

Microsoft Engage 2022



micro-MediDetect-age
AT YOUR SERVICE 24/7

micro-MediDetect-age

Documentation

Priyanka Kumari
27th May, 2022

Project Overview

micro-MediDetect-age is a fully functional disease diagnosing website using face recognition technology made using Agile development methodology as part of the Microsoft Engage 2022 program.

[Watch demo video](#)

Inspiration

- **Heart Rate Detector (Pulse Detector)**

Because the heart's function is so critical, knowing your heart rate is crucial. The heart, in particular, is in charge of transporting oxygen and nutrient-rich blood throughout your body. Everything in the body is affected when it isn't functioning properly. Your heart rate is one way to assess your heart health — and, by extension, your overall health.

Measuring your resting heart rate (RHR), which is the number of heart beats per minute when you're at rest, gives you a real-time picture of how healthy your heart muscle is. Adults' heart rates typically range between 60 and 100 beats per minute.

A RHR of more than 100 indicates anaemia or cardiomyopathy, while a RHR of less than 60 indicates hypothyroidism, cardiac disease, high potassium levels in the blood, or some illnesses. At the same time, someone's heart rate may be slower due to being physically fit or pregnant, taking medication, or sleeping irregularly. Because there are no concrete metrics to go by, it's vital to remember that a healthy heart rate will vary depending on the situation.

- **Wilson Syndrome**

Wilson's illness threatens the lives of almost 20,000 people by causing organ or liver failure. Wilson's Syndrome is a recessive genetic ailment that affects your body's capacity to eliminate excess copper, resulting in a deadly build-up. However, if diagnosed early enough, this illness can be cured. Some persons in remote and neglected locations, unfortunately, may not have access to healthcare. I concentrated on this group of people and developed a web service that can identify Wilson's disease using a symptom known as Kayser-Fleischer rings, which are brown rings around the iris produced by an excess of copper.

- **Genetic Diseases**

With a global population of over 7.6 billion people, around 61 crore people are affected by uncommon genetic illnesses. Despite the fact that this is a large report, we still don't see them receiving sufficient care. They are an underserved segment of our community,

and we must take appropriate measures to help them. Though we may not be able to entirely cure the majority of them, we can certainly make a difference in their life by making small gestures.

Methodology

Agile Software Development Methodology is used in making micro-MediDetect-age by dividing the large project feature into small chunks and agile sprints. Dividing the project into two agile sprints with each sprint further divided in 3 phases:

1. Planning and Prototyping Phase: In this proper workflow structure was made with techstack and functionalities to be implemented. Followed by that, prototyping by designing the UI on Figma and then implementation of it as website.
2. Implementation- building the fully functional features in this phase.
3. Testing and Review

First Sprint:

Starting Date: 7th May, 2022

Ending Date: 20th May, 2022

Features Developed and Released: Heart pulse rate detection model using face recognition and deployment using streamlit, account creation system, Wilson Detection model.

Second Sprint:

Starting Date: 20th May, 2022

Ending Date: 26th May, 2022

Features Developed and Released: Involved ironing out bugs from the first sprint, website creation, genetic diseases prediction feature using face recognition, voice chatbot and immediate hospital finder.

Following Agile SDLC involved releasing the features like heart rate model by deploying it and enhancing its accuracy parallelly with other features. It resulted in

completion of project in time, ready to make changes and frequent delivery of product.

Tools and Technologies/ Techstack:

Frontend:

- HTML
- CSS
- Javascript
- Jquery

Backend:

- PHP
- MySQL for database

Building models/features:

- Python
- Machine Learning
- Tensorflow
- Opencv
- Pytorch
- Streamlit
- Numpy
- Deep Learning

- **Figma for Design:**

<https://www.figma.com/file/PLF0WhBHO1Fgt3LyluLXZZ/micro-Medi-Detect-age?node-id=0%3A1>

Features/Project Services

1. User Login/ Signup

1.1 Description: Users can securely login with their email id and password used for creating an account on micro-MediDetect-age

1.1.1 Input: Name, email ID, password for account creation, and email ID and password

1.1.2 Output: Redirect if successful login/ account creation and error message displayed if wrong details entered.

2. Heart Rate Detector Model:

2.1 Face Recognition

2.2 Forehead detect in face

2.2 Heart Rate/ Pulse Rate Detection Model

2.3 Web Electrocardiogram Generation

3. Wilson Syndrome Detector

3.1 Face and Eye Recognition

3.2 Kayser-Fleischer rings / Brown rings detection in eyes to detect disease

4. Genetic Disease Detector

5. Immediate Hospital Finder

6. Voice Chat Bot

7. Proper Documentation

Working/Workflow

- **Heart Rate Detection:**

Traditional heart rate monitoring is done with a chest strap or an optical sensor on the back of a smart watch. However, optical heart rate measurement's accuracy and reliability vary from person to person, and it may not operate at all with specific activities or sports. Currently, the most precise wrist heart rate measurements are within 10% of the chest-measured heart rate 80% of the time. Although chest straps are more accurate, they are also more burdensome. Furthermore, for many people, the expense of a fitness watch or chest is unreasonable. Recent advances in machine learning have enabled a new method of measuring heart rate that is more accurate than earlier approaches based just on video.

Given the exponential surge in telehealth owing to the pandemic and its possible use cases, we designed a web app to provide a way to detect heart rate or aid enhance the tools already available.

Photoplethysmography is a technology that uses light to obtain heart rate information. Photoplethysmography refers to the recording of swellings as they appear in the light, as loosely translated from its Greek roots. Swellings are caused by blood being pushed from the heart to every region of the body via the circulatory system, which is made up of blood vessels. The volume of blood that reaches the capillaries in the fingers and face swells and then recedes with each beat of a person's heart.

We can monitor heart rate by measuring ebb and flow using the flash of a camera phone to highlight the skin and create a reflection since blood absorbs light. Because the frames per second of a video are consistent, it may be used to detect heart rate quite accurately.

