DIABETIC RETINOPATHY

USING TRANSFER LERANING WITH CNN

Group-6

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Introduction

What is Diabetic Retinopathy (DR)?

Diabetic retinopathy is a complication of diabetes that affects the eyes, caused by damage to the blood vessels in the retina.

Challenges:

- Late Diagnosis
- Manual Screening
- Lack of accessibility

Transfer Learning

A machine learning technique where a model pre-trained on a large dataset is fine-tuned for a specific task.

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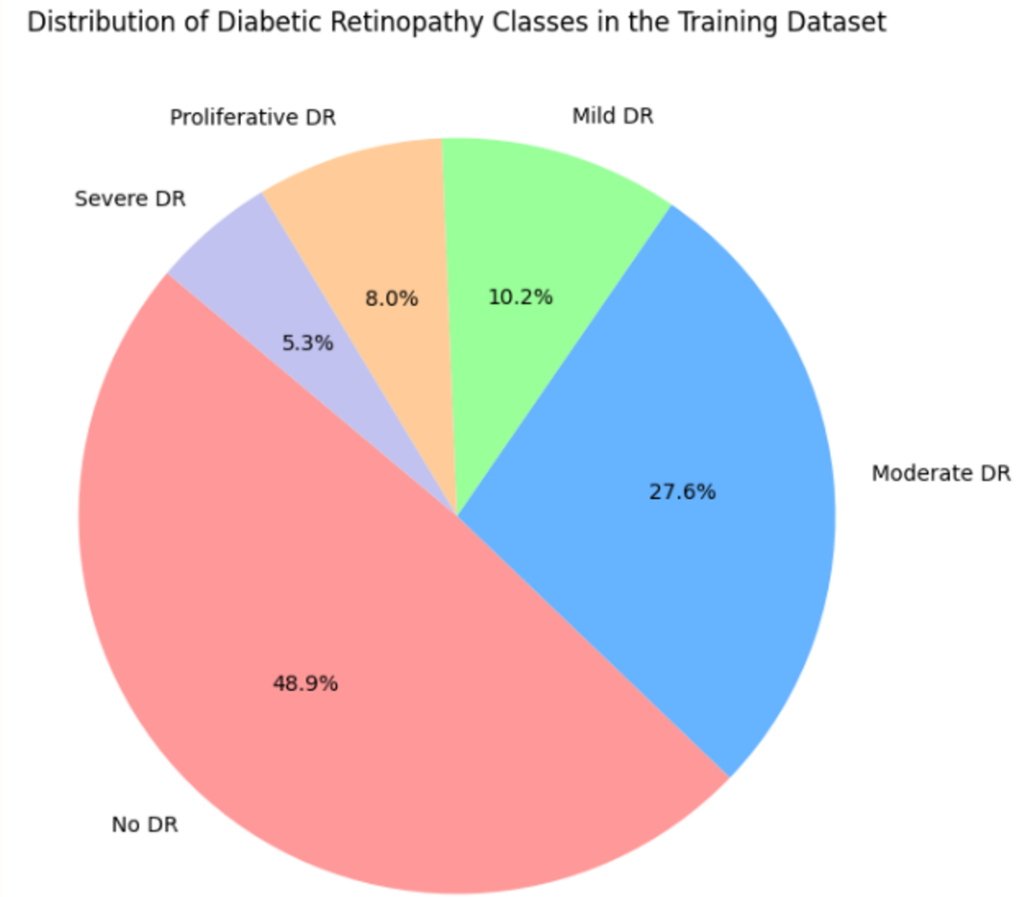
Dataset overview:

Dataset Source: APTOS 2019 Blindness Detection (KAGGLE)

Dataset Composition: Total Images: 3,662 (Training : 2,930 images and Testing: 366 images and validation: 366 images)

Image Labels & Severity Levels

- 0 - No DR
- 1 - Mild DR
- 2 - Moderate DR
- 3 - Severe DR
- 4 - Proliferative DR



