



IoT Assisted Myopia Classification using Convolutional Neural Network

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ABSTRACT: This project focuses on early detection of myopia (short-sightedness) in children by continuously analyzing eye behavior and mobile phone usage patterns. Excessive mobile usage at short distances is a major contributor to childhood myopia. The system uses camera-based eye detection and AI algorithms to monitor eye strain indicators and predict myopia risk in real time

- Myopia (short-sightedness) has become increasingly common among children due to excessive mobile phone usage, close screen viewing, and lack of outdoor activities. This project proposes an AI-based intelligent myopia detection system that continuously monitors a child's eye condition while using a mobile device.

- The analyzed results are transmitted to an Arduino-based IoT module, which displays eye health status and risk levels on an LCD screen and sends data to a cloud platform. Output values such as eye strain level, blink count, usage duration, and myopia risk score are processed in real time. When unsafe conditions are detected, the system triggers visual alerts, buzzer notifications, and mobile alerts to parents through the IoT network.

KEYWORDS: IoT, Myopia Classification, Convolutional Neural Network, Medical Imaging, Smart Healthcare, Deep Learning, Vision Screening

I. INTRODUCTION

Myopia, commonly known as short-sightedness, is a growing eye health problem among children worldwide. In recent years, the widespread use of smartphones, tablets, and digital screens at an early age has significantly increased the risk of myopia progression. Children often use mobile devices for long durations at close viewing distances, leading to excessive eye strain and reduced visual comfort.

- Traditional myopia detection methods rely on periodic clinical eye examinations conducted in hospitals or eye care centers. These methods are effective but are time-consuming, costly, and reactive, as myopia is usually detected only after noticeable vision deterioration occurs. Moreover, such methods do not provide continuous monitoring of a child's daily mobile usage habits, which play a major role in eye health degradation.

OBJECTIVES

To develop an affordable and portable smart artificial ventilator to assist the patients in pandemic and emergency situation using machine learning and IOT.

The primary aim of this work is to develop a reliable system for real-time monitoring of eye. The objectives are:

- To design a compact and user-friendly monitoring device
- To implement non-invasive sensing techniques
- To process physiological data in real time
- To enable wireless transmission of data
- To reduce power consumption for longer operation
- To provide an affordable healthcare solution

II. LITERATURE REVIEW

This paper introduced an AI-based predictive model for childhood myopia using lifestyle factors such as screen time, reading distance, and environmental exposure. Machine learning algorithms were used to predict myopia risk levels. However, the system relies on manually entered data rather than real-time eye image analysis, reducing detection



accuracy and automation.

The authors proposed a computer vision-based eye fatigue detection system using facial landmark detection and eye aspect ratio (EAR). The system successfully detects prolonged eye strain and reduced blink rate. While effective for fatigue analysis, this approach does not classify myopia levels and does not integrate mobile usage duration or IoT-based alert systems.

This study presented a smartphone-based eye monitoring system that uses the mobile front camera to track eye movement and blink rate. The system focuses on identifying early symptoms of eye strain caused by excessive screen exposure. Although the system provides real-time monitoring, it does not include advanced AI-based classification for myopia detection and lacks parental alert mechanism.

III. PROBLEM STATEMENT

There is a lack of an automated, intelligent, and preventive system that can continuously monitor children's eye conditions during mobile usage, analyze eye strain indicators using artificial intelligence, and provide early myopia detection along with timely alerts. Without such a system, early-stage myopia often progresses into severe vision impairment, increasing long-term dependency on corrective lenses and medical intervention. • Therefore, the problem is to design and develop an AI-based myopia detection system integrated with mobile eye monitoring and IoT technology that can identify early signs of myopia, monitor harmful usage patterns, and alert parents in real time to prevent long-term vision damage in children.

IV. EXISTING SYSTEM

myopia detection in children is mainly carried out through traditional clinical eye examination methods and manual observation of visual discomfort. These systems depend on periodic hospital visits, where eye specialists evaluate the child's vision using standard optometric tools. Although effective in diagnosing vision defects, the existing systems are reactive rather than preventive, as myopia is often identified only after significant vision deterioration has occurred. • The commonly used existing approaches include Snellen chart testing, autorefractor measurements, retinoscopy, and school-based vision screening programs. These tests provide accurate results at the time of examination but do not offer continuous monitoring of eye health during daily activities, particularly during prolonged mobile phone usage. As a result, early-stage eye strain and gradual myopia progression often remain undetected.

