Deep Learning Fundus Image Analysis for Early Detection of Diabetic Retinopathy

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1.INTRODUCTION

1.1 Project Overview

The retina of the human eye can develop visible microvascular consequences from diabetes, including diabetic retinopathy and macular edema, the images of which are being employed for manual disease screening and diagnosis. Deep learning-based automatic detection for this labour-intensive task could be quite helpful. Although we only employ a limited portion of photos for the four-grade diabetic macular edema scales for the first time, we provide a deep learning system that identifies referable diabetic retinopathy comparable or better than presented in the prior studies. These findings imply that a deep learning system could improve screening and diagnostic cost-effectiveness while delivering performance above required levels, and that the technology could be used in clinical exams demanding finer grading**.** There were 2.6 million visually impaired and blind people worldwide in 2015, and it is predicted that number would increase to 3.2 million by 2020. Although it is anticipated that diabetic retinopathy would become less common in high-income nations, low- and middle-income nations must prioritise the early diagnosis and treatment of the condition. Recent developments in deep learning technologies have allowed researchers to demonstrate that automated diabetic retinopathy screening and grading are effective at reducing labour costs. Although ultra-wide-field fundus photography can capture up to 82% of the retinal surface, conventional fundus photography is still used by the majority of automatic systems.

1.2 Purpose

The purpose of diabetic retinopathy is to detect preventable blindness from diabetic retinopathy in the enormous, growing population of diabetics, fully

automated screening technologies are essential (DR). EyeArt provides a computerised, highly accurate, cloud-based DR screening solution that can quickly and accurately screen millions of photos. This enables efficient, widespread screening deployment to assist in the triage of DR patients who most urgently require eye treatment. The principal objective of this course is to provide an introduction to basic concepts and techniques for medical image processing and to promote interests for further study and research in medical imaging processing.

2. LITERATURE SURVEY

2.1 Existing problem

The abnormal blood vessels associated with diabetic retinopathy stimulate the growth of scar tissue, which can pull the retina away from the back of the eye. This can cause spots floating in your vision, flashes of light or severe vision loss.

2.2 References

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[10] Chaki J, Ganesh ST, Cidham SK, Theertan SA (2020) Machine learning and artificial intelligence based diabetes mellitus detection and self-management: a systematic review. J King Saud Univ Comput Inf Sci.

2.3 Problem Statement Definition

Diabetes mellitus frequently results in diabetic retinopathy (DR), which results in lesions on the retina that impair vision. Blindness may result if it is not caught in

time. Such an algorithm may facilitate early diagnosis, referral to a retina specialist for more regular monitoring, and possibly consideration of early action if it were to be developed on bigger and more diverse datasets. Additionally, it might enhance the enrollment of patients in therapeutic studies that target DR.

2.3 Problem Statement Definition

Diabetic Retinopathy (DR) is a condition that can develop in your eye if you are diagnosed with type 1 or type 2 diabetes. It damages a part of one's eye called the retina, which is the tissue that lines the back of one's eye. Signals transmitted from the retina to the brain allow one to see. High blood sugar levels due to diabetes cause damage to its blood vessels. This initially induces partial vision loss and over time one can lose their eyesight completely. The good news is that, when the symptoms of the patient are discovered in the early stages, with proper treatment one can prevent further vision loss. So it is very important for us to detect diabetic retinopathy in its early stages and prevent the patient from further damaging their eyesight. Hence, we propose a solution wherein if the fundus image, an image which displays the interior surface of the eye, is available, this problem can be easily detected by running a machine learning or deep learning model which can predict the presence of Diabetic Retinopathy in the early stages

3. IDEATION & PROPOSED SOLUTION

3.1 Empathy Map Canvas

Empathy Map Canvas for the Proposed Solution is shown below

3.2 Ideation & Brainstorming

Ideation 1

This Project, primarily aims on the techniques used to identify the initial diabetic occurrence in human being using the digital image processing, which analyze the captured input image of an eye and obtain an understanding or make a decision to produce a balanced reliable bioinformatics details about the retina of an eye of human begin, whether he/she reflecting any symptoms of diabetes which helps early detection of disease, these process include the processing of image through various phases like eye image capturing, image enhancement, image restoration, morphological processing, segmentation , representation with description and finally object reorganization to find any changes in blood vessel patters in the retina to produce the high accuracy reliable results in the classification of images of diabetic retinopathy which occurs in patient of diabetic, helping in early detection of the diabetes and makes the best use of technology to take preventive measures towards healthy life.

