TANVI GERA

PROJECT MILESTONE 2

APRIL'2024

USING ARTIFICIAL INTELLIGENCE

DIABETIC RETINOPATHY DETECTION

PROBLEM STATEMENT

Diabetic Retinopathy (DR) is a severe eye disease that affects millions of people globally. It arises as a complication of uncontrolled blood sugar levels in individuals with type 1 or type 2 diabetes. Left untreated, DR can lead to irreversible vision loss and even blindness. The project aims to leverage the capabilities of Artificial Intelligence (AI) and Deep Learning to develop an accurate and efficient model for early detection of DR from retinal images.

Project Goals:

1. **Detection Accuracy:** Train a deep neural network model using Convolutional Neural Networks (CNNs) and Residual Blocks to accurately classify retinal images into different stages of DR.
2. **Early Intervention:** Enable doctors to identify DR before it progresses to irreversible stages, allowing timely intervention and prevention of blindness.
3. **Scalability:** Create a scalable solution that can handle a large volume of retinal images efficiently, making it practical for widespread clinical use.

Significance:

The project has the potential to revolutionize DR diagnosis by providing an automated, reliable, and rapid screening tool. By detecting DR early, we can significantly improve patient outcomes and reduce the burden on healthcare systems.

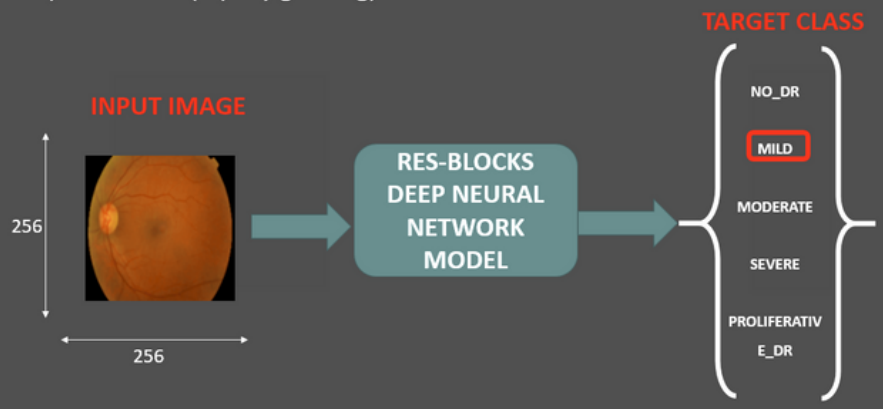
APPROACH

1. UNDERSTAND THE PROBLEM STATEMENT AND BUSINESS CASE
2. IMPORT LIBRARIES AND DATASETS
3. PERFORM DATA EXPLORATION AND VISUALIZATION
4. PERFORM DATA AUGMENTATION AND CREATE DATA GENERATOR
5. UNDERSTAND THE THEORY BEHIND CONVOLUTIONAL NEURA NETWORKS
6. BUILD A RESNET DEEP NEURAL NETWORK MODEL
7. COMPILE AND TRAIN THE DEEP NEURAL NETWORK MODEL
8. ASSESS THE PERFORMANCE OF THE TRAINED MODEL

APPROACH

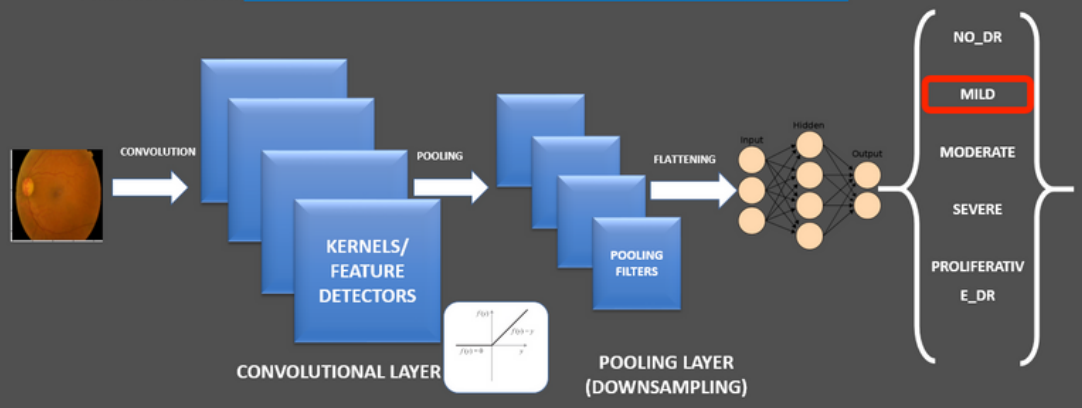
INPUTS AND OUTPUTS

- The dataset consists of 3553 color images belonging to 5 categories.
- Categories that are present in the data are No_DR, Mild, Moderate, severe and proliferative (rapidly growing).