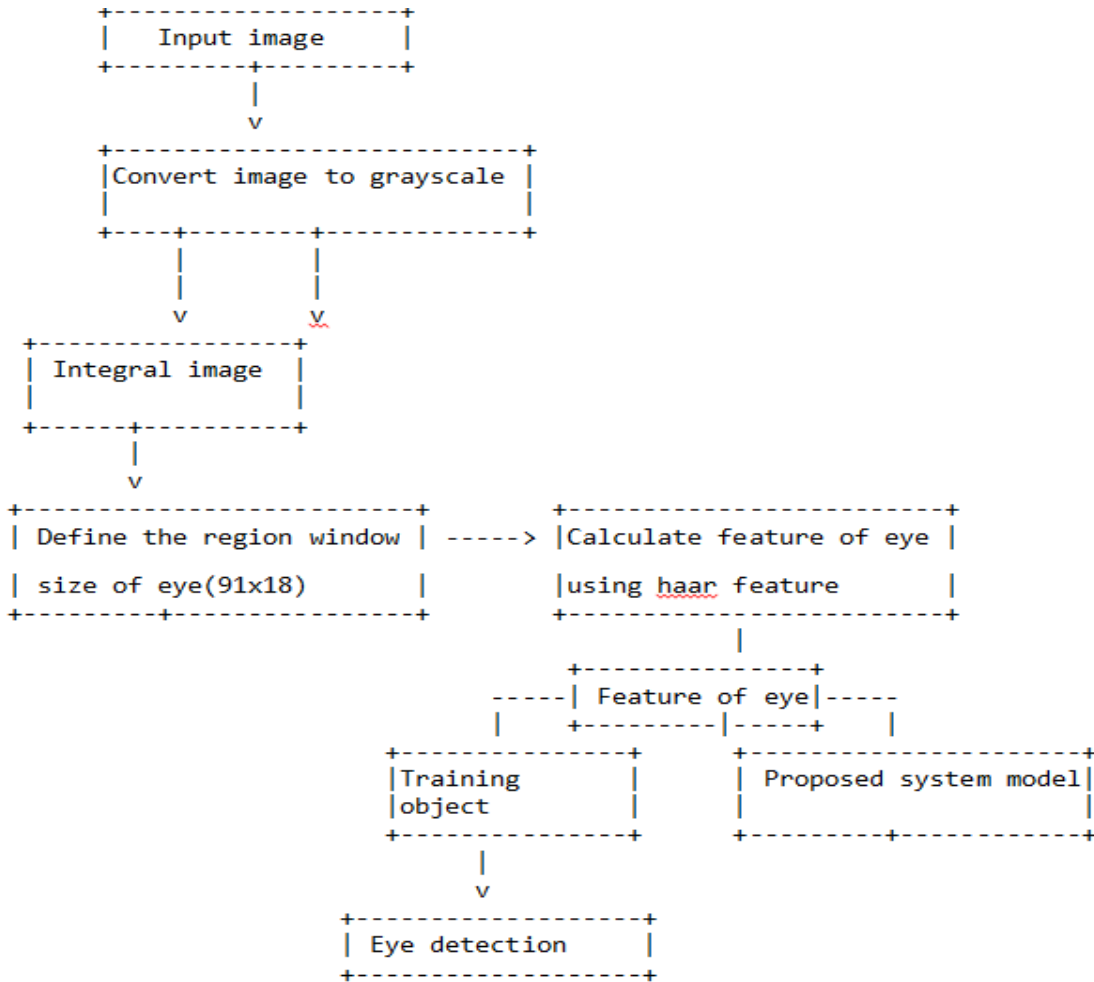
V. PROPOSED SYSTEM

The proposed system introduces an AI-Based Myopia Detection System for Children Using Mobile Eye Monitoring, integrated with Arduino and IoT technology, to enable early detection and prevention of myopia. Unlike conventional clinical approaches, the proposed system performs continuous real-time monitoring of a child's eye condition during mobile device usage and automatically identifies harmful eye usage patterns. • The system combines computer vision, deep learning algorithms, embedded systems, and IoT communication to analyze eye behavior, evaluate myopia risk, and generate instant alerts. The primary goal of this system is to detect early-stage myopia, promote healthy screen habits, and reduce long-term vision impairment among children.



VI. BLOCK DIAGRAM

The overall working of the system can be represented using the following block diagram:



VII. HARDWARE COMPONENTS

Power Supply Unit

The power supply unit delivers stable voltage to all components. It includes regulators and filters to ensure safe and efficient operation. The design is optimized for portability and energy efficiency.

Arduino uno

Arduino uno is ATmega328 based microcontroller board. Its operating voltage is 5V dc and its operating frequency is 16MHz

LCD Display

Liquid crystal displays (LCDs) are used in similar applications where LEDs are used.

- LCD is used to visualize the status of our project, which is programmed to display the Temperature and MAX30100 Sensor values, so that we can easily able to visualize the health parameters.
- Its operating voltage is 5v dc supply

IOT

Node MCU is an open source IoT platform. Its operating voltage is 5v dc supply. It includes firmware which runs on the ESP8266 Wi-Fi SoC from Espressif systems, and hardware which is based on the ESP-12 module.

- Advanced data analytics
- Improved sensor accuracy
- Mobile application development



SOFTWARE REQUIREMENTS

Sketch IDE-Arduino Programming

Arduino IDE (Integrated Development Environment) is a free, open-source software used to write, compile, and upload code to Arduino boards. It's the go-to tool for Arduino programming.

Software embedded C language , PYTHON

VIII. CONCLUSION

Myopia or nearsightedness is a prevalent refractive error affecting millions worldwide. Accurate classification is crucial for effective management and treatment. Our project successfully implemented a classification model to categorize myopia into various stages.

Achieved high accuracy in classification

Utilized machine learning algorithms and image processing techniques

Potential applications in clinical diagnosis and personalized treatment plans

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