Ideation 2

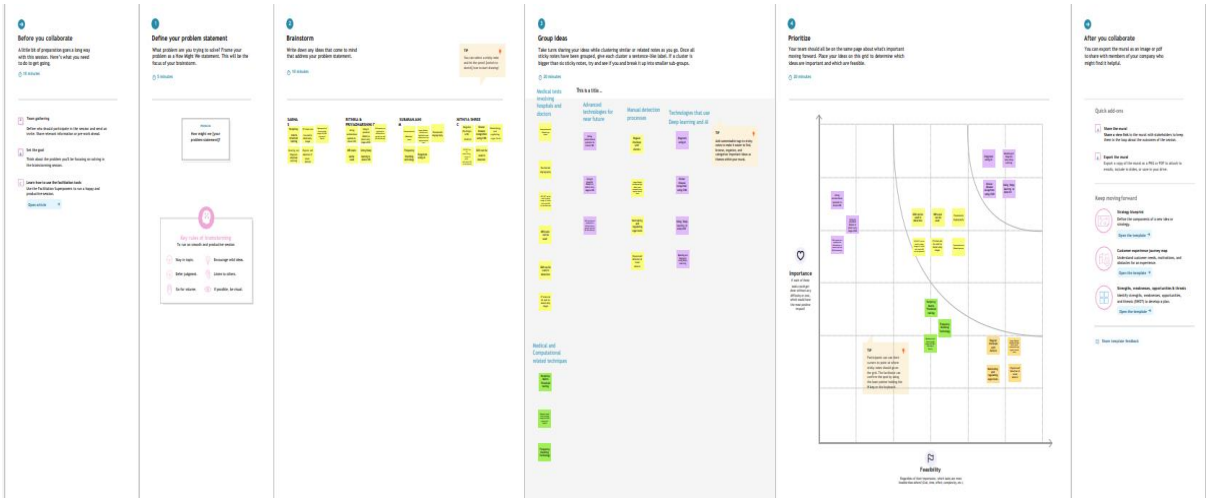
The study is based on the rising situation in the developing world, suggests diabetic retinopathy may soon be a major problem in the clinical world as it is a major cause of blindness. Hence, detection of diabetic retinopathy is important. This paper focuses on to analyse the retinal images normal or abnormal and find the metrics of DR by using Raspberry Pi kit. To detect the diabetic retinopathy from retinal images using python through Threshold, Colour-k means clustering algorithm, water algorithm, mean shift algorithm, distance algorithm.

Ideation 3

Diabetic retinopathy is caused by the retinal micro vasculature which may be formed as a result of diabetes mellitus. Blindness may appear as a result of unchecked and severe cases of diabetic retinopathy. Manual inspection of fundus images to check morphological changes in microaneurysms, exudates, blood vessels, haemorrhages, and macula is a very time consuming and tedious work. It can be made easily with the help of computer-aided system and inter variability for the observer. In this paper, several techniques for detecting microaneurysms, haemorrhages, and exudates are discussed for ultimate detection of non proliferative diabetic retinopathy. Blood vessels detection techniques are also discussed for the diagnosis of proliferative diabetic retinopathy.

Brain storming

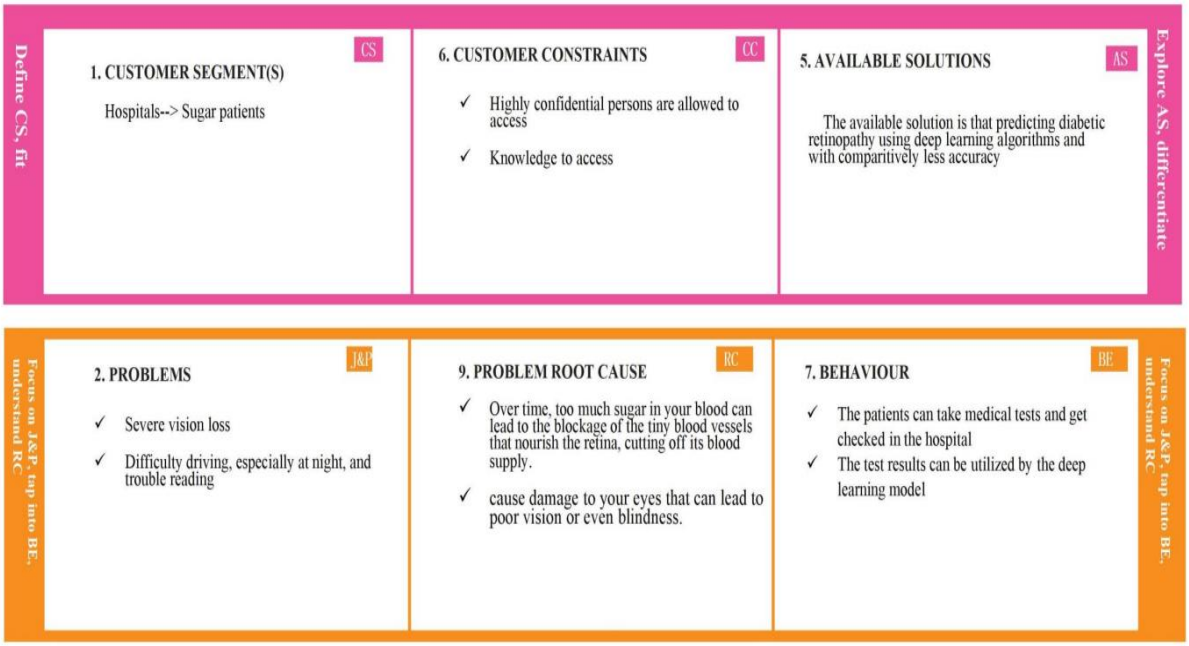
Brain storming for the Proposed Solution is shown below



