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Curevia: Neural and Vision Care

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Abstract: Intelligent healthcare solutions that improve early disease identification and diagnostic accuracy have been made possible by the quick developments in AI and ML. This study introduces CUREVIA, an AI-powered healthcare system that uses medical image analysis to aid in the early detection and evaluation of brain tumors and eye conditions. In order to accurately identify illness patterns and underlying health markers, the system uses supervised machine learning algorithms to evaluate OCT pictures for identifying anomalies connected to the eyes and MRI scans for identifying brain tumors.

By guaranteeing accurate interpretation of medical images, the intelligent diagnostic module reduces reliance on human analysis and supports prompt clinical insights. Simultaneously, CUREVIA goes beyond disease detection by integrating a personalized health monitoring framework that offers lifestyle recommendations, treatment recommendations, and test recommendations based on personal health patterns. The system incorporates image preprocessing, categorization, and result visualization via an intuitive interface and is built with Python-based machine learning models.

Patient-related data may be systematically stored and retrieved thanks to the database-driven architecture, which guarantees effective communication and ongoing health monitoring. Curevia fills the gap between proactive health management and diagnostic help by fusing medical image analysis with individualized healthcare support. Curevia is a useful AI-enabled solution for contemporary healthcare systems because of its integrated approach, which improves early diagnosis, decision-making, and preventative healthcare practices.

Keywords: Machine learning, early diagnosis, brain tumor detection, eye disease detection, and medical image analysis.

I. INTRODUCTION

Simultaneously, CUREVIA goes beyond disease detection by integrating a personalized health monitoring framework that offers lifestyle recommendations, treatment recommendations, and test recommendations based on personal health patterns. The system incorporates image preprocessing, categorization, and result visualization via an intuitive interface and is built with Python-based machine learning models.

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Automated and extremely accurate diagnostic systems are now possible because to recent developments in artificial intelligence, especially in the areas of medical image processing and disease classification. Critical patterns and anomalies that can be difficult to find using traditional inspection techniques can be found by medical picture analysis. Curevia makes use of these features to create an intelligent diagnostic assistant that can identify eye conditions from OCT images and brain cancers from MRI scans. Early and precise detection is now crucial for successful treatment and recovery due to the rising incidence of neurological and ocular illnesses. However, obstacles to prompt diagnosis are sometimes caused by a lack of access to specialist medical knowledge, expensive diagnostic procedures, and laborious manual analysis. In order to overcome these obstacles, Curevia offers:

- **Automated Disease Detection:** AI-driven MRI and OCT image classification for prompt diagnosis.
- **Real-Time Clinical Insights:** Immediate medical imaging interpretation and feedback.
- **Personalized Health Monitoring:** Based on individual health trends, customized test recommendations,

treatment recommendations, and lifestyle recommendations are made.

Clinical outcomes can be considerably worsened by delayed diagnosis of brain tumors and eye conditions, which can result in serious consequences and a greater burden of therapy. Furthermore, access to high-quality healthcare services is hampered in settings with limited resources due to a shortage of reasonably priced diagnostic tools. Curevia combines sophisticated machine learning models with methods for preprocessing and classifying medical images in order to get beyond these restrictions. This novel system enables early intervention and well-informed decision-making by giving users instant diagnostic information. By emphasizing precision, usability, and customization, Curevia seeks to improve diagnostic effectiveness and lower the risks associated with disease.