The simplicity of this low-cost, non-invasive, and safe video technology is difficult to surpass.

- **Wilson Syndrome:**

To recognise Kayser-Fleischer rings which are indication of Wilson Syndrome (dark rings that appear to encircle the iris of the eye due to copper deposition) ,my programme employs a neural network to implement this. The machine learning model is then uploaded to Google's servers so that when the person visits the website where it is connected and deployed, it downloads the model and does the machine learning picture processing locally itself.

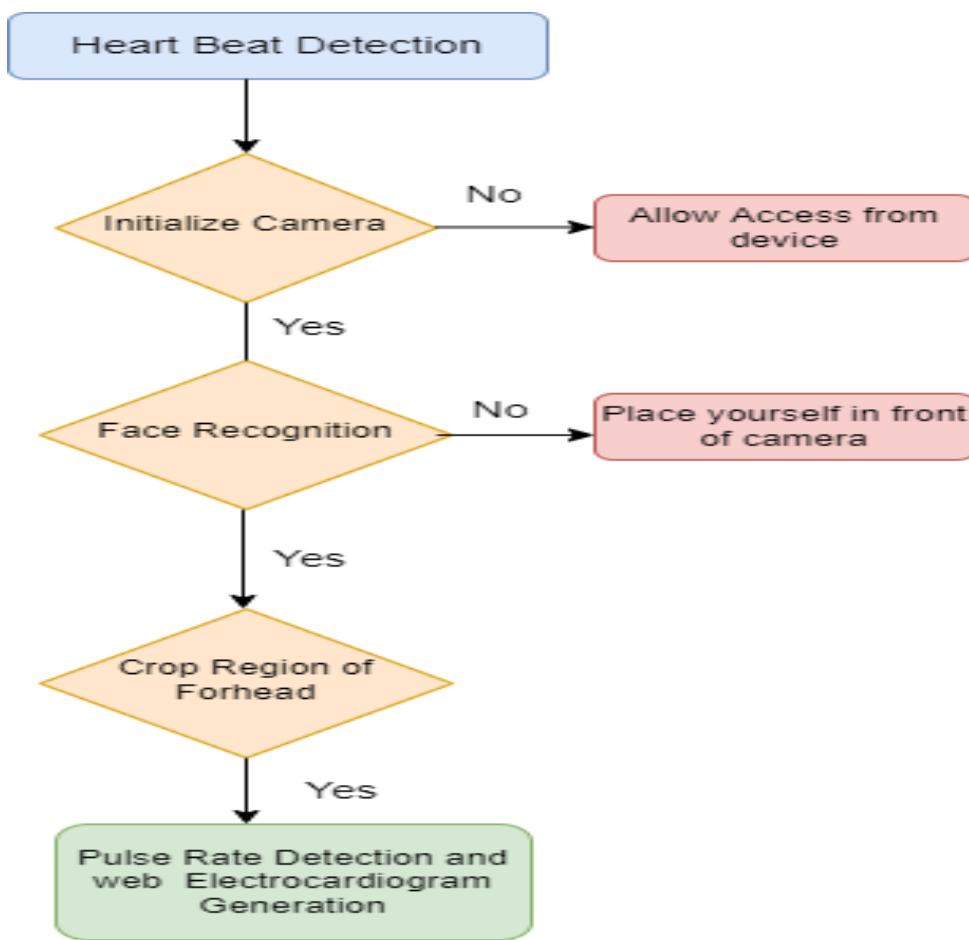
- **Genetic Disease**

On top of VGGFace, I used four Fully Connected layers. Then, on top of it, three fully linked layers and an SVM classifier. The Transfer Learning method allows us to re-use previously learnt features. The SGD optimizer was employed with a very low learning rate of 0.0001 and a momentum of 0.9.

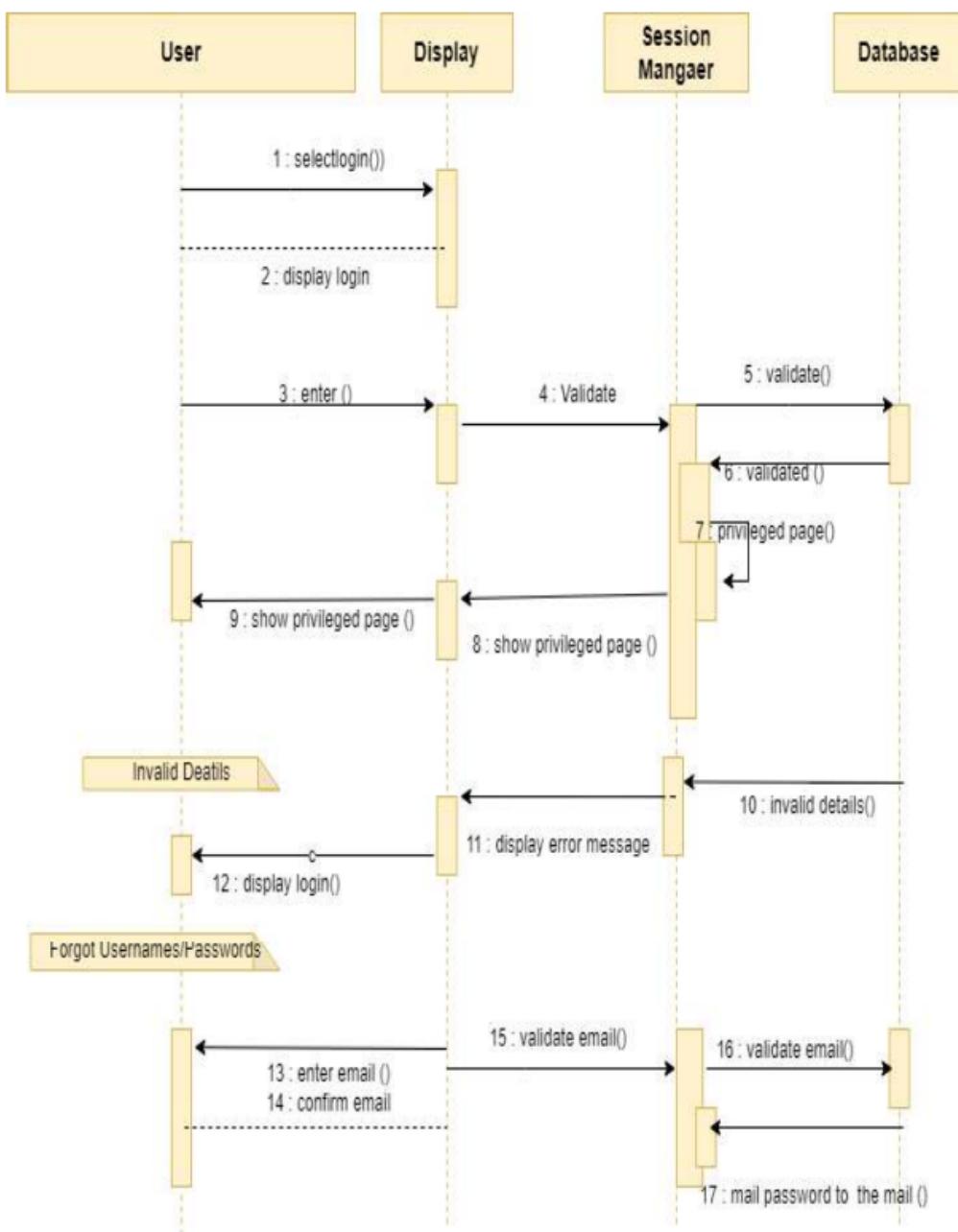
- When the validation loss stopped improving, a callback was defined in keras to reduce the learning rate by 0.1.
 - In each example, the batch size was set at 32.
 - As a baseline for good categorization, we try to reduce cross-entropy loss.
- The deep learning classifier was created using the keras (v2) package.
- The Tesla K80 GPU was used to train the model.
- The accuracies stabilised around 100 epochs after a total of 200 epochs were run.

UML Diagram and Flowcharts

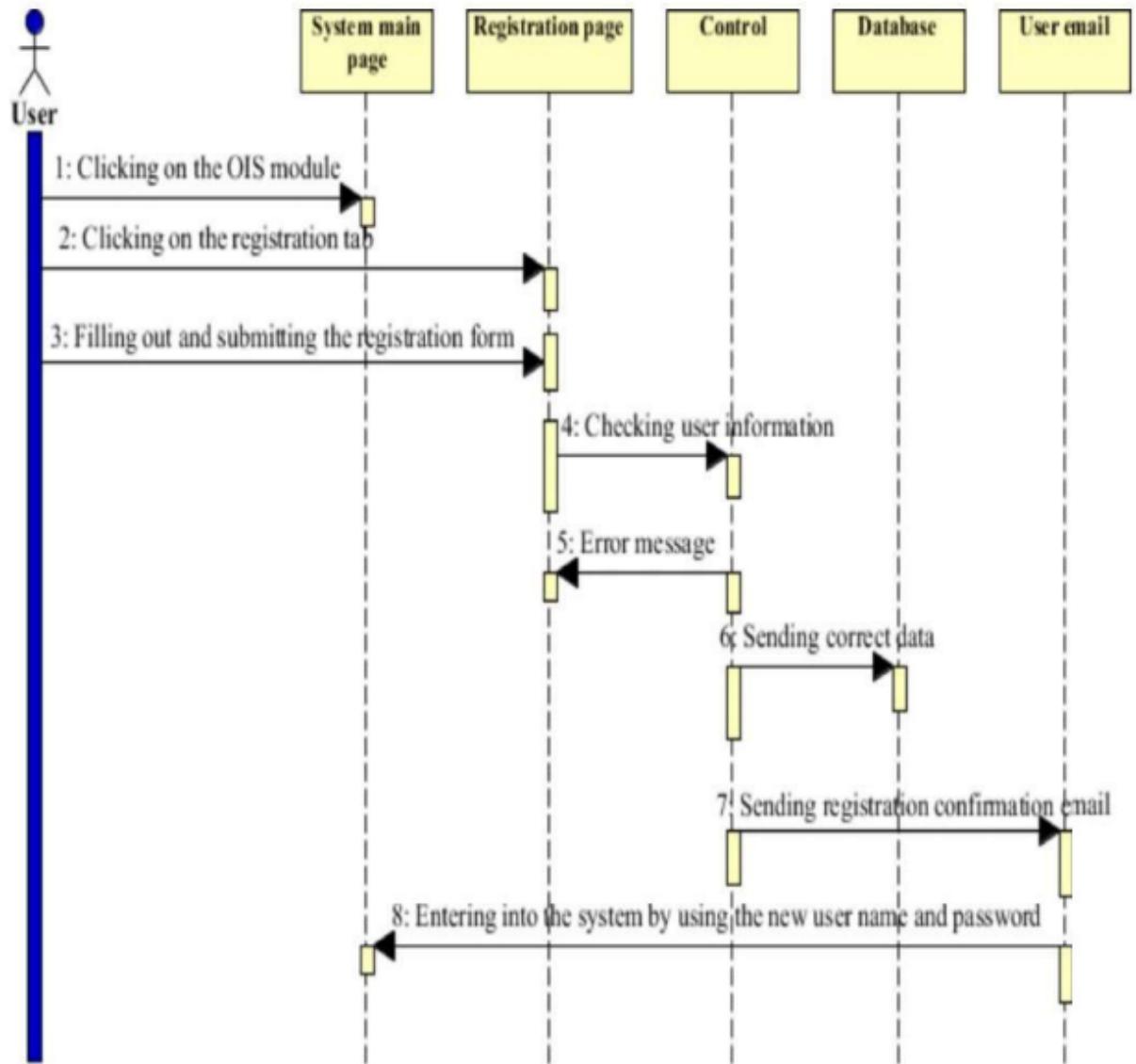
- Flowchart Diagram for Heart Rate Monitor System using Face Recognition