3.3 Proposed Solution

The scientific community has proposed numerous AI-based techniques for the identification and categorization of diabetic retinopathy on fundus retinal images. In this, a Convolutional Neural Network (CNN), which is used for the early diagnosis of diabetic retinopathy, is taken into consideration as a deep learning methodology. The best method for identifying and treating diabetic retinopathy, which poses a threat to eyesight, is routine dilated eye exams. They are affordable and can help avoid blindness. This programme satisfies their needs without costing them anything. This can be used as a business strategy because it keeps the affected patient from going blind. The majority of regular people and hospitals will make use of this programme. This programme will be expandable. The appropriate diagnostic and health advice (integrated with their everyday lifestyle) will be shown once the image is categorised under the five categories of diabetic retinopathy.

3.4 Problem Solution fit



4. REQUIREMENT ANALYSIS

4.1 Functional requirement

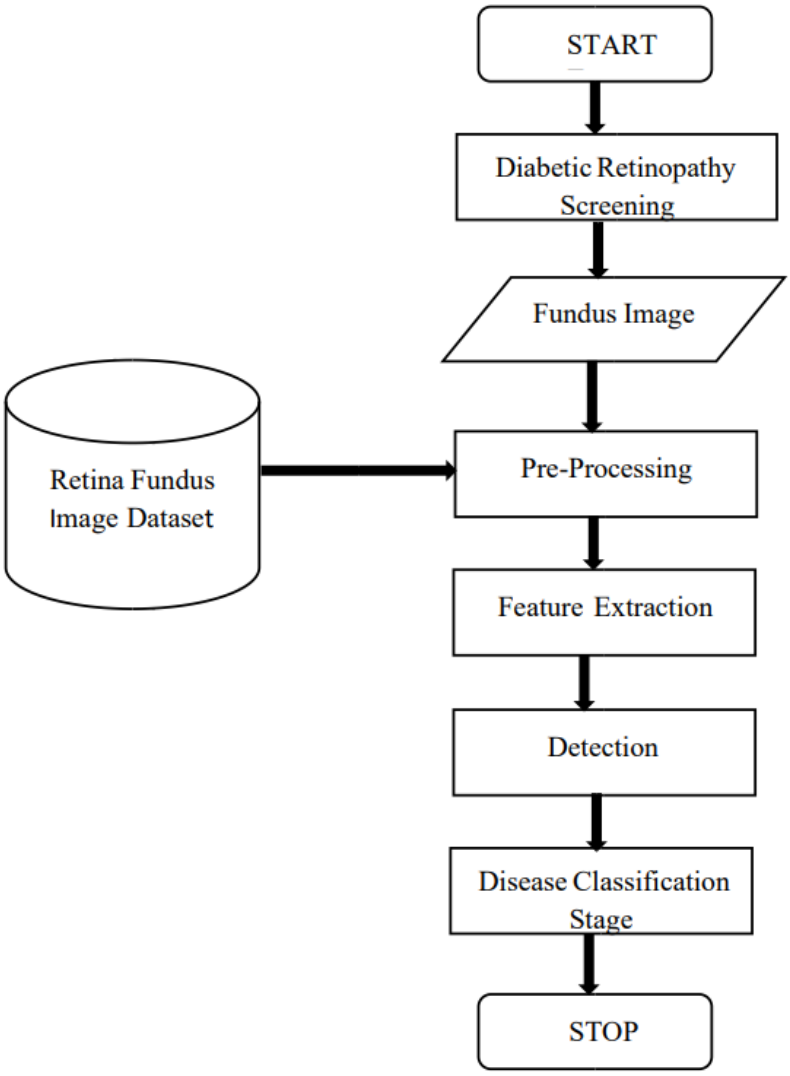
S No.	Functional Requirement	Sub Requirement (Sub-Task)
1	Identifying the population eligible for screening	Utilize registries to guarantee that individual information is gathered and up-to-date, and choose which group needs to be tested based on the strongest evidence at hand.
2	Invitation and information	Invite the full cohort to the screening and provide each group the information they need. To encourage informed involvement.
3	Testing	Conduct screening test(s) using agreed/recommended Methods
4	Referral of screen positives and reporting of screen-negative results	Send the appropriate services any positive findings from the screen. Make sure that people who continue to participate in the screening programme are informed about screen negatives as well.
5	Diagnosis	Diagnose true cases and identify false positives.
6	Treatment	Correctly address the situation and intervene; in some cases, surveillance or follow-up may also be required.
7	Outcomes	By acquiring, evaluating, and reporting data, you can spot false negatives and improve the performance and cost-effectiveness of the screening programme.

