رواد مصر الرقمية

وزارة الاتصـــــالات
وتكنولوجيا المعلومات

Heart Disease Prediction

By / Heart Attack Team 💔

December 2025

Project Idea

Problem

Heart disease is **difficult to detect early**

Manual diagnosis can be **slow**

Manual diagnosis is **prone to errors**

Proposed Solution

Dual-approach system for heart disease prediction

Machine learning on **clinical data**

Deep-learning model on **echocardiogram videos**

Ejection Fraction (EF) prediction

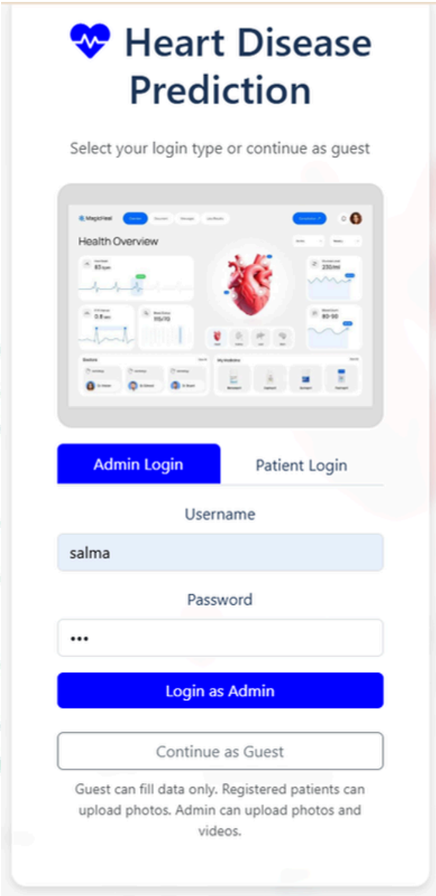
Unique Value

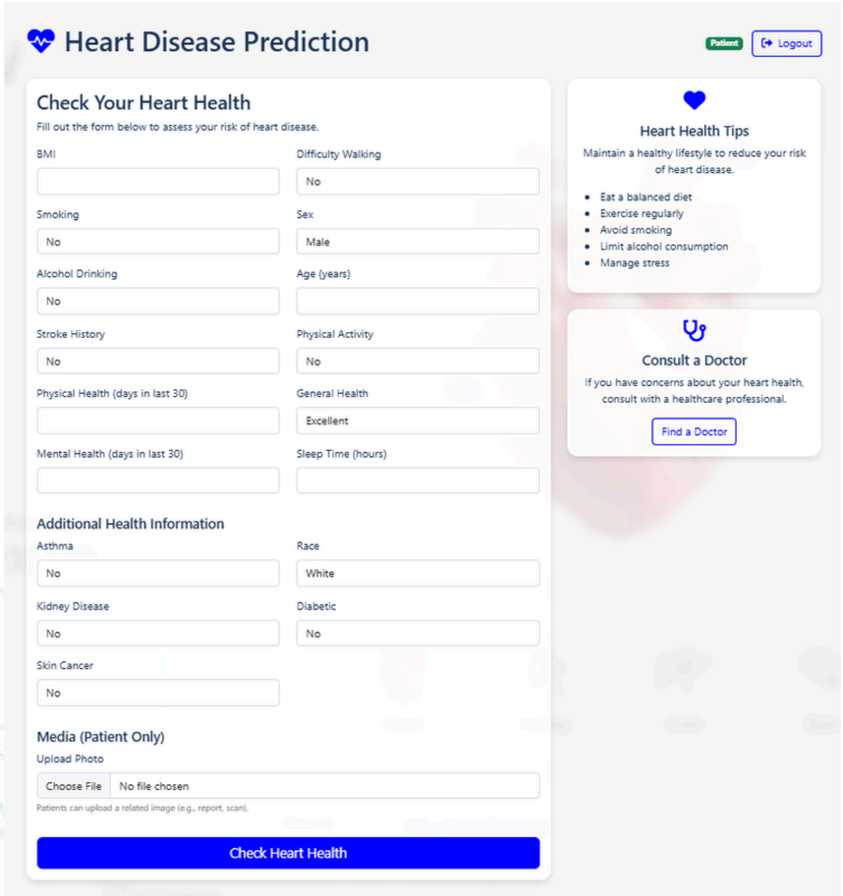
Combines tabular data analysis with computer vision

