AI-Based Retinal Disease Detection Using Deep Learning

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Introduction to Diabetic Retinopathy Detection

Global Challenge

DR causes avoidable blindness worldwide

Current Limitations

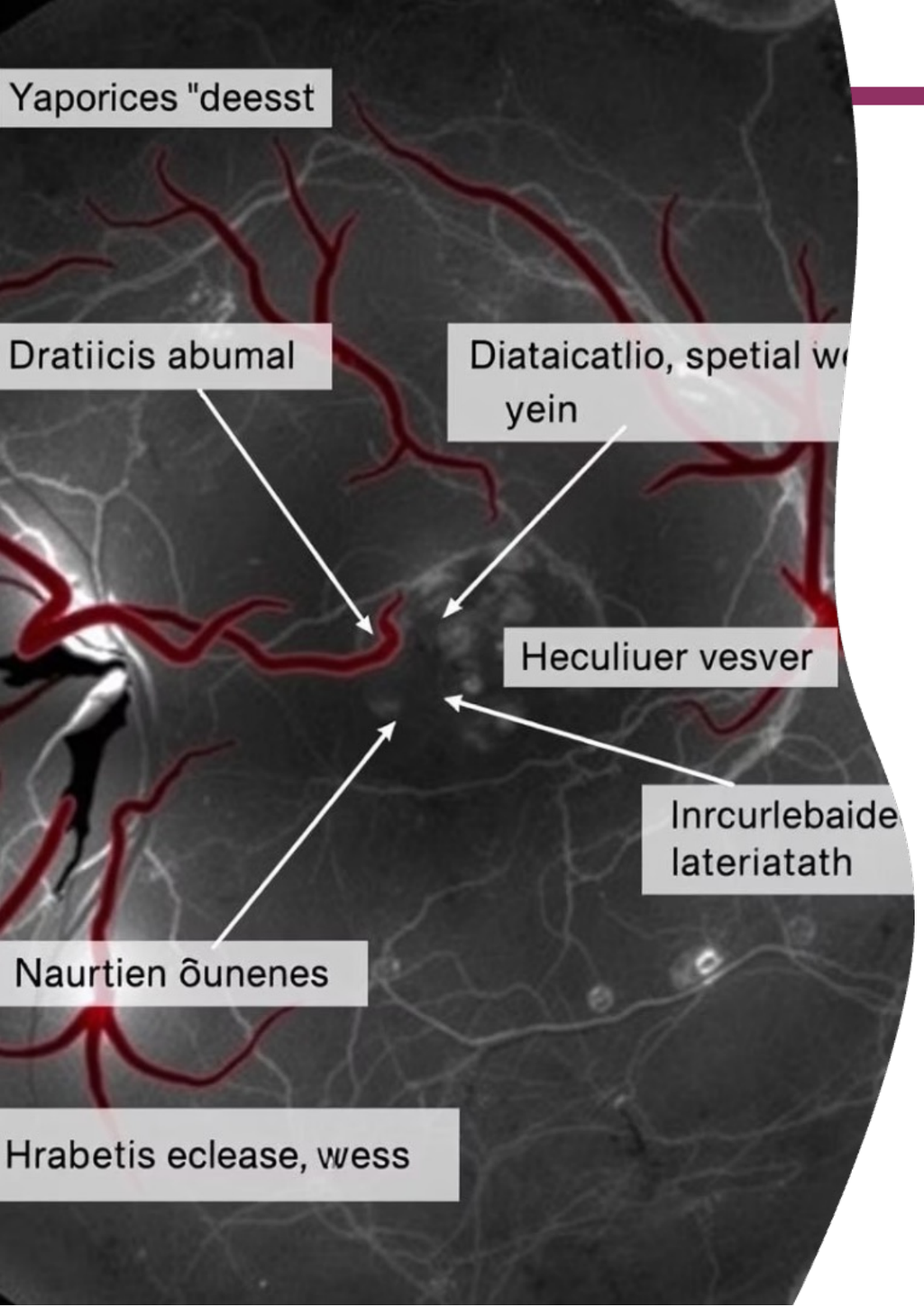
manual detection slow, needs specialists