4.2 Non-Functional requirements

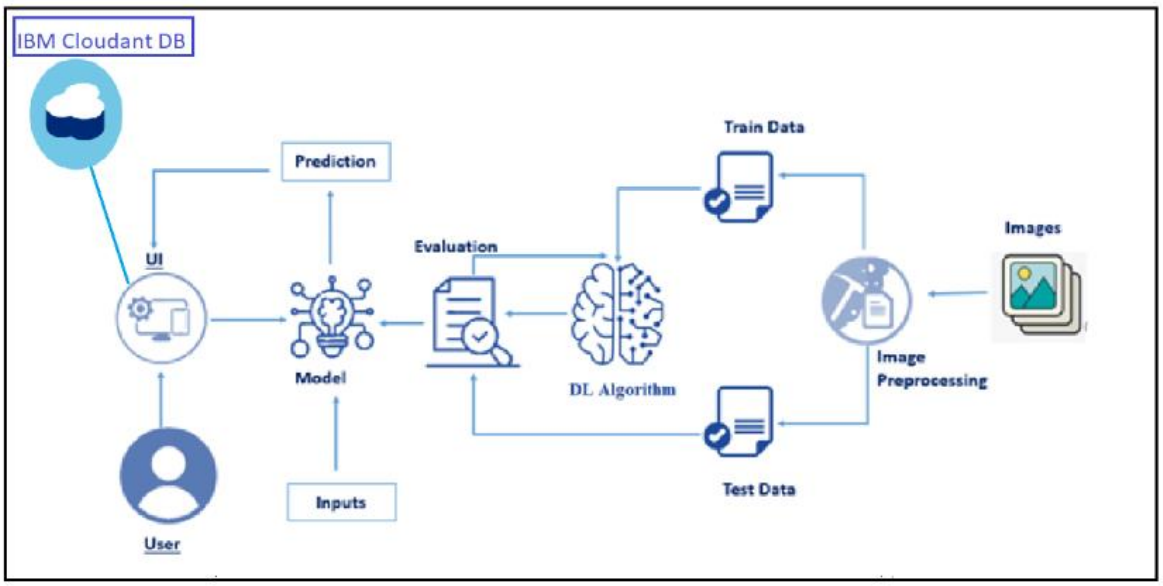
S No.	Non-Functional Requirement	Description
1	Usability	Five different screening and clinical grading methods for diabetic retinopathy are presented with new findings. Utilising state-of-the-art results for accurately detecting images based on clinical five-grade diabetic retinopathy.
2	Security	AI-powered deep learning can increase precision around delicate organs and tissues, minimize blood loss, infection risk, and discomfort during detection and screening.
3	Reliability	The ability of deep learning to recognise patterns by creating intricate associations based on input data and comparing them to performance benchmarks represents a significant leap.
4	Performance	AI is the capacity to finish a task, to put it simply. Mostly carried out by a robot or computer, with assistance from humans. Frequent illustrations for retinal findings that could increase the accuracy of outcomes recorded.
5	Availability	Health care affordability, quality, and accessibility can be amplified using this technology.
6	Scalability	It is possible to build on existing systems and employ a progressive approach to improving the efficacy of current procedures in order to make high-quality systematic diabetic retinopathy screening a universal offer to all individuals with diabetes.

