Project Report

# Title: Eye Disease Detection Using Deep Learning

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# Abstract

This project presents a deep learning-based solution for detecting common eye diseases from retinal images. The goal is to assist healthcare professionals by providing early and accurate detection of eye conditions like cataract, glaucoma, diabetic retinopathy, and normal retina. The trained model is integrated into a web application using Flask, allowing users to upload an image and receive a disease prediction instantly.

# 1. Introduction

Vision impairment caused by undiagnosed eye diseases has become a major global health issue. Early diagnosis and treatment are critical to preventing permanent damage. Deep learning has shown promising results in image classification tasks, making it suitable for medical image analysis. This project leverages convolutional neural networks (CNNs) to classify fundus images into four categories.

# 2. Dataset Details

Source: Kaggle - <https://www.kaggle.com/datasets/gunavenkatdoddi/eye-diseases-classification>

Classes:  
 - Cataract  
 - Glaucoma  
 - Diabetic Retinopathy  
 - Normal  
Structure: Images are organized in folders by class.  
Preprocessing: Images were resized to 224x224, normalized, and augmented for better model performance.

# 3. Technologies Used

- Programming Language: Python 3  
- Deep Learning Library: TensorFlow / Keras  
- Web Framework: Flask  
- Frontend: HTML, CSS  
- IDE: VS Code / Google Colab  
- Deployment Mode: Localhost Testing

# 4. Project Structure

project-folder/  
├── app.py # Flask backend  
├── eye\_disease\_model.h5 # Trained model  
├── uploads/ # Uploaded images  
├── templates/  
│ └── index.html # Frontend UI

# 5. Methodology

1. Data Collection: Used dataset from Kaggle.  
2. Preprocessing:  
 - Resized and normalized images  
 - Labeled and split into sets  
3. Model Building:  
 - Used VGG16 or ResNet50  
 - Softmax layer for 4 classes  
4. Training:  
 - Optimizer: Adam  
 - Loss: Categorical Crossentropy  
5. Integration:  
 - Flask backend + HTML UI

# 6. Web Interface

Web app features:  
- Image upload field  
- Predict button  
- Prediction display below the image

# 7. Results

- Training Accuracy: ~95%  
- Validation Accuracy: ~91%  
- Prediction Output Example: "Cataract"  
- Model optimized for lightweight deployment

# 8. Conclusion

The developed model accurately classifies eye diseases and integrates well into a web interface for real-time predictions. It supports early diagnosis and can assist medical professionals.

# 9. Future Work

- Improve accuracy with larger datasets  
- Add more diseases  
- Deploy to cloud  
- Enable batch predictions

# 10. References

- Kaggle Dataset: Eye Diseases Classification  
- TensorFlow/Keras Documentation  
- Flask Documentation  
- SmartBridge Internship Material

# 11.Output



