Supervised By

Dr. Ibrahim Zaghloul

Dr. Desouky

TA. Mahmoud Hadad

Implemented By

Khaled Mohamed Soliman

Ziad Ayman Mohamed

Anas Barakat Ahmed

Mahmoud Ahmed Mohamed

Graduation Project Academic

Year 2022-2023

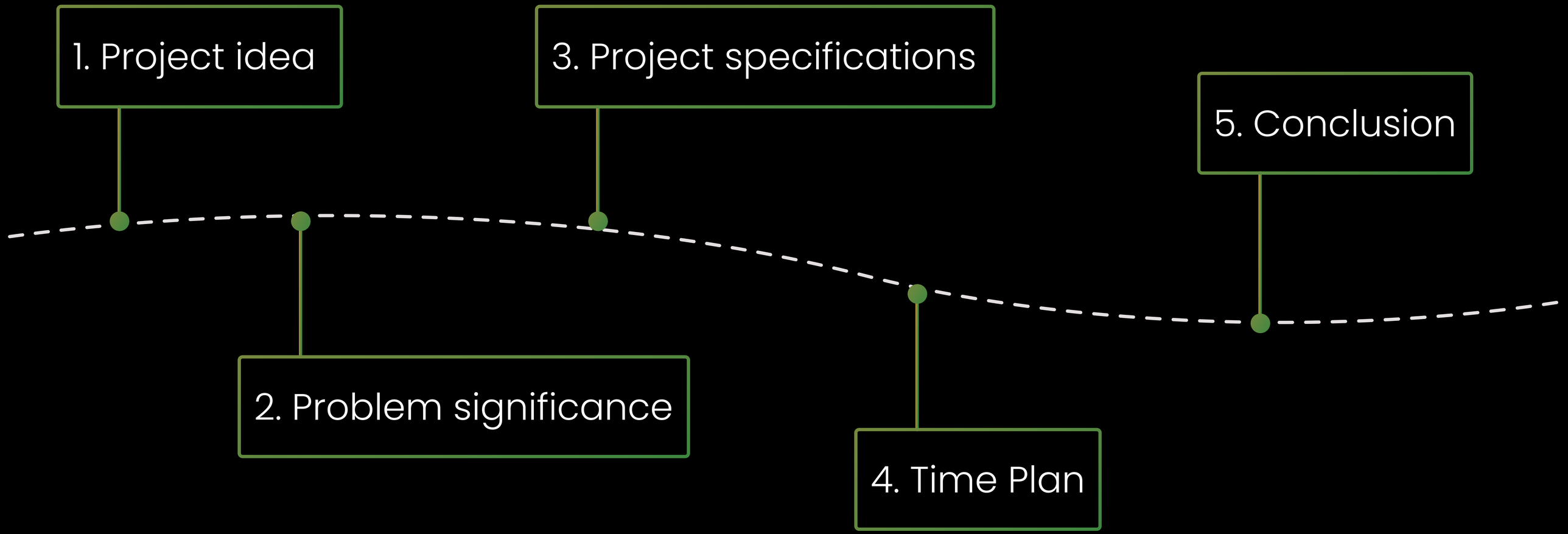
Final Presentation

OpticAI

Revolutionizing eye care with AI

OpticAI

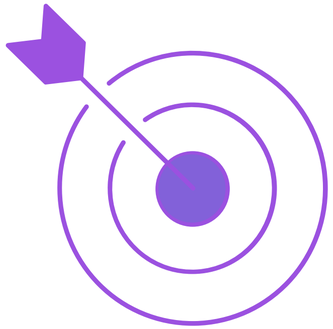
Content


1. Project idea
2. Problem significance
3. Project specifications
4. Time Plan
5. Conclusion

01 Project Idea

Project Idea

Idea: diagnosis of eye diseases such as cataract, glaucoma, diabetic retinopathy, AMD and Myopia through fundus images using powered AI.

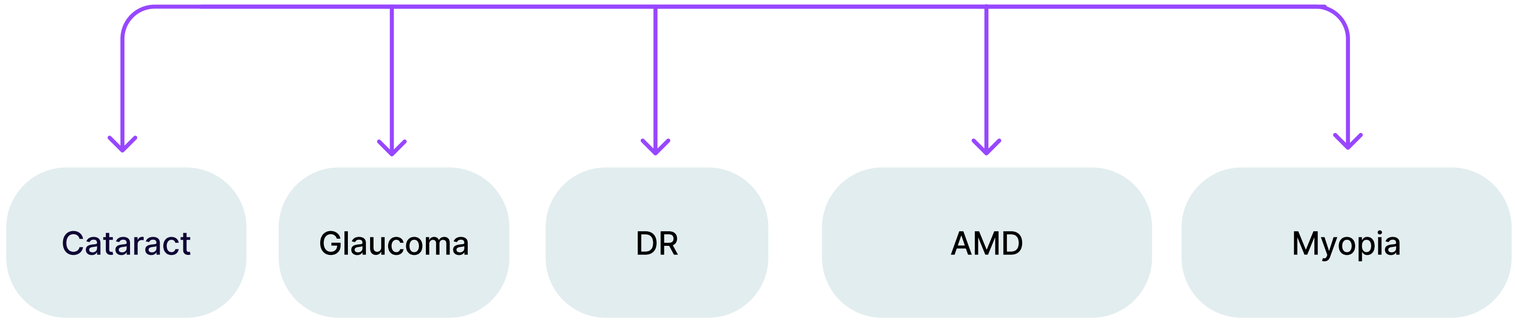


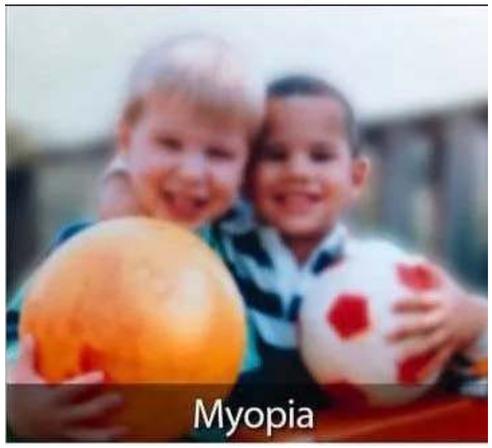
Domain: Bioinformatics , medical image diagnosis.

02 Problem Significance

What Is The Problem

We Aim to catch up with the eye disease diagnosis before it turns into vision loss, using high accuracy artificial intelligence models





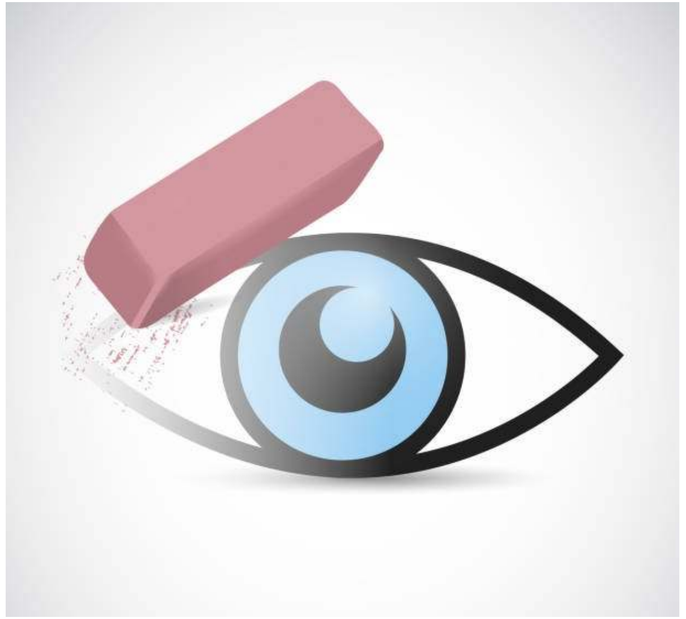
Why

•Eye Diseases Can Cause Gradual Vision Loss Without Noticeable Symptoms.

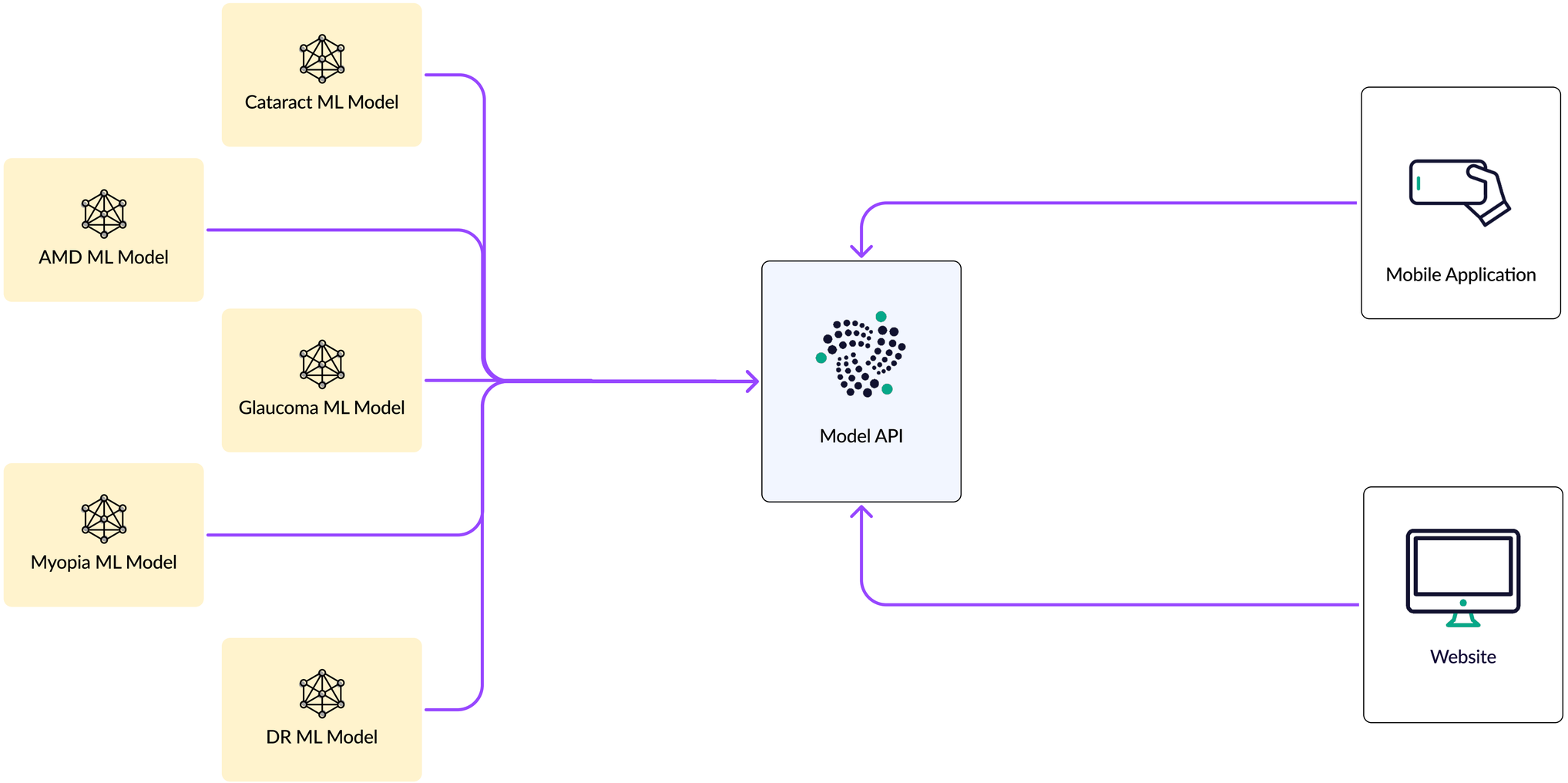
•Most Of These Diseases Cause Irreversible Damage To The Eyes.

•Manual Examinations Are Time-Consuming, Subjective, And Can Lead To Incorrect Diagnoses And Treatments.

•The Increasing Number Of People Suffering From Eye Diseases, Particularly In Developing Countries.



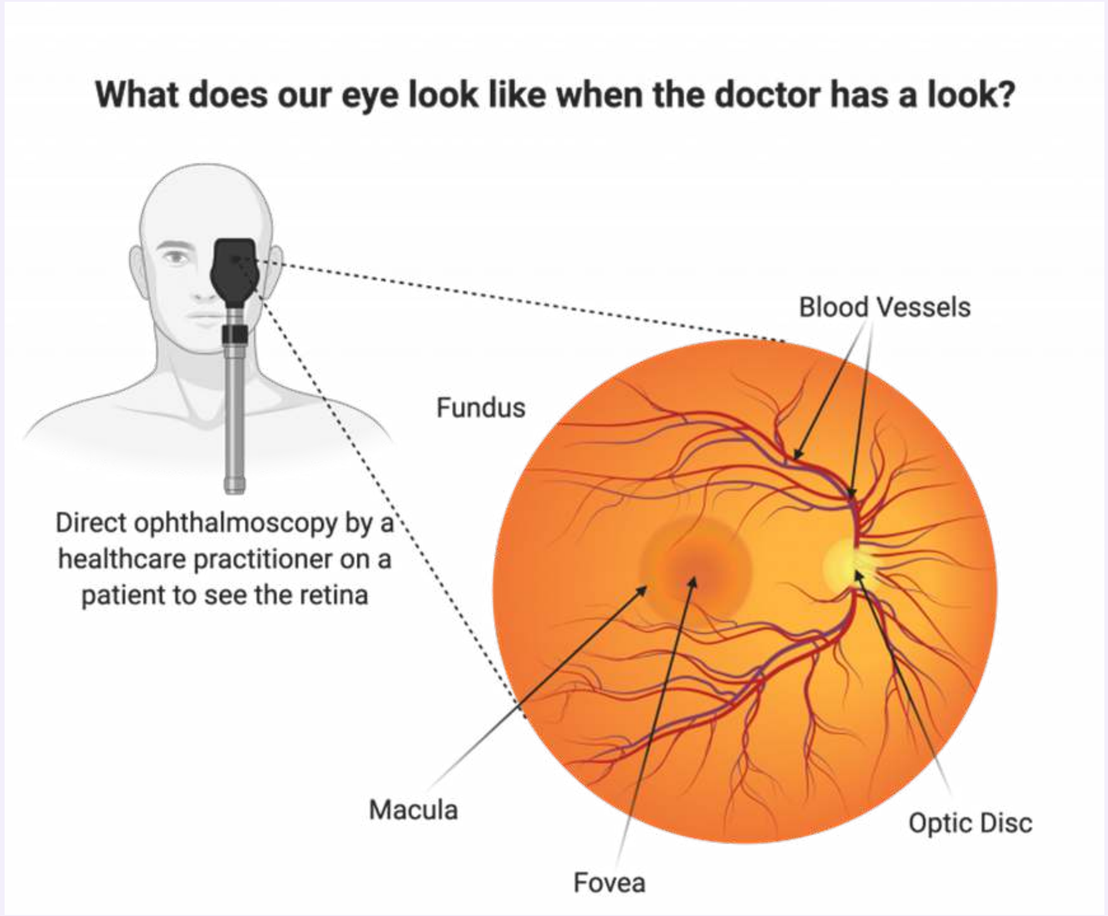
How


Cataract ML Model
AMD ML Model
Glaucoma ML Model
Myopia ML Model
DR ML Model
Model API
Mobile Application
Website

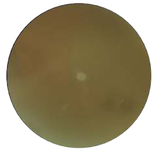
Dataset (Fundus)

Fundus images are photographs of the back of the eye, including the retina, optic disc, macula, and fovea.