5. PROJECT DESIGN

5.1 Data Flow Diagrams



5.2 Solution & Technical Architecture



5.3 User Stories

User Type	Functional Requirement	User Story Number	User Story	Acceptance criteria	Priority	Release
CUSTOMER	Dashboard	USN-1	As a user, I can I must be able to upload image of my eyes.	I can upload or take image.	High	Sprint-1
		USN-2	As a user, I will receive the diagnosis as to whether I have retinopathy or not.	I can receive the diagnosis.	High	Sprint-1
		USN-3	As a user, I receive the severity of the retinopathy.	I can receive the severity of the retinopathy.	Medium	Sprint-2
		USN-4	As a user, I can receive the suggested remedy.	I can receive the suggested remedy.	Medium	Sprint-2

6. PROJECT PLANNING & SCHEDULING

6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, and password, and confirming my password.	10	High	NithiyaShree C
Sprint-1	E-mail confirmation	USN-2	As a user, I will receive a confirmation email once I have registered for the application	10	Medium	Subaranjani M
Sprint-2	Login	USN-3	As a user, I can log into the application by entering my email & password	5	High	NithiyaShree C Rithika G
Sprint-2	Upload Images	USN-4	As a user,I should be able to upload the image of ECG.	10	High	Priyadharshini R Subaranjani M
Sprint-2	Dashboard	USN-5	As a user, based on my requirement I can navigate through the dashboard.	5	Medium	Rithika G Sabna S
Sprint-3	Train the model	Task 1	As a developer, the dataset will be uploaded and trained by developed algorithm.	20	High	Sabna S Nithiyashree C
Sprint-4	Testing & Evaluation	Task 2	As a developer, we tested the trained model using the provided dataset and model will be evaluated for accurate results.	10	High	Rithika G Subaranjani M
Sprint-4	Display predicted result	USN-6	As a user, I can view the predicted result in the dashboard.	10	High	Priyadharshini R Sabna S

6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	6 Days	22 Oct 2022	26 Oct 2022	20	27 Oct 2022
Sprint-2	20	6 Days	28 Oct 2022	02 Nov 2022	20	03 Nov 2022
Sprint-3	20	6 Days	03 Nov 2022	08 Nov 2022	20	08 Nov 2022
Sprint-4	20	6 Days	09 Nov 2022	12 Nov 2022	20	12 Nov 2022

7. CODING & SOLUTIONING

7.1 Feature

We have developed a website which authenticates users and help them upload and check the seriousness of the diabetics. We have developed a multilayer deep convolutional neural network that classifies the user image of an eye to which extense has the disease diabetics has been affected. The model will classify the images into 5 categories of diabetics and report them on asking for prediction. We have also developed a messaging service for receiving message for the type of diabetics.

8. TESTING

8.1 Test Cases

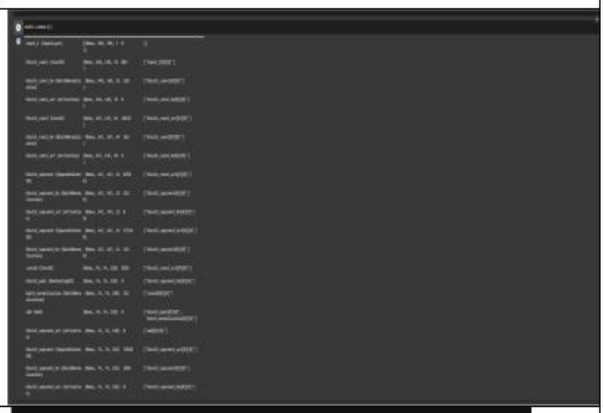
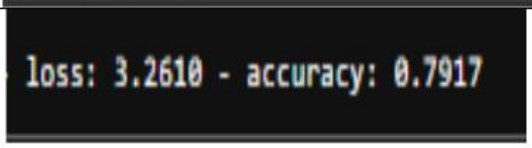
Resolution	Severity 1	Severity 2	Severity 3	Severity4	Subtotal
By Design	5	4	2	3	14
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	9	2	4	15	30
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	17	14	13	21	65

8.2 User Acceptance Testing

Section	Total Cases	Not Tested	FAIL	Pass
Print Engine	9	0	0	9
Client Application	45	0	0	45
Security	2	0	0	2
Out-source Shipping	3	0	0	3
Exception Reporting	9	0	0	9
Final Report Output	4	0	0	4
Version Control	2	0	0	2

