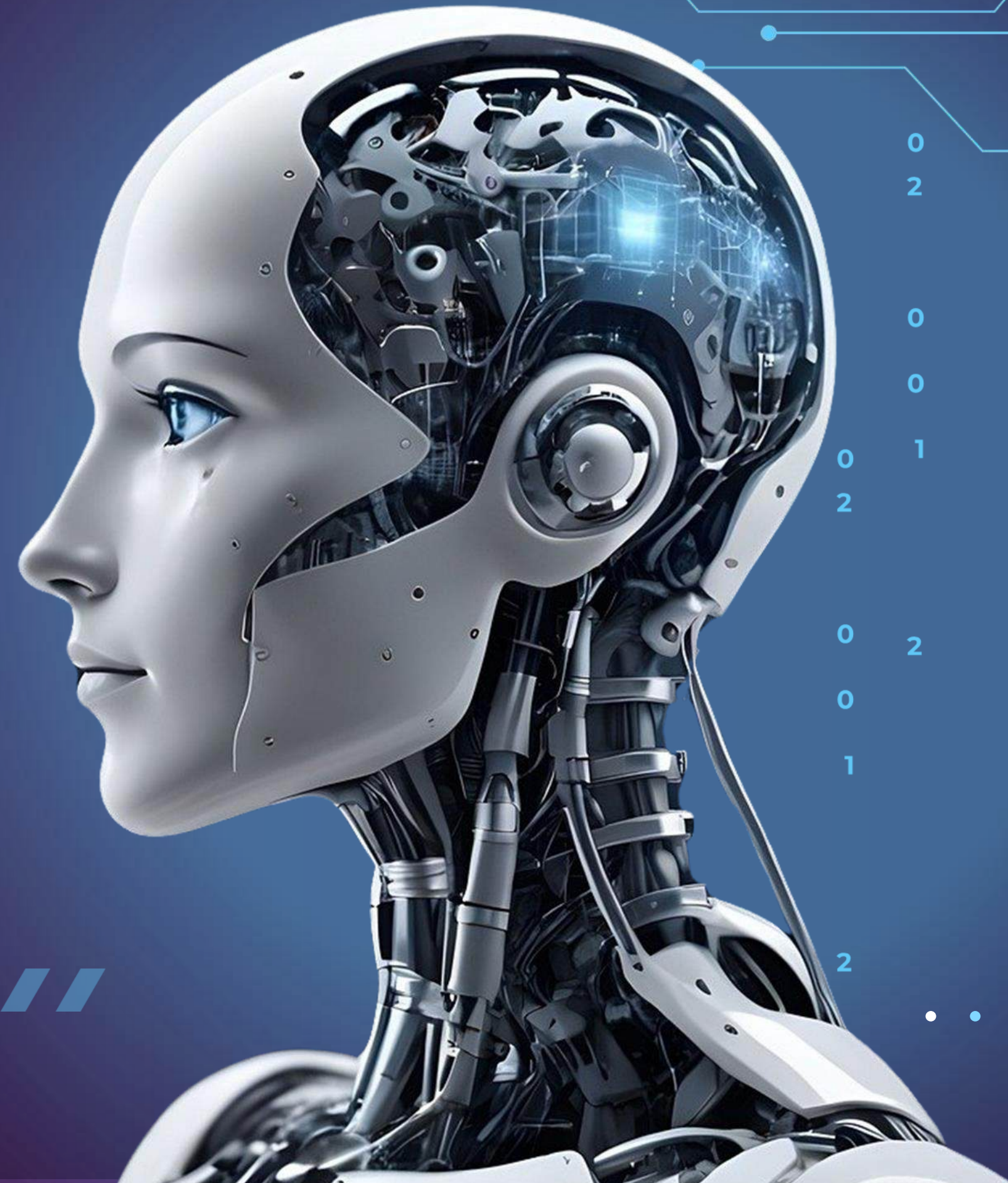


TUMOR TRACE : MRI – Based AI for Breast Cancer Detection



BY MU DARSHAN



PROJECT OVERVIEW

Objective:

Build a machine learning model to classify breast cancer status (benign or malignant) using MRI images.

Goal:

Aid in the early detection of breast cancer to improve patient outcomes.

