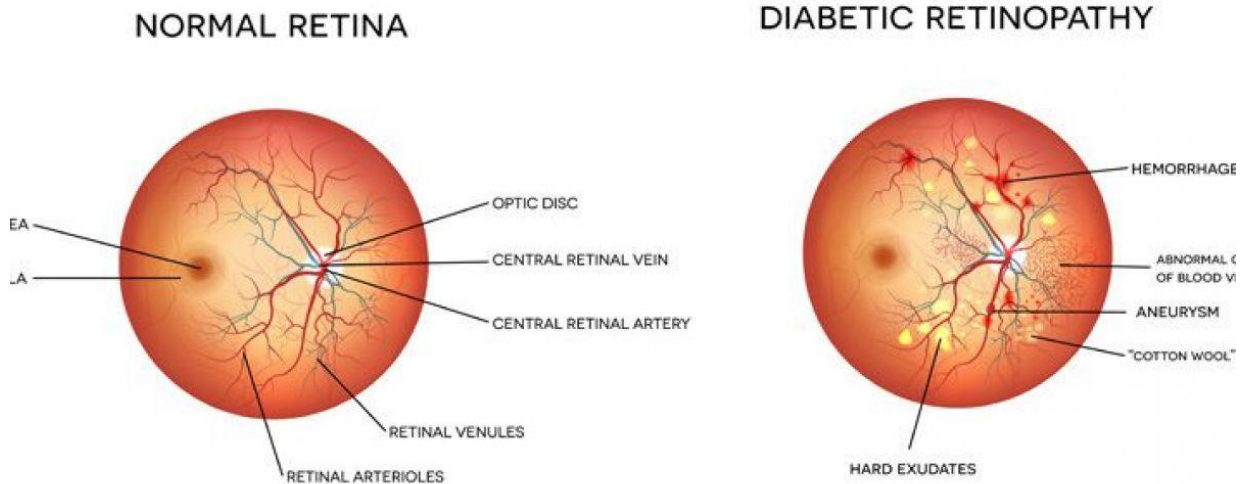


Deep Learning Fundus Image Analysis for Early Detection of Diabetic Retinopathy



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1) **INTRODUCTION TO PROJECT**

Diabetes complications that damage the eyes are referred to as diabetic retinopathy (die-uh-BET-ik reti-NOP-uh-thee). Damage to the blood vessels in the light-sensitive tissue at the back of the eye is what causes it (retina). Initially, diabetic retinopathy may not manifest any symptoms or may only result in minor vision issues. But it might result in blindness. Any person with type 1 or type 2 diabetes has the potential to acquire the illness. The likeliness of developing this ocular problem increases with the duration of diabetes and the degree of blood sugar management.

SYMPTOMS:

During the early stages of diabetic retinopathy, you might not experience any symptoms.

As the situation worsens, you could get:

- You may notice spots or black strings in your vision (floaters)
- distorted vision
- unstable vision
- regions of vision that are dark or vacant
- loss of vision

DIAGNOSIS:

A thorough dilated eye exam is the most effective method for diagnosing diabetic retinopathy. To better observe inside your eyes during this examination, drops are put in your eyes to enlarge (dilate) your pupils. Your close vision may get blurry while using the drops until they wear off many hours later. Your eye doctor will examine both the inside and outside of your eyes during the examination. An injection of dye is then given into an arm vein after your eyes

have been dilated. Pictures are then captured when the dye passes through the blood vessels in your eyes. Blood vessels that are closed, damaged, or leaking might be located on the photographs.

PURPOSE:

While blindness from diabetes is permanent, the good news is that it is almost completely preventable, especially if diabetic patients receive an annual diabetic eye exam. Early detection and treatment of diabetic retinopathy is key and reduces the risk of severe vision loss by 90%. Diabetic eye screening is crucial because it guards against vision loss. Your eyes are susceptible to damage from diabetic retinopathy if you have diabetes. Before you notice any changes in your eyesight, screening might find the disease early on. Because having your vision corrected can enhance the quality of daily living, regular eye exams are crucial. They will aid in the early detection of disorders that could cause blindness, such as age-related macular degeneration, glaucoma, and cataracts. Falls could be increased by poor vision. In children, the test is performed to screen for vision problems. Vision problems in young children can often be corrected or improved.

2)LITERATURE SURVEY

Sangheon, et al [2]. Pack's main goal is to categorise each of the DR's several stages using the fewest learnable characteristics possible. The VGG-NiN model is built by stacking the VGG16, the spatial pyramid pooling layer (SPP), and the network-in-network to create a highly nonlinear scale-invariant deep model (NiN). The suggested VGG-NiN model can process a DR image of any size because of the benefits of the SPP layer. The model also gains additional nonlinearity from the stacking of NiN, which enhances categorisation overall. The experimental results show that, in terms of accuracy and effective use of computer resources, the proposed model performs better than cutting-edge approaches.

Automatically diagnosing diabetic retinopathy was studied, and Akhilesh Kumar Gangwar and Vadlamani Ravi proposed a special deep learning hybrid to solve the problem. Transfer learning is used to layer a specific block of CNN layers on top of the Inception-ResNet-v2 network that has already been trained in order to construct the hybrid model. We evaluated the performance of the proposed model using the Messidor-1 dataset for diabetic retinopathy and the APTOS 2019 blindness detection (Kaggle dataset). Our model performed better than other reported results. We found test accuracy to be 72.33 and 82.18 percent on the Messidor-1 and APTOS datasets, respectively.