9. RESULTS

9.1 Performance Metrics

S.NO	PARAMETER	VALUES	SCREENSHOT
1	Model Summary	Total params:21,885,485 Trainable params:1,024,005 Non-trainable params:20,861,480	
	Accuracy	Training Accuracy– 0.7917 Validation Accuracy– loss3.2610	
	Confidence Score(Only Yolo Projects)	Class Detected Confidence score	- - - -

10. ADVANTAGES & DISADVANTAGES

ADVANTAGES

- The digital image processing technology can be used in detection of diabetic retinopathy and the classification such as exudates, microaneurysms and haemorrhages using fundus images helps in detecting the initial stage of diabetes.
- The diagnostic methods, evaluation and comparison methods, fact, and the procedure are proposed for automatic detection of diabetic retinopathy.
- The results of automatic diabetic retinopathy methods helps in finding the disease in its initial stage further can take preventive measure to minimize the loss to diabetic patient.
- For the past several decades, tremendous efforts have been made to decrease the complications of diabetes, including diabetic retinopathy.

- New diagnostic modalities like ultrawide field fundus fluorescein angiography and spectral domain has allowed more accurate diagnosis of early diabetic retinopathy and diabetic macular edema.
- This helps in the detection of retinopathy at an early stage; timely treatment of this disease will prevent permanent vision loss.
- In proliferative diabetic retinopathy, an Anti inflammatory medicine or anti vascular endothelial growth factor medication injection can help in the new blood vessels contraction process.

DISADVANTAGES

- This field needs more research on detecting the initial stages of diabetic symptoms accurately in human beings, the continuous research will definitely gives us more reliable methods of finding initial stage of diabetic, which will be helpful in life saving for human being.
- According to survey Anti vascular endothelial growth factors are now extensively used to treat diabetic retinopathy and macular edema with promising results.
- There remains uncertainty over the long-term effects and the socio-economic costs of these agents.
- If a person with diabetes gets legitimate eye mind consistently and treatment when fundamental, DR will once in a while cause all out blindness.
- Non proliferative diabetic retinopathy contains early indications of DR and it is extremely critical to recognize and analyze DR at its initial stages.

11. CONCLUSION

Image segmentation techniques perform well comparable to the methods used in practice. The outcome of the image segmentation method depends on a variety of variables, including intensity, texture, and image content. In our project, a quick and effective method for removing blood vessels and hard exudates from a colour fundus image of the eye has been introduced. The simulation outcomes on the retinal dataset show how the suggested methodology may be used with retinal pictures and enhances blood vessel and hard exudates recognition to lessen human error or to give service in remote places. An significant screening method for the early diagnosis of diabetic retinopathy is presented in our project effort. The suggested technique takes less time to compute in order to automatically identify the significant clinical aspects of retinal pictures, such as blood vessels, hard exudates, and optic disc. As a result, the system's output after receiving a retinal image shows the existence of exudates. When an ophthalmologist visits an eye camp, he can use a fundus camera to capture retinal images of several patients, and once these images are uploaded into a system, any problems can be quickly found. This shortens the analysis process and increases productivity.

12. FUTURE SCOPE

Detection of Micro – aneurysm and also maculopathy be predicted and performance can be compared. In addition, as part of our ongoing research, we want to broaden the applicability of the suggested technique to include additional categories of medical imaging, such OCTA images. In addition to the qualities listed in the suggested technique, others can be taken in account.