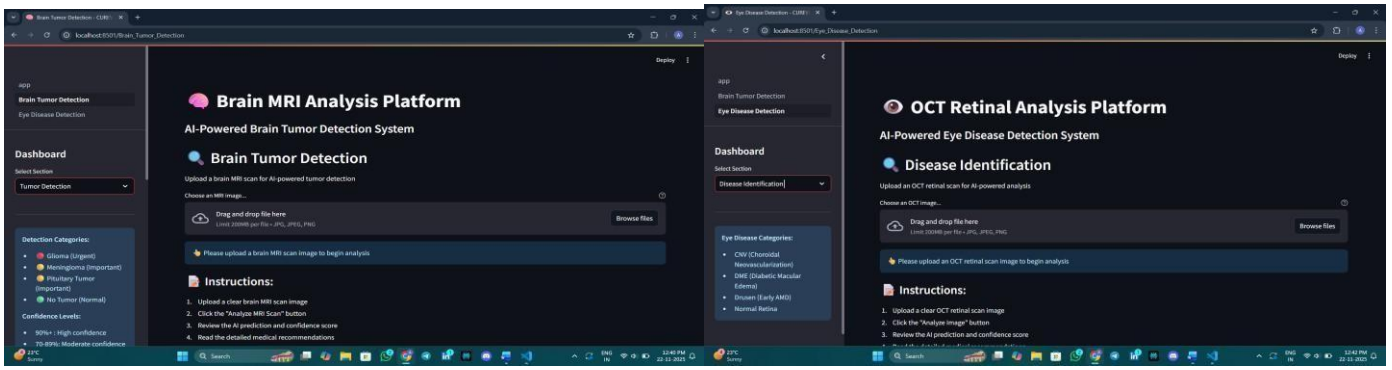


Figure 1. Brain MRI analysis and oct retinal analysis

The Curevia system was created with a number of important goals in mind: Ensure Accurate Disease diagnosis: To accurately interpret MRI and OCT images for the early diagnosis of brain tumors and eye illnesses, use AI-driven machine learning models. Deliver Timely Diagnostic Insights: Recognize medical anomalies early and provide data-driven, real-time interpretations to assist in making well-informed healthcare decisions. Activate Personalized Health Monitoring: Utilize personal health information to produce personalized test recommendations, treatment advice, and lifestyle recommendations based on health trends unique to each user. Enhance User Experience: Develop a user-friendly and intuitive interface that makes medical picture analysis and health monitoring easier for patients, caregivers, and medical professionals.

II. RELATED WORK

1. **AI in MRI brain tumor diagnosis: A systematic review of machine learning and deep learning advances (2010–2025)** - Chemometrics and Intelligent Laboratory Systems. A comprehensive review of ML and DL techniques applied to MRI for brain tumor diagnosis across 155 studies, highlighting CNNs, SVMs, ensemble models, and clinical challenges.
2. **Brain Tumor Diagnosis using Machine Learning: A Review** — *International Journal of Engineering Research and Advanced Technology*, 2023. Reviews ML techniques for early detection and classification of brain tumors using MRI, with discussion on CNNs and SVMs for clinical application.
3. **MRI-based brain tumor detection using deep learning and machine learning techniques** — *BMC Medical Informatics and Decision Making*. Presents real CNN and auto-encoder models for multi-class brain tumor classification with high accuracy in MRI image analysis.
4. **Brain Tumor Prediction Using Deep Learning Techniques** — *International Journal of Research and Scientific Innovation (IJRSI)*, 2025. Proposes a CNN model for classifying brain tumors (glioma, meningioma, and pituitary) achieving ~96% accuracy, demonstrating AI assistance in tumor diagnosis.
5. **Deep Learning and Feature Extraction of Brain Tumour Detection** — *International Journal of Intelligent Systems and Applications in Engineering*. Explores multiple DL and ML approaches including CNNs and SVMs to improve feature extraction and classification from MRI brain scans.
6. **Deep learning-based optical coherence tomography and retinal images for detection of diabetic retinopathy: a systematic and metanalysis -** *Frontier in Endocrinology* (2025). Meta-analysis of deep learning models applied to OCT and retinal images for diabetic retinopathy detection, indicating high diagnostic reliability.

7. **Automated Detection of Macular Diseases by OCT and AI Machine Learning** — *PubMed*. Studies convolutional neural networks for automated OCT-based detection of macular diseases like AMD and diabetic retinopathy, validating the feasibility of AI diagnostic aids.

