Eye Vision Care with Smartphone Technology

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Project Supervisor: Ms Tahimna Khan

Submitted By

Hamza Iqbal

Ahmed Asif

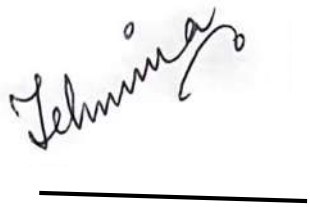
Syed Areeb Tariq

Computer Science Department

Sir Syed University of Engineering and Technology

Certification

This is to certify that [**Syed Areeb Tariq**], **[2020F-BCS-005]** , [**Hamza Iqbal**], **[2020F-BCS-008]** and **[Ahmed Asif]**, **[2020F-BCS-020]** have successfully completed the final project **[Eye Vision Care with Smartphone Technology],** at the **[Sir Syed University of Engineering and Technology]**, to fulfill the partial requirement of the degree **[Bachelors ✓in Computer Science].**



External Examiner

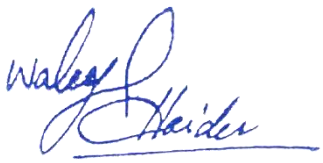
[Name of Examiner]

[Designation]

Project Supervisor

[Name of Supervisor]

[Designation]



Chairman

Department of [Name of Department], [Name of University]

Project Title (mention project title here)

Sustainable Development Goals

(Please tick the relevant SDG(s) linked with FYDP)

SDG No	Description of SDG	SDG No	Description of SDG
SDG 1	No Poverty	SDG 9	Industry, Innovation, and Infrastructure
SDG 2	Zero Hunger	SDG 10	Reduced Inequalities
SDG 3	Good Health and Well Being ✓	SDG 11	Sustainable Cities and Communities
SDG 4	Quality Education	SDG 12	Responsible Consumption and Production
SDG 5	Gender Equality	SDG 13	Climate Change
SDG 6	Clean Water and Sanitation	SDG 14	Life Below Water
SDG 7	Affordable and Clean Energy	SDG 15	Life on Land
SDG 8	Decent Work and Economic Growth	SDG 16	Peace, Justice and Strong Institutions
		SDG 17	Partnerships for the Goals

Range of Complex Problem Solving			
	Attribute	**Complex Problem**	
1	Range of conflicting requirements	Involve wide-ranging or conflicting technical, engineering and other issues.	
2	Depth of analysis required	Have no obvious solution and require abstract thinking, originality in analysis to formulate suitable models.	
3	Depth of knowledge required	Requires research-based knowledge much of which is at, or informed by, the forefront of the professional discipline and which allows a fundamentals-based, first principles analytical approach.	
4	Familiarity of issues	Involve infrequently encountered issues	
5	Extent of applicable codes	Are outside problems encompassed by standards and codes of practice for professional engineering.	
6	Extent of stakeholder involvement and level of conflicting requirements	Involve diverse groups of stakeholders with widely varying needs.	
7	Consequences	Have significant consequences in a range of contexts.	
8	Interdependence	Are high level problems including many component parts or sub-problems	
Range of Complex Problem Activities			
	Attribute	**Complex Activities**	
1	Range of resources	Involve the use of diverse resources (and for this purpose, resources include people, money, equipment, materials, information and technologies).	
2	Level of interaction	Require resolution of significant problems arising from interactions between wide ranging and conflicting technical, engineering or other issues.	
3	Innovation	Involve creative use of engineering principles and research-based knowledge in novel ways.	
4	Consequences to society and the environment	Have significant consequences in a range of contexts, characterized by difficulty of prediction and mitigation.	
5	Familiarity	Can extend beyond previous experiences by applying principles-based approaches.	

Abstract

Our project EyeHealthAI, pioneers the fusion of artificial intelligence (AI) and healthcare to tackle a critical challenge: early detection of eye diseases. In an era where smartphones are ubiquitous, we are developing a mobile application that harnesses the power of AI and computer vision to empower individuals to monitor their eye health conveniently and accurately.

Eye diseases, if left undiagnosed, can lead to vision loss. 'EyeHealthAI' leverages smartphone cameras and advanced algorithms to enable users to perform self-assessments for various eye conditions. Our commitment is to create a user-friendly and accessible tool that aids in the early detection of eye diseases.

'EyeHealthAI' has the potential to revolutionize eye health monitoring, offering a transformative solution for millions of individuals. Join us on this journey to safeguard precious eyesight through cutting-edge technology.