These images are captured using specialized cameras



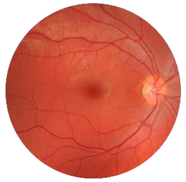
Models



Cataract

ResNet50
99%

1058



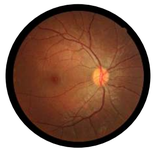
Dataset

Color Fundus Photographs/Images From Left And Right Eyes And Doctors' Diagnostic Keywords From Doctors.

1051

AMD

VGG19
84%



Glaucoma

VGG19
99%

1022

937

Mypoia

VGG19
97%

DR

InceptionV3
95%

2800

620

Hypertension

VGG19, EfficientNetB0
72%

Cataract

Assessment

91%

Our old work

CNN efficientB0

Cataract 400 fundus images

96%

Related work

CNN

Cataract ODIR-5k 1058

fundus images

Final

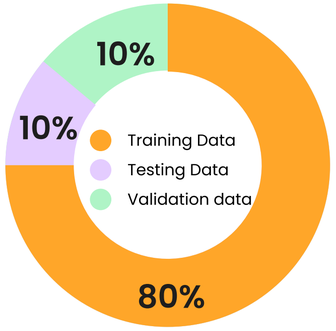
99%

Cataract

Dataset

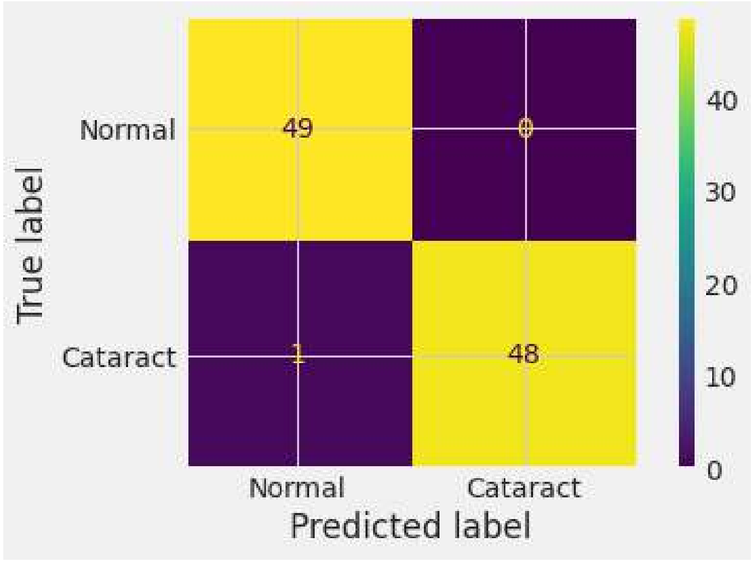
Ocular Disease Intelligent Recognition (ODIR)