The deep-learning system was developed by Ashish Bora, et al [6]. The system was then assessed using an internal validation set of 7976 eyes and an external validation set of 4762 eyes. The baseline traits, demographics, and distribution of the grades of diabetic retinopathy in the development and validation sets are shown in Table 1. 685 (19%) and 346 (15%), respectively, of the 3678 eyes in the internal validation set and the 2345 eyes in the external validation set with known 2-year mild or worse diabetic retinopathy outcomes, developed the condition within 2 years after screening but did not have it at the time. Additionally, there were variations in the two datasets' glycated haemoglobin concentrations (appendix p 14), racial and ethnic composition, and grading practises (table 1). (Appendix, Pages 6–7) .

An automated classification method is presented by Quang H. Nguyen, et al [5]. to evaluate the severity of diabetic retinopathy (DR) based on the analysis of fundus images with various illumination and fields of vision. Our approach achieves 80 percent sensitivity, 82 percent accuracy, 82 percent specificity, and 0.904 AUC for

categorising images into 5 categories ranging from 0 to 4, where 0 is no DR and 4 is proliferative DR.

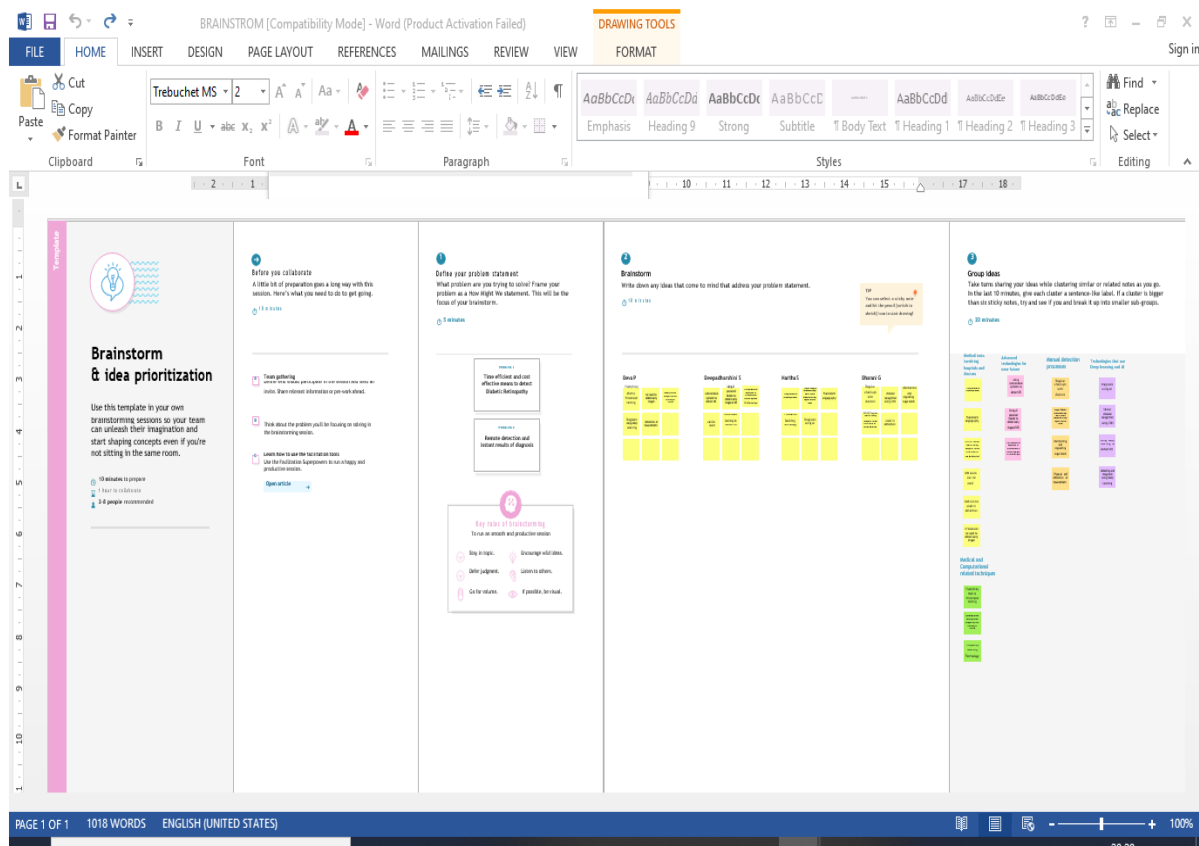
From a human-centered viewpoint, Emma Beede, et al [8]. investigate a deep learning system used in clinics to identify diabetic eye disease. Based on interviews and observations at eleven clinics in Thailand, we describe current eye-screening practises, user expectations for an AI-assisted screening process, and post-deployment experiences. The patient experience, nurse workflows, and model performance are all impacted by a variety of socio-environmental factors, according to our research. These results serve as a starting point for our discussion of the advantages of conducting prospective model correctness assessments alongside human-centered evaluative research

