGBoost model achieved an accuracy rate of over 90% in predicting Parkinson's risk based on voice data.

APP INTERFACE

01 BUILT WITH STREAMLIT, THE APP SUPPORTS VARIOUS INPUT METHODS

Users can manually input data, import CSV files for analysis.

02 INCLUDES SHAP SUMMARY AND FORCE PLOTS

These visualizations help interpret model predictions and feature importance.

03 CONFIDENCE-BASED WARNINGS ENHANCE USER EXPERIENCE

The app provides alerts based on the confidence of predictions.

04 TREND PLOTS ARE GENERATED USING PLOTLY

Visual representation of trends in the data over time or across sessions.

05 LOGS ARE STORED LOCALLY FOR USER REFERENCE

All interactions and outputs are logged on the user's device for convenience.

Parkinson's Structured Data Predictor

Current Patient ID: 12367

Upload a CSV or enter acoustic biomarker values manually to predict Parkinson's disease.

Input Data Prediction & Results

How would you like to provide input?

- Manual Entry
 Upload CSV

Manually Enter Feature Values

MDVP:Fo(Hz)

0.000000

- +

MDVP:Fhi(Hz)

0.000000

- Activate V
Go to Setting

EXPLAINABLE AI (XAI)



01

SHAP EXPLANATIONS FOR TRANSPARENCY

Utilizing SHAP (SHapley Additive exPlanations) to provide clear insights into model predictions, enhancing trust and understanding.

02

GLOBAL: BAR/SUMMARY PLOT

Employing global visualizations such as bar or summary plots to illustrate the overall feature importance across the dataset.

03

LOCAL: PER-PATIENT FORCE PLOT

Using local explanations like force plots for individual patients to show how specific features influenced the model's prediction.

04

SUPPORTS HUMAN-IN-THE-LOOP DESIGN

Facilitating a human-centered approach in AI systems, where human expertise is integrated into model decision-making processes.

RELIABILITY & SAFETY

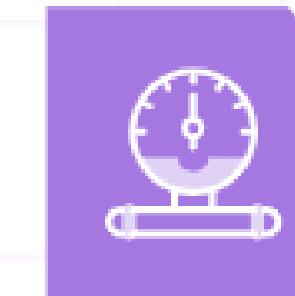




MLOPS / DEPLOYMENT



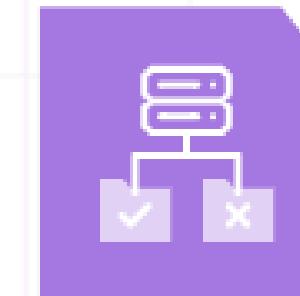
Model serialized with pickle



MLflow used for parameter
logging, metrics tracking, and
artifact storage



Versioned .pkl files



Local execution for secure and
offline use

REGULATORY ALIGNMENT

CLASS II A (MDR RULE 11) COMPLIANCE IS ESSENTIAL FOR MEDICAL DEVICES

This classification ensures that devices meet safety and efficacy standards before market entry.

AI ACT CLASSIFIES HIGH-RISK AI APPLICATIONS AS PER ANNEX III, ART. 5

High-risk AI systems undergo rigorous assessments to ensure they do not harm users.

SIMULATES ESTABLISHED STANDARDS: ISO 14971, IEC 62304, AND GDPR

These standards guide risk management, software development, and data privacy respectively.

ALTAI FOCUSES ON HUMAN AGENCY, ROBUSTNESS, AND PRIVACY

It emphasizes the importance of user control, system reliability, and data protection in AI systems.

RISK & BENEFIT ANALYSIS

RISKS

- False positives/negatives
- Input errors
- Misuse by unqualified users

CONTROLS

- Confidence scores
- SHAP plots
- Input validation
- Disclaimers



POST-MARKET SURVEILLANCE (PMS)

LOCAL LOGS SAVED PER PATIENT

01

This ensures accountability and traceability of patient data.

MANUAL AUDITS ARE POSSIBLE

02

Facilitates verification and validation of data integrity.

RETRAINING IS ENABLED WITH LOGGED
SESSIONS

03

This allows for continuous improvement of models based on real-world data.

A PLAN FOR MONTHLY REVIEW AND
MODEL DRIFT IS ESTABLISHED

04

Ensures models remain effective and relevant over time.

LIMITATIONS

LACK OF DEMOGRAPHIC INFORMATION LIMITS ANALYSIS

The absence of age and gender data restricts the understanding of how these factors may influence the risk predictions.