Undertaking

I certify that the project **[Eye Vision Care with Smartphone Technology]** is our own work. The work has not, in whole or in part, been presented elsewhere for assessment. Where material has been used from other sources it has been properly acknowledged/ referred.

Syed Areeb Tariq

2020F-BCS-005

Hamza Iqbal

2020F-BCS-008

Ahmed Asif

2020F-BCS-020

Acknowledgement

We truly acknowledge the cooperation and help make by **Ms Tahmina Khan, Lecturer** of **Sir Syed University of Engineering and Technology.** He has been a constant source of guidance throughout the course of this project.

We are also thankful to our friends and families whose silent support led us to complete our project.

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Chapter 1

Introduction

Our project EyeHealthAI, pioneers the fusion of artificial intelligence (AI) and healthcare to tackle a critical challenge: early detection of eye diseases. In an era where smartphones are ubiquitous, we are developing a mobile application that harnesses the power of AI and computer vision to empower individuals to monitor their eye health conveniently and accurately.

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Statement of the problem

The problem is that people belonging to the lower-middle class cannot afford frequent eye checkups, which becomes unaffordable for them. This issue matters because it restricts their access to essential eye healthcare, leading to potential undiagnosed eye conditions that could worsen without timely detection and treatment. It also affects their quality of life and may lead to preventable vision impairment or related health complications due to the lack of affordable eye care services. Problem Statement:

In many parts of the world, access to specialized healthcare services, such as eye specialists, is limited or financially burdensome, disproportionately affecting underserved and economically disadvantaged populations. A prevalent issue in this regard is the lack of timely and affordable access to eye care, which results in undiagnosed eye infections and related complications among marginalized communities.

This problem statement addresses the urgent need to provide a cost-effective and accessible solution to assist underserved individuals, particularly those facing financial constraints, in detecting and managing eye infections. The absence of timely intervention can lead to worsened conditions, reduced quality of life, and even vision impairment. Consequently, a comprehensive and inclusive approach is required to mitigate these challenges.

Goals/Aims & Objectives

- Designing and developing the mobile application for both iOS and Android platforms.
- Developing the backend infrastructure for data storage and processing. Integrating machine learning models for infection detection.
- Training and fine-tuning machine learning models for accurate infection detection. Ongoing model optimization for improved accuracy.
- Providing comprehensive information about eye infections, including causes, symptoms, and treatments. Developing content on precautionary measures and the impacts of infections.
- Implementing features to guide users on self-care, preventive measures, and when to seek medical attention. Offering recommendations for visiting a doctor if necessary.

Motivation

Early Detection and Intervention:

Early detection of eye diseases can significantly improve the chances of successful treatment and management.

Accessibility to Healthcare:

It allows users to perform initial screenings at their convenience, potentially identifying issues that may require professional attention.

Preventive Healthcare:

The app can serve as a tool for preventive healthcare, promoting regular eye check-ups even in the absence of noticeable symptoms.

Global Impact:

Eye diseases are prevalent worldwide, and an app can have a global impact by reaching a diverse and widespread population.

Cost-Effective Screening:

The app can provide a cost-effective alternative to traditional eye screenings, making it accessible to a broader demographic.

Methods

Select Appropriate Technologies:

Choose appropriate technologies for image processing and analysis. Machine learning and computer vision techniques are commonly used for image recognition tasks.

Develop Image Processing Algorithms:

Design image processing algorithms to preprocess and enhance eye images for better analysis.

Implement Machine Learning Models:

Train machine learning models, such as convolutional neural networks (CNNs), to recognize patterns associated with different eye diseases.

User Interface (UI) and User Experience (UX) Design:

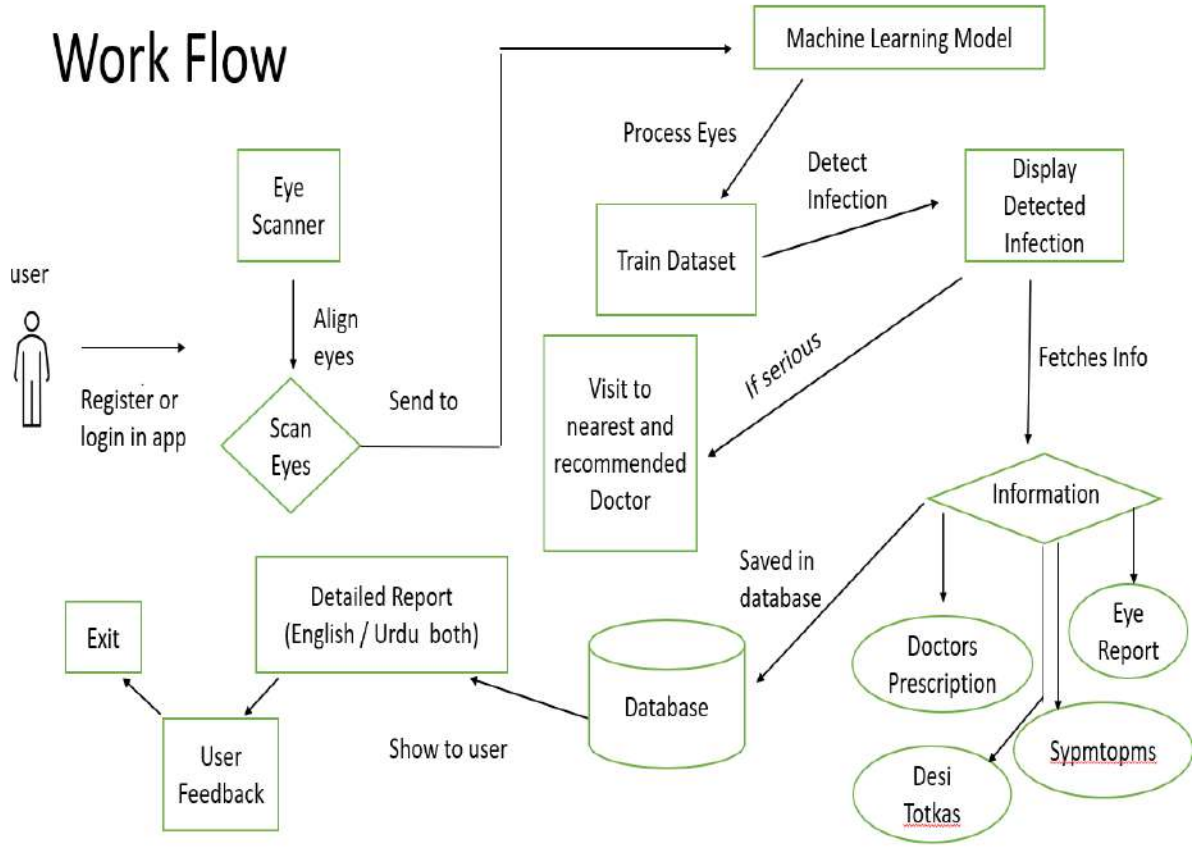
Develop an intuitive and user-friendly interface for the app. Consider the user experience and ensure that the app guides users through the process effectively.

Integration of AI Models with the App:

Integrate the trained machine learning models with the app, allowing seamless communication between the user interface and the backend algorithms.

Chapter 2

2.1 Architecture Diagram



Chapter 3

1. 4.1 Proposed Solution/Results & Discussion

Your proposed solution should relate the current situation to a desired result and describe the benefits that will accrue when the desired result is achieved. So, begin your proposed solution by briefly describing this desired result.

Activity	Optimistic (a)	Most Likely (m)	Pessimistic (b)	Expected (Te)
Requirements analysis and design	<1 Month	1 Month	>1 Month	1 Month
Model and Mobile App Development	7 Month	10 Month	11 Month	9 Month
Testing, Deployment and Document	< 1 Month	1 Month	>1 Month	1 Month

Table 1: PERT Activity Time estimate table

Chapter 4

7.1 Conclusion & Recommendation

The development of an eye disease detection app holds significant promise in revolutionizing healthcare by leveraging advanced technologies to enhance early detection and monitoring of various eye conditions. Through collaboration with medical experts, the integration of machine learning models, and a user-friendly interface, these apps have the potential to empower individuals to take a proactive role in their eye health.The benefits of such apps include increased accessibility to eye health services, cost-effective screenings, and the potential to reach a global audience. By providing users with a tool for self-assessment, education, and early intervention, these apps contribute to the overall improvement of eye health outcomes. The significant features are identified using feature selection methods and the intersection of the selected features are showing the common features. From the common features we obtain the understanding of the symptoms responsible for the eye diseases. In future works, a multivariate or uni-variate analysis may be conducted to identify specific symptoms and acquire insights about a particular eye disease. The application of explainable artificial intelligence to interpret the best model could be another improvement of this work.

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