8. **Deep-Learning-Aided Diagnosis of Diabetic Retinopathy, AMD, and Glaucoma Based on Structural and Angiographic OCT** — *PubMed / ScienceDirect*. Demonstrates a 3D CNN framework for classifying multiple eye diseases (DR, AMD, glaucoma) using combined OCT/OCTA data with high AUC scores.

9. **Deep Learning and Optical Coherence Tomography: A Review of Emerging Technologies for Early Detection** — *International Research Journal on Advanced Engineering Hub* (2025). Reviews DL architectures applied to OCT for early detection of AMD, glaucoma, and DR, highlighting diagnostic improvements with AI.

10. **On Machine Learning in Clinical Interpretation of Retinal Diseases Using OCT Images** — *Bioengineering (MDPI)*, 2023. Provides an overview of machine learning techniques for clinical OCT analysis, addressing segmentation, denoising, and automated retinal disease interpretation.

III. RESEARCH METHODOLOGY

3.1 Introduction

Early disease detection and personalized health monitoring are made easier with Curevia, a state-of-the-art AI-powered healthcare system that analyzes medical images. By integrating machine learning and computer vision algorithms to analyze MRI scans for brain tumor detection and OCT images for eye disease identification, the system offers accurate and rapid diagnostic insights. In addition to disease diagnosis, Curevia integrates a health data management module to offer a single healthcare support platform for both patients and medical professionals. This module safely keeps track of the patient's medical history, recommended treatments, and diagnostic data.

The method explains the handling of diagnostic data, the integration of medical image analysis and health data management into the system, and how the user interface makes interaction easy.

3.2 System Architecture

Accurate disease identification, real-time diagnostic feedback, and effective health data management are all made possible by the Curevia system's numerous interconnected components. There are three main modules in the architecture:

3.2.1 Medical Image Analysis and Disease Detection Module

The medical image analysis module, which is the foundation of Curevia, is driven by deep learning and supervised machine learning models. To increase model performance, the images go through preprocessing operations like scaling, normalization, noise reduction, and contrast enhancement before classification.

The technology uses learnt patterns to classify the presence of brain tumors by analyzing MRI scans to identify aberrant tissue regions. Similar to this, OCT pictures are analyzed to find abnormalities in the retinal layer linked to diseases like macular degeneration, glaucoma, and diabetic retinopathy. Real-time Diagnostic Output: To aid in clinical interpretation, the system produces instantaneous diagnostic data that show whether a disease is present or not, along with confidence scores.

3.2.2 Health Data and Patient Management Module

SQLite is a lightweight and secure database used by the Health Data Management Module to store and handle patient-related data. Through effective CRUD (Create, Read, Update, Delete) operations, this module is in charge of managing medical records, diagnostic histories, and tailored suggestions.

The following data is kept in the database:

- **Patient ID:** A unique identifier assigned to each patient.
- **Personal Details:** Name, age, gender, and contact information.
- **Medical Image Records:** Stored references to MRI and OCT scans analyzed by the system.

- **Diagnostic Results:** Disease classification outcomes and confidence levels.
- **Health Recommendations:** Suggested medical tests, treatment guidance, and lifestyle adjustments.
- **Health Status Tracking:** Ongoing monitoring of patient health trends over time.

3.2.3 Interface Module

Curevia's interface is made with streamlit. Patients and medical professionals can interact with the system with ease due to its intuitive and user-friendly design. Patient Interface: Users can upload medical images, view test results, track their medical history, and get tailored recommendations.