Approach:

Utilize deep learning models, data preprocessing, and evaluation metrics.



Problem Statement!!

The Problem:

- Breast cancer is a leading cause of death among women worldwide.
- Early detection plays a vital role in improving survival rates.
- Manual analysis of MRI scans is slow, expensive, and prone to errors.

The Need:

- Automated, accurate, and fast classification of MRI scans to detect cancer earlier and more reliably.
- This project aims to develop a ml model that can accurately classify MRI images as benign or malignant there by aiding in early detection and diagnosis of breast cancer

Project Goal:

- Develop a machine learning model that can classify MRI images as benign or malignant, aiding in early detection and diagnosis.

Overview & Steps



Data collection from MRI images.
Preprocessing for model input.
Model training and evaluation.



Data Collection - Obtain labeled MRI datasets.
Data Preprocessing - Resize images, normalize pixel values, data augmentation.



Model Development - Implement deep learning models (VGG16, ResNet).
Evaluation - Assess performance using metrics like accuracy, precision, recall, F1 score.

Data Collection and Preprocessing



Dataset :

Contains MRI images labeled as either benign or malignant.

Source of Dataset:

<https://www.sciencedirect.com/science/article/abs/pii/S0010482523007205>



Preprocessing Steps:

Grayscale Conversion: Convert images to grayscale.

Resizing: Resize images to a standard dimension (e.g., 224x224).

Normalization: Normalize pixel values to a range suitable for neural network input.

Augmentation: Apply techniques like rotation and flipping to augment the dataset.

Handling Class Imbalance: Use techniques like oversampling, undersampling, and class weights..



Models Used and Development

Models Used:

VGG16: A convolutional neural network with 16 layers.

ResNet18 & ResNet50: Deeper architectures using residual connections for improved training.

Model Selection:

VGG16: Chosen for its simplicity and effectiveness in image classification.

ResNet18 & ResNet50: Chosen for better performance with deeper layers and residual learning.

Development Steps:

Initialize pre-trained models.

Fine-tune on the breast cancer dataset.

Train and validate models.





Precision

Ability to avoid false positives.

Recall

Ability to identify actual positive cases (sensitivity)..

F1 Score

Harmonic mean of precision and recall.

Evaluation Metrics

AUC (Area Under Curve)

Measures how well the model distinguishes between benign and malignant tumors.

Accuracy

Percentage of correct predictions.