CLINICAL VALIDATION IS PENDING

The model has not undergone clinical trials to confirm its accuracy and reliability in real-world settings.

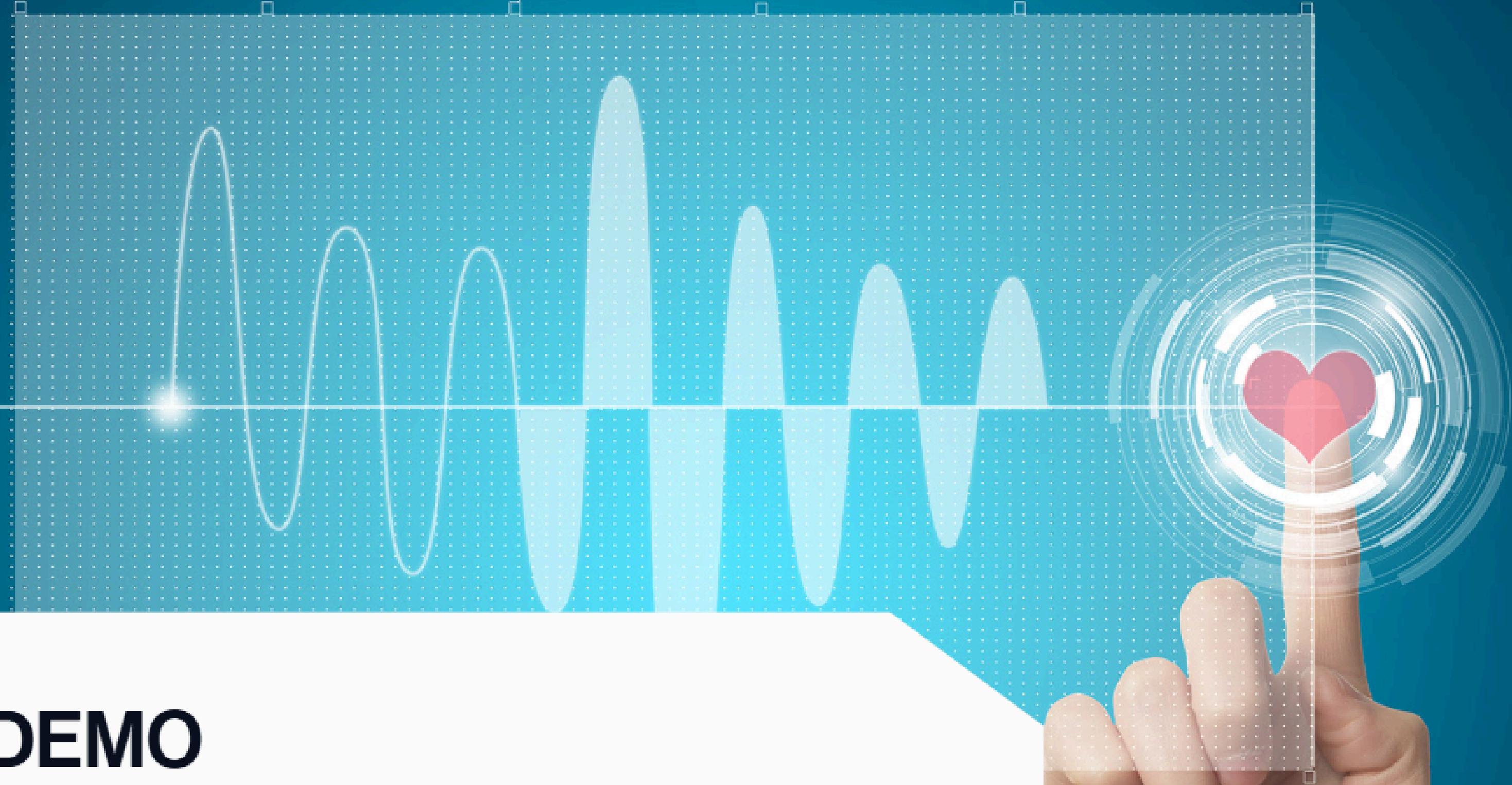
DATASET IS SMALL, AFFECTING RELIABILITY

A small sample size can lead to overfitting and may not represent the broader population effectively.

DEPLOYMENT REQUIRES ENCRYPTION

To ensure privacy and security, encryption measures must be implemented before the system can be deployed.





GUI DEMO

Know More

CONCLUSION