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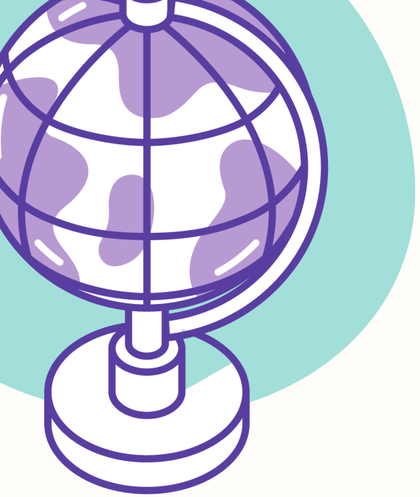

Methodology

Dataset Preparation: Train-validation-test splits; images resized to 224x224 and normalized.

Model Architecture:

Base Model : ResNet50 with pre-trained ImageNet weights.

Custom Layers : Added layers for fine-tuning; softmax output for 5- class classification.

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CNN

1)A type of deep learning algorithm designed to process structured grid-like data such as images.

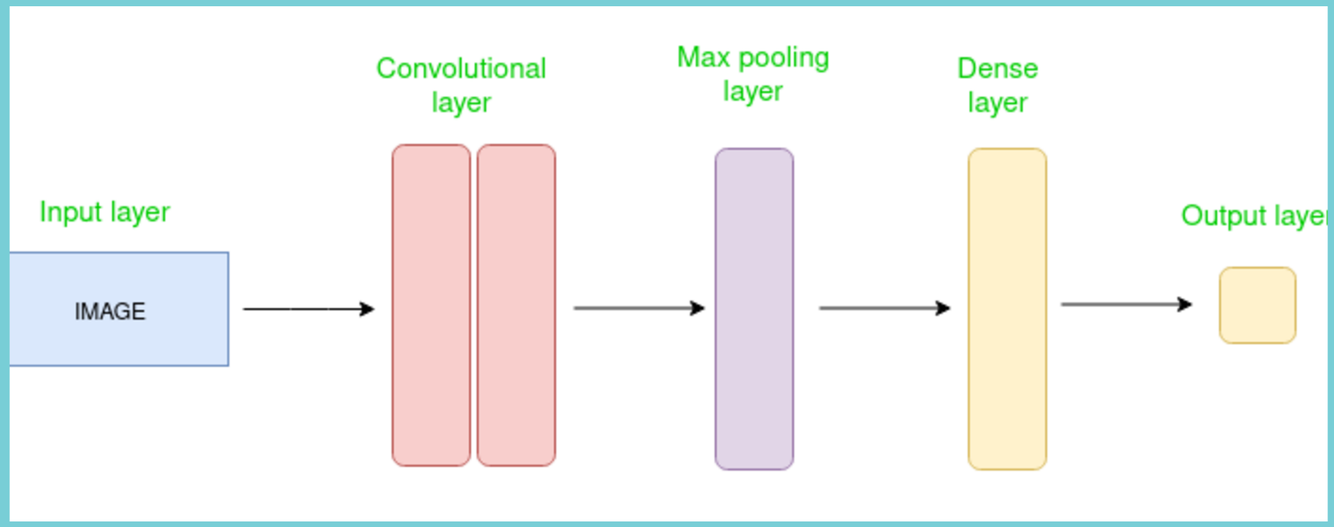
2)Inspired by the visual cortex of the brain

Key Characteristics:

- *Automatically extracts features from raw data.*
- *Reduces the need for manual feature engineering.*
- *Efficient for high-dimensional data like images.*

How CNN Works?

1.Convolution layer:*Extracts features using filters/kernels.*
2.Pooling layer:*Reduces dimensionality and retains essential information(e,g., MaxPooling).*
3.Fully Connected Layer:*Combines features and makes predictions.*



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ResNet

ResNet solves the issue of vanishing gradients in deep networks, allowing us to train very deep models effectively.