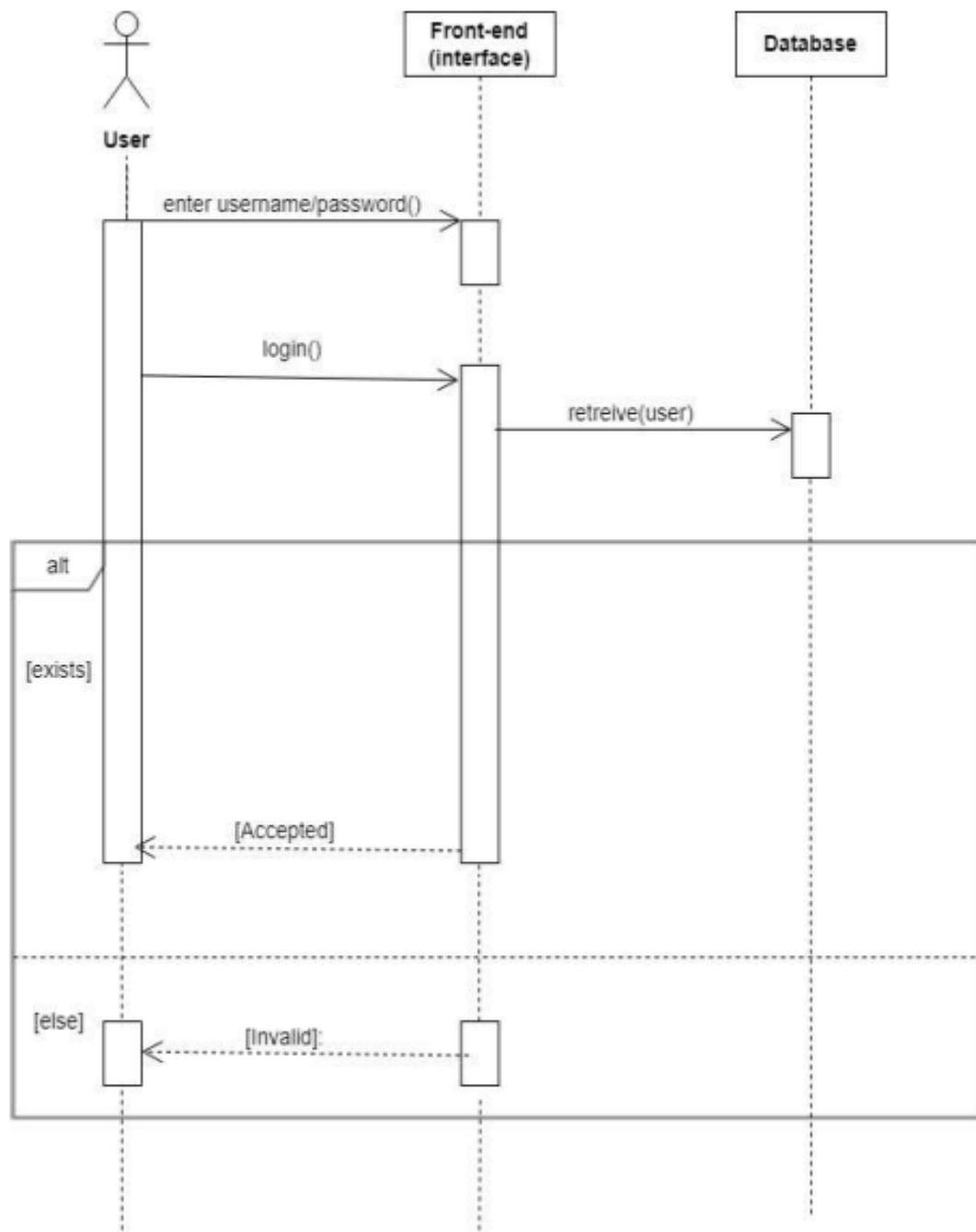
- Sequential Diagram for Login and Authentication



- **Sequential Diagram for User Registration:**



- **Sequential Diagram for Password Authentication**



Implementation

- **Heart Rate Monitor**

A face detector is used to cut a section of the forehead out of a live webcam feed to measure pulse rate remotely. The repetitions that are suggestive of a heartbeat are then examined on this region of skin.