13. APPENDIX

Source Code

```
import numpy as np
import os
from tensorflow.keras.models import load_model
from tensorflow.keras.preprocessing import image
from tensorflow.keras.applications.inception_v3 import preprocess_input
from flask import Flask, request,flash, render_template, redirect,url_for
from cloudant.client import Cloudant
from twilio.rest import Client
model = load_model(r"Updated-xception-diabetic-retinopathy.h5")
app = Flask(__name__)
app.secret_key="abc"
```

```
app.config['UPLOAD_FOLDER'] = "User_Images"
# Authenticate using an IAM API key

client = Cloudant.iam('08bcbaf0-260b-48e0-abdb-08db348afcf2-bluemix',
                      'yhZfUubpS3vS1vEKZSS37teD6IAUi8oLynOCQLIwnQsa',
connect=True)
# Create a database using an initialized client
my_database = client.create_database('my_database')
if my_database.exists():
print("Database '{0}' successfully created.".format('my_db'))
# default home page or route

user = ""

@app.route('/')
def index():
   return render_template('index.html', pred="Login", vis ="visible")


@ app.route('/index')
def home():
    return render_template("index.html", pred="Login", vis ="visible")


# registration page
@ app.route('/register',methods=["GET","POST"])
def register():
```

```
    if request.method == "POST":
        name =  request.form.get("name")
        mail = request.form.get("emailid")
        mobile = request.form.get("num")
    pswd = request.form.get("pass")
        data = {
            'name': name,
            'mail': mail,
            'mobile': mobile,
            'psw': pswd
        }
        print(data)
        query = {'mail': {'$eq': data['mail']}}
        docs = my_database.get_query_result(query)
        print(docs)
        print(len(docs.all()))
        if (len(docs.all()) == 0):
    url = my_database.create_document(data)
            return render_template("register.html", pred=" Registration Successful ,
    please login using your details ")

     else:
        return render_template('register.html', pred=" You are already a member ,
please login using your details ")
   else:
     return render_template('register.html')
```

```
@ app.route('/login', methods=['GET','POST'])
def login():
    if request.method == "GET":
        user = request.args.get('mail')
passw = request.args.get('pass')
print(user, passw)
 query = {'mail': {'$eq': user}}
        docs = my_database.get_query_result(query)
        print(docs)
        print(len(docs.all()))
        if (len(docs.all()) == 0):
            return render_template('login.html', pred="")
        else:
            if ((user == docs[0][0]['mail'] and passw == docs[0][0]['psw'])):
flash("Logged in as " + str(user))
                return render_template('index.html', pred="Logged in as "+str(user), vis
="hidden", vis2="visible")
            else:
                return render_template('login.html', pred="The password is wrong.")
else:
    return render_template('login.html')


@ app.route('/logout')
```

```
def logout():
    return render_template('logout.html')


@app.route("/predict",methods=["GET", "POST"])
def predict():
    if request.method == "POST":
        f = request.files['file']
        # getting the current path 1.e where app.py is present
        basepath = os.path.dirname(__file__)
        #print ( " current path " , basepath )
        # from anywhere in the system we can give image but we want that
filepath = os.path.join(str(basepath), 'User_Images', str(f.filename))
        #print ( " upload folder is " , filepath )
f.save(filepath)
img = image.load_img(filepath, target_size=(299, 299))
        x = image.img_to_array(img)  #ing to array
        x = np.expand_dims(x, axis=0)  # used for adding one more dimension
        #print ( x )
img_data = preprocess_input(x)
        prediction = np.argmax(model.predict(img_data), axis=1)

    index = [' No Diabetic Retinopathy ', ' Mild NPDR ',
            ' Moderate NPDR ', ' Severe NPDR ', ' Proliferative DR ']
    result = str(index[prediction[0]])
    print(result)
account_sid = 'AC8e0f2f5263d71c8f630a6486779cf08b'
```

```
auth_token = '30b489873afb3c47340070eabd6bfb15'

        client = Client(account_sid, auth_token)

        ''' Change the value of 'from' with the number
        received from Twilio and the value of 'to'
        with the number in which you want to send message.'''
        message = client.messages.create(
                                from_='+16075363206',
                                body ='Results: '+ result,
                                to ='+919445979800'
                            )
        return render_template('prediction.html', prediction=result, fname = filepath)
    else:
        return render_template("prediction.html")

if __name__ == "__main__":
app.debug = True
app.run()
```

Index.html

```
<!DOCTYPE html>

<html lang="en">

  <head>

    <meta charset="UTF-8" />

    <meta http-equiv="X-UA-Compatible" content="IE=edge" />

    <meta name="viewport" content="width=device-width, initial-scale=1.0" />

    <!-- CSS only -->
```

```
    <link

href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.1/dist/css/bootstrap.min.css"
      rel="stylesheet"
      integrity="sha384-
iYQeCzEYFbKjA/T2uDLTpkwGzCiq6soy8tYaI1GyVh/UjpbCx/TYkiZhlZB6+
fzT"
      crossorigin="anonymous"
    />
    <!-- JavaScript Bundle with Popper -->
    <script

src="https://cdn.jsdelivr.net/npm/bootstrap@5.2.1/dist/js/bootstrap.bundle.min.j
s"
      integrity="sha384-
u1OknCvxWvY5kfmNBILK2hRnQC3Pr17a+RTT6rIHI7NnikvbZlHgTPOOm
Mi466C8"
      crossorigin="anonymous"
    ></script>
    <style>
      #navbarRight {
          margin-left: auto;
          padding-right:10px;
```

```
        }
        .navbar-brand{
            padding-left:15px;
        }
    </style>
    <title>DR Predcition</title>
  </head>
  <body>
    <nav class="navbar navbar-expand-lg navbar-light bg-dark">
        <div>
        <a class="navbar-brand"href="#"style="color:aliceblue">Diabetic Retinopathy Classification</a>
        </div>
        <div class="navbar-collapse collapse w-100 order-3 dual-collapse2" id="navbarNav">
          <ul class="navbar-nav mr-auto text-center" id="navbarRight">
            <li class="nav-item active">
              <a class="nav-link" href="index" style="color: aliceblue;">Home </a>
            </li>
            <li class="nav-item">
              <a class="nav-link" href="login" style="color: aliceblue;">Login</a>
            </li>
```

```
          <li class="nav-item">
            <a class="nav-link" href="register"style="color: aliceblue;">Register</a>
          </li>
          <li class="nav-item">
            <a class="nav-link" href="predict"style="color: aliceblue;">Prediction</a>
          </li>
        </ul>
      </div>
    </nav>
    <div class="d-flex justify-content-center">
      <img style="width:70vw;" src="static/diabetic-retinopathy-home.jpg">
      </div>
  </body>
</html>
```