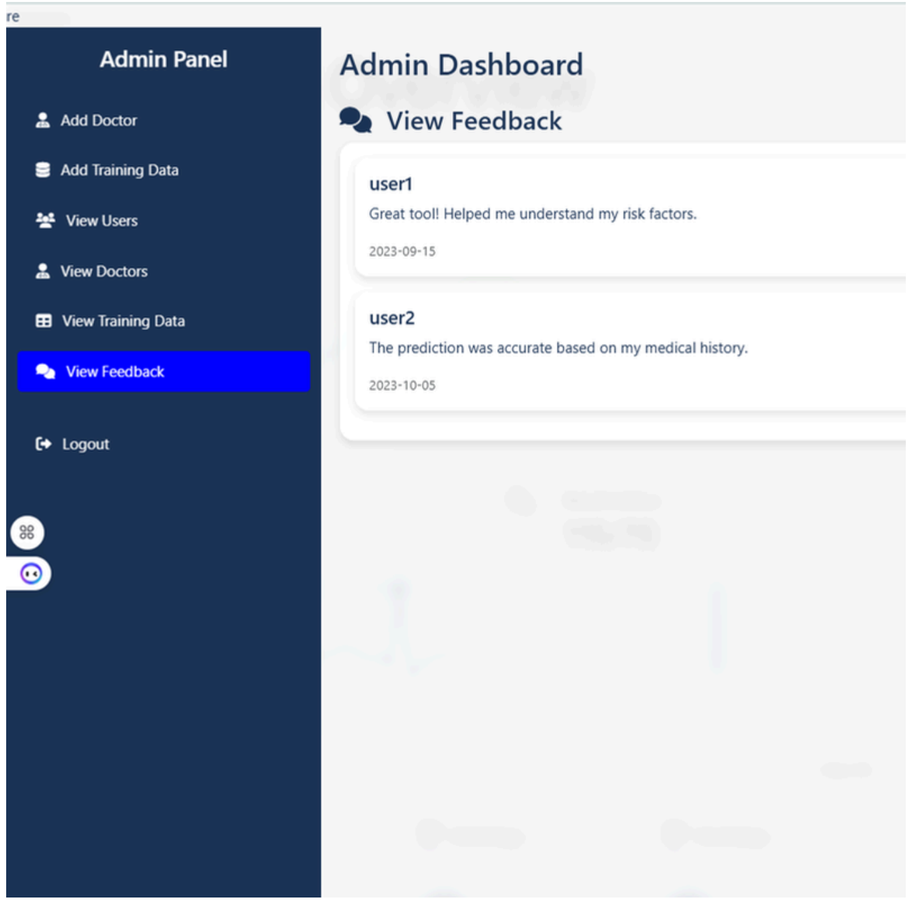
Provides **more accurate** heart health assessment

Offers **comprehensive** evaluation than either method alone

Project Wiframe







Ejection Fraction (EF) Prediction System

Upload an echocardiography video and the deep learning model will predict the **Ejection Fraction (EF)** with color-coded severity levels.

How to use:

1. Upload a video file (.mp4, .avi, .mov, .mkv)
2. Click "Predict EF" to analyze the video
3. View the results and sample frames
4. Check the prediction history below

Upload Echocardiography Video

0X2D66FC105DDE8B38.avi 428.6 KB

Predict EF

Clear History | Download History

About EF Values:

- **Normal EF**: ≥55% (Green)
- **Mildly Reduced EF**: 40-54% (Orange)
- **Severely Reduced EF**: <40% (Red)

Model Information:

- Architecture: 3D CNN
- Input: 20 frames (112x112 RGB)
- Training Dataset: EchoNet-Dynamic