- 1058 Fundus Images

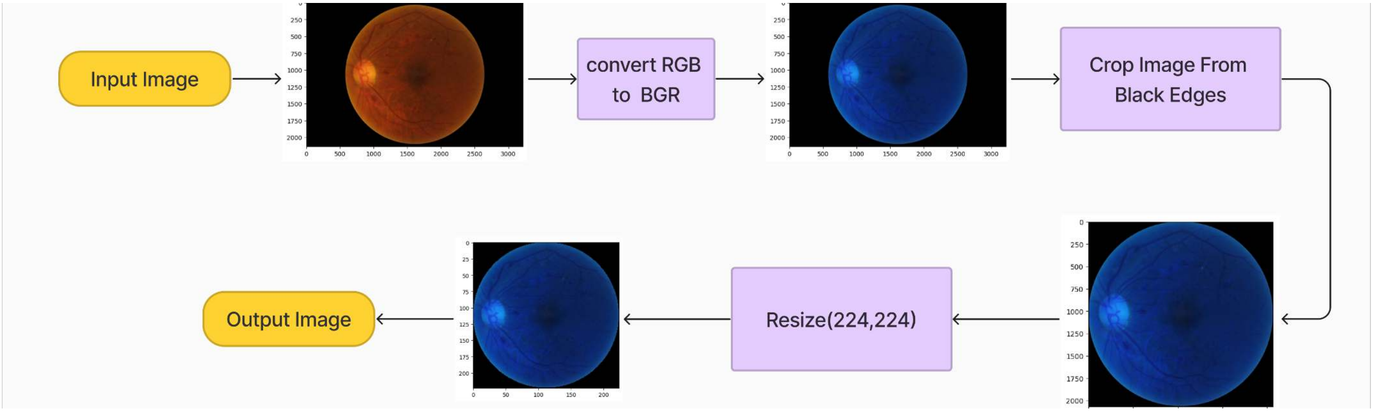


Confusion Matrix

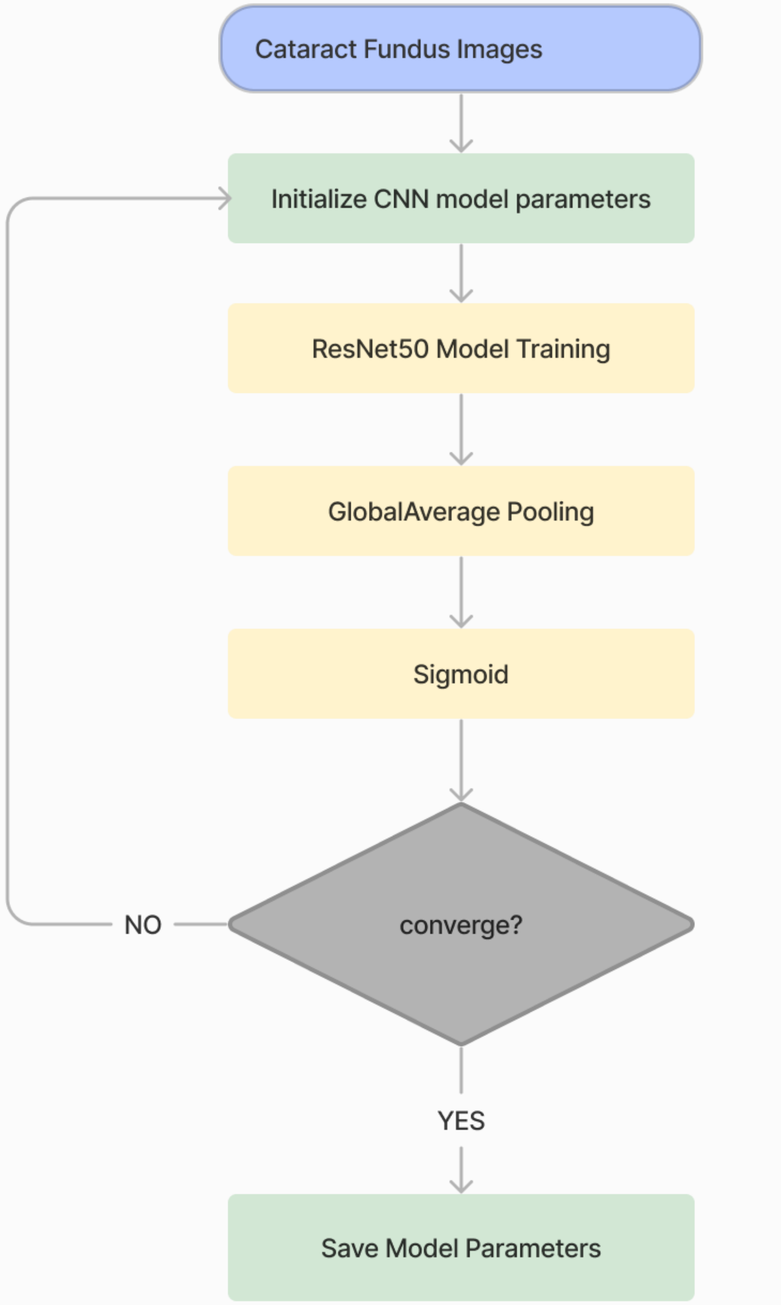
99% acc



Preprocessing



Model Architecture



Glaucoma

Assessment

83%

Our old work

CNN 12 layer

Glaucoma 1253 fundus images

93%

Related work

CNN

LAG database

fundus images cropped to optic cup

Final

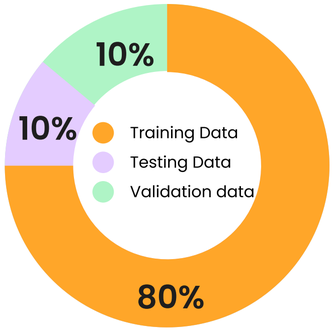
99%

Glaucoma

Dataset

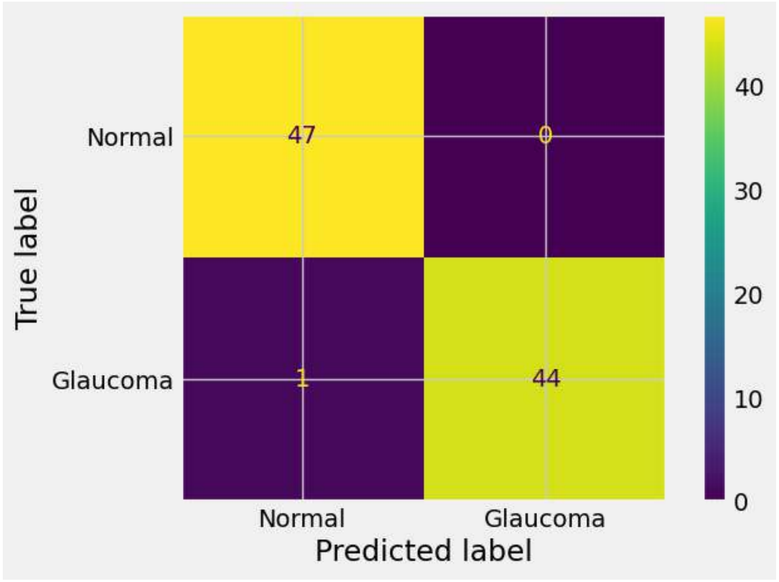
GlaucomaDatase From Kaggle

- 1022 Fundus Images

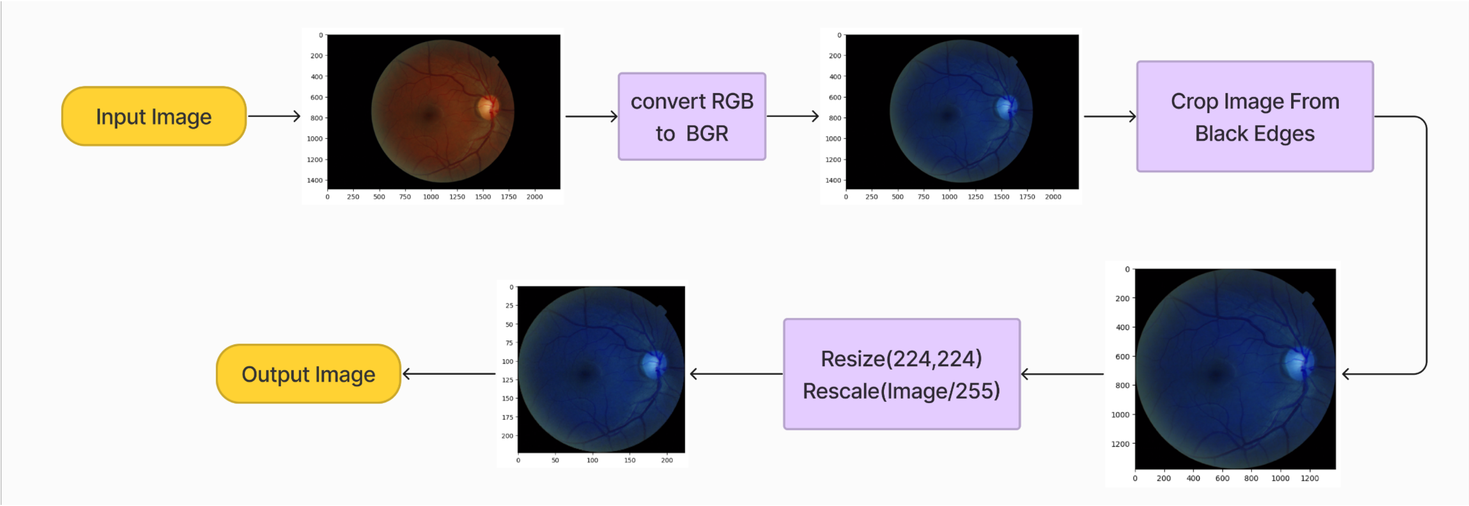


Confusion Matrix

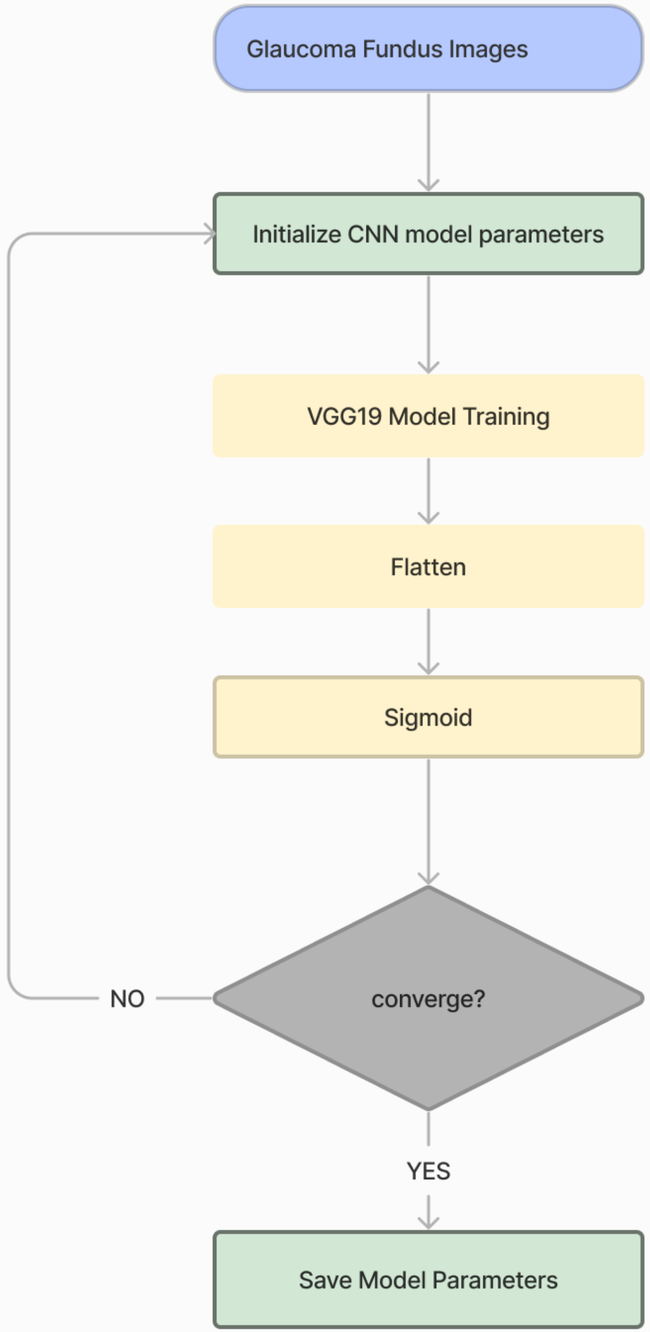
99% acc



Preprocessing



Model Architecture



Diabetic Retinopathy

Assessment

75%

Our old work

CNN 7 layers

Messidor-1 1744 images

96%

Related work

unknown model

Messidor-2

Final

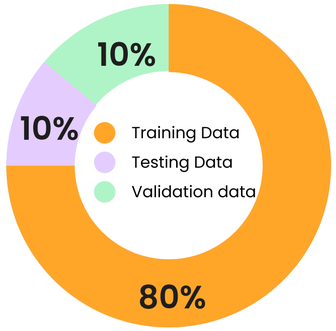
95%

Diabetic Retinopathy

Dataset

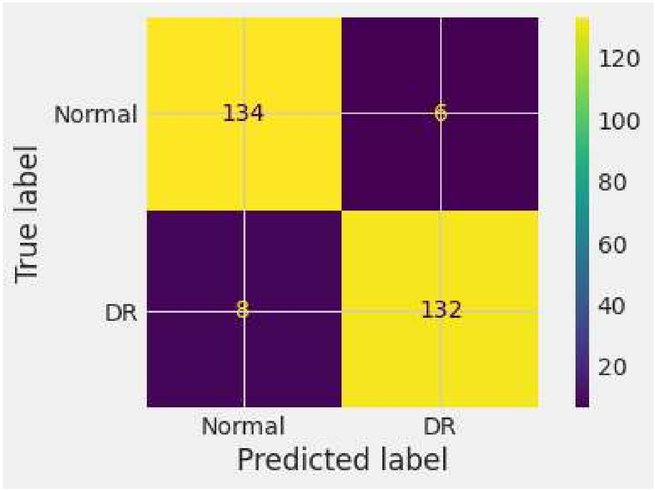
Asia Pacific Tele-Ophthalmology Society(Aptos-2019-Blindness)

- 2800 Fundus Images

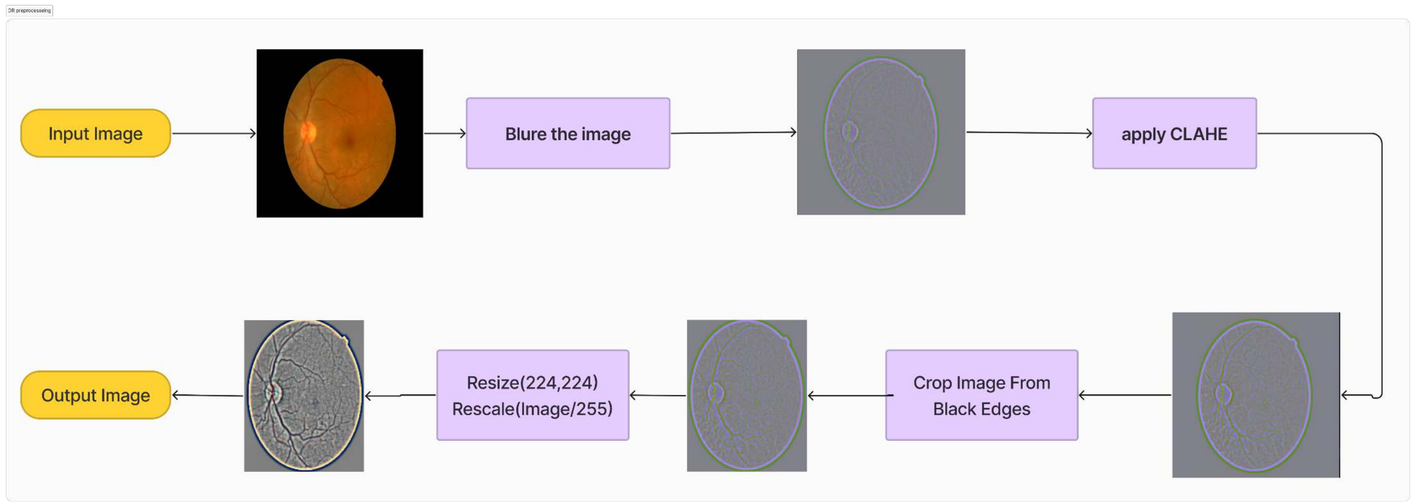


Confusion Matrix

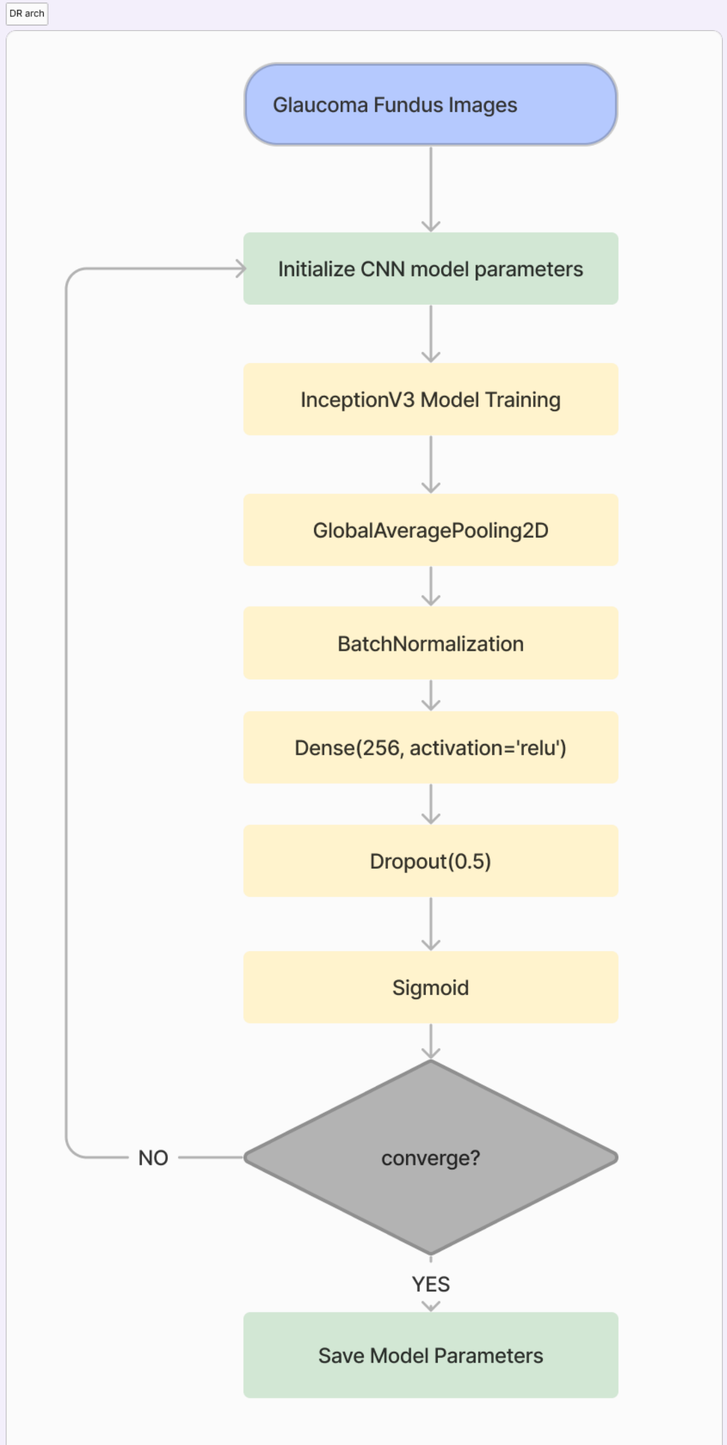
95% acc



Preprocessing

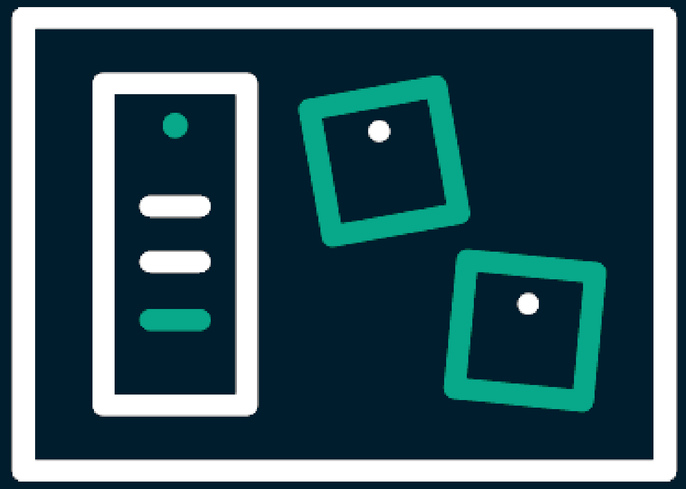


Model Architecture



Experts Feedback

(Dr. Amro Al Shafi - PHD In Ophthalmology)



1- Common Diseases

- age-related macular degeneration (AMD)
- Hypertension
- Mypoia

2- Simultaneously Diagnosis

we provide 5 eye classification models that can work simultaneously to diagnose multiple diseases at once.

3- Motivation

Doctor inspired us to continue on such project as it can be used for insurance and periodic check up

AMD

Assessment

82%

Our old work

InceptionV3

ODIR5K

91%

Related work

Nine layer CNN model

Private dataset

Final

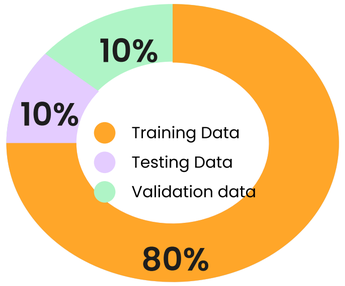
84 %

AMD

Dataset

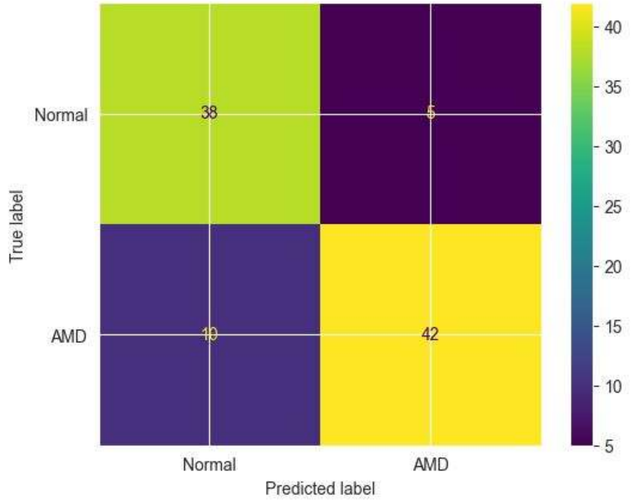
Ocular Disease Intelligent Recognition (ODIR5K)