Login.html

```
<!DOCTYPE html>
<html lang="en">
  <head>
    <meta charset="UTF-8" />
    <meta http-equiv="X-UA-Compatible" content="IE=edge" />
```

```
    <meta name="viewport" content="width=device-width, initial-scale=1.0" />
    <!-- CSS only -->
    <link

href="https://cdn.jsdelivr.net/npm/bootstrap@5.2.1/dist/css/bootstrap.min.css"
      rel="stylesheet"
      integrity="sha384-
iYQeCzEYFbKjA/T2uDLTpkwGzCiq6soy8tYaI1GyVh/UjpbCx/TYkiZhlZB6+
fzT"
      crossorigin="anonymous"
    />
    <!-- JavaScript Bundle with Popper -->
    <script

src="https://cdn.jsdelivr.net/npm/bootstrap@5.2.1/dist/js/bootstrap.bundle.min.j
s"
      integrity="sha384-
u1OknCvxWvY5kfmNBILK2hRnQC3Pr17a+RTT6rIHI7NnikvbZlHgTPOOm
Mi466C8"
      crossorigin="anonymous"
    ></script>
    <style>
      #navbarRight {
```

```
        margin-left: auto;
        padding-right:10px;

    }
    .navbar-brand{
        padding-left:15px;
    }
  </style>
  <title>DR Predcition</title>
 </head>
 <form action="",method='POST'>
  <nav class="navbar navbar-expand-lg navbar-light bg-dark">
    <div>
    <a class="navbar-brand" href="#" style="color:aliceblue">DR Register</a>
    </div>
    <div class="navbar-collapse collapse w-100 order-3 dual-collapse2" id="navbarNav">
      <ul class="navbar-nav mr-auto text-center" id="navbarRight">
        <li class="nav-item active">
          <a class="nav-link" href="index" style="color: aliceblue;">Home </a>
        </li>
```

```
        <li class="nav-item">
          <a class="nav-link" href="login" style="color: aliceblue;">Login</a>
        </li>
        <li class="nav-item">
          <a class="nav-link" href="register"style="color: aliceblue;">Register</a>
        </li>
      </ul>
    </div>
  </nav>
  <br><br>
  <form class="form-inline">
  <div class="container" style="width: 600px; height: 600px;">
    <div class="mb-3 d-flex justify-content-center"><script src="https://cdn.lordicon.com/xdjxvujz.js"></script>
        <lord-icon
            src="https://cdn.lordicon.com/elkhjhci.json"
            trigger="hover"
            style="width:200px;height:200px">
        </lord-icon></div>

        <div class="mb-3">
```

```
            <input type="email" class="form-control" id="exampleInputEmail1" name="mail" aria-describedby="emailHelp" placeholder="Enter Registered Mail ID">
            </div>
            <div class="mb-3">
             <input type="password" class="form-control" id="exampleInputPassword1" name="pass" placeholder="Enter Password">
            </div>
            <div class="mb-3">
            <button type="submit form-control" class="btn btn-dark btn-primary" style="width:100%;">Login</button>
          </div>
      </div>
    </form>
  </body>
</html>
```

Github Link

https://github.com/IBM-EPBL/IBM-Project-4561-1658734504

Github demolink

https://github.com/IBM-EPBL/IBM-Project-4561-1658734504/blob/main/Final%20Delivarables/Demo%20Link/video%20link.txt