Uses residual blocks with skip connections, enabling the network to "skip" layers and learn identity mappings when necessary.

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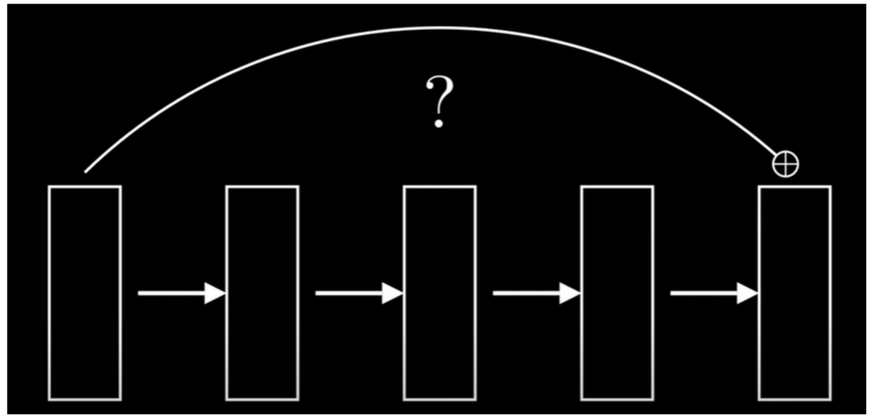
Residual Blocks

- Core of ResNet



- Each input can be connected to the output either through an identity shortcut or a convolutional shortcut.
- Skip Connection: Bypasses one or more layers, reducing the risk of degradation as depth increases.
- Helps the model focus on learning only the "residuals" or important details

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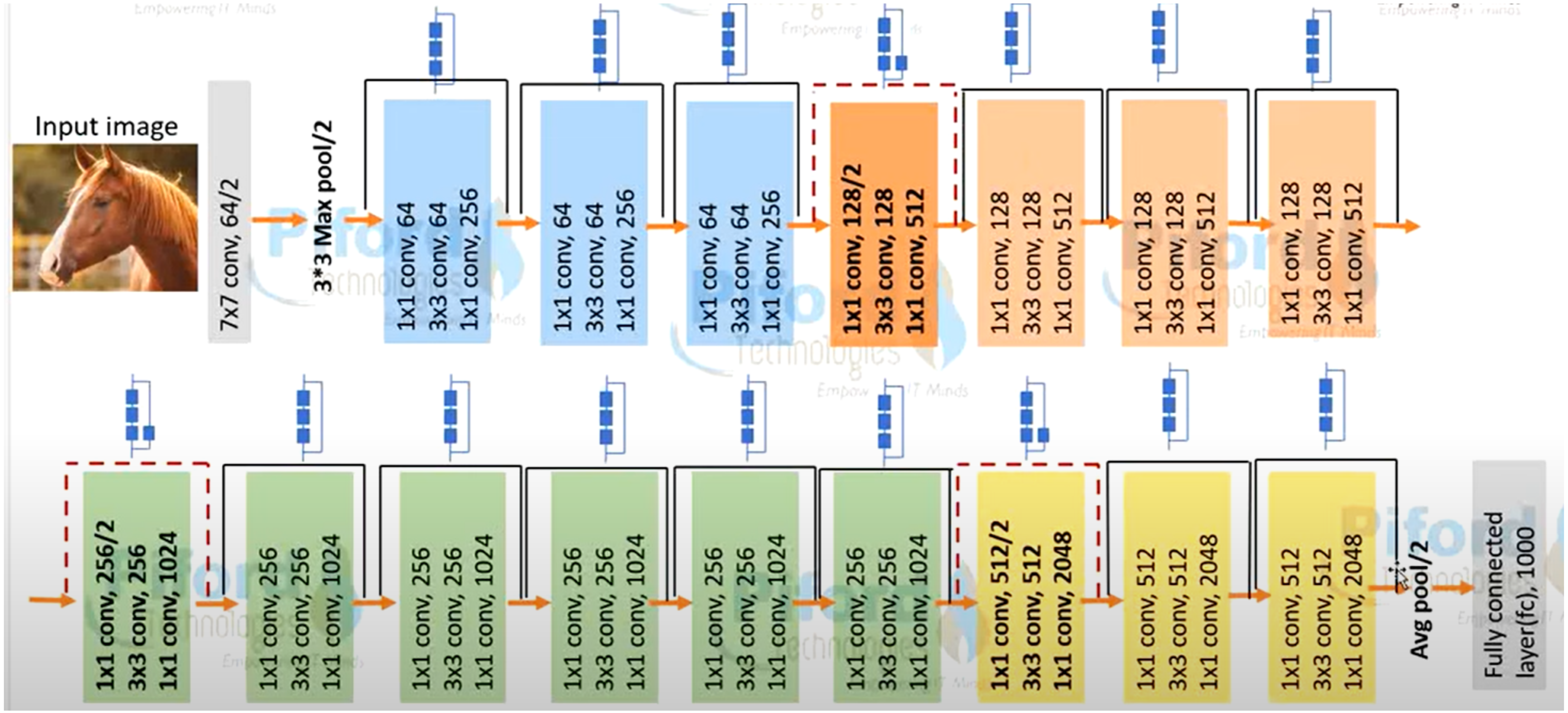
ResNet50