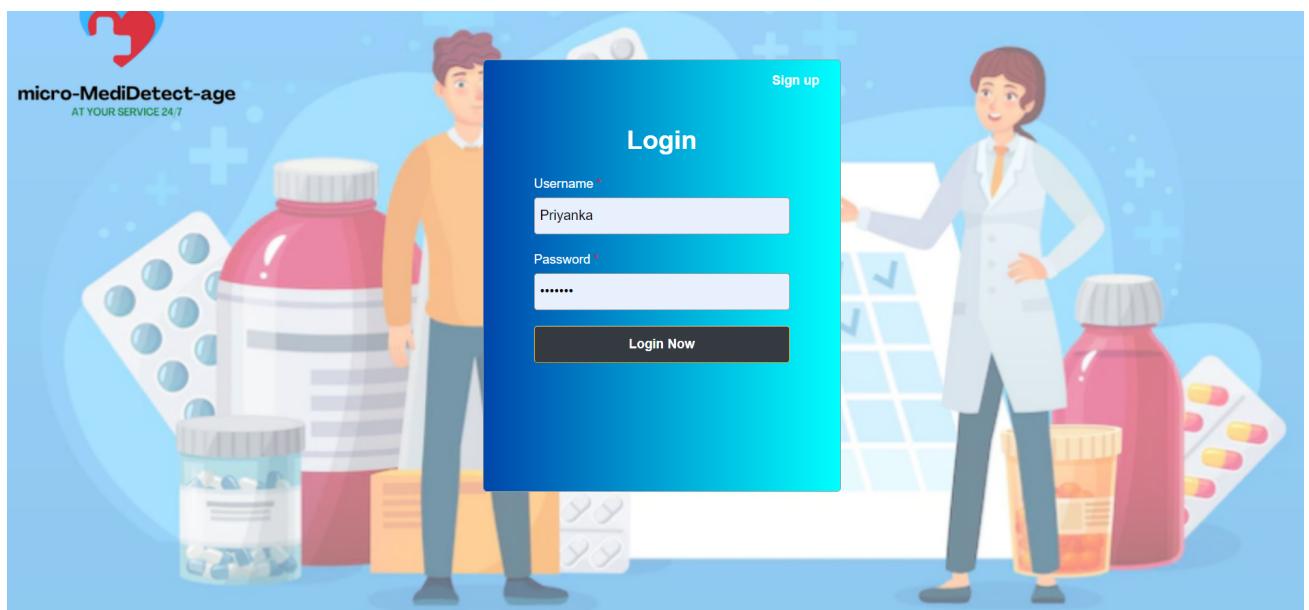
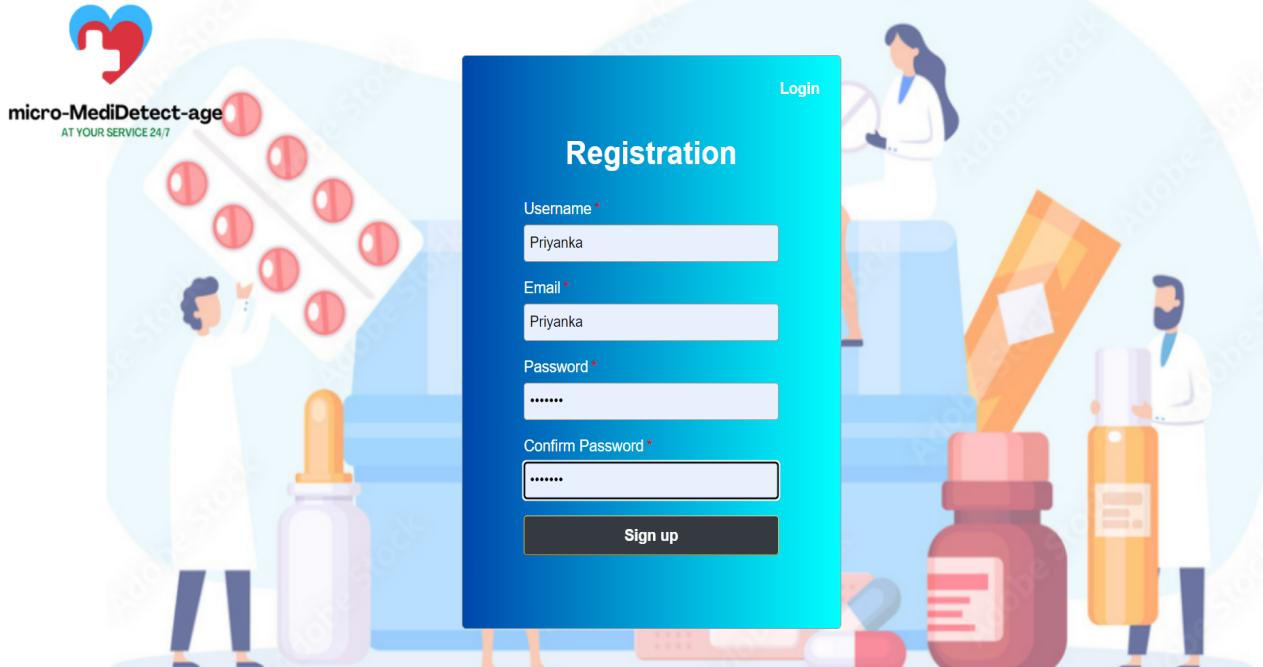
The RetinaFace mobilenet face detector is used in our system since it is both fast and reliable. This rapid face detector uses an 8-core CPU to run in real-time. This pipeline is implemented as a streamlit webpage that uses WebRTC to send frames to a server that handles the stream.

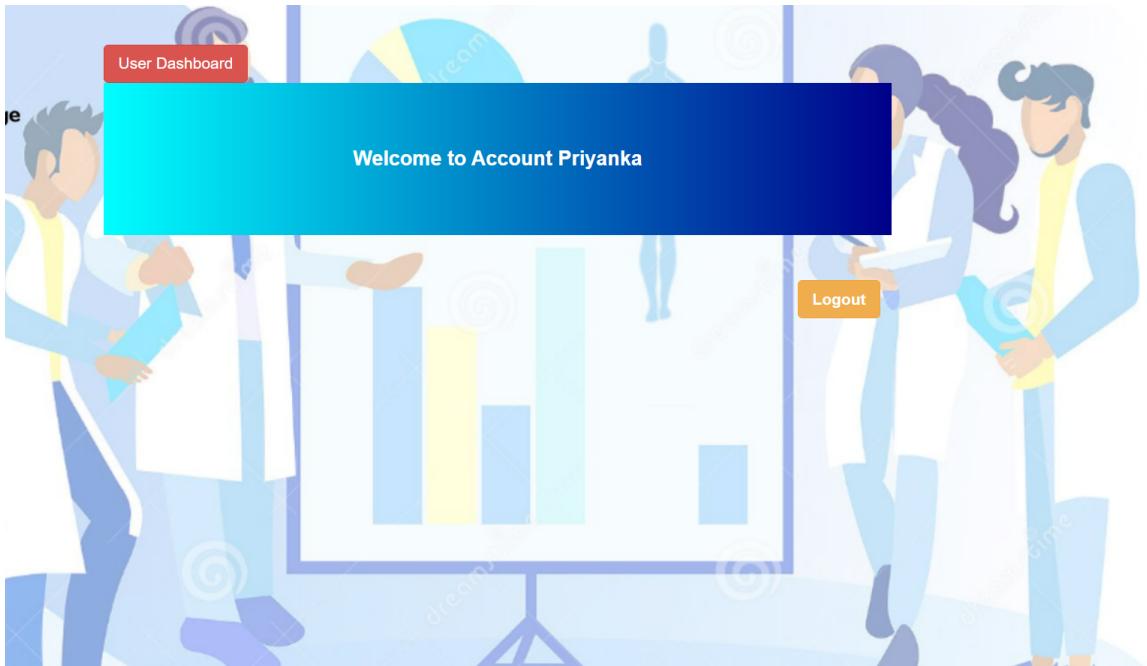
Watch Demo of this feature:

- **Wilson Syndrome Detector**

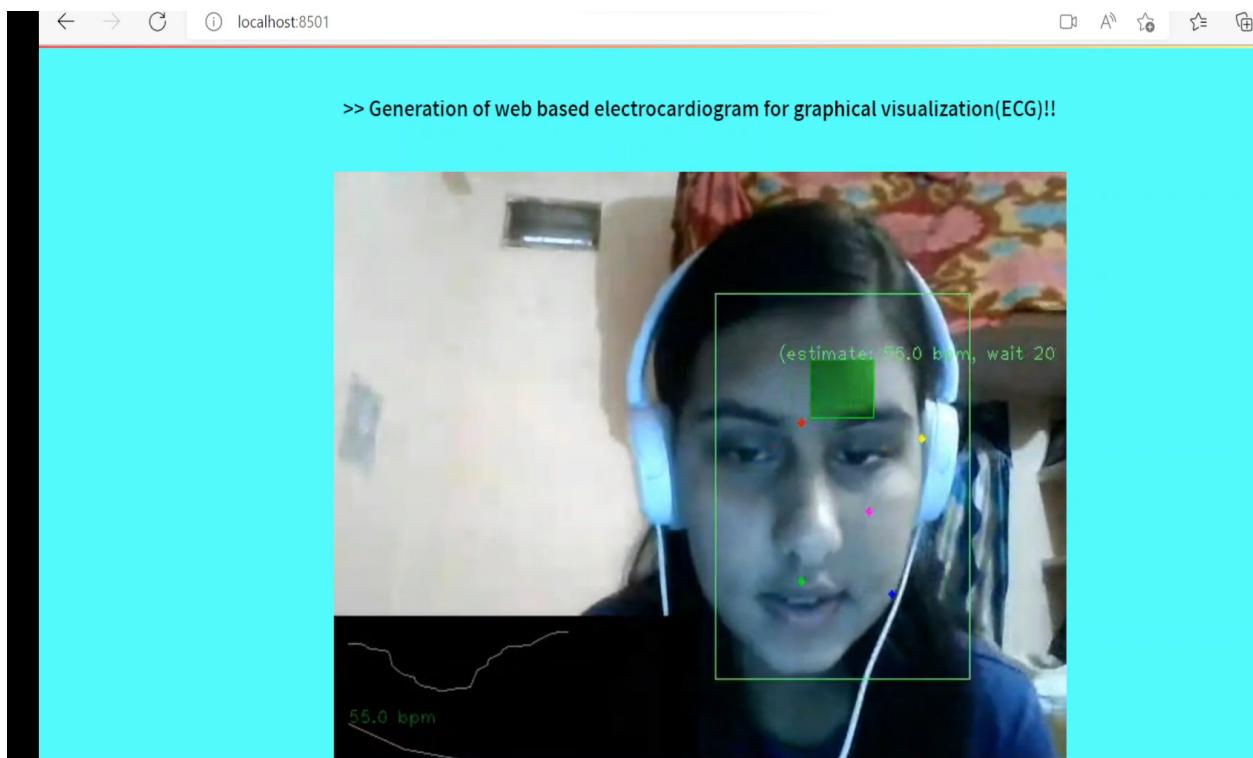
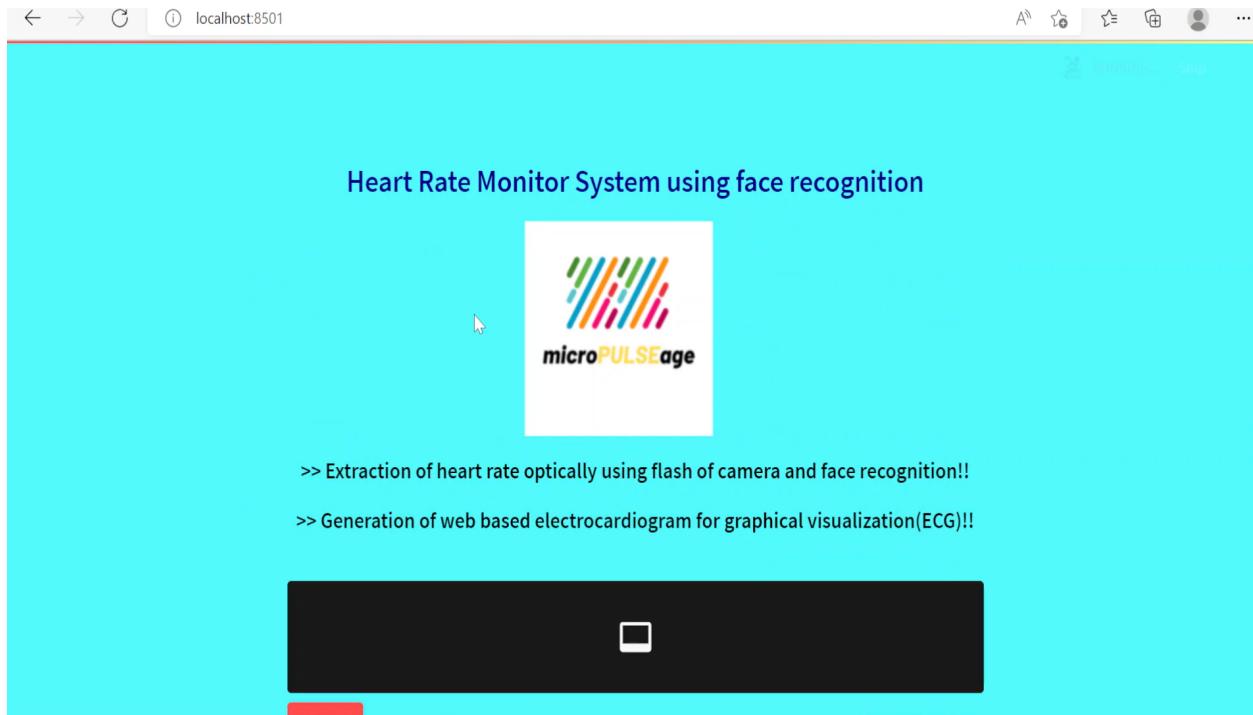
The method is originally a generic ml algorithm that is repurposed and altered to be more lightweight and suitable for the purpose. To establish the Wilson's Positive classification, the algorithm is trained with 35 photos of Kayser-Fleischer rings from patients with blue eyes. To establish the Wilson's Negative classification, it is trained with 25 photos of blue eyes without rings. Finally, the No Eye Detected classification is created by training it with 50 random photos. There were 500 epochs in total. I uploaded the model to an external server for hosting and then the website, which featured HTML/CSS, JavaScript, and JQuery, is created.