- 1051 Fundus Images

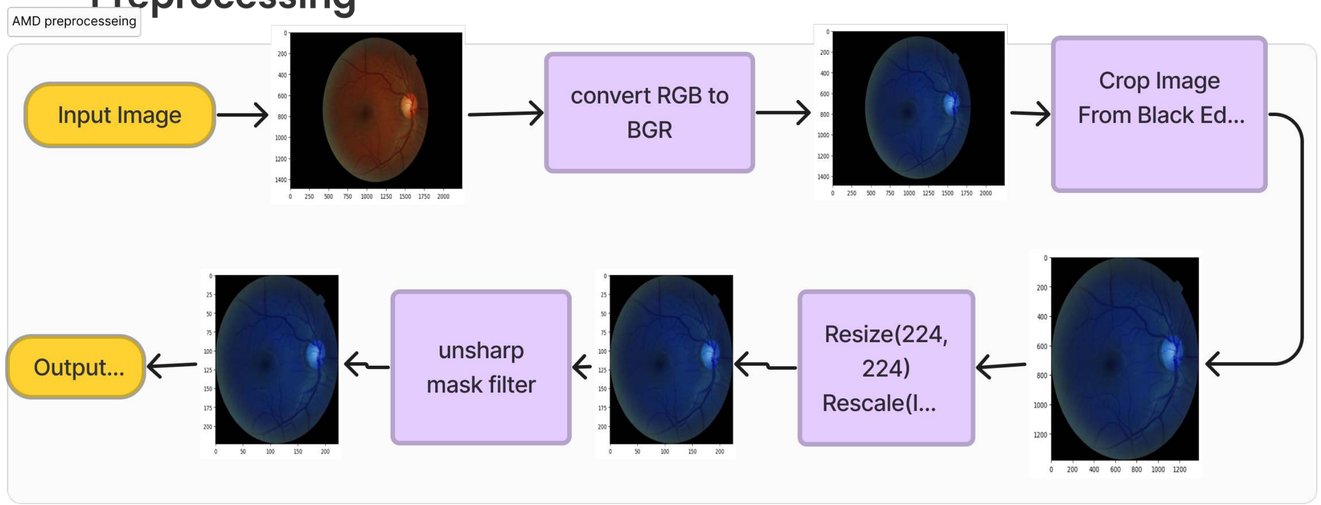


Confusion Matrix

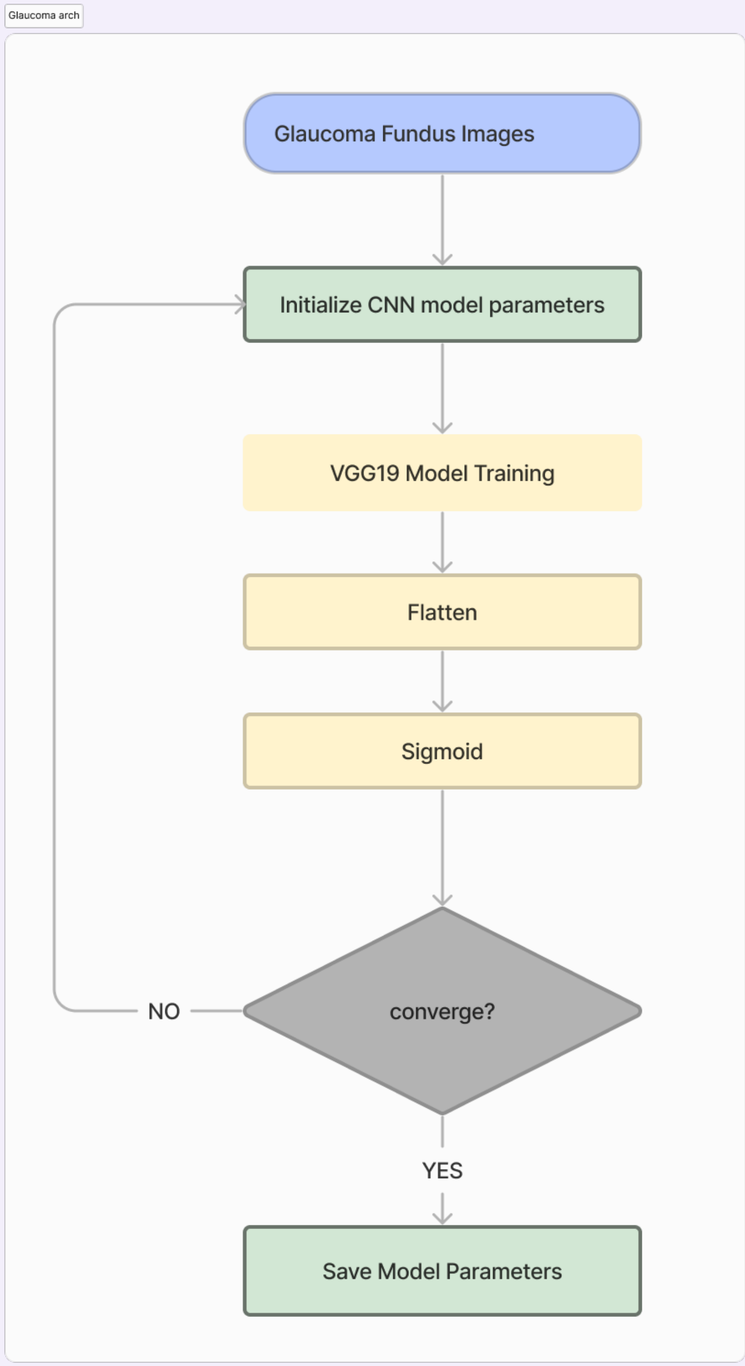
84% acc



Preprocessing



Model Architecture



Myopia
Assessment

Final

94%

Our old work

ResNet50, efficientB7

ODIR5K

98%

Related work

VGG19

ODIR5K

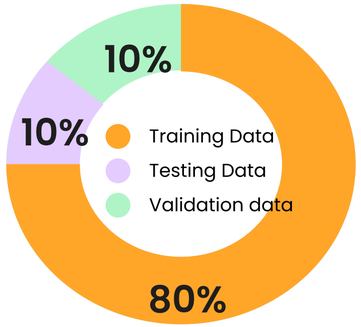
97%

Myopia

Dataset

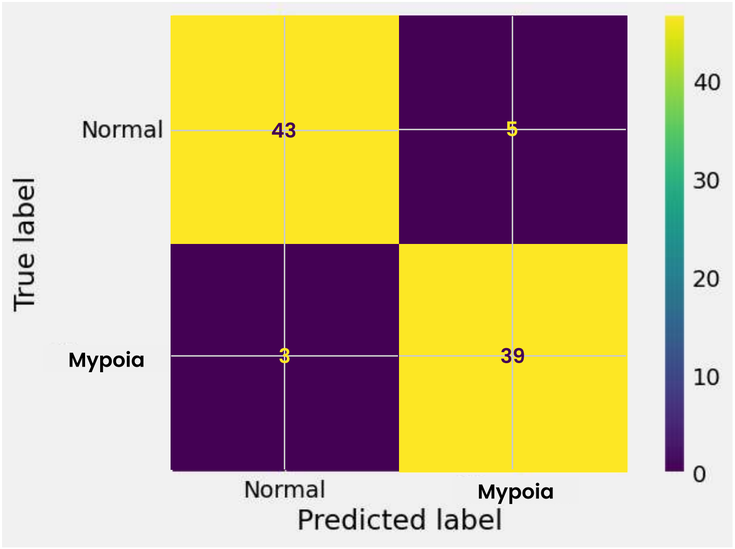
Ocular Disease Intelligent Recognition (ODIR5K)