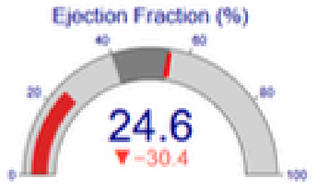
EF Prediction

24.57%

Status: **Severely Reduced EF**

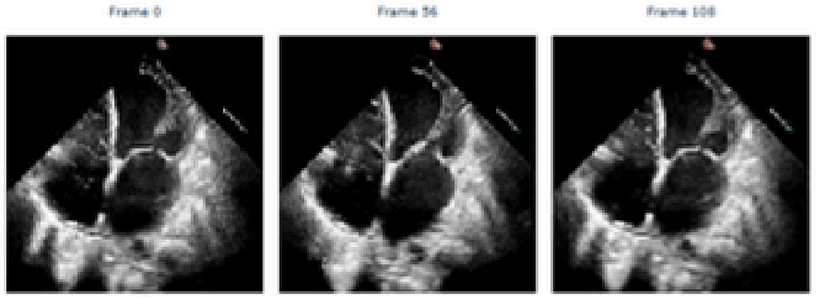
Video Duration	Total Frames	FPS
2.53 sec	109	43.00

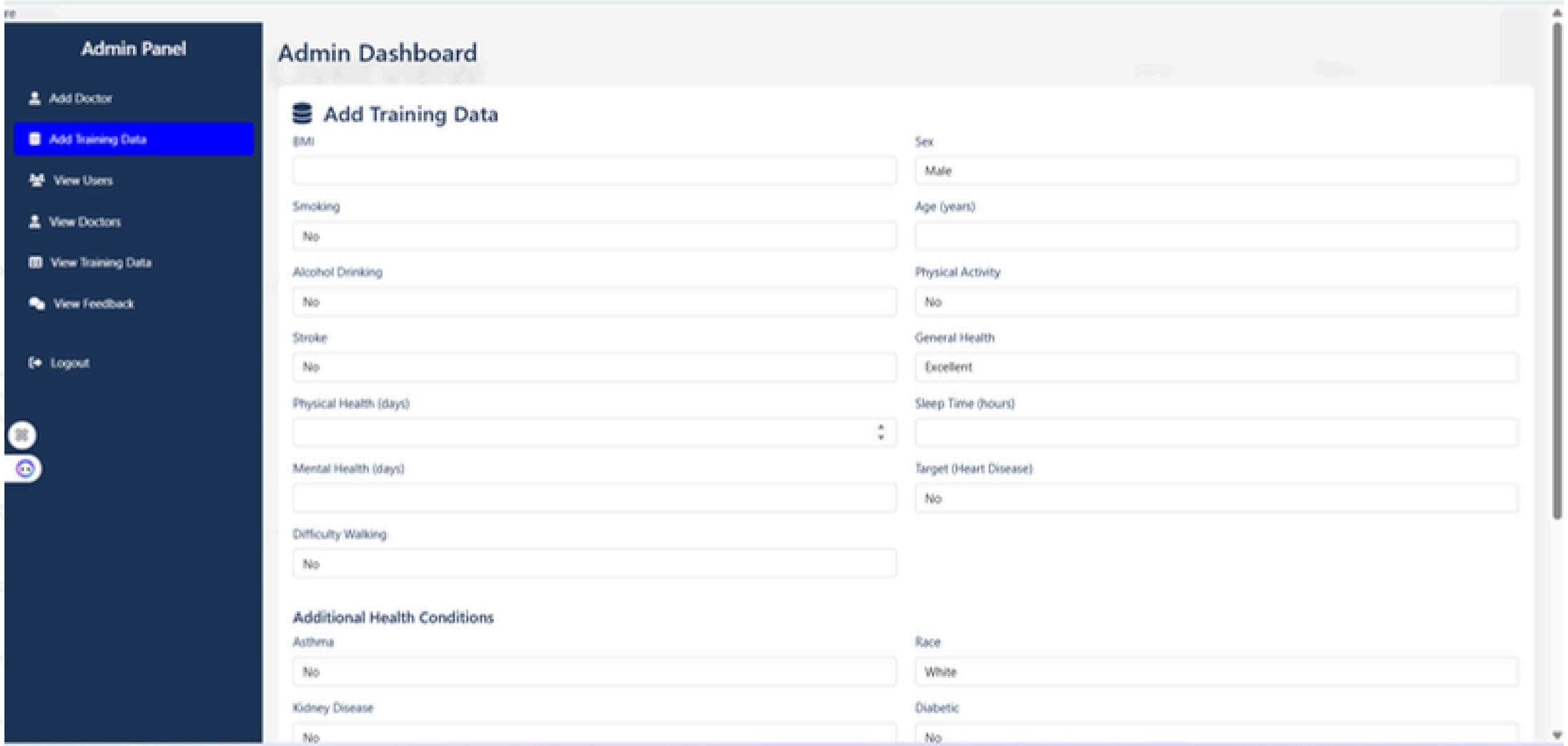
EF Value Visualization



Sample Frames from Video

Sample Frames from Video




Admin Panel
Add Doctor
Add Training Data
View Users
View Doctors
View Training Data
View Feedback
Logout
Admin Dashboard
Add Training Data
BMI
Sex
Male
Smoking
No
Age (years)
Alcohol Drinking
No
Physical Activity
No
Stroke
No
General Health
Excellent
Physical Health (days)
Sleep Time (hours)
Mental Health (days)
Target (Heart Disease)
No
Difficulty Walking
No
Additional Health Conditions
Asthma
No
Race
White
Kidney Disease
No
Diabetic
No

End Users + Features

Primary End Users

Healthcare Professionals
Cardiologists & clinicians who need **fast and reliable** assessments

Medical Researchers
Analyzing heart disease patterns and EF trends

Patients
Individuals who want **early risk screening** and heart function evaluation

Key Features

Heart Disease Prediction
Patients enter basic health information → system predicts heart disease risk

Dual-Interface Platform
Separate views for doctors and patients with customized tools

Echocardiogram Video Analysis
Doctors upload echo videos → system predicts the Ejection Fraction (EF)

Data Cleaning Pipeline
Ensures accurate predictions for both tabular and video inputs

For Patients

- Provides **simple, fast** early heart disease risk screening
- Eliminates the need for medical images they don't have
- Helps them understand their **health status** before visiting a doctor

For Doctors

- Provides **simple, fast** early heart disease screening