Prototype of UI and Screenshots of Project



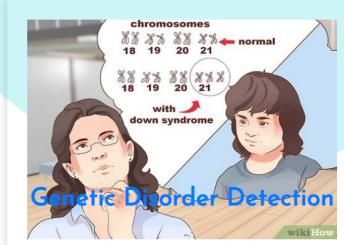
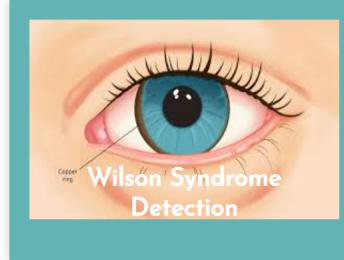


A mockup of a healthcare website for "micro-MediDetect-age". The header includes a logo with a heart icon and the text "micro-MediDetect-age AT YOUR SERVICE 24/7". Navigation links for "HOME", "SERVICES", "ABOUT", and "CONTACT" are at the top. A "HelpLine" button is in the top right. The main content area features a large call-to-action: "We Are Here For Your Care" and "To Ensure You're Healthy...". Below this, a message says "We are here for your care 24/7. Any help just call us." Two buttons are present: "Our Services" and "Chat with MediEngage". To the right, a circular graphic shows three people interacting with a large smartphone displaying a graph and the text "MONDAY 7 AM".



SERVICES

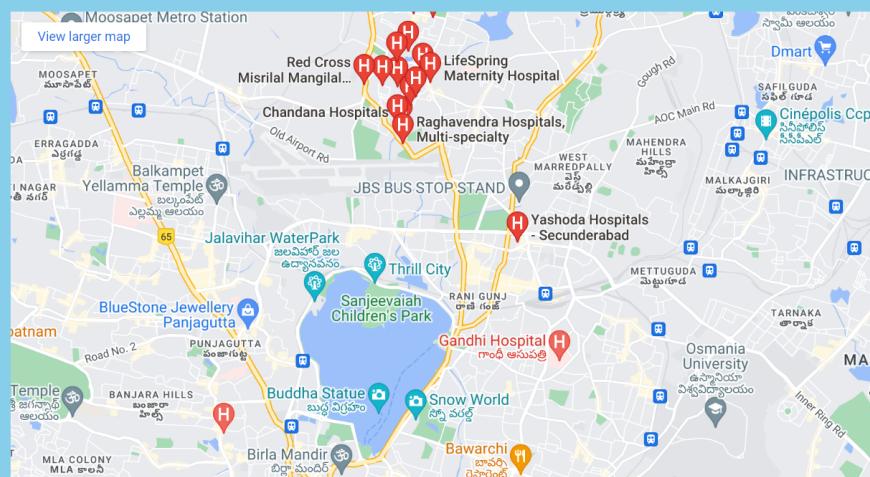
Non-Invasive, low-cost and safe Disease Detection features using face recognition to ensure your well being !!
All the best!



hospitals during emergency.

Address

Plot no.83 new bowenpally, Hyderabad



About micro-GeniDetect-age and its features

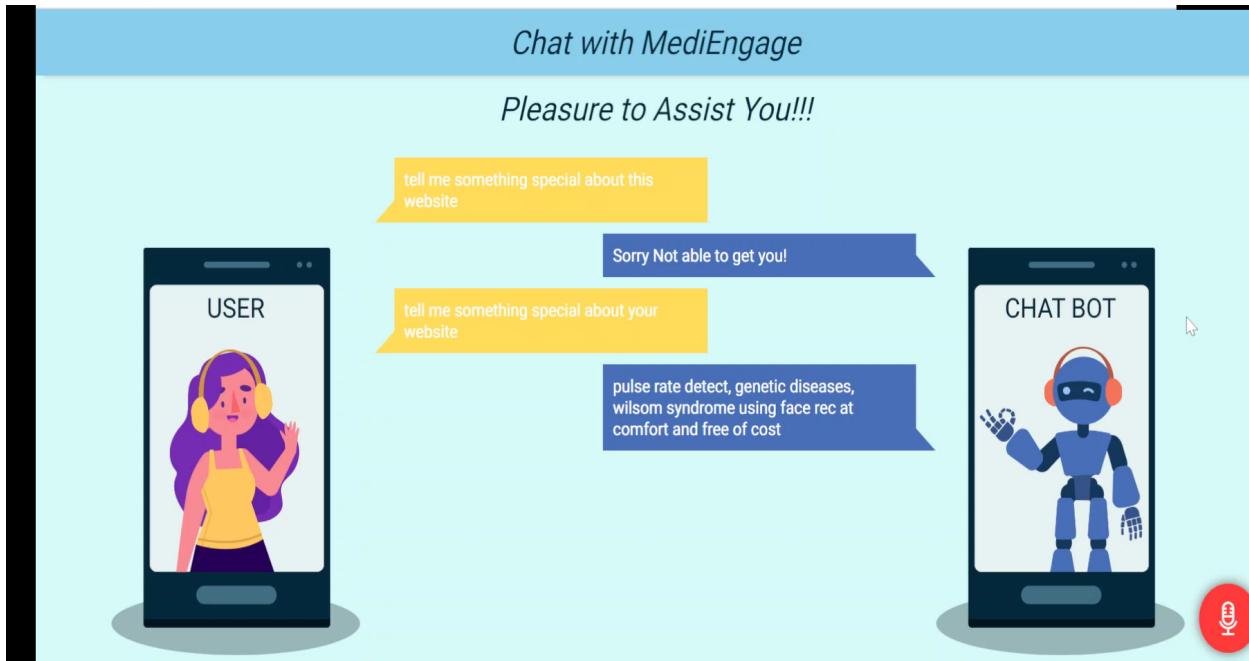
Problem:

With a global population of over 7.6 billion people, around 61 crore people are affected by uncommon genetic illnesses. Despite the fact that this is a large report, we still don't see them receiving sufficient care. They are an underserved segment of our community, and we must take appropriate measures to help them. Though we may not be able to entirely cure the majority of them, we can certainly make a difference in their life by making small gestures. Solving this problem - Click Button below :))

Gentic Disease Detect Model

Approach Used:

Employed the ResNet-50 design, which is based on residual learning networks and is therefore easier to optimize, allowing to train deeper networks. As a result, network capacity and performance are improved overall.



Testing

User Registration Test Cases:

Test Case ID	Test Objective	Test Data	Expected Results	Actual Results	Test Pass/Fail
UR01	Entering Only few fields of Registration Form	mail= nikhitha@gmail.com phone number=" " password="nik" confirm password="nik"	Error message to give all required details for registration	As Expected	pass
UR02	Registering with already existing mail	mail= tanmayee@gmail.com phonenumer="7075913589" password="nik" confirm password="nik"	Error message showing that the mail already exists	As Expected	pass
UR03	Registering with Different pass and confirm password	mail= nikhitha@gmail.com Phonenumber="7075913589" password="nik" confirm password="nikh"	Error message showing Password and confirm password doesn't match	As Expected	pass
UR04	Registering with Valid Data	mail= nikhitha@gmail.com Phonenumber="7075913589" password="nik" confirm password="nik"	Successfully logged in to their profile	As Expected	pass

Manual Testing for possible test cases :

- Testing done for possible test cases are shown below:

1	micro-MediDetect-age	Project Name: micro-MediDetect-age	Microsoft Engage 2022				
2		Test Cases Executed By:	Priyanka Kumari				
3		Test Case Execution Date:	27th May, 2022				
4	Test Cases	Test Title	Test Step	Test Data	Expected Result	Actual Result	Status
5	1.	Test Signup Successful	Successful creation of account	Name, email ID, password	Successful Message and redirects to login page	Successful Message and Redirected to login page	Passed/Success
6	2.	Test Successful Login	User enter credentials and login	username, password	Redirecting to Home Page	Redirected to Home Page	Passed/Success
7	3.	Test Unsuccessful Login	User enter wrong credentials	username, wrong password	Display error message	Displayed error message	Passed/Success
8	4.	Test Successful Heart Rate Generator	Heart Rate/ Pulse Rate Generated with web electrocardiogram	Users Face Recognition, Webcam	Heart Rate and electrocardiogram generation	Heart Rate and electrocardiogram generated	Passed/Success
9	5.	Test Unsuccessful Heart Rate Generator	Face not Recognized	No Webcam or no user face recognition	No Pulse Rate and Electrocardiogram generation	No pulse rate /electrocardiogram generated	Passed/Success
10	6.	Test Successful Wilson Syndrome	Face Detection and generation of Wilson Syndrome	Webcam /Image having face/ Live user face	Outcome generation of Wilson Syndrome	Outcome generated for Wilson Syndrome	Passed/Success
7	3.	Test Unsuccessful Login	User enter wrong credentials	username, wrong password	Display error message	Displayed error message	Passed/Success
8	4.	Test Successful Heart Rate Generator	Heart Rate/ Pulse Rate Generated with web electrocardiogram	Users Face Recognition, Webcam	Heart Rate and electrocardiogram generation	Heart Rate and electrocardiogram generated	Passed/Success
9	5.	Test Unsuccessful Heart Rate Generator	Face not Recognized	No Webcam or no user face recognition	No Pulse Rate and Electrocardiogram generation	No pulse rate /electrocardiogram generated	Passed/Success
10	6.	Test Successful Wilson Syndrome	Face Detection and generation of Wilson Syndrome	Webcam /Image having face/ Live user face	Outcome generation of Wilson Syndrome	Outcome generated for Wilson Syndrome	Passed/Success
11	7.	Test Unsuccessful Wilson Syndrome	Face/Eye not Recognized	Wrong input/image, webcam issue	No outcome generation for Wilson Syndrome	No outcome generated for Wilson Syndrome	Passed/Success
12	8.	Test Unsuccessful Eye Detection in Face	Users face and eye not detected	Webcam not initialized, wrong input/image	No detection of eye and Wilson syndrome	Wilson Syndrome and eye not Detected	Passed/Success

Future Scope

The future scope of my project includes improving the existing features and also adding new features:

- Deploying the model for genetic diseases detection (which can detect 7 different diseases) using face recognition using streamlit and then hosting it on heroku.
- Making Skin Disease Detection model using face recognition and then adding it as one more service. (Have made till skin detection on face and have to improve for disease detection)
- Automatic OTP Sender on mobile and email during login as one more security layer using WebOTP API.