3) IDEATION AND PROPOSED SOLUTION

3.1) EMPATHY MAP CANVAS



3.2 IDEATION & BRAINSTORMING



3.3 PROPOSED SOLUTION

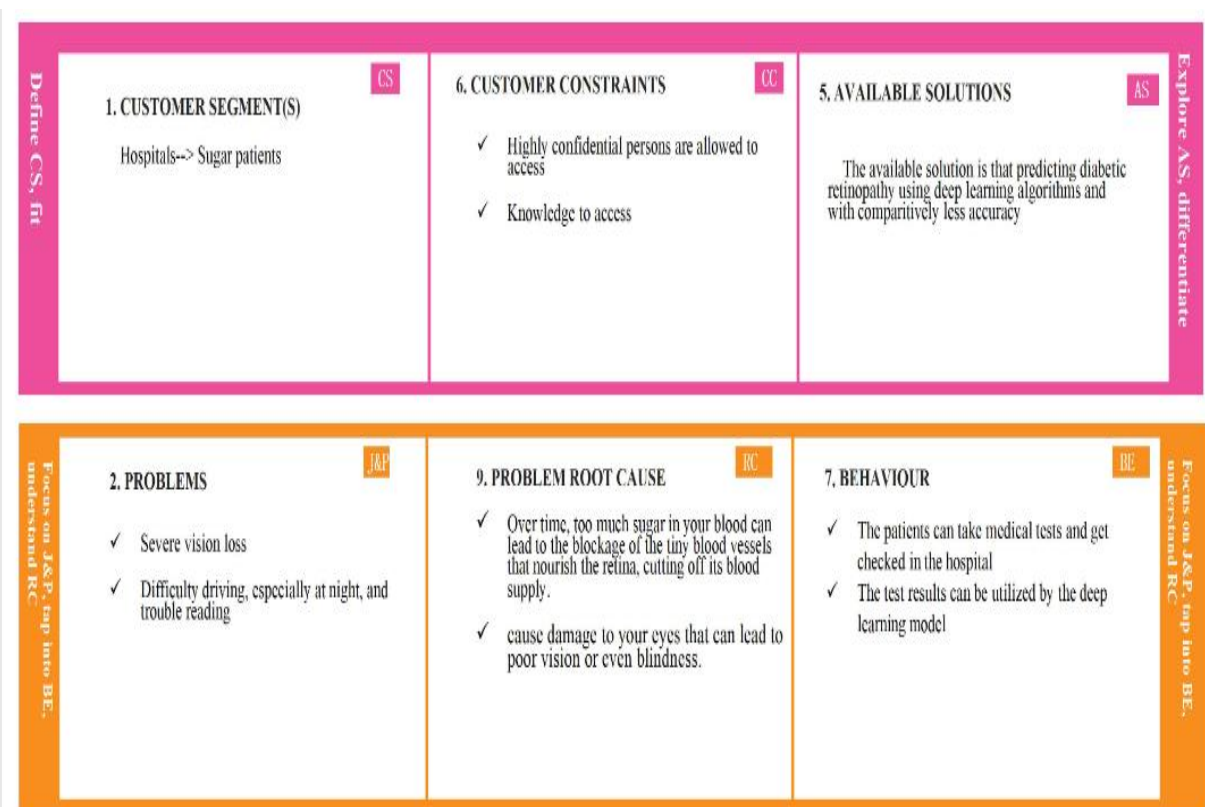
Proposed Solution Template:

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	Diabetic Retinopathy(DR) is a common complication of diabetes mellitus, which causes lesions on the retina that effect vision. If it is not detected early, it can lead to blindness. Development on larger and more diverse datasets, such an algorithm could enable early diagnosis and referral to a retina specialist for more frequent monitoring and even consideration of early intervention. Moreover, it could also improve patient recruitment for clinical trials targeting DR.
2.	Idea / Solution description	Many Artificial-Intelligence-powered methods have been proposed by the research community for the detection and classification of diabetic retinopathy on fundus retina images.
3.	Novelty / Uniqueness	This work considers a deep learning methodology specifically a Convolutional Neural Network(CNN), which is applied for the early detection of diabetic retinopathy.

4.	Social Impact / Customer Satisfaction	Regular dilated eye examinations are an effective approach to detecting and treating vision-threatening diabetic retinopathy. They can help prevent blindness, and they are cost-effective. This application satisfying their requirements without spending any cost.
5.	Business Model (Revenue Model)	This can be converted as a bussiness model because it helps to prevent blindness of affected patient. Most of the common people and the hospitals will use this application.
6.	Scalability of the Solution	This application will be scalable. Once the image is classified under the five category of diabetic retinopathy then the suitable diagnosis and the health tips(integrated with their daily life style) will be displayed.

3.4 PROBLEM SOLUTION FIT



Identify strong TR & EM	3. TRIGGERS ✓ The longer you have diabetes and the less controlled your blood sugar is, the more likely you are to develop this eye complication.	10. YOUR SOLUTION Diabetic Retinopathy(DR) is a common complication of diabetes mellitus, which causes lesions on the retina that effect vision. If it is not detected early, it can lead to blindness. Many Artificial-Intelligence-powered methods have been proposed by the research community for the detection and classification of diabetic retinopathy on fundus retina images. Moreover, it	8. CHANNELS of BEHAVIOUR CII ONLINE ✓ People check with the symptoms and causes through surfing and they also check for laboratories which perform the medical tests. They can also like to get the results quickly without any delay.

	4. EMOTIONS: BEFORE / AFTER BEFORE: -->Anxious about getting checked with doctor immediately and knowing their medical condition. AFTER: -->After diagnosis and getting the results for their tests patients would be happy that they got to know about their conditions at very early stage and get cured in a painless way.	could also improve patient recruitment for clinical trials targeting DR. SL	OFFLINE ✓ Most of the times the patients require a complete health examination and they should visit the hospital and get the prescribed medical tests done.