- 973 Fundus Images

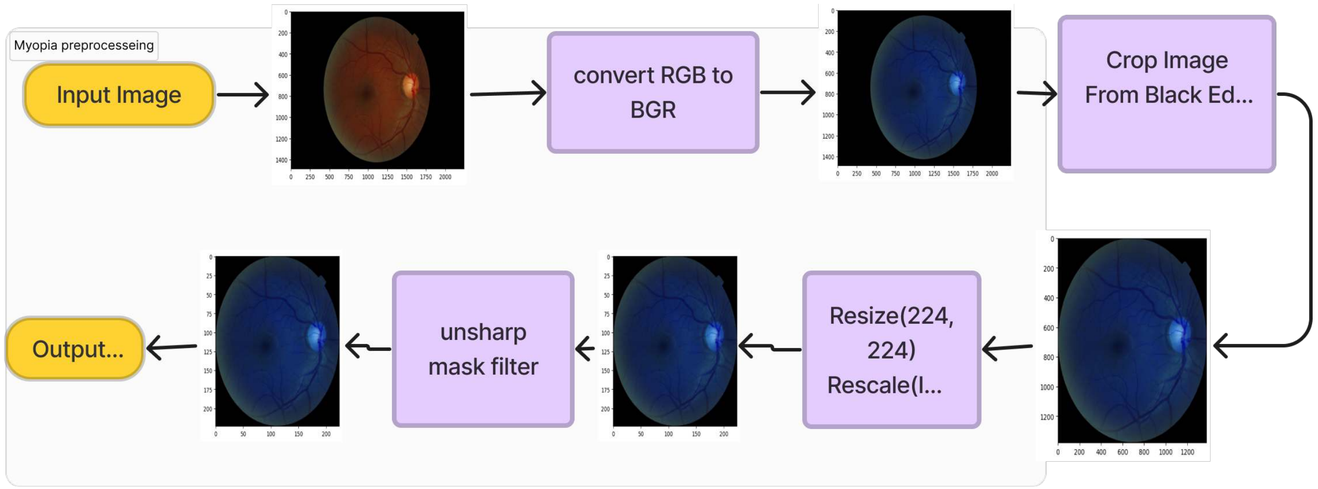


Confusion Matrix

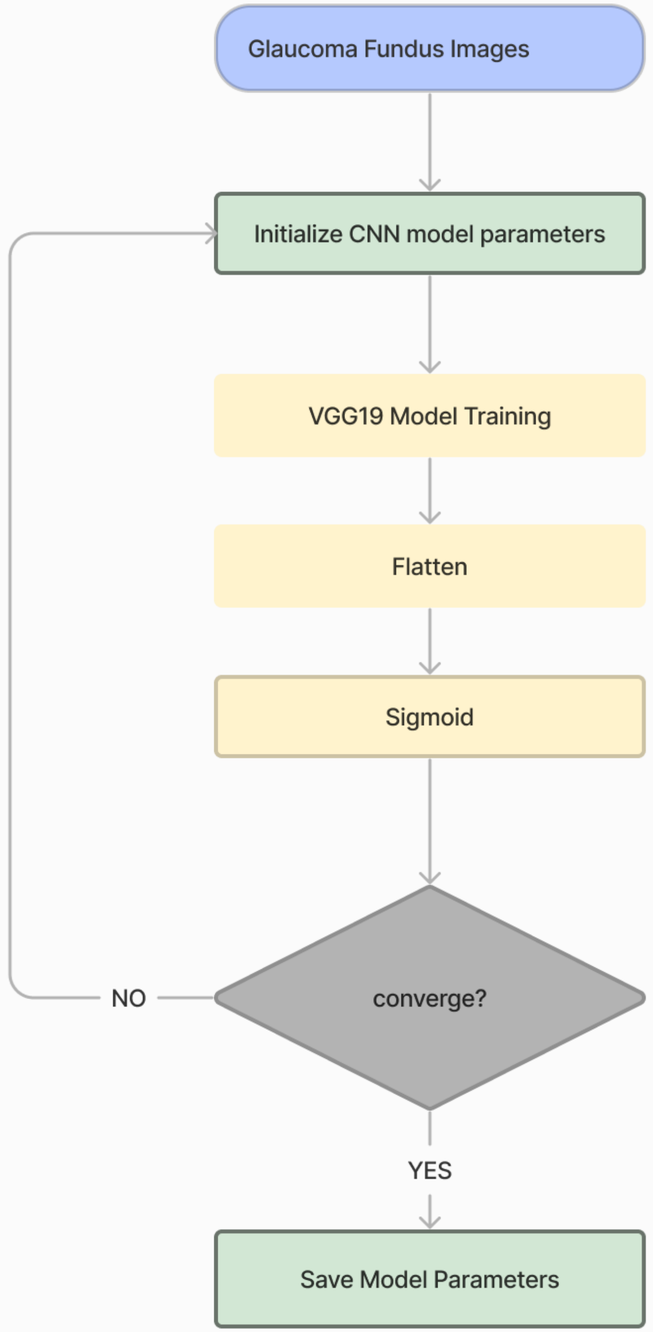
97% acc



Preprocessing

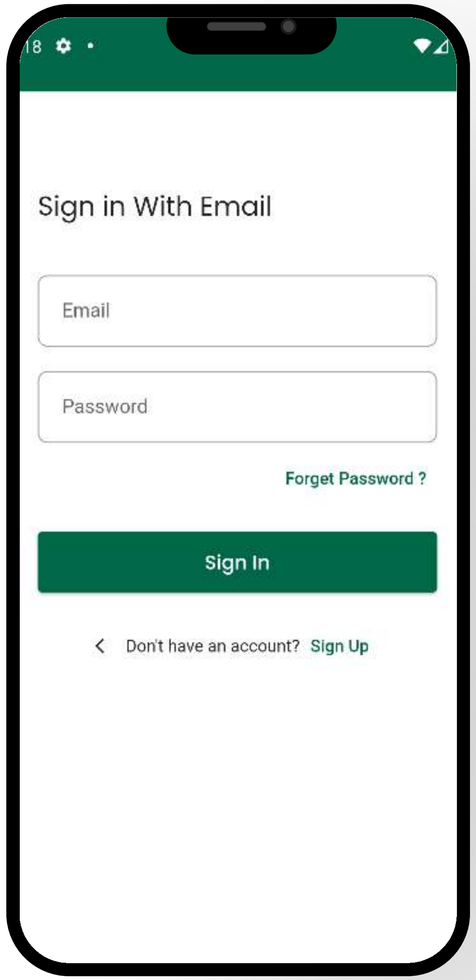


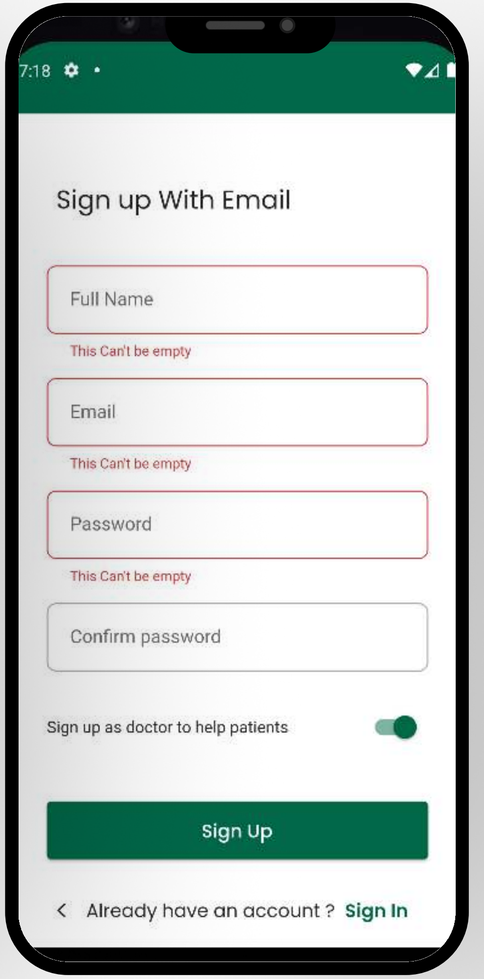
Model Architecture

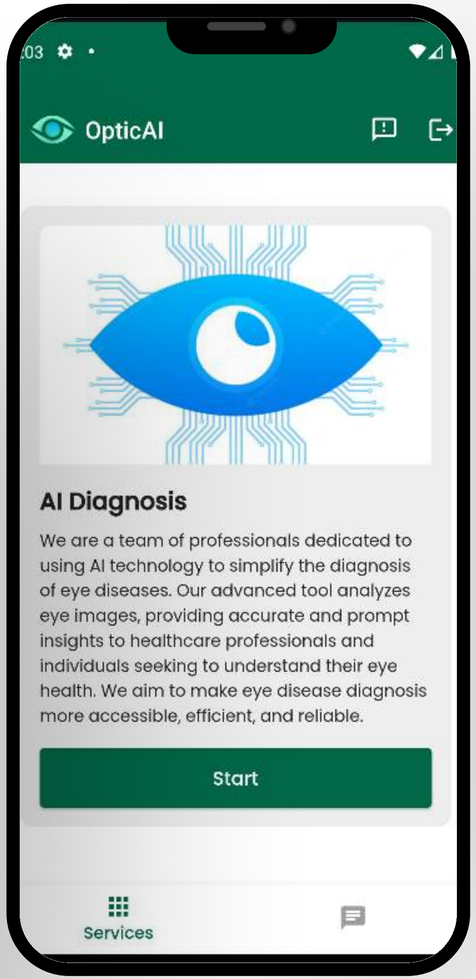


OpticAI

Mobile App

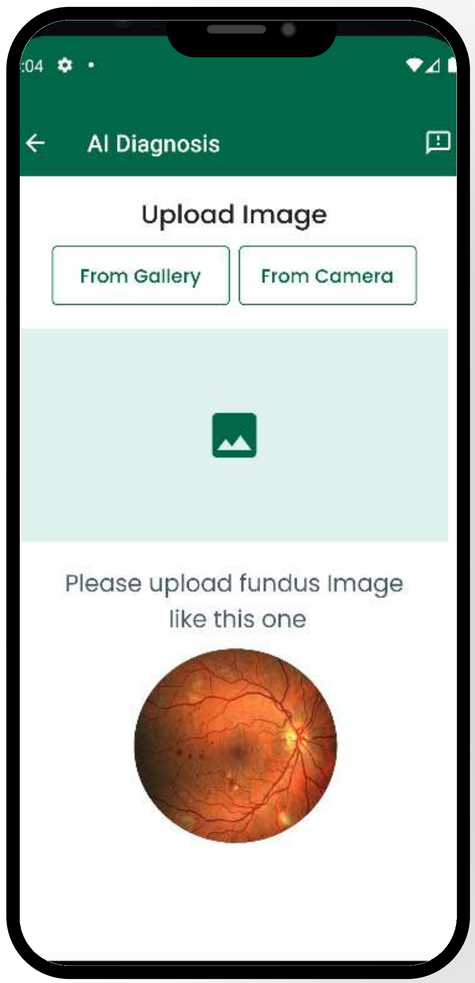


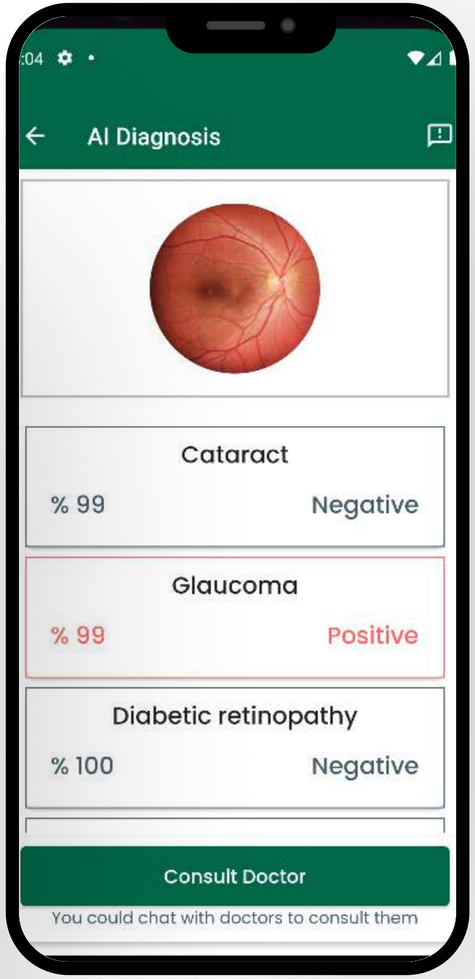


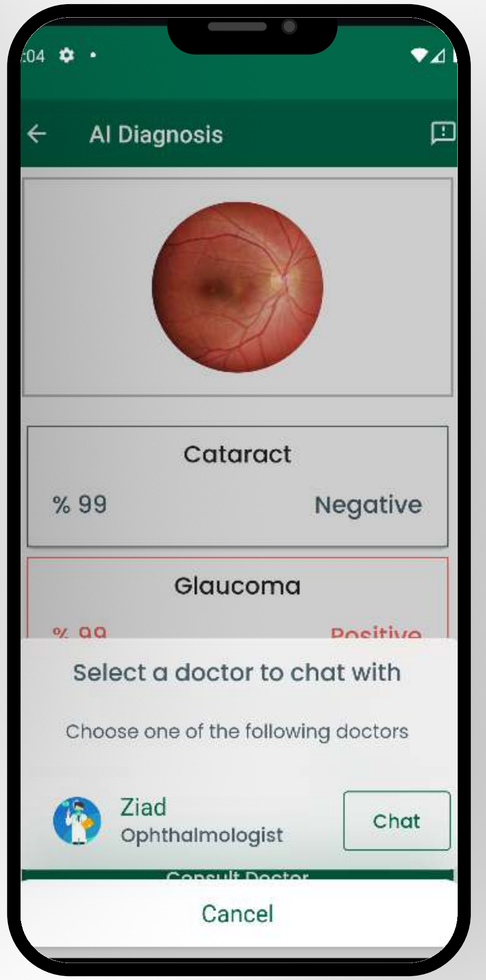


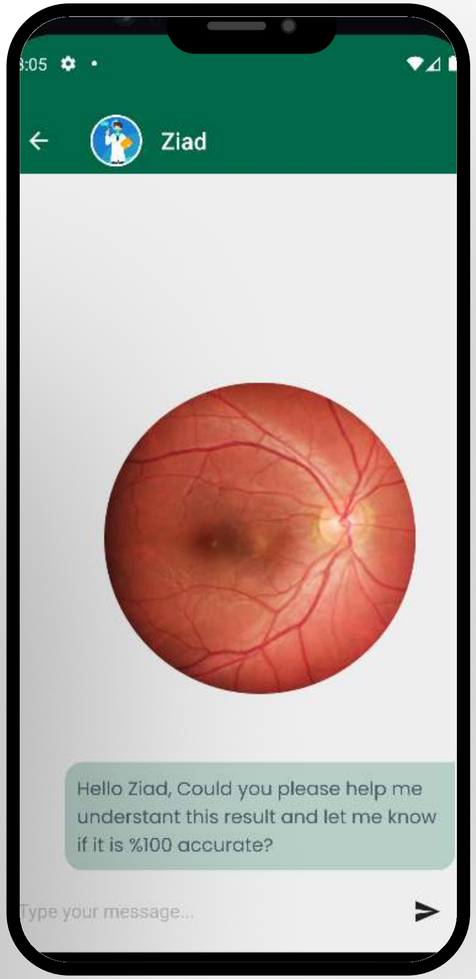
OpticAI

Mobile App



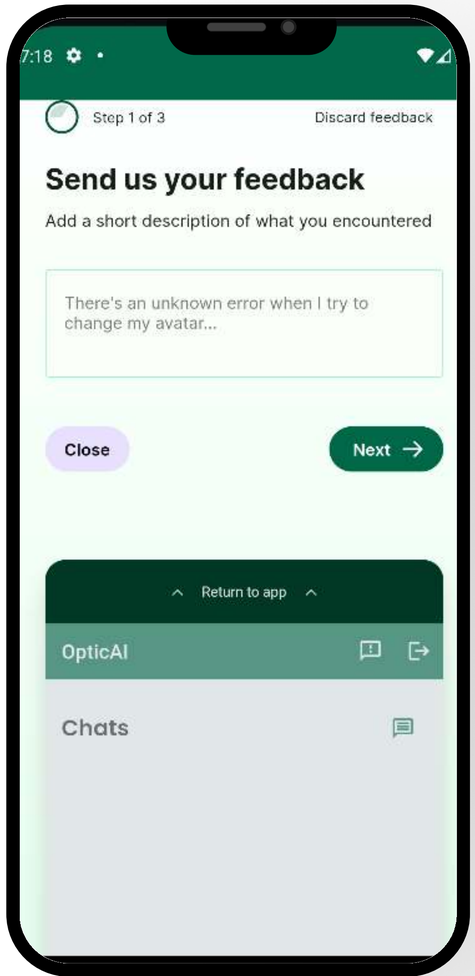


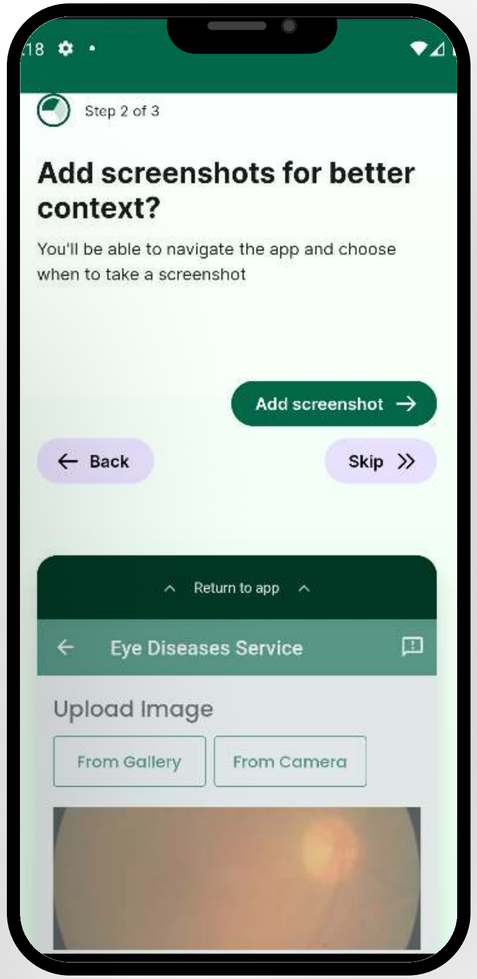


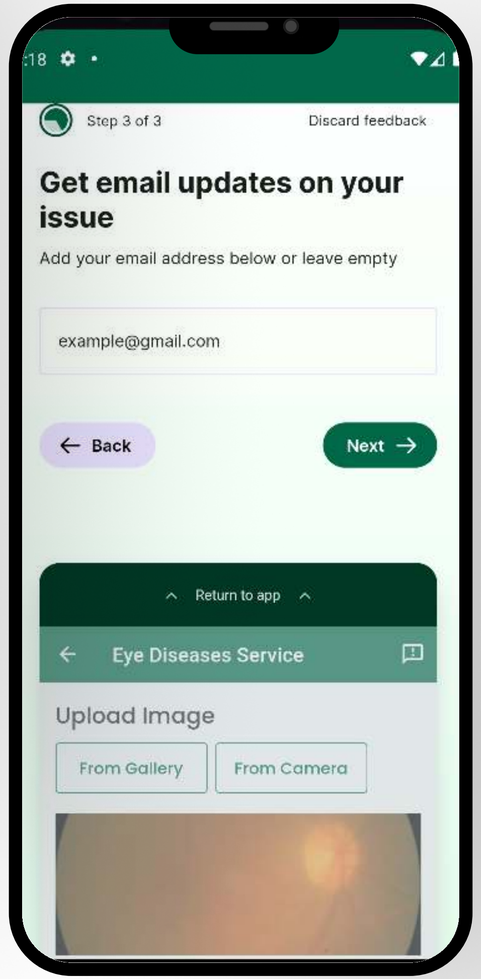


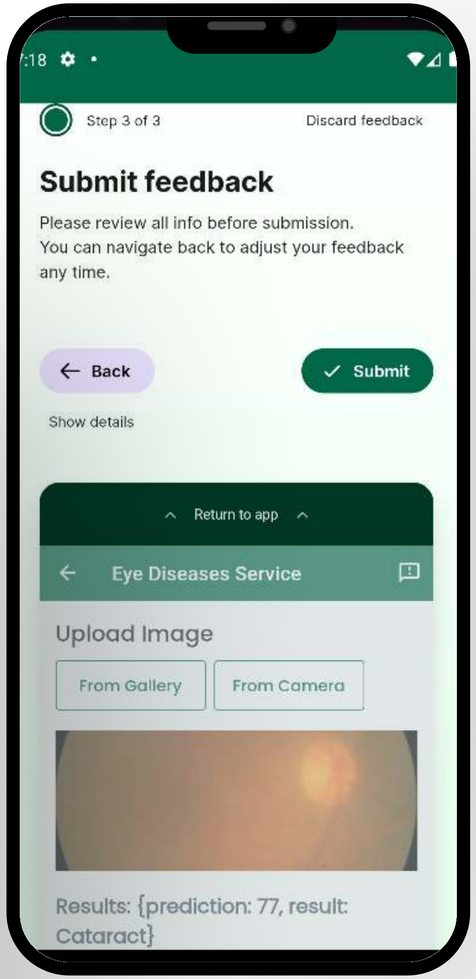
OpticAI

Mobile App

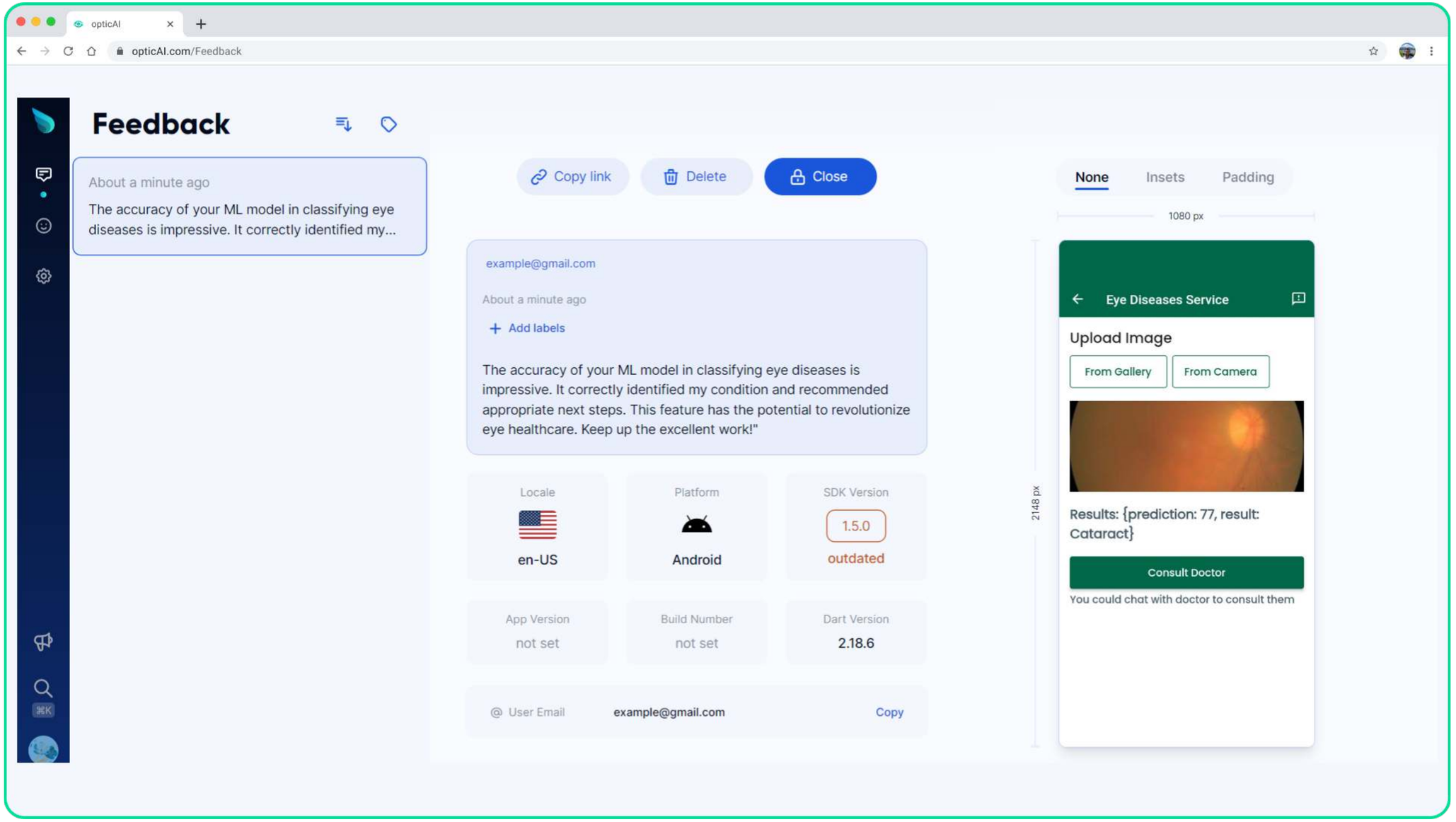




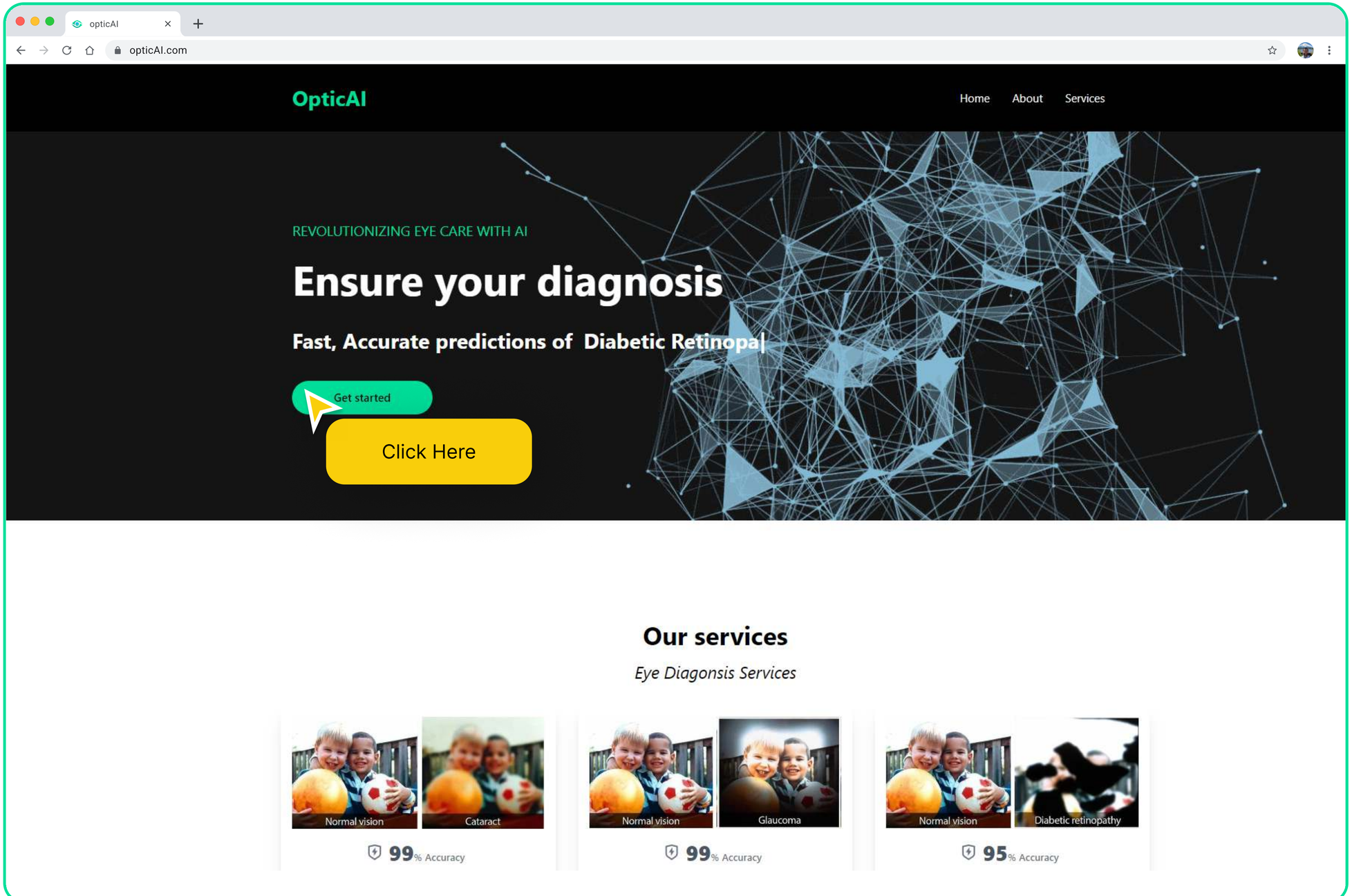




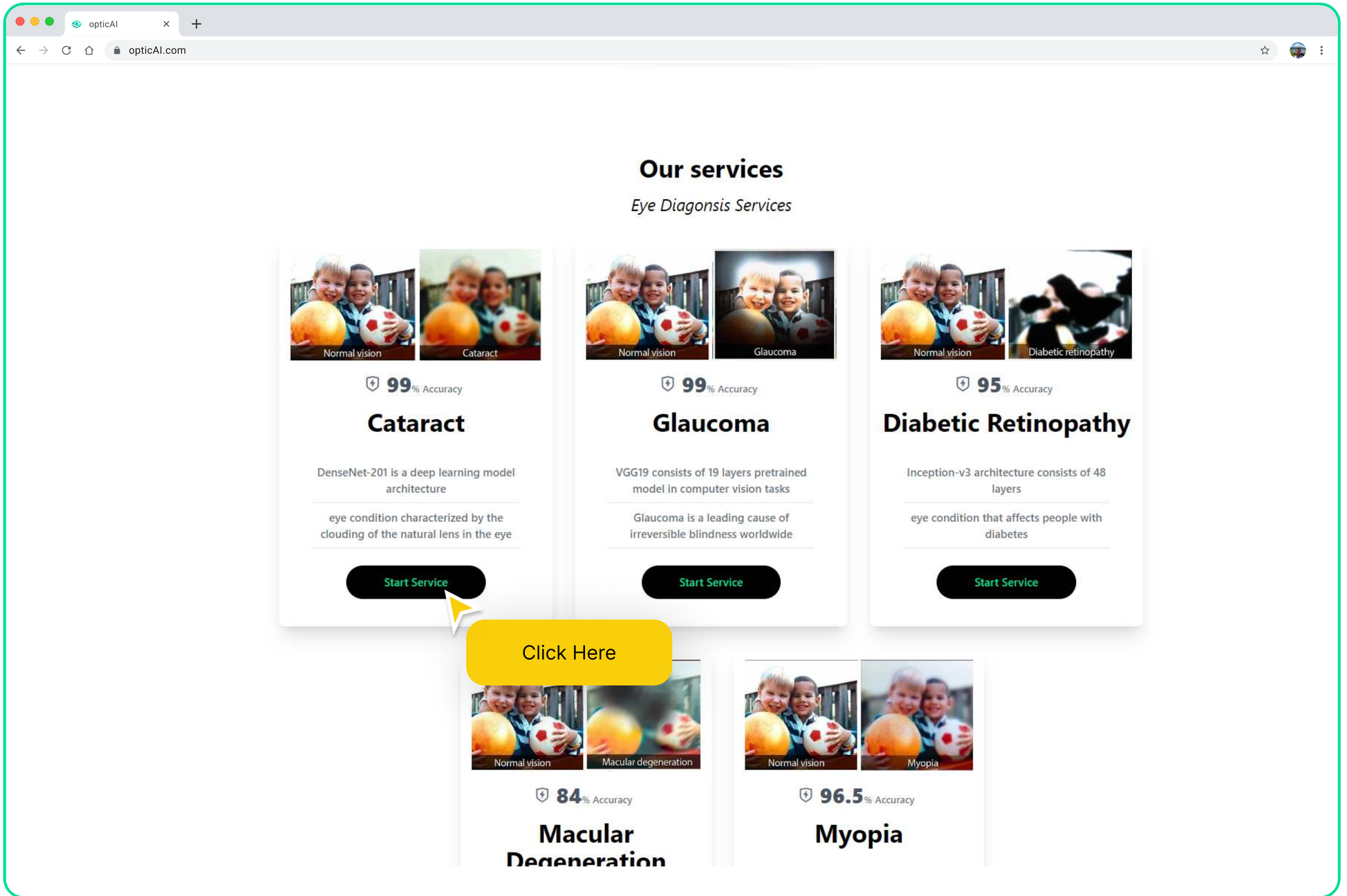
Feedback


opticAI
opticAI.com/Feedback
Feedback
About a minute ago
The accuracy of your ML model in classifying eye diseases is impressive. It correctly identified my...
Copy link
Delete
Close