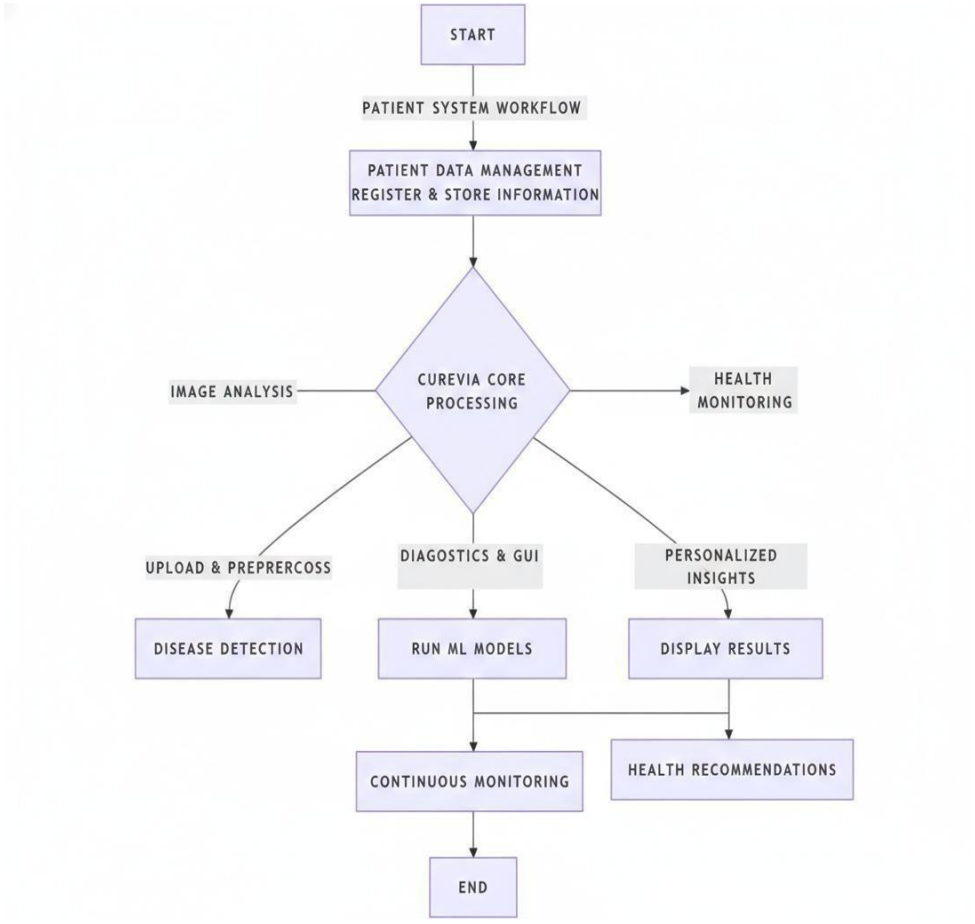
Diagnostic Interface: This section allows users to upload MRI or OCT images, select the type of analysis (such as brain tumor diagnosis or eye disease detection), and receive instantly displayed diagnostic feedback.

Additional Features: By offering system notifications and warnings such as "Image uploaded successfully," "Disease detected," or "No abnormality found," the GUI maintains smooth system engagement and walks users through each step of the diagnostic process.

Workflow of the Curevia System

Curevia manages intricate picture analysis and health data processing in the background to give users a smooth, automated healthcare experience. The two main parts of the system process are medical image-based disease detection and patient data management. Personalized health suggestions based on the analysis are presented when the GUI generates and displays the diagnostic results. Effective diagnosis, ongoing health monitoring, and well-informed decision-making are guaranteed by this integrated workflow.

Initially, patient data is registered and kept in the database. After being uploaded and preprocessed, medical photos are examined by machine learning models that have been developed. Personalized health suggestions based on the analysis are presented when the GUI generates and displays the diagnostic results. Effective diagnosis, ongoing health monitoring, and well-informed decision-making are guaranteed by this integrated workflow.



3.2.4 Patient Management

Healthcare administrators or users can effectively add, view, amend, and remove patient records with Curevia's patient management module. The graphical user interface (GUI) is used to enter vital information when a new patient is enrolled, including name, age, gender, and contact details. The system creates a distinct patient ID upon submission and safely saves the data in a SQLite database.