CONVOLUTIONAL NEURAL NETWORKS

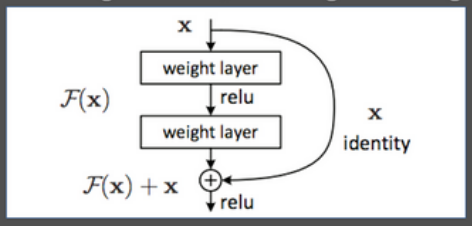
- CNN in action: https://www.cs.ryerson.ca/~aharley/vis/conv/flat.html



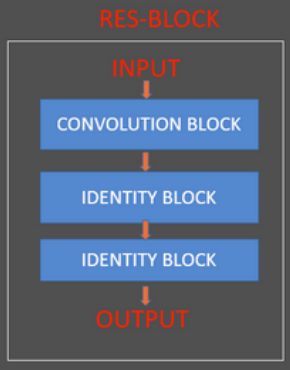
APPROACH

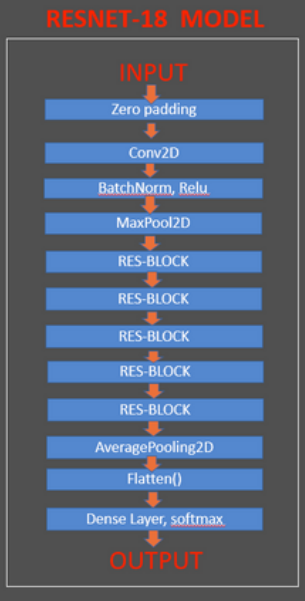
RESNET (RESIDUAL NETWORK)

- As CNNs grow deeper, vanishing gradient tend to occur which negatively impact network performance.
- Vanishing gradient problem occurs when the gradient is back-propagated to earlier layers which results in a very small gradient.
- Residual Neural Network includes “skip connection” feature which enables training of 152 layers without vanishing gradient issues.
- Resnet works by adding “identity mappings” on top of the CNN.
- ImageNet contains 11 million images and 11,000 categories. ImageNet is used to train Res-Net deep network.

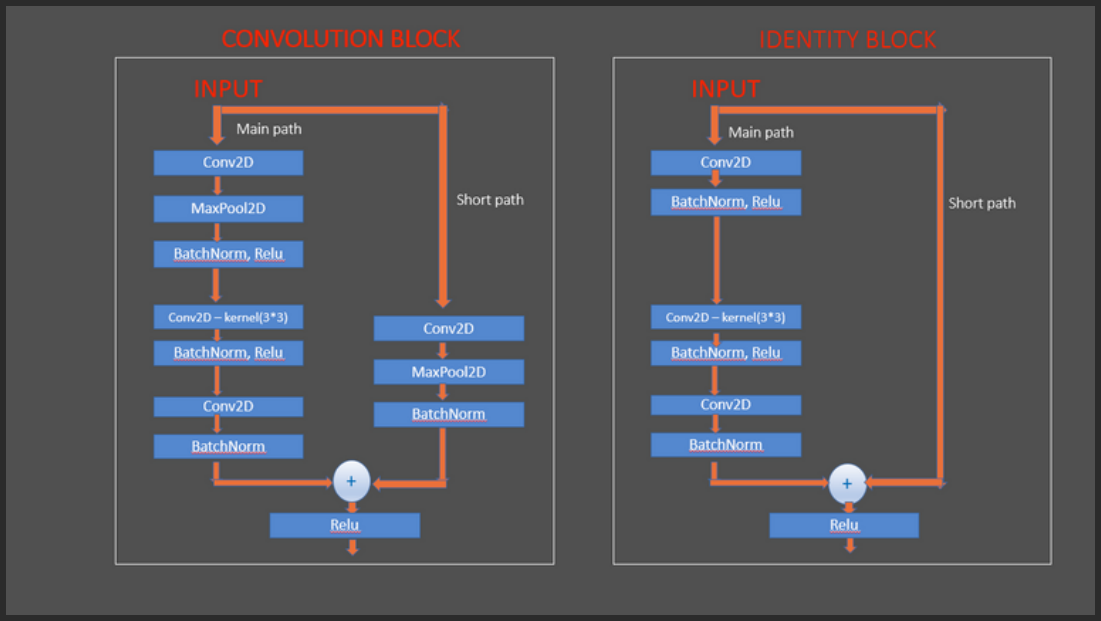


https://commons.wikimedia.org/wiki/File:Resnet.png

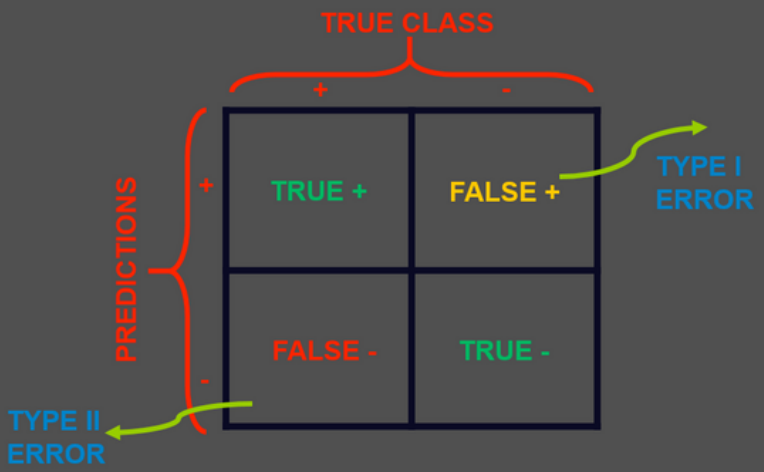




APPROACH



CONFUSION MATRIX



RESOURCES

Data Source

HTTPS://WWW.KAGGLE.COM/C/DIABETIC-RETINOPATHY-DETECTION