example@gmail.com
About a minute ago
Add labels
The accuracy of your ML model in classifying eye diseases is impressive. It correctly identified my condition and recommended appropriate next steps. This feature has the potential to revolutionize eye healthcare. Keep up the excellent work!"
Locale
en-US
Platform
Android
SDK Version
1.5.0
outdated
App Version
not set
Build Number
not set
Dart Version
2.18.6
User Email
example@gmail.com
Copy
None
Insets
Padding
1080 px
2148 px
Eye Diseases Service
Upload Image
From Gallery
From Camera
Results: {prediction: 77, result: Cataract}
Consult Doctor
You could chat with doctor to consult them

Website

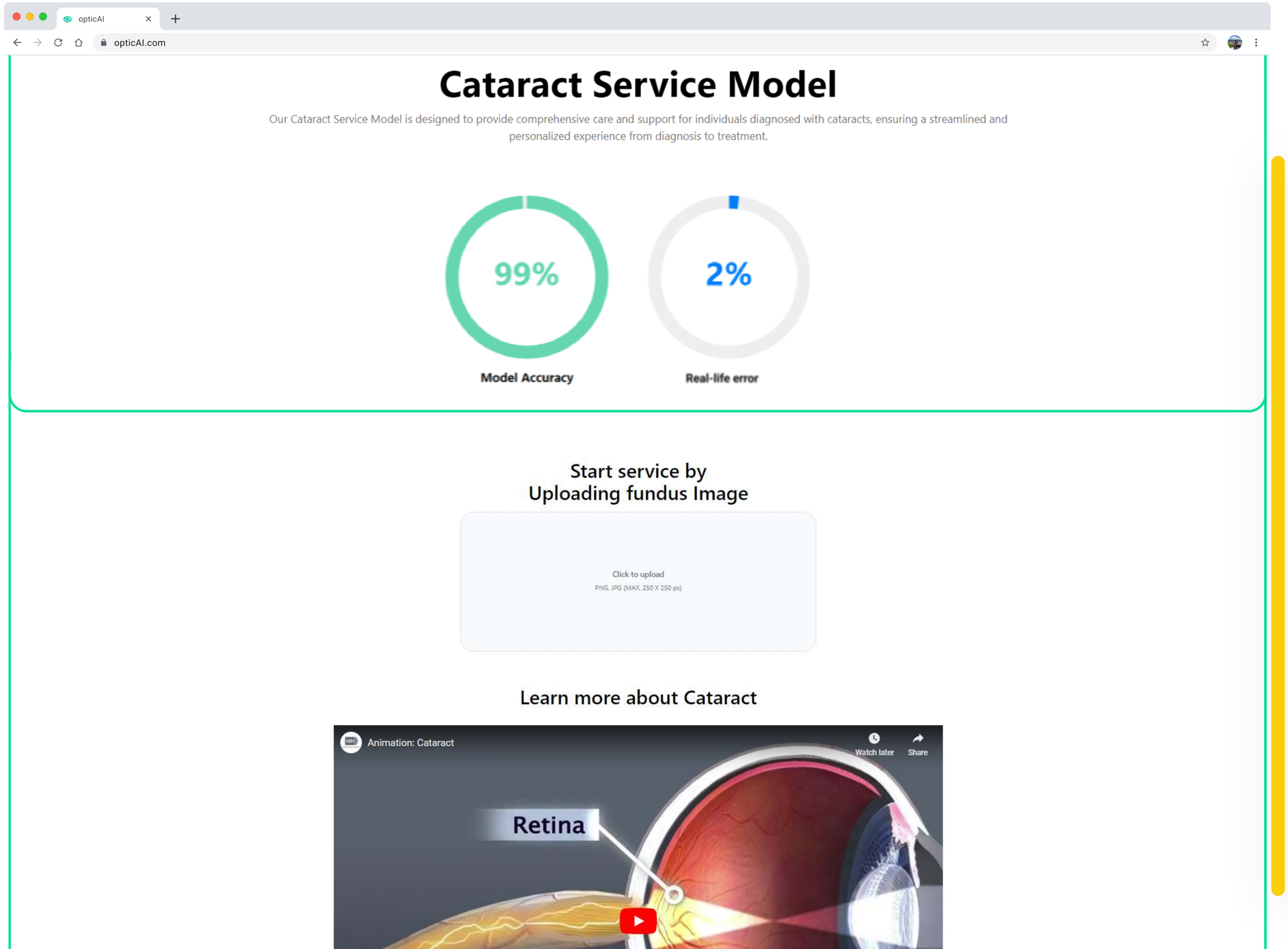

opticAI
opticAI.com
OpticAI
Home
About
Services
REVOLUTIONIZING EYE CARE WITH AI
Ensure your diagnosis
Fast, Accurate predictions of Diabetic Retinopa
Get started
Click Here
Our services
Eye Diagonsis Services
Normal vision
Cataract
99% Accuracy
Normal vision
Glaucoma
99% Accuracy
Normal vision
Diabetic retinopathy
95% Accuracy

