

Project Design Phase-I

Solution Architecture

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Project Name	Deep Learning Model for Eye Disease Prediction

Solution Architecture:

Overview

This solution architecture outlines a high-level design for an eye disease management system using deep learning. The system will be deployed in a cloud-based environment to ensure scalability and reliability. It will use a deep learning model to classify eye diseases from medical images and predict their severity in real time. The system will also provide healthcare professionals with tools to access and manage patient data, generate insights, and monitor system performance.

System Components

The system will consist of the following components:

- **User Interface (UI):** A web-based dashboard for healthcare professionals/personnel to access and interact with the system. The UI will provide a user-friendly interface for inputting patient data and medical images, viewing diagnostic results, and managing patient records.
- **Data Ingestion and Storage:** The system will have data ingestion mechanisms to receive medical images and patient information from various sources, such as electronic health records (EHRs), medical devices, and patient portals. The system will also have secure and compliant storage solutions for both structured and unstructured data.
- **Preprocessing Module:** The preprocessing module will enhance the quality of medical images and clean and transform data to ensure consistent input for the deep learning model.
- **Deep Learning Model:** The system will use a deep learning model trained on a large dataset of labelled eye images to classify eye diseases and predict their severity in real time.
- **Caching and Real-Time Analysis:** The system will use a caching mechanism to store previous predictions and optimize response time. It will also perform real-time analysis of incoming medical images for immediate diagnosis.

- **Feedback Loop:** The system will have an endpoint for collecting feedback from healthcare professionals regarding model predictions. This feedback will be used to continuously update the model and improve its accuracy.
- **Cloud-Based Infrastructure:** The system will be deployed in a cloud-based environment to ensure scalability and reliability. It will also use auto-scaling capabilities to adapt resources based on demand.
- **Security and Compliance:** The system will implement security measures like encryption, access controls, and regular security audits to protect patient data. It will also comply with healthcare data privacy regulations.
- **Reporting and Visualization:** The system will provide reporting tools to generate insights and visualizations of disease trends and patient data. It will also have a dashboard for monitoring system performance and model accuracy.
- **Machine Learning Model interpretability:** The system will provide tools for interpreting model decisions and providing explanations to healthcare professionals.

System Workflow

The system workflow will be as follows:

1. A healthcare professional uploads a medical image to the system using the UI.
2. The preprocessing module enhances the image quality and cleans and transforms the data.
3. The deep learning model classifies the disease and predicts its severity.
4. The system caches the prediction and returns it to the healthcare professional immediately.
5. The healthcare professional reviews the prediction and provides feedback, if necessary.
6. The system updates the model with the feedback to improve its accuracy.

Conclusion

This solution architecture provides a comprehensive and scalable approach to developing an eye disease management system using deep learning. The system can help healthcare professionals improve the accuracy and efficiency of eye disease diagnosis and management, leading to better patient outcomes.

Solution Architecture Diagram:

