

# AI-powered classification of the diabetic retinopathy severity

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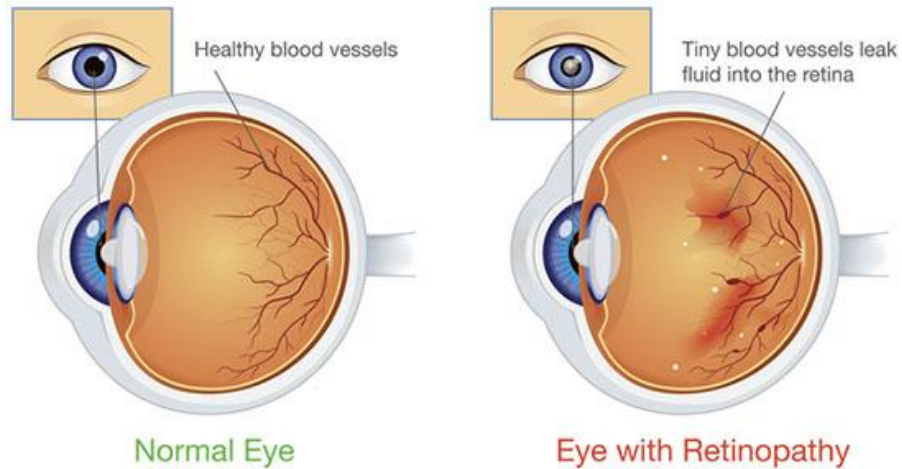
# Agenda

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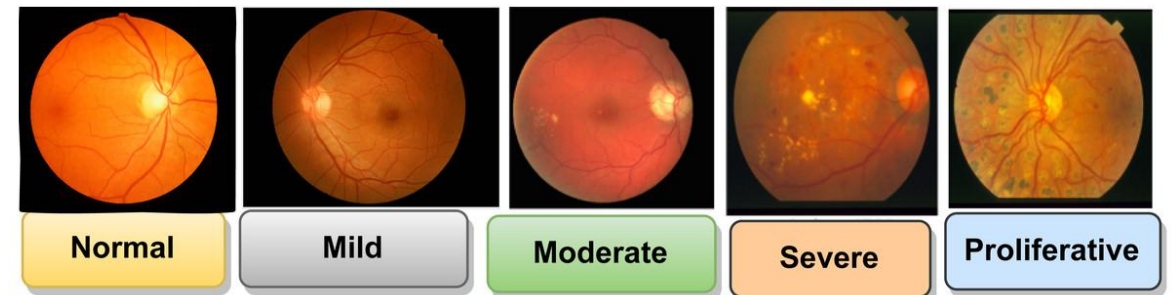
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# Introduction

## Diabetic Retinopathy



**Comparison between Normal Eye and Eye with Retinopathy**



**The severity of Diabetic Retinopathy ranges from Normal to Proliferative**

# Problem Statement

## Cause

- Diverse severity of disease
- Different physical conditions of patients
- Different disease manifestations of patients

## Consequence

- Incorrect classification in the early stages
- Treatment is time-consuming and costly
- Affect to patients' physical and mental health

# Objectives

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Deep learning models classify Diabetic Retinopathy via retinal high-resolution images.

- **Efficiency:** Automatic classification can screen twice as many patients as the traditional method.
- **Accuracy:** It achieves 90% accuracy of classification at the early stage.
- **Real-world application:** It reduces classification time, helps patients be treated early, and improves the quality of patients' lives.
- **Reliability:** It needs to be updated continuously.
- **Scalability:** It can find out other eye diseases except Diabetic Retinopathy.

# Data Collection

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- **Diabetic Retinopathy 224x224 (2019 Data)** with the link:  
<https://www.kaggle.com/datasets/sovirath/diabetic-retinopathy-224x224-2019-data>
- **Diabetic Retinopathy Unzipped** with the link:  
<https://www.kaggle.com/datasets/saipavansaketh/diabetic-retinopathy-unzipped>
- **eye\_diseases\_classification** with the link:  
<https://www.kaggle.com/datasets/gunavenkatdoddi/eye-diseases-classification>

# Data Preprocessing & Data Analysis

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- **Data Preprocessing**

- ✓ Resize image for standardization
- ✓ Identify and handle missing data
- ✓ Reduce the quantity of photos which is unclear or have no labels

- **Data Analysis**

- ✓ Analyze a dataset's statistics, such as image resolution, class distribution
- ✓ Identify potential issues, such as imbalanced classes

# Model Selection & Evaluation

- **Deep Learning Model:** EfficientNet
- **Libraries:** Python, NumPy, Matplotlib, Scikit-learn.

Criteria	ResNet	DenseNet	EfficientNet	Vision Transformer
Accuracy	x x	x x x	x x x x	x x x x x
Training Speed	x x x x	x x x	x x x x x	x x
Suitable for medical data	x x x x	x x x	x x x x x	x x
Save resources	x x x x	x x x	x x x x x	x x

$$\text{Accuracy} = \frac{\text{Number of correctly classified images}}{\text{Total number of images}}$$



# Project Timeline

3 and a half months,  
divided into 2  
milestones:

- **Milestone 1:**  
Baseline Model  
Development
- **Milestone 2:**  
Model Optimization  
Deployment

Q3 2025	Q4 2025		
September	October	November	December
Project Planning Data Collection			
	Data Preprocessing Data Analysis		
		★	
		Model Selection Baseline Model Development	
			★
			Model Optimization Deployment Testing & Evaluation Deployment & Finalization

# Conclusion

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- This project aims to develop a deep learning model **EfficientNet** using for Diabetic Retinopathy classification via retinal high-resolution images.
- The steps, such as data preprocessing, model training, and evaluation, are implemented to create accurate and efficient classification.
- The expected outcome is to reduce classification time, patients can have good treatment, and improve their life quality.

# References (1/2)

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- **Comparison between Normal Eye and Eye with Retinopathy.** From *Diabetic Retinopathy* [Photograph], by Bobbi Nodell, 2020, (<https://newsroom.uw.edu/news-releases/ai-technology-doesnt-reliably-detect-diabetic-eye-disease>). 206.543.7129
- **The severity of Diabetic Retinopathy ranges from Normal to Proliferative.** From *Stages of DR* [Photograph], by Prasanna Porwal, Samiksha Pachade, Ravi Kamble, Manesh Kokare, Girish Deshmukh, Vivek Sahasrabuddhe, Fabrice Meriaudeau, April 24, 2018, “Indian Diabetic Retinopathy Image Dataset (IDRiD)”, IEEE Dataport, <https://dx.doi.org/10.21227/H25W98>, (<https://peerj.com/articles/cs-1947/>). CC BY 4.0 DEED.

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- **Samia Akhtar, Shabib Aftab, Oualid Ali, Munir Ahmad, Muhammad Adnan Khan, Sagheer Abbas & Taher M. Ghazal.** (30 January 2025). A deep learning based model for diabetic retinopathy grading. *Scientific Reports*, volume 15, Article number: 3763 (2025). <https://www.nature.com/articles/s41598-025-87171-9>.
- **Zijian Wang, Yi Wang, Chun Ma, Xuan Bao & Ya Li.** (10 August 2025). Diabetic retinopathy classification using a multi-attention residual refinement architecture. *Scientific Reports*, volume 15, Article number: 29266 (2025). <https://www.nature.com/articles/s41598-025-15269-1>

Thank you