Website


opticAI
opticAI.com
Our services
Eye Diagonsis Services
Normal vision
Cataract
99% Accuracy
Cataract
DenseNet-201 is a deep learning model architecture
eye condition characterized by the clouding of the natural lens in the eye
Start Service
Normal vision
Glaucoma
99% Accuracy
Glaucoma
VGG19 consists of 19 layers pretrained model in computer vision tasks
Glaucoma is a leading cause of irreversible blindness worldwide
Start Service
Normal vision
Diabetic retinopathy
95% Accuracy
Diabetic Retinopathy
Inception-v3 architecture consists of 48 layers
eye condition that affects people with diabetes
Start Service
Click Here
Normal vision
Macular degeneration
84% Accuracy
Macular Degeneration
Normal vision
Myopia
96.5% Accuracy
Myopia

OpticAI

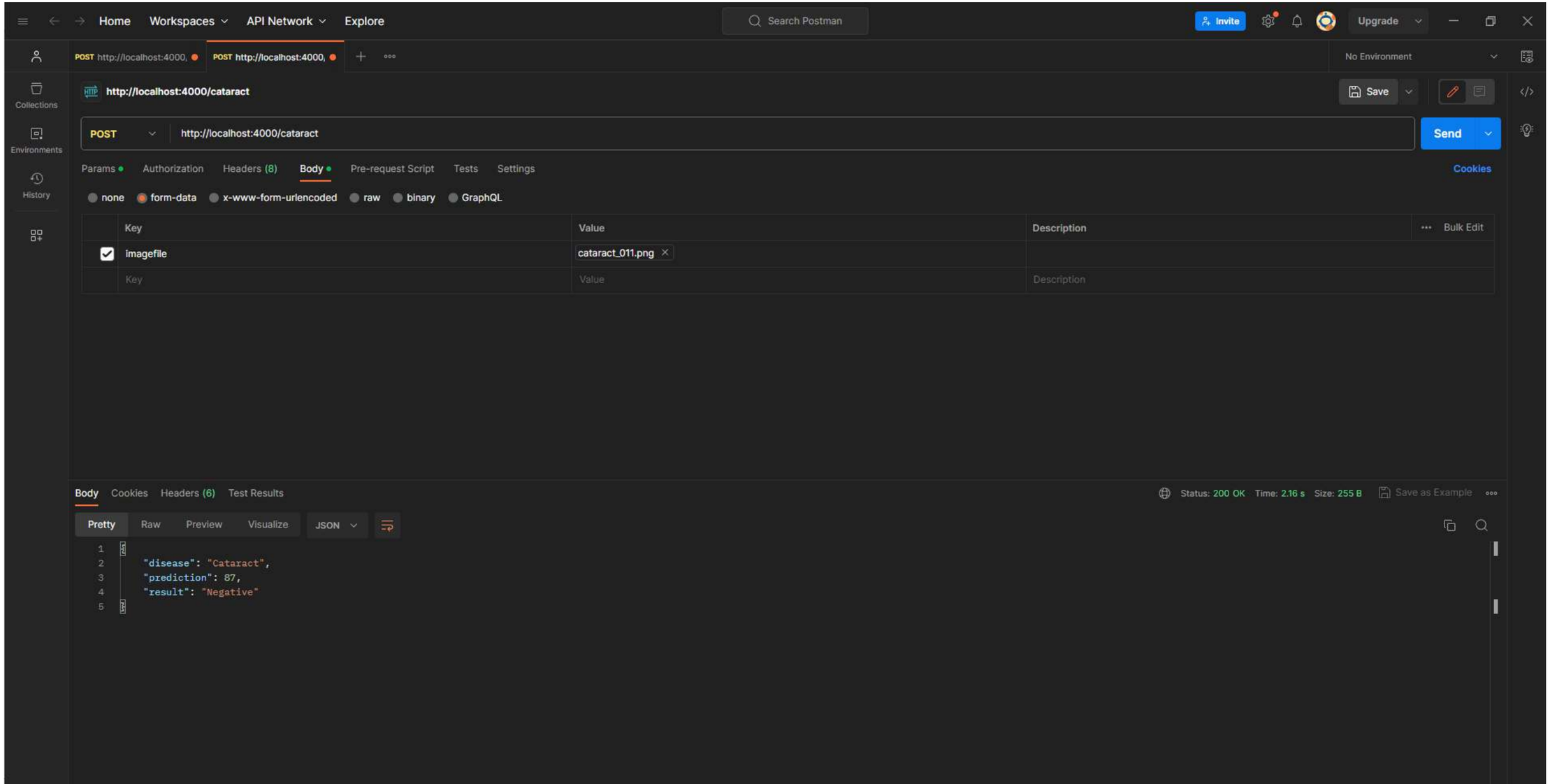
Website



API

```python
from flask import Flask, request, jsonify
from tensorflow import keras

from keras_preprocessing.image import load_img
from keras_preprocessing.image import img_to_array
import numpy as np
from PIL import Image
from flask_cors import CORS
import cv2
import numpy as np


app = Flask(__name__)
CORS(app)

cataract_classification_model = keras.models.load_model("
D:/Ocular/Catract/OcularCatract/my_model/ResNet50-Cataract_classification-98.98.h5")
glaucoma_classification_model = keras.models.load_model("
D:/Ocular/Catract/OcularCatract/my_model/VGG19-Glaucoma_classification-98.91.h5")
retinopathy_classification_model = keras.models.load_model("
D:/Ocular/Catract/OcularCatract/my_model/inception-DR_classification-95.00.h5")
amd_classification_model = keras.models.load_model("
D:/Ocular/Catract/OcularCatract/my_model/VGG19-AMD_classification-84.21.h5")
myopia_classification_model = keras.models.load_model("
D:/Ocular/Catract/OcularCatract/my_model/VGG19-Myopia_classification-96.59.h5")

```

API


Home
Workspaces
API Network
Explore
Search Postman
Invite
Upgrade
POST http://localhost:4000,
POST http://localhost:4000,
No Environment
Collections
Environments
History
http://localhost:4000/cataract
Save
POST
http://localhost:4000/cataract
Send
Params
Authorization
Headers (8)
Body
Pre-request Script
Tests
Settings
Cookies
none
form-data
x-www-form-urlencoded
raw
binary
GraphQL
Key
Value
Description
Bulk Edit
imagefile
cataract_011.png
Key
Value
Description
Body
Cookies
Headers (6)
Test Results
Status: 200 OK
Time: 2.16 s
Size: 255 B
Save as Example
Pretty
Raw
Preview
Visualize
JSON
1 {
2 "disease": "Cataract",
3 "prediction": 87,
4 "result": "Negative"
5 }

Pros & Cons

Positives

- cover a set of models that diagnose various eye diseases with a higher level of accuracy
- communication with various ophthalmologists

Negatives

- Requires special fundus cameras which is relatively expensive (3000$ -> 7000$)
- Input Data might not be enough for certain diseases

03 Project Specifications

Functional & Non-Functional

Functional

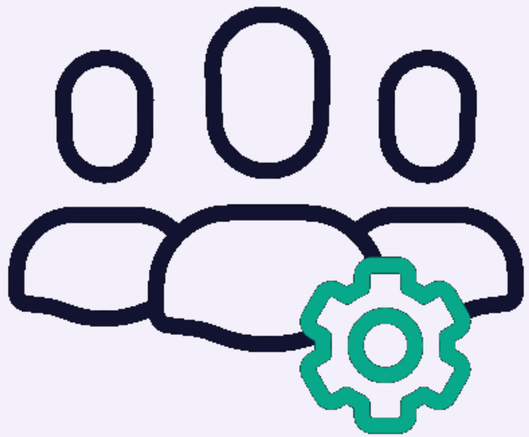
- Sign in / Sign Up
- Image Upload
- Machine Learning Model
- User Feedback
- Chat Functionality

Non-functional

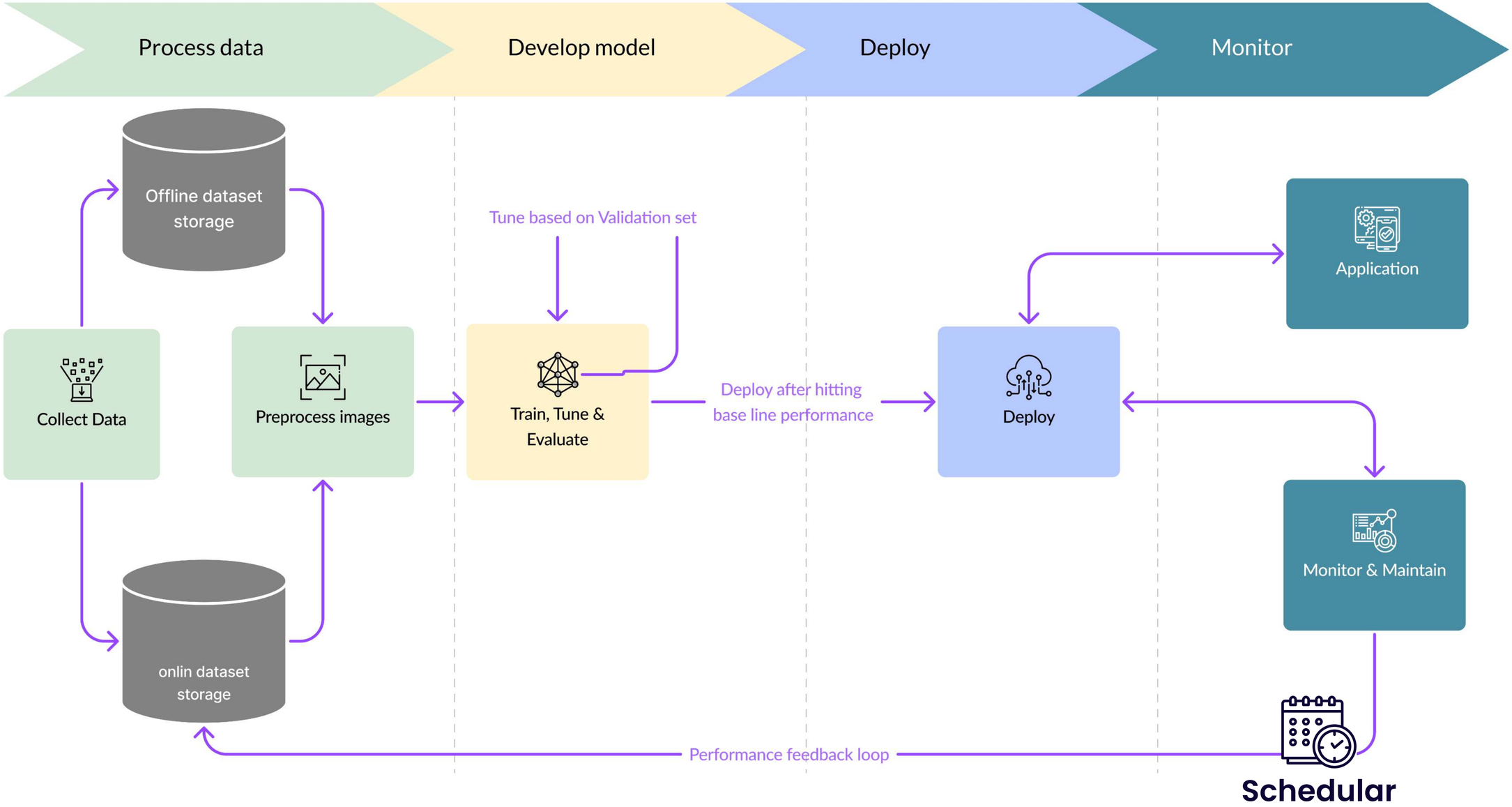
- Security
- Usability
- Reliability
- Compatibility

Stakeholders

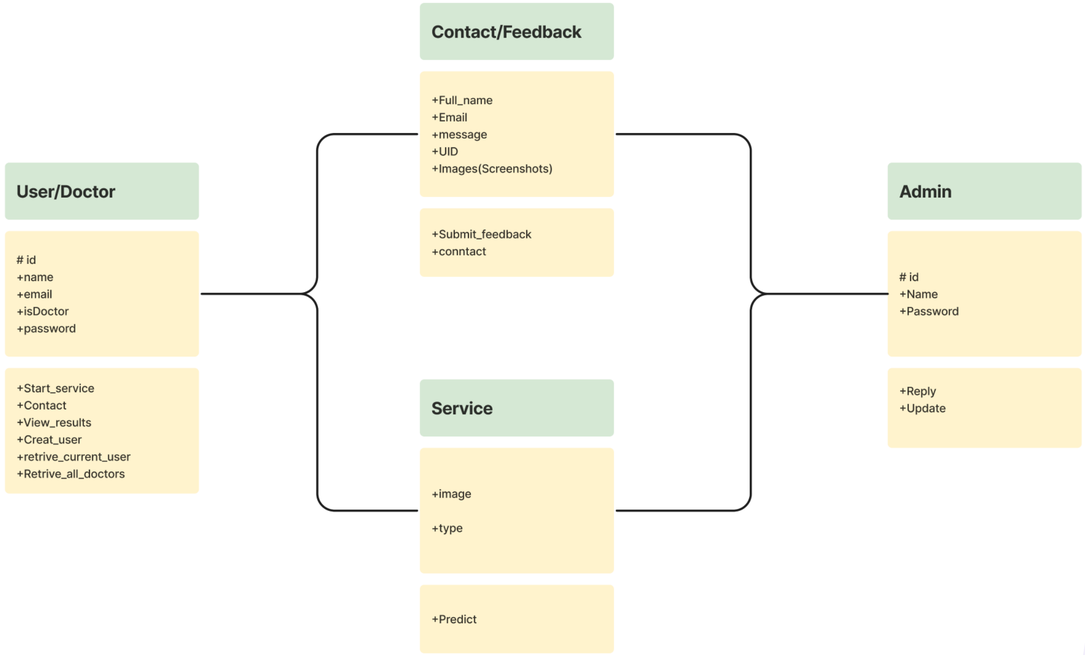
- Patients
- Ophthalmologists
- Researchers
- Medical Equipment Manufacturers