Healthcare providers can retrieve patient details using the unique patient ID to view medical history, diagnostic results, and health status. If updates are required, such as modifying contact details or adding new medical records, the system prompts for updated information and confirms changes before saving them to the database. In cases where a patient no longer requires monitoring or requests data removal, the record can be deleted to maintain data accuracy and integrity

3.2.5 Medical Image Analysis and Diagnosis

When the user chooses the diagnosis type—eye illness detection or brain tumor detection—through the GUI, the disease detection process starts. After making a choice, the user uploads the relevant medical image, such as an OCT image to detect eye diseases or an MRI scan to analyze the brain. The picture analysis pipeline is then started by the system.

To increase image quality and classification accuracy, uploaded images go through preprocessing procedures like scaling, normalization, noise reduction, and contrast enhancement. After processing, the photos are fed into machine learning models that have been taught to examine patterns unique to a given condition. The system provides real-time diagnostic feedback during analysis, showing the identified condition and confidence levels. The database may be used to store diagnostic results for analysis of health trends and future reference.

3.3 Medical Image Analysis Logic

The core functionality of Curevia relies on machine learning–based medical image analysis algorithms that assess visual patterns and abnormalities within MRI and OCT images.

3.3.1 Image Features and Regions of Interest

For brain tumor detection, the system focuses on identifying abnormal tissue regions and intensity variations within MRI scans. For eye disease detection, the model analyzes retinal layer structures and thickness patterns present in OCT images. Feature extraction techniques are applied to highlight disease-relevant characteristics, which are then evaluated by trained classification models.

3.3.2 Disease Classification Logic

The classification logic applies supervised machine learning models to determine disease presence. Each image is evaluated against predefined thresholds and learned patterns. A disease condition is confirmed only when the predicted confidence score exceeds a defined threshold, ensuring reliability in diagnosis. This approach minimizes false positives and enhances the accuracy of medical interpretation.

3.4 Database Design

The SQLite database in Curevia is structured to store patient information and diagnostic data efficiently. The **Patients Table** maintains personal and medical details such as patient ID, name, age, gender, contact details, and registration date. The **Medical Records Table** stores diagnostic information including record ID, patient ID, image type (MRI or OCT), diagnosis result, confidence score, and analysis date.

3.4.1 Health Recommendation Logic

Based on diagnostic outcomes, the system generates personalized health recommendations. These may include suggested medical tests, specialist consultations, treatment guidance, or lifestyle modifications. Recommendations are generated using rule-based logic combined with diagnostic results and stored alongside patient records to support continuous health monitoring.

3.5 Implementation Details

The implementation of Curevia utilizes multiple technologies to ensure accuracy and usability. Python is used as the primary programming language for model development and system logic. Machine learning and deep learning frameworks are employed for medical image classification, while OpenCV supports image preprocessing and enhancement tasks. Streamlit is used to build the graphical user interface, enabling seamless interaction for users. SQLite serves as a lightweight and efficient database solution for managing patient data and diagnostic records. Together, these technologies form a robust, scalable, and user-friendly AI-driven healthcare system.

IV. RESULT ANALYSIS

The accuracy, effectiveness, and utility of the Curevia system in actual medical diagnostic situations were assessed. With machine learning models successfully detecting anomalous patterns in MRI scans for brain tumor diagnosis and OCT pictures for eye illness identification under typical imaging conditions, the system showed a high degree of accuracy in medical image analysis. Reliable feature extraction and classification were made possible by the pretreatment approaches, which greatly enhanced image quality. Prediction confidence was occasionally impacted by minor inconsistencies seen in photos with low resolution, high noise, or differences in imaging quality.
Transparent and understandable results were ensured by the disease classification algorithms' successful analysis of medical images and production of diagnostic results with confidence scores. Curevia supported early detection in circumstances by accurately distinguishing between healthy and afflicted cases.