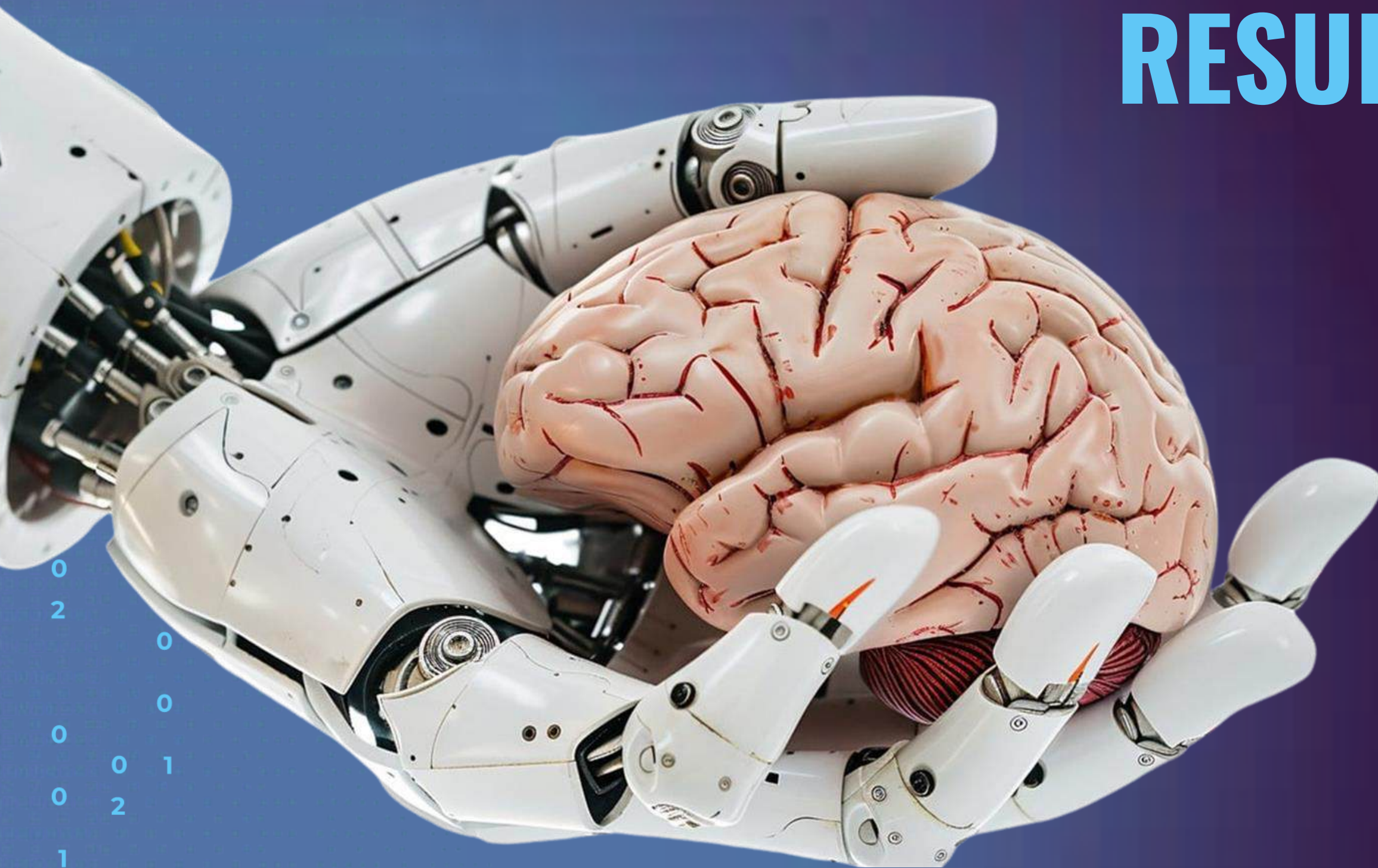
Confusion Matrix

Helps in understanding the performance of your classification, showing true positives, false positives, etc.