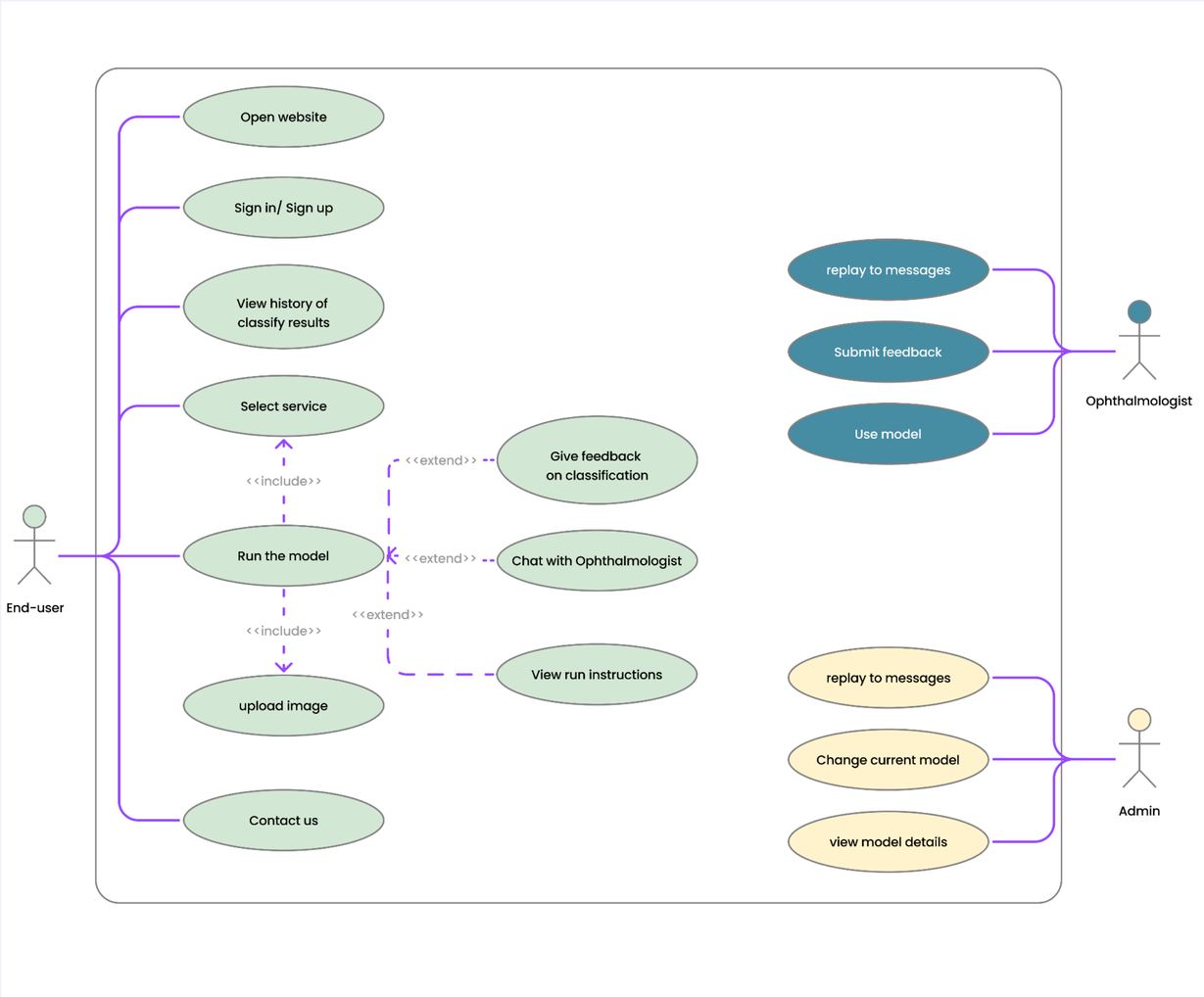
System Architecture



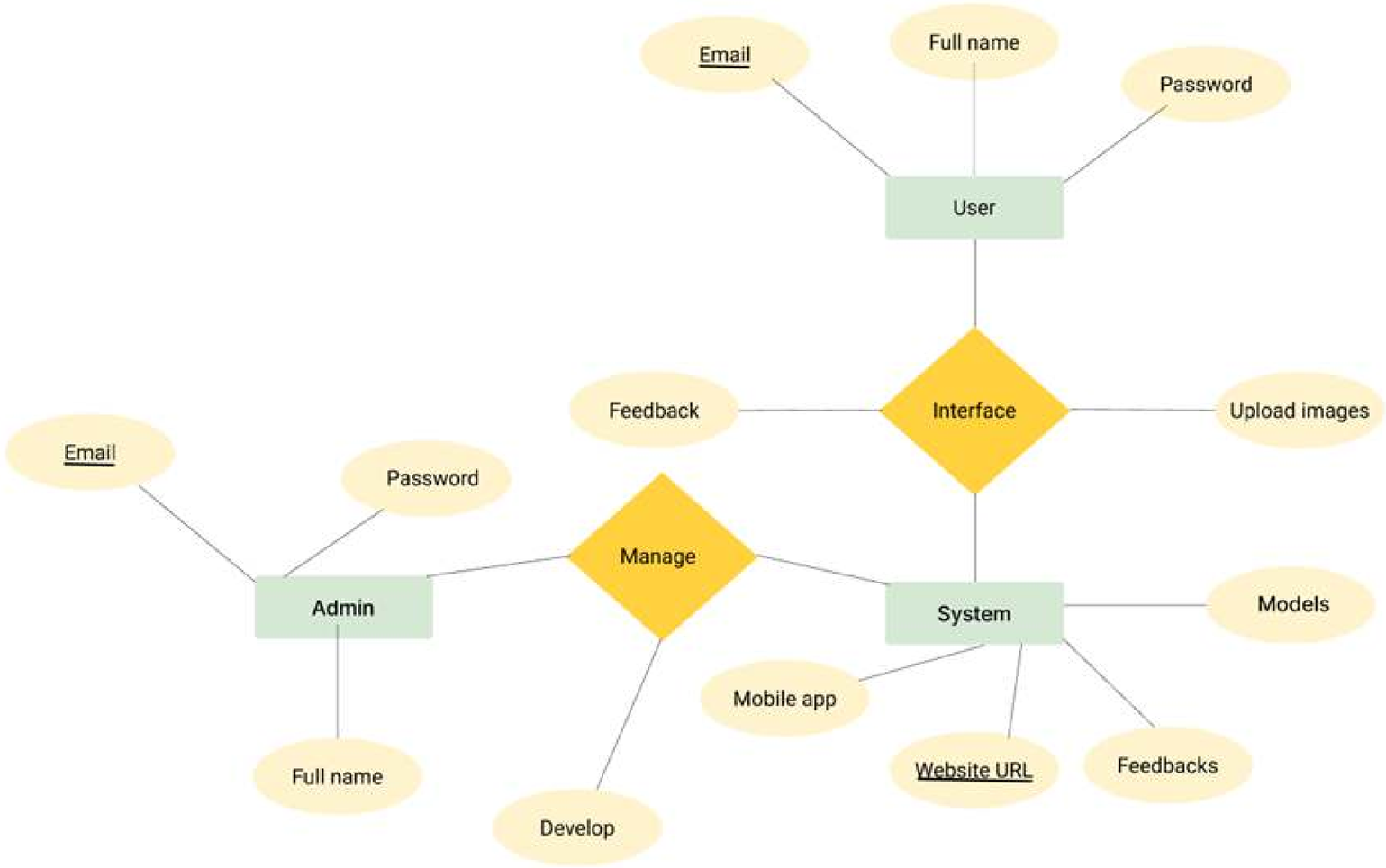
Class Diagram



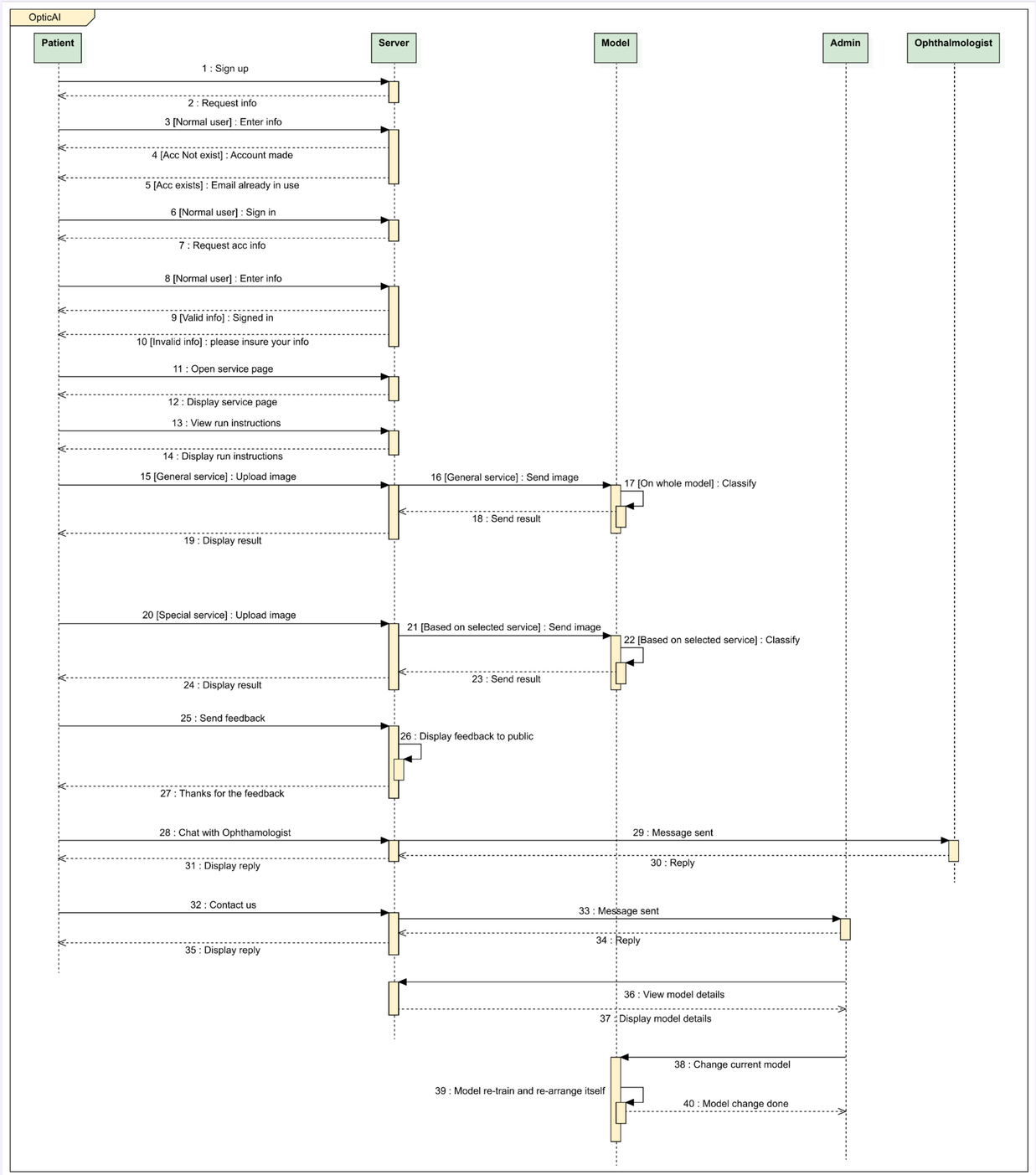
Use Case Diagram



Entity Relationship Diagram



Sequence Diagram



04 Time Plan

Time Plan

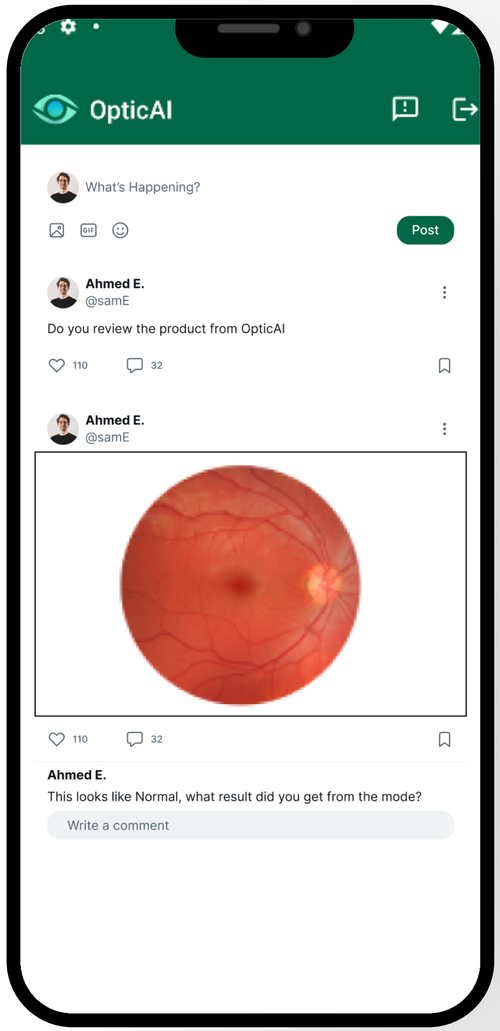

Term 1
Term 2
Tasks
months
September
October
November
December
February
March
April
May
June
July
1 Background Research
2 Survey Conduction
3 Technology Selection and Learning
4 Collect Fundus Images for Three Diseases
5 Process the Collected Fundus Images for Models Training
6 Create a Diagnostic Model for Eye Diseases
7 Assess the Model's Effectiveness
8 Implement new models for each recommended disease
9 Mobile Application
10 Web Page
11 Testing
12 Deployment
13 Documentation
miro

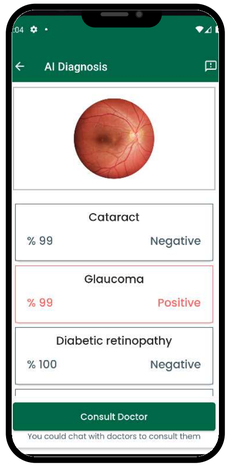
05 Conclusion

Conclusion

- The proposed solution will be integrated into a user-friendly interface for ease of use.
- This project represents a step towards better healthcare outcomes and opportunities for further research and development in the area.

Looking Into The Future





Dataset

Color Fundus Photographs/Images From Left And Right Eyes And Doctors' Diagnostic Keywords From Doctors.

620

Hypertension

VGG19, EfficientNetB0

72%

Thank You!