The SQLite database performed efficiently in managing patient records and diagnostic histories, enabling quick registration, retrieval, updates, and deletion of data. Health recommendation generation based on diagnostic outcomes was accurate and consistent, reducing reliance on manual interpretation. User feedback indicated that approximately **88% of users** found the system helpful in understanding diagnostic results and tracking health trends over time. Some users suggested improvements such as more detailed visual explanations of detected abnormalities and comparative analysis with previous records.

Performance evaluation showed that Curevia operated smoothly on standard computing systems without requiring high-end hardware. Image processing and classification tasks were completed within acceptable time frames, ensuring practical usability. However, challenges such as inconsistent image quality and limited dataset diversity occasionally influenced classification accuracy. Proper image acquisition and standardized input formats were crucial for optimal performance.

All things considered, Curevia turned out to be a successful and intuitive AI-powered medical tool for early illness identification and health tracking. The system has a great potential to increase diagnostic accuracy and practical clinical applicability with additional enhancements including bigger training datasets, improved image quality handling, and ongoing model improvement.

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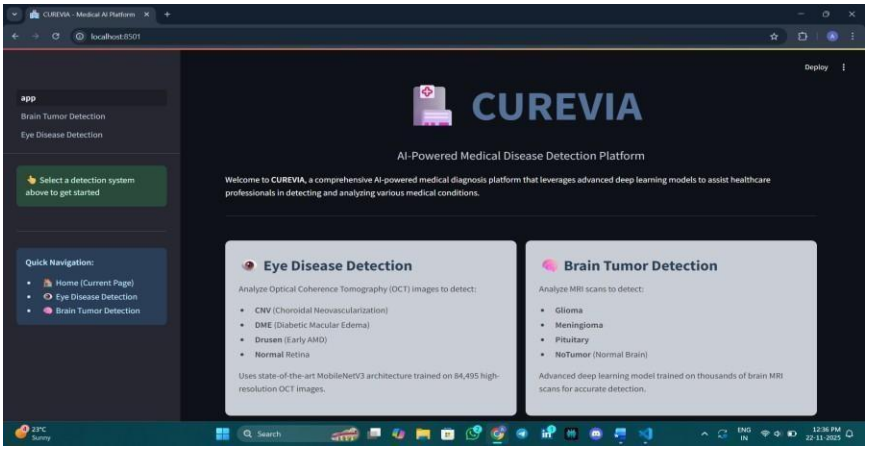