4) REQUIREMENT ANALYSIS SOLUTION REQUIREMENTS

(FUNCTIONAL & NON-FUNCTIONAL)

4.1 FUNCTIONAL REQUIREMENTS:

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	Identifying the population eligible for screening	Use registries to ensure that people's details are collected and current, and decide which group needs to be tested based on the best available evidence.
FR-2	Invitation and information	Invite the entire cohort to the screening, and provide information that is appropriate for each group. To facilitate participation with knowledge
FR-3	Testing	Conduct screening test(s) using agreed/recommended Methods
FR-4	Referral of screen positives and reporting of screen-negative results	Send all positive findings from the screen to the appropriate services. additionally, ensure that screen negatives are communicated to People who continue to participate in the screening program
FR-5	Diagnosis	Diagnose true cases and identify false positives
FR-6	Treatment	Correctly intervene and treat situations; in some circumstances, surveillance or follow-up may also be necessary
FR-7	Outcomes	Identify false negatives and increase the performance and cost-efficiency of the screening program by gathering, analyzing, and reporting results.

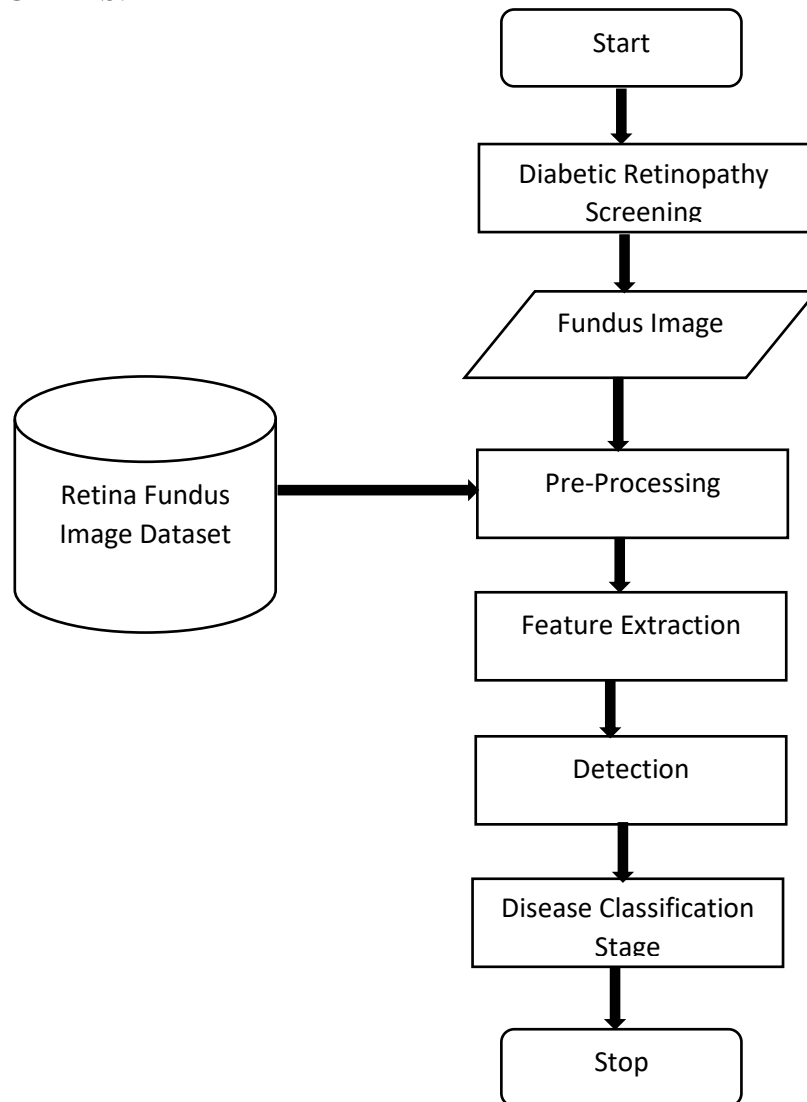
4.2 NON-FUNCTIONAL REQUIREMENTS:

Following are the non-functional requirements of the proposed solution.

FR No.	Non-Functional Requirement	Description
NFR-1	Usability	New findings for five distinct screening and clinical grading systems for diabetic retinopathy are presented. incorporating cutting-edge outcomes for precisely identifying photographs based on clinical five-grade diabetic retinopathy
NFR-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.
NFR-3	Reliability	Deep Learning's capability to do pattern recognition by building complex associations based on input data and comparing them to performance standards is a significant advancement.
NFR-4	Performance	Simply said, AI is the ability to complete a task. primarily performed by a robot or computer, with the involvement of people. common templates for illustrating retinal findings that could be improved accuracy of results recorded.
NFR-5	Availability	Health care affordability, quality, and accessibility Can be amplified using this technology.
NFR-6	Scalability	In order to make high-quality systematic diabetic retinopathy screening a universal Offer to all persons with diabetes, it is possible to expand on existing systems and use a stepwise approach to enhancing the efficacy of present techniques.