0
2
0
2
0
0
0
1
0
2
0
0
1

RESULTS & IMPACT

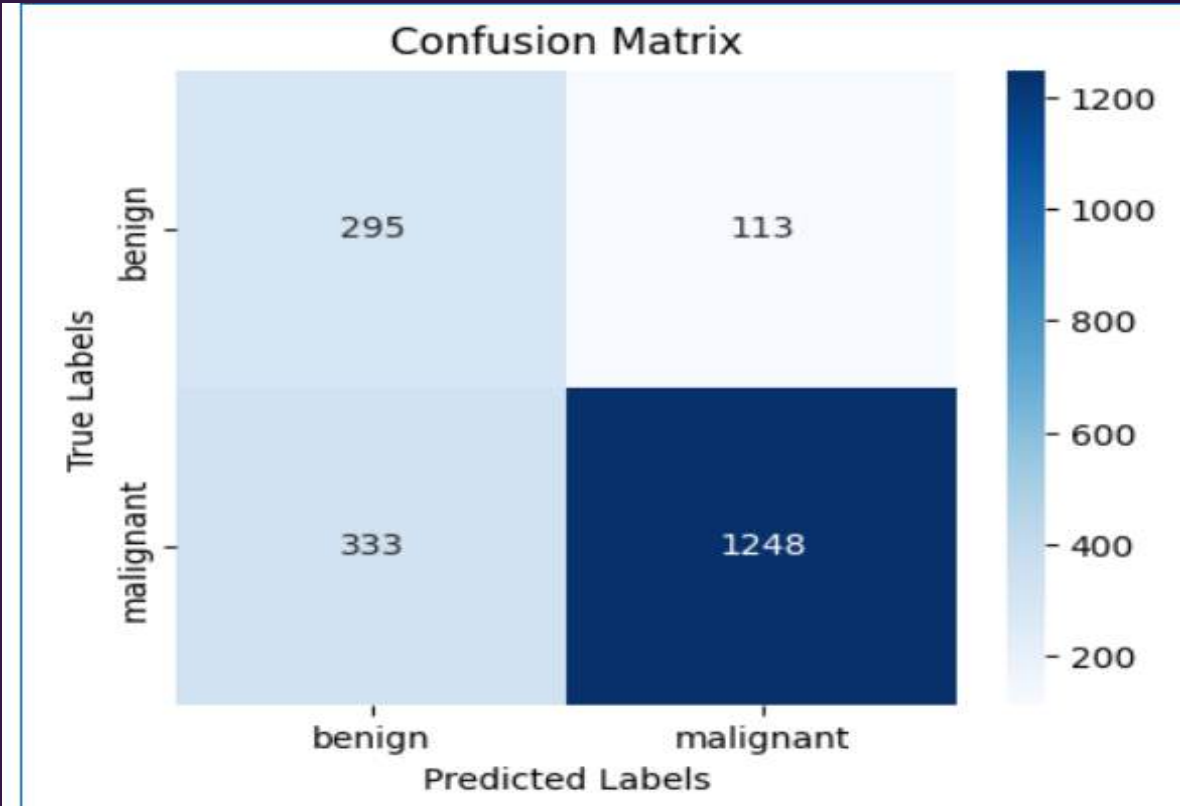
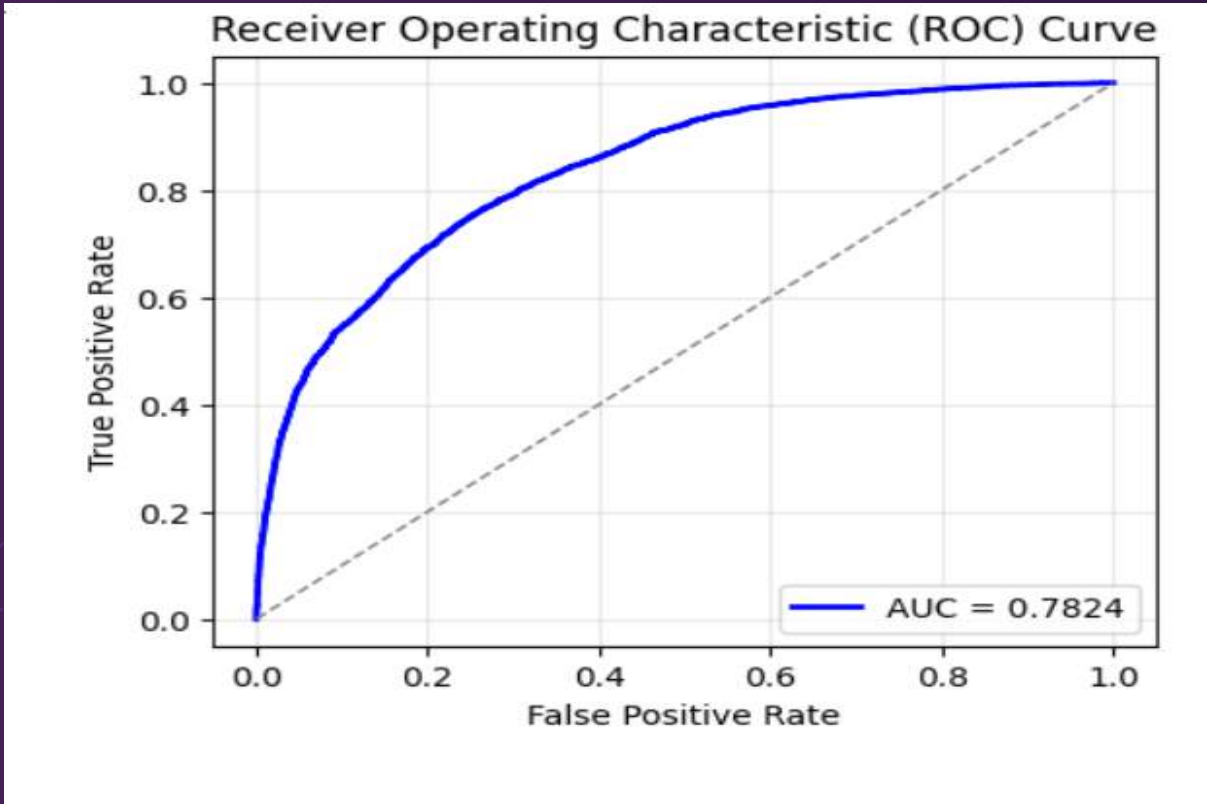
1. MODEL – VGG16
2. MODEL – RESNET18
3. MODEL – RESNET 80