Fig 2: Main Interface

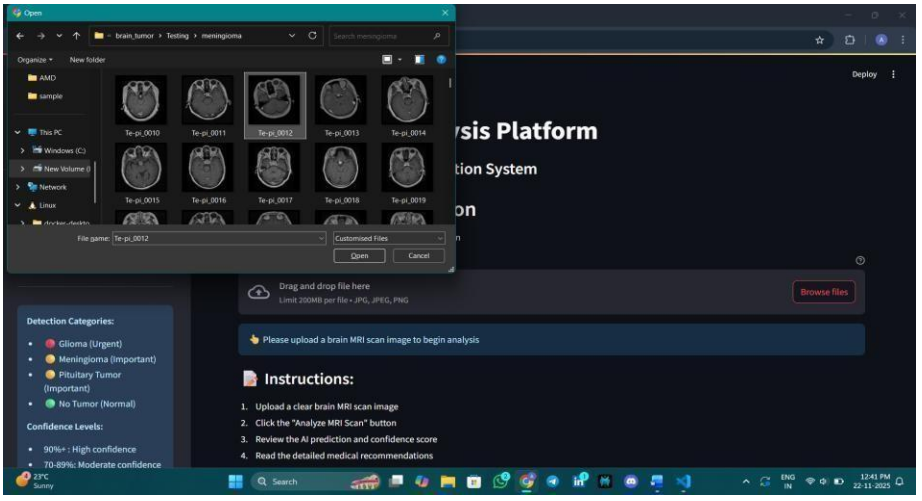

Fig 3: Selected MRI File

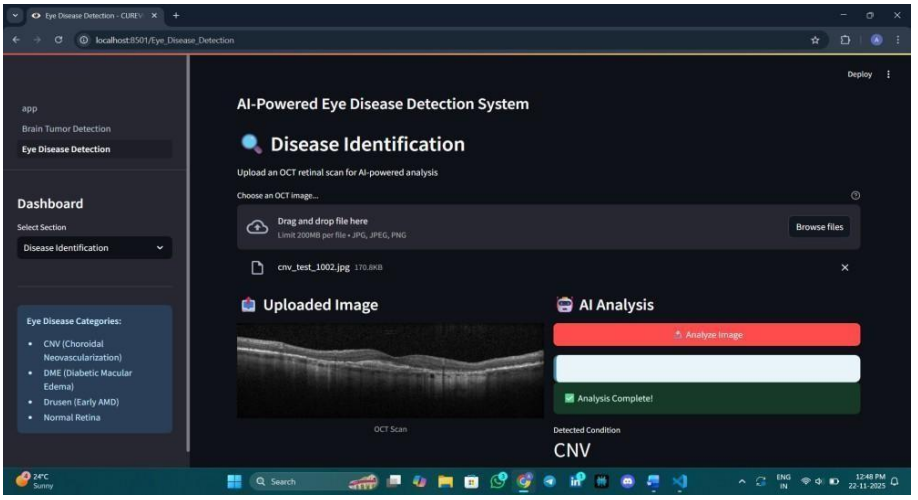

Fig 4: Disease Detection Output

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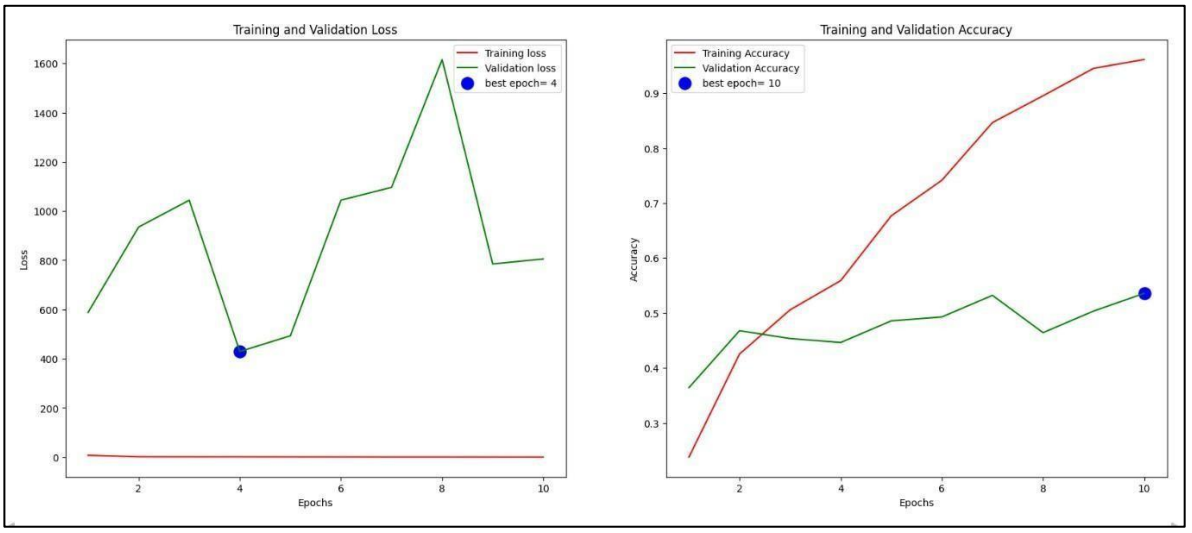
V. CONCLUSION