AI Advantage

Deep learning enables faster, accurate analysis

Early Detection Importance

Crucial to prevent vision loss



Project Objectives

Multi-class Classification

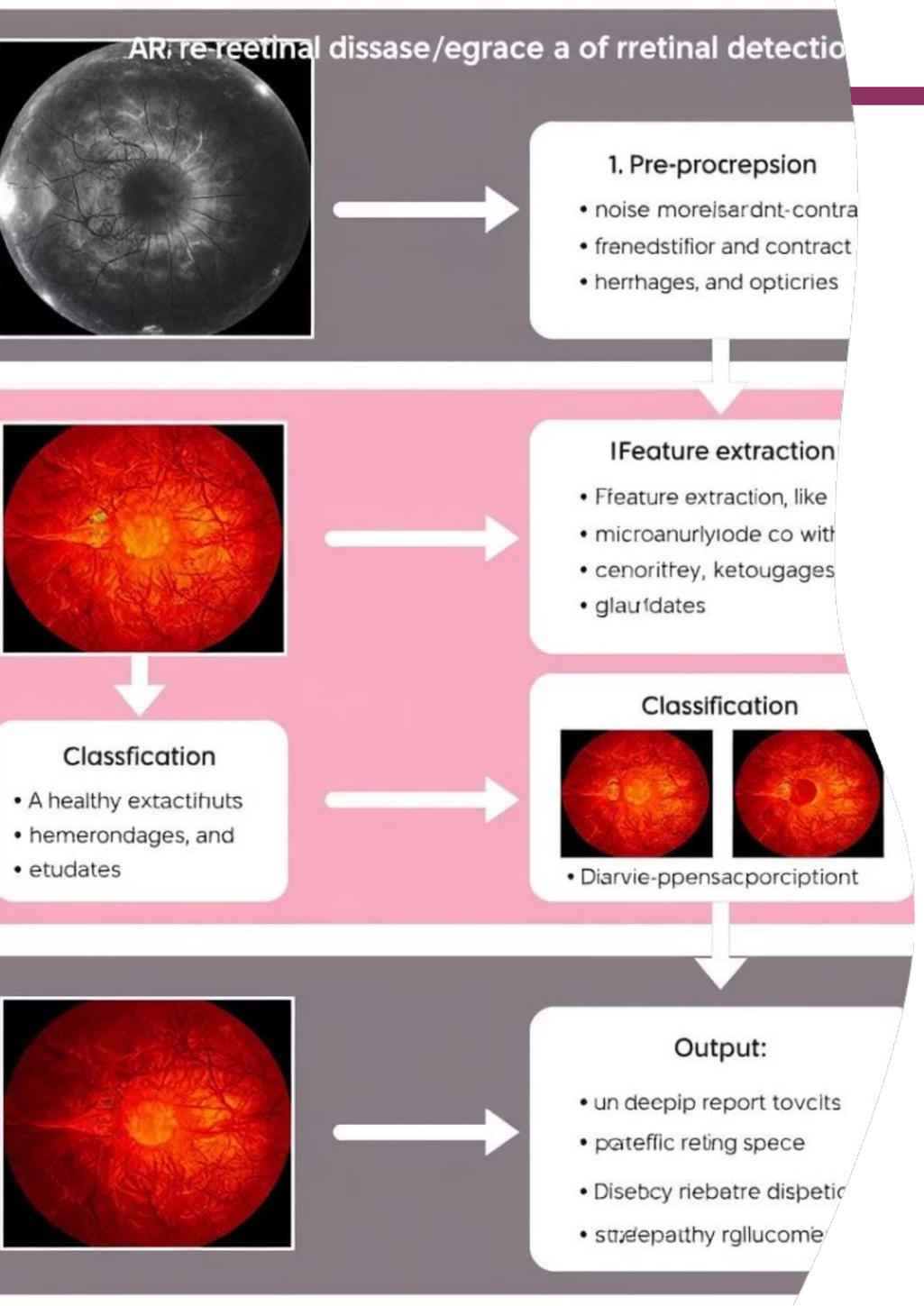
5 DR severity levels predicted

Automation

Reduce manual screening reliance

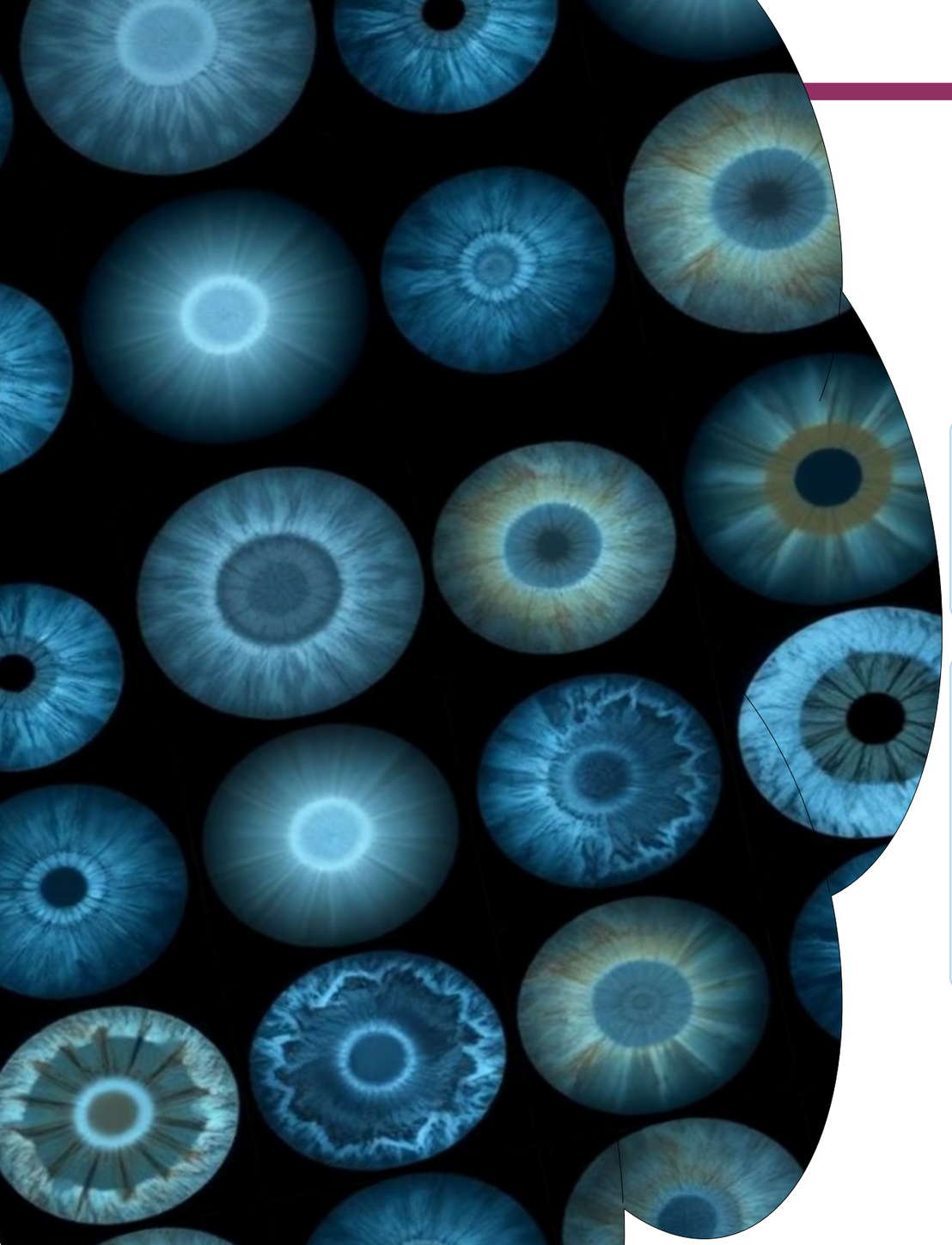
Early Diagnosis

Prevent blindness through timely detection



System Workflow

1. Image Upload
2. Preprocessing
3. CNN Model (ResNet50V2)
4. DR Level Output



Dataset & Preprocessing

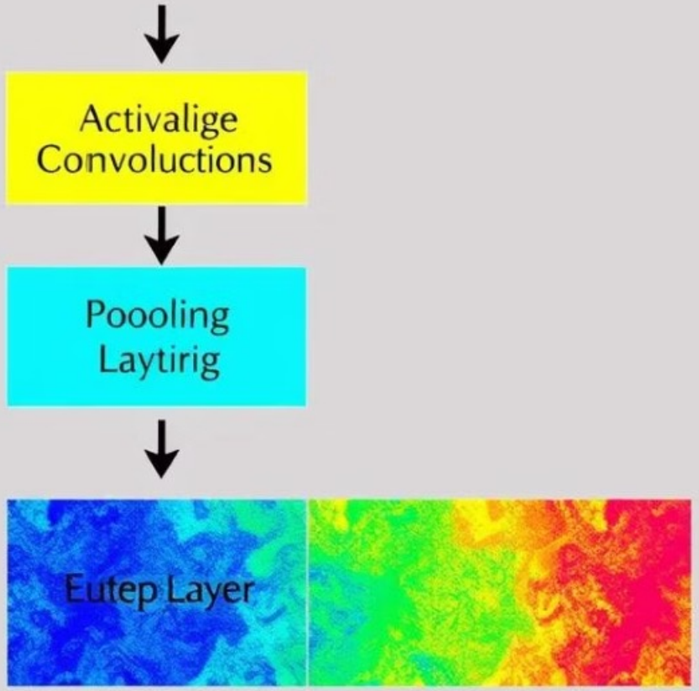
Dataset

20,000 retinal images categorized into 5 severity classes.

Preprocessing

- Normalization for consistent brightness
- Augmentation: rotation, zoom, flip, shear, brightness
- Data split: 60% train, 25% validation, 15% test

Input Layer



Model Architecture: ResNet50V2 Transfer Learning

Base Model

Pretrained on ImageNet

Fine-Tuning

Last 50 layers unfrozen for training

Added Layers

Pooling, BatchNorm, Dense, Dropout, Softmax

Training & Evaluation

Training Setup

Adam optimizer with learning rate 1e-4, 10 epochs on augmented data.

Results

Validation accuracy stable at 75.91%, test accuracy 75.40%.

Loss function: categorical crossentropy with final loss 0.7561.

Applications, Benefits & Future Work

Clinical & Remote Use

Fast, accessible screening reduces specialist workload.

Future Improvements

- Boost accuracy beyond 85%
- Detect additional eye diseases
- Optimize for mobile and edge devices
- Expand clinical trials and telemedicine support