5) PROJECT DESIGN

5.1 DATA FLOW DIAGRAMS:

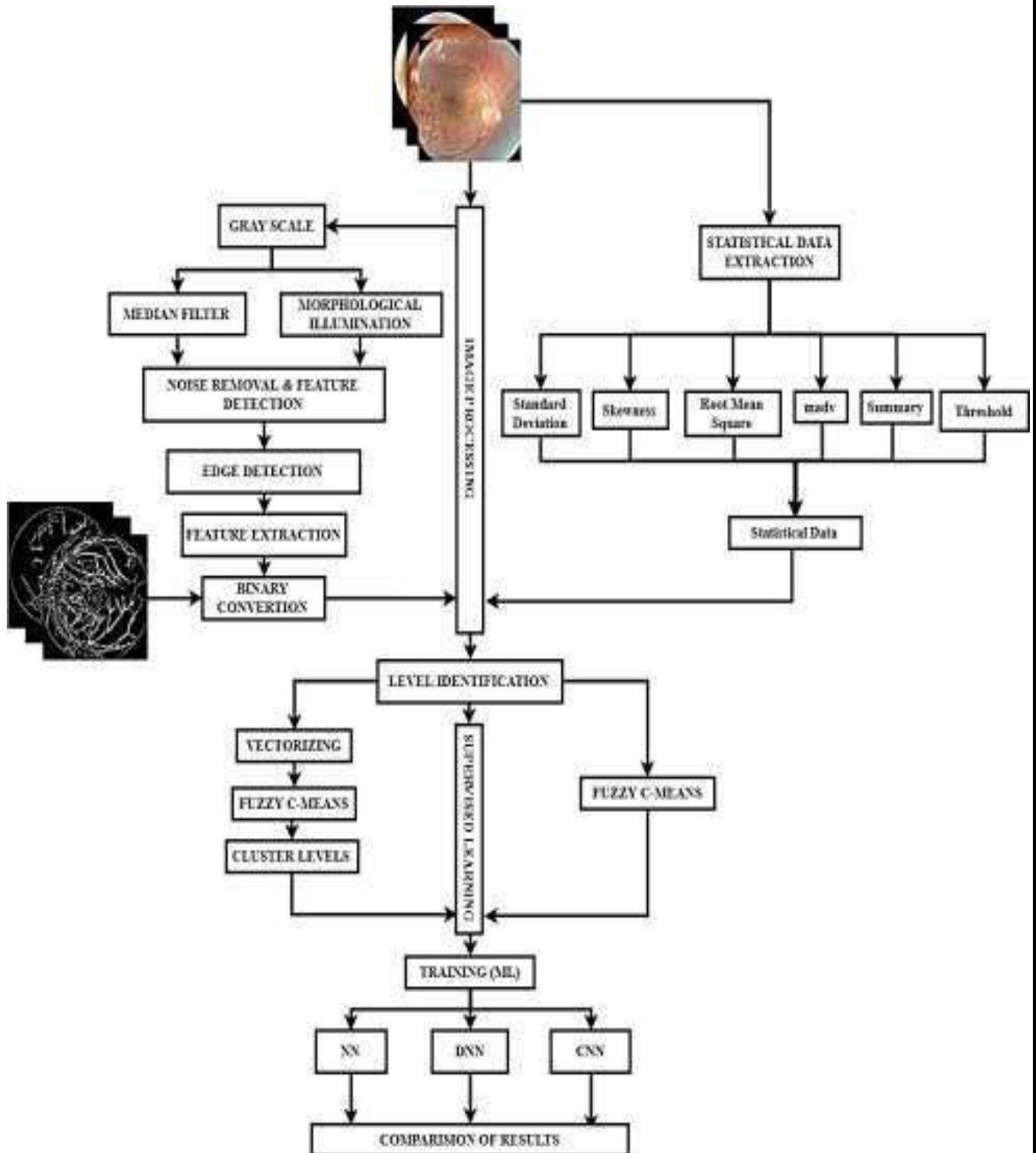


5.2 SOLUTION ARCHITECTURE



- ✓ Collecting the datasets of various medical tests done for patients from the hospitals .
- ✓ Feature selection – Using only the most important data and removing the unwanted features by performing dimensionality reduction .
- ✓ Applying Classification techniques like VGG16 and VGG19 algorithms.
- ✓ Model building – Create the DL model and doing testing and training on the model by providing test and train data respectively.
- ✓ Predict the output and evaluating the performance of the model.
- ✓ Deploying the model with UI with all required features.
- ✓ Providing the input data and it predicts the result.

SOLUTION ARCHITECTURE DIAGRAM:



5.3 USER STORIES:

User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	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 AND SCHEDULING

6.1 SPRINT PLANNING & ESTIMATION DELIVERY SCHEDULE

Project Tracker, Velocity & Burndown Chart: (4 Marks)

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	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

6.2)SPRINT DELIVERY SCHEDULE:

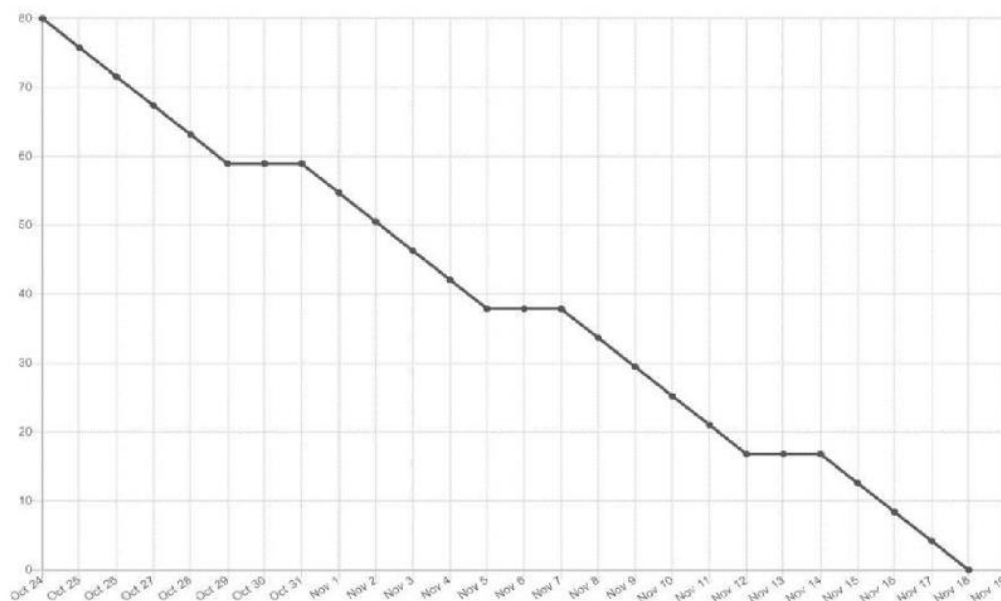
Product Backlog, Sprint Schedule, and Estimation (4 Marks)

Use the below template to create product backlog and sprint schedule

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	Deepadharshini S
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	Haritha S
Sprint-2	Login	USN-3	As a user, I can log into the application by entering my email & password	5	High	Deepadharshini S Deva P
Sprint-2	Upload Images	USN-4	As a user, I should be able to upload the image of ECG.	10	High	Dharani G
Sprint-2	Dashboard	USN-5	As a user, based on my requirement I can navigate through the dashboard.	5	Medium	Deva P Haritha S

6.3)REPORTS FROM JIRA SOFTWARE:

Burndown Chart



A burn down chart is a graphical representation of work left to do versus time. It is often used in agile software development methodologies such as Scrum. However, burn down charts can be applied to any project containing measurable progress over time.

7) CODING AND SOLUTIONING

7.1)FEATURE:

APPLYING XG-BOOST FOR DATASET

7.1 Feature 1:

Predicting the stages of Diabetic retinopathy

CODE:

```
@app.route('/prediction')
def prediction():
    full_filename = os.path.join(app.config['UPLOAD_FOLDER'], 'retina.jpg')
    full_filename1 = os.path.join(app.config['UPLOAD_FOLDER'], 'image6.png')
    return
    render_template('prediction.html',image=full_filename,image2=full_filename1)
@app.route('/afterpred',methods=["GET","POST"])
def afterpred():
    if request.method=="POST":
        full_filename2 = os.path.join(app.config['UPLOAD_FOLDER'],
        'retina.jpg')
        full_filename1 = os.path.join(app.config['UPLOAD_FOLDER'],
        'image6.png')
        f=request.files['pfile']
        filepath=os.path.join('static','uploads',f.filename)
        f.save(filepath)
        img=image.load_img(filepath,target_size=(224,224))
        x=image.img_to_array(img)
        x=np.expand_dims(x,axis=0)
        img_data=preprocess_input(x)
        prediction=np.argmax(model.predict(img_data),axis=1)
        index=["no dr","mild dr","moderate dr","severe dr","proliferate"]
        result=str(index[prediction[0]])
        print(result)
        return
        render_template('prediction.html',prediction=result,image=full_filename2,image2=full_filename1)
    else:
        full_filename = os.path.join(app.config['UPLOAD_FOLDER'],
        'loginimg.jpg')
        return render_template('login.html',pred="Please login using your
        credentials",image=full_filename)
```

Explanation:

On entering the prediction page, the user will be directed to upload the test images.On clicking thesubmit button ,the result indicating the stage of Diabetic Retinopathy will be dispalyed.

7.2 Feature 2:

Queries from user

CODE:

```
@app.route('/query')
def query():
    my_database_query = client['my_database_query']
    dt=[]
```

```

for document in my_database_query:
dt.append(document['who'])
dt.append(document['phoneno'])
dt.append(document['query'])
return render_template('query1.html',data=dt)
@app.route('/afterquery', methods=['POST','GET'])
def afterquery():
my_database_query = client['my_database_query']
x=[x for x in request.form.values()]
data1={
'_id':x[0],
'who':x[1],
'phoneno':x[2],
'query':x[3],
}
query={'_id':{'$eq':data1['_id']}}
docs=my_database_query.get_query_result(query)
if(len(docs.all())==0):
url=my_database_query.create_document(data1)
my_database_query = client['my_database_query']
dt=[]
for document in my_database_query:
dt.append(document['who'])
dt.append(document['phoneno'])
dt.append(document['query'])
return render_template('query1.html',predict="Query submittedSuccessfully",data=dt)
else:
url=my_database_query.create_document(data1)
my_database_query = client['my_database_query']
dt=[]
for document in my_database_query:
dt.append(document['who'])
dt.append(document['phoneno'])
dt.append(document['query'])
return render_template('query1.html',predict="Query submitted
Successfully",data=dt)

```

Explanation:

On entering the home page, any queries of the user can be posted by clicking the query button. In

query page there will be the list of queries and responses posted so far, the user will be asked to enter phone number and corresponding query. On hitting the submit button their query will be submitted and can be viewed by both the user and admin.