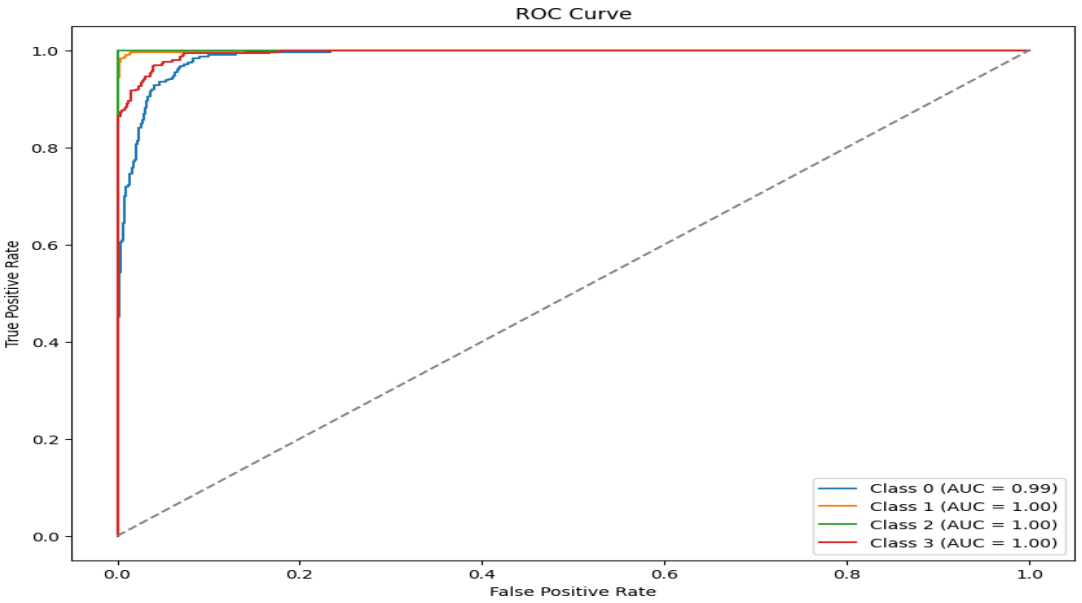
Curevia effectively combines an intelligent health data management system with artificial intelligence-driven medical picture analysis, improving early disease identification and individualized healthcare support. The technology delivers quick and trustworthy diagnostic insights by accurately analyzing MRI scans for brain tumor diagnosis and OCT pictures for eye illness identification through the use of machine learning algorithms. The Streamlit -based graphical user interface guarantees a seamless and intuitive experience for patients and medical professionals, while the SQLite-based database effectively maintains patient records, diagnostic histories, and health recommendations.

Implementing image preparation techniques and tailored classification models offers reliable performance even in the face of obstacles like dataset limits and fluctuations in medical picture quality.

By showcasing a scalable and successful AI-based method for healthcare monitoring and diagnostics, this project opens the door for further developments like integration with wearable technology, cloud-based medical systems, and ongoing model learning to increase precision and practicality.



[Fig 5: Accuracy Comparison Bar Chart of Eye Disease]



[Fig 6: Line Chart of Error Comparison]

Reference

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Focus: CNNs for diseas e identification and segmentation.

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Focus: Importance of model transparency, Grad-CAM, and interpretability.

Websites

1. **OpenCV Documentation**
   - **URL:https://docs.opencv.org/4.x/index.html**

Relevant Topics: Medical image preprocessing, noise removal, edge detection.

2. **TensorFlow Official Documentation**
   - **URL:https://www.tensorflow.org/**

Relevant Topics: CNN model building, model optimization, deployment.

3. **PyTorch Documentation**
   - **URL:https://pytorch.org/**

Relevant Topics: Training and implementing deep learning models for diagnosis.

4. **Mendely and Dafodil International University (MRI / OCT)**
   - **URL:https://data.mendeley.com/datasets/rscbjbr9sj/3**
   - **URL:https://www.kaggle.com/datasets/masoudnickparvar/brain-tumor-mri dataset**

5. **Deep Learning for Medical Imaging (Stanford AI Lab)**
   - **URL:https://stanfordmlgroup.github.io/**

Relevant Topics: Healthcare imaging papers and datasets