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Methodology

Training:

01 **Data Augmentation:**
Enhanced dataset using ImageDataGenerator

02 **Transfer Learning :**
Pre-trained ResNet50, integrated with custom dense layers

03 **Optimizations:**
Learning Rate Scheduler, Early Stopping

04 **Training Summary:**
25 epochs

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How the model is evaluated

During Training Phase

Validation Loss: Measures the error during validation.

Validation Accuracy: Measures the model's performance on validation data.

During Testing Phase

Test Accuracy: Manual calculation to confirm accuracy.

Classification Metrics:

Print Classification report: Accuracy, Precision, Recall, F1-score, Confusion matrix

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Results

Classification Report:

	precision	recall	f1-score	support
Class 0	0.94	0.76	0.84	199
Class 1	0.77	0.95	0.85	167
accuracy			0.84	366
macro avg	0.86	0.85	0.84	366
weighted avg	0.86	0.84	0.84	366

Accuracy: **85.52%**

Confusion Matrix:

```
[[151  48]
 [  9 158]]
```

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Conclusion

Our model effectively detects diabetic retinopathy, achieving high accuracy in classification.

Early detection can help prevent vision loss in diabetic patients, improving quality of life.

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Future Research

To improve the model's accuracy, future work could focus on experimenting with advanced neural network architectures and fine-tuning hyperparameters.

Additionally, expanding the dataset to include a broader demographic variety would help the model generalize better to diverse patient populations, making it more effective in real-world applications.

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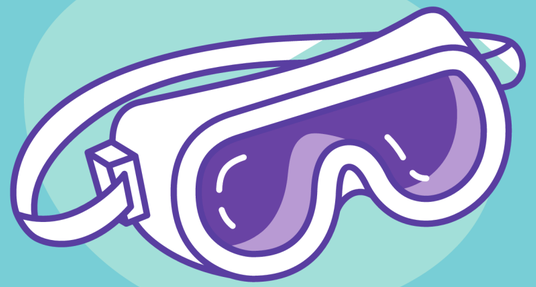

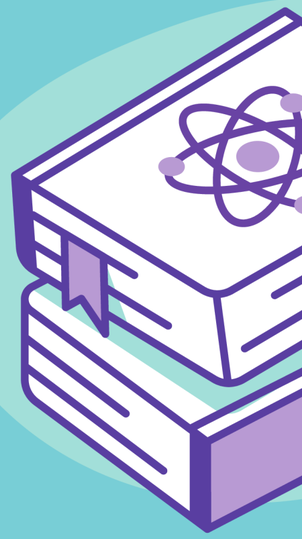

THANK YOU