7.3 Feature 3:

Response to User Queries by admin

CODE:

```

@app.route('/respond')
def respond():
my_database_query = client['my_database_query']
dt=[]
for document in my_database_query:
dt.append(document['who'])
dt.append(document['phoneno'])

```

```

dt.append(document['query'])
return render_template('respond.html',data=dt)
@app.route('/afterrespond', methods=['POST','GET'])
def afterrespond():
my_database_query = client['my_database_query']
x=[x for x in request.form.values()]
data1={
'_id':x[0],'who':x[1],
'phoneno':x[2],
'query':x[3]
}
query={'_id':{'$eq':data1['_id']}}
docs=my_database_query.get_query_result(query)
if(len(docs.all())==0):
url=my_database_query.create_document(data1)
my_database_query = client['my_database_query']
dt=[]
for document in my_database_query:
dt.append(document['who'])
dt.append(document['phoneno'])
dt.append(document['query'])
return render_template('respond.html',predict="Response posted
Successfully",data=dt)
else:
url=my_database_query.create_document(data1)
my_database_query = client['my_database_query']
dt=[]
for document in my_database_query:
dt.append(document['who'])
dt.append(document['phoneno'])
dt.append(document['query'])
return render_template('respond.html',predict="Response posted
Successfully",data=dt)

```

Explanation:

After Admin logs in, by clicking the Respond Queries button in admin page, an admin can view all the queries and the responses sent so far, he/she can send response to every Query by entering the Query's phone number and the response. Once the response is posted it will be reflected on both admin and user's query page.

7.4 Feature 4:

Forgot password

CODE:

```

@app.route('/fp')
def fp():
full_filename = os.path.join(app.config['UPLOAD_FOLDER'],'forgotpw.png')
return render_template('fp.html',image=full_filename)
@app.route('/afterfp', methods=['POST','GET'])
def afterfp():

```

```

pn=request.form['phoneno']
securityques=request.form['secques']
npassw=request.form['npwd']
cpassw=request.form['cpwd']
docs=my_database[pn]
if(npassw==cpassw and securityques==docs['securityquestion']):
    full_filename =
    os.path.join(app.config['UPLOAD_FOLDER'],'loginimg.jpg')
    docs['pwd'] = cpassw
    docs.save()
    return render_template('login.html',predict="Successfully
updated",image=full_filename)
if(securityques!=docs['securityquestion']):
    full_filename =
    os.path.join(app.config['UPLOAD_FOLDER'],'forgotpw.png')
    return render_template('fp.html',predict="Incorrect answer to
security question",image=full_filename)
if(npassw!=cpassw):
    full_filename =
    os.path.join(app.config['UPLOAD_FOLDER'],'forgotpw.png')
    return render_template('fp.html',predict="New and confirm password
does not match",image=full_filename)

```

Explanation:

User or Admin on reaching the login page can use the forgot password option and can change their passwords. For the purpose of security only when the answer to the security question by the user matches with the answer given during registration and only when the new and confirm password matches the password of the particular user will be updated

7.5 Feature 5:

Modification of location by User

CODE:

```

@app.route('/modify',methods=["GET","POST"])
def modify():
    full_filename = os.path.join(app.config['UPLOAD_FOLDER'])
    return render_template('modify.html',predict="Please enter your new
location")
@app.route('/aftermodify',methods=["GET","POST"])
def aftermodify():
    if request.method=="POST":
        user=session['pn']
        pwd=request.form['pwd']
        nloc=request.form['location']
        docs=my_database[user]
        if (pwd==docs['pwd']):
            full_filename =
            os.path.join(app.config['UPLOAD_FOLDER'],'pimg.jpg')
            docs['location'] = nloc
            docs.save()
            return render_template('modify.html',predict="Successfully
updated")

```

```

else:
full_filename = os.path.join(app.config['UPLOAD_FOLDER'],
'retina.jpg')full_filename1 = os.path.join(app.config['UPLOAD_FOLDER'],
'image6.png')
return
render_template('prediction.html',image=full_filename,image2=full_filename1)

```

Explanation:

A user can change their location to get appropriate hospital preference by changing their location in the modify page. The the new location will get updated when password is correct, and their phone number will be retrieved using the sessions variable and the database will be updated.

8) TESTING

8.1)TESTCASES:

Test case ID	Feature Type	Component	Test Scenario	Pre-Requirement	Steps To Execute	Test Data	Expected Result	Actual Result	Status	Comments	TC for Automation(Y/N)	BUG ID	Executed By
Dashboard_TC_001	Non Functional	Prediction Page	Verify User can access the modify page the changing location details.	User should already registered with the application and login with their credentials	1.From home page enter the login page through "Login" button. 2.Enter your credentials and login. 3.This will redirect to prediction page. the Modify button to enter the modify page to modify location.		Should able to enter the modify page	Working as expected	Pass				Deepakharshini S Deva P
Dashboard_TC_002	Non Functional	Prediction Page	Verify user can able to submit the form with new location update.	User should already registered with the application.	1.Enter the password and new location. 2.click submit.	password:2000 newlocation:chennai	Should able to submit the form and update database when password is correct for the user and display "Invalid credentials". Should not update the database and "updated successfully"	Working as expected	Pass	Only few places like Coimbatore, Chennai, Madurai, Tiruchir are added for location.			Haritha S Chandra G
Dashboard_TC_003	Non Functional	Prediction Page	Verify user cannot update on wrong password.	User should already registered with the application.	1.Enter the password and new location. 2.click submit.	password:abbb newlocation:chennai	Should not update the database and redirect the modify page and display "Invalid credentials"	Not working as expected	Fail				Haritha S Chandra G
Dashboard_TC_004	Non Functional	Prediction Page	Verify user able to access location suggestion page.	User should already registered with the application and login with their credentials.	1.Enter the password and new location. 2.click submit.	password:1111 newlocation:coimbatore	Should not update and render the same page.	Working as expected	Fail				Deepakharshini S Deva P
Dashboard_TC_005	Non Functional	Prediction Page	Verify user able to access location suggestion page.	User should already registered with the application and login with their credentials.	1.From home page enter the login page through "Login" button. 2.Enter your credentials and login. 3.This will redirect to prediction page. 4.Click the Hospital button to get hospital suggestions.		User should able to redirected to location suggestion page and find the suggested locations.	Working as expected	Pass	Only few places like Coimbatore, Chennai, Madurai, Tiruchir are added for location.			Deepakharshini S Deva P
Dashboard_TC_006	Non Functional	Prediction Page	Verify user is given the suggestions only according to their current location.	User should already registered with the application and login with their credentials.	1.From home page enter the login page through "Login" button. 2.Enter your credentials and login. 3.This will redirect to prediction page. 4.Click the Hospital button to get hospital suggestions.		Should get appropriate hospital suggestion.	Working as expected	Pass				Haritha S Chandra G
Dashboard_TC_006	Non Functional	Prediction Page	Verify after modification in location user able to get the location suggestions for the new location.	User should already registered with the application and login with their credentials.	1.From home page enter the login page through "Login" button. 2.Enter your credentials and login. 3.This will redirect to prediction page. 4.Click the Hospital button to get hospital suggestions.		Should show the hospitals according to new location.	Working as expected	Pass				Deepakharshini S Deva P
Database_TC_001	Non Functional	Admins Page	Verify Admins can access the update hospital details.	Admins should be valid	1.From home page enter the login page through "Login" button. 2.Enter Admin credentials and login. 3.This will redirect to admin page. 4.Click the update location button to update locations.		Should render the update location page.	Working as expected	Pass				Haritha S Chandra G
Database_TC_002	Non Functional	Admins Page	Verify Admins can enter the updates details.	Admins should be valid	1.Enter the hospital name, location and contacts with the location detail and click submit.	location:coimbatore hospital:Eye care hospital location:VV perum contact:9943177	Should able to submit and make update in database.	Working as expected	Pass				Deepakharshini S Deva P
Database_TC_003	Non Functional	Admins Page	Verify Admins can add new hospital location.	Admins should be valid	1.Enter the hospital name, location and contacts with the location detail and click submit.	location:coimbatore hospital:Vasud eye hospital location:valkavall contact:95778	Should able to Add new location.	Working as expected	Pass				Haritha S Chandra G

8.2)USER ACCEPTANCE TESTING:

Acceptance Testing UAT Execution & Report Submission

Date	03 November 2022
Team ID	PNT2022TMID06905
Project Name	Project - Deep Learning Fundus image analysis for early detection of Diabetic Retinopathy
Maximum Marks	4 Marks

1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	2	3	20
Duplicate	1	0	3	0	4
External	2	3	0	1	6
Fixed	11	2	4	20	37
Not Reproduced	0	0	1	0	1
Skipped	0	0	1	1	2
Won't Fix	0	5	2	1	8
Totals	24	14	13	26	77

3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource 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 METRICES (IN PERCENTAGE):

CLASS	PRECISION	RECALL	F1 SCORE	SUPPORT
Mild	0.57	0.38	0.45	698
Moderate	0.43	0.61	0.50	655
No_DR	0.48	0.38	0.43	688
Proliferate_DR	0.86	0.96	0.91	536
Severe	0.85	0.90	0.87	616

10) ADVANTAGES

- Perform complex tasks, smart and automated, better generalization, domain knowledge, decision making.
- Can generate well-defined features through automated feature learning.
- Have the capability to learn and to generate new features from extracted and existing features.
- Used for deep feature extraction and image classification. It has a high dimensionality. This means that we can create more learning models by adding more layers to our neural network.

DISADVANTAGES

- It requires very large amount of data in order to perform better than other techniques.
- Applications can vary greatly from application to application, and testing technique for analysis, validation and scaling vary widely.
- It is computationally very expensive, requiring a large amount of memory and computational resources, and it is not easy to transfer it to other problems.
- It requires very advanced optimization techniques, and these should have been incorporated to obtain good results.

11) CONCLUSION

- In the given guided project I understood the problem to classify if it is a regression or a classification kind of problem.
- I also came to know how to pre-process the data using different data-preprocessing techniques.
- The suggested model is significantly productive than manual techniques and other approaches adopted as a component of operations used in agriculture with processing time of less than 1s per picture.

12)FUTURE SCOPE

It focus on improving camera systems for early retinopathy diagnosis in their future work. The existing methods' effectiveness lies in their ambiguity. It may be impressive for algorithms to be hybridised in order to have even more accuracy. There are still unanswered questions about the visualisation and comprehension of the features that deep learning algorithms employ to optimise learning and produce precise predictions. A worthwhile and difficult field of research is the merging of conventional and DL-based systems for the selection of the most appropriate features and detection of health issues. Research may also highlight the development of creative plans for overcoming the limitations of the most recent cutting-edge technology. The lack of diagnostic interpretations in the solutions prevents their extensive application in practical clinical settings. To get beyond this obstacle to their application, interpretable DL approaches must be improved in the future.

13) APPENDIX

GITHUB LINK:

<https://github.com/IBM-EPBL/IBM-Project-10778-1659203232>

PROJECT DEMO LINK:

<https://drive.google.com/file/d/1R9FVAB84QDSwNSwJ5xzPGb4Yn4oJdN-P/view?usp=sharing>