- Automates EF measurement from echo videos
- Saves time and increases **diagnostic accuracy**
- Provides consistent, objective heart function evaluation

Data Structure

Data Structure

Tabular Clinical Data

Stored in **CSV file** format

Echocardiogram Videos

Stored as **AVI files** in structured directory

Processing Pipeline

Loaded, processed, and fed into **ML/DL models**

Data Flow

Data Collection

Clinical data from CSV

Videos from local folders

Storage & Access

CSV as structured table

Videos read frame-by-frame

Model Processing

Tabular data for ML models

Video frames for DL models

Video Data Processing

Frame Extraction

20 frames extracted from each video

Frame Resizing

Frames resized to **uniform dimensions**

Normalization

Pixel values normalized for **deep-learning model**

Tabular Data Processing

Data Cleaning

Removed **duplicates** and **missing values**

Outlier Removal

Removed **unrealistic values**

Encoding & Preparation

Data encoded and prepared for **model training**

Programming Languages + Frameworks

Programming Languages

Python
Machine Learning, Deep Learning, Data Processing

JavaScript
Interactive web interface

Frameworks & Tools

PyTorch
Deep learning models for EF prediction

Scikit-Learn
Tabular data machine learning

Pandas & NumPy
Data handling and preprocessing

OpenCV
Video frame extraction and processing

Gradio
Web interface for model interaction

Supporting Technologies

Google Colab

Training environment and TPU support

CSV Storage

Local video directories

Plotly/Matplotlib

Data visualization

Live Application + Testing

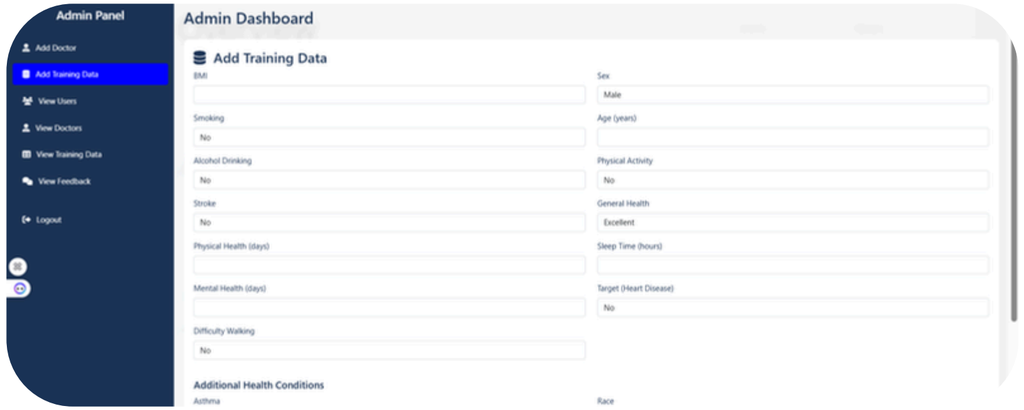
Current Live State

Beta Version Available

Application includes **two active interfaces**:

- Patient interface: Heart-disease prediction from tabular data
- Doctor EF interface: Gradio tool for uploading echo videos

Application Interface Preview



Testing Phases

Unit Testing

- Video loading
- Frame extraction
- Prediction function

Integration Testing

- Gradio UI
- Deep-learning pipeline
- Visualizations

User Testing

- Doctors tested EF prediction
- Patients tested tabular input flow

Doctors Feedback

Clear & Fast

- EF prediction with **color coding**
- Frame previews provide **visual confirmation**

> "The system saves significant time compared to manual EF calculations."

Clinical Utility

- Integrates well with **existing workflow**
- Provides **consistent measurements**

> "The color-coded results help quickly identify patients needing immediate attention."

Patients Feedback

Ease of Use

- **Simple tabular form** interface
- Clear **risk assessment** results

> "I was able to understand my heart health status before visiting the doctor."

Health Awareness

- Provides **early warning** signs
- Motivates **lifestyle changes**

> "The system helped me understand what factors contribute to heart disease risk."

Deliverables + Timeline

1 Data Collection, Exploration & Preprocessing

1 Sept → 20 Sept

Main Tasks

- Collect clinical + echocardiography data
- EDA & data quality checks
- Preprocessing & cleaning

Deliverables

- Dataset Exploration Report
- EDA Notebook
- Cleaned Dataset

2 Data Analysis, Visualization & Feature Engineering

21 Sept → 10 Oct

Main Tasks

- In-depth analysis
- Statistical insights
- Visualizations & Feature engineering

Deliverables

- Analysis Report
- Health Trend Visualizations
- Feature Engineering Summary

3 Predictive Model Development & Optimization

11 Oct → 30 Oct

Main Tasks

- Train ML models (RF, LR, XGBoost)
- Evaluation & cross-validation
- Hyperparameter tuning

Deliverables

- Model Evaluation Report
- Final Optimized Model
- Model Codebase

4 MLOps, Deployment & Monitoring

31 Oct → 10 Nov

Main Tasks

- Deploy the web app
- Build API for predictions
- Logging & monitoring setup

Deliverables

- Deployed Application
- MLOps Report
- Monitoring Setup

5 Computer Vision Development (EFNet Module)

10 Nov → 17 Nov

Main Tasks

- Extract 20 frames per videos
- 3D-CNN EFNet model development
- Gradio doctor interface
- Frame preview system

Deliverables

- EFNet Model
- Gradio EF Prediction Tool
- CV Documentation

6 Final Documentation & Presentation

17 Nov → 20 Nov

Main Tasks

- Final report
- Stakeholder presentation
- System packaging

Deliverables

- Final Project Report
- Final Presentation Slides

Project Team + Roles

Team Members

Salma Salah
Data Analysis Lead

- Lead: Data Analysis (Milestone 2)
- UI Development (Frontend, Backend , API)

Abdulrahman Ibrahim
MLOps Lead

- Deployment & Monitoring (MLOps)
- (Milestone 4)

Heba Adel
Model Optimization Lead

- Model Optimization (Milestone 3)
- Presentation

Raghad Hamdy
ML Modeling Lead

- Machine Learning Modeling
- Model Evaluation (Milestone 3)

Fatema Taher
Data Preprocessing & Computer Vision Lead

- Data Preprocessing (Milestone 1)
- Documentation & Final Presentation
- Computer Vision Model (EF Prediction)

Collaboration Methods

Team Collaboration Approach

- Regular team meetings
- Shared documentation
- Agile-style weekly milestones
- Version control

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We appreciate your time and attention.
Your feedback helps us improve and move closer to making healthcare more predictive, accessible, and intelligent. ❤

Heart Attack Team

heartattackdepi3@gmail.com

github.com/Salma-Salah420/HeartDiseasePrediction

https://heartwebsitewith-dataand-photosand.vercel.app/