VGG16

INCORPORATING ETHICS

Methods for integrating ethics into the AI development process



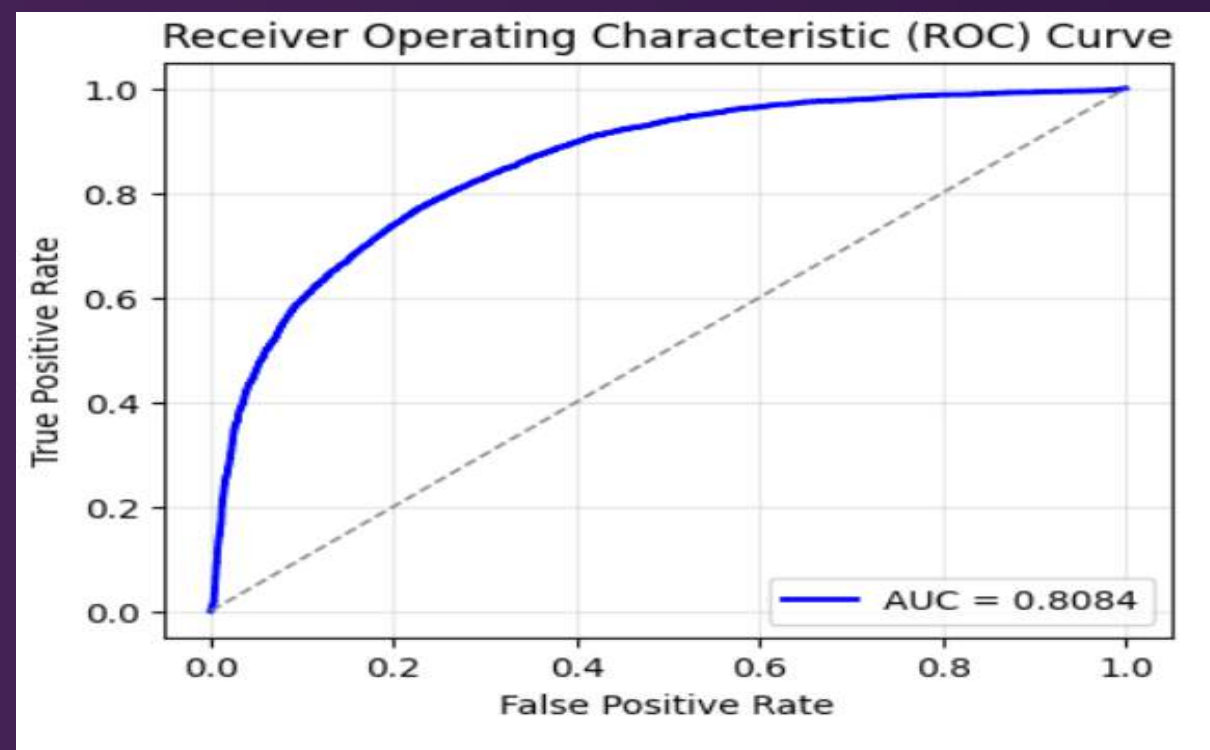
CONFUSION MATRIX: $\begin{bmatrix} 1005 & 933 \\ 777 & 4136 \end{bmatrix}$

**SPECIFICITY: 1.0000,
SENSITIVITY: 0.0000,
AUC: 0.7824**

**TEST SET:
AVERAGE LOSS: 0.5217,
ACCURACY: 5141/6851 (75.04%)**

	precision	recall	f1-score	support
benign	0.5640	0.5186	0.5403	1938
malignant	0.8159	0.8418	0.8287	4913
accuracy			0.7504	6851
macro avg	0.6900	0.6802	0.6845	6851
weighted avg	0.7447	0.7504	0.7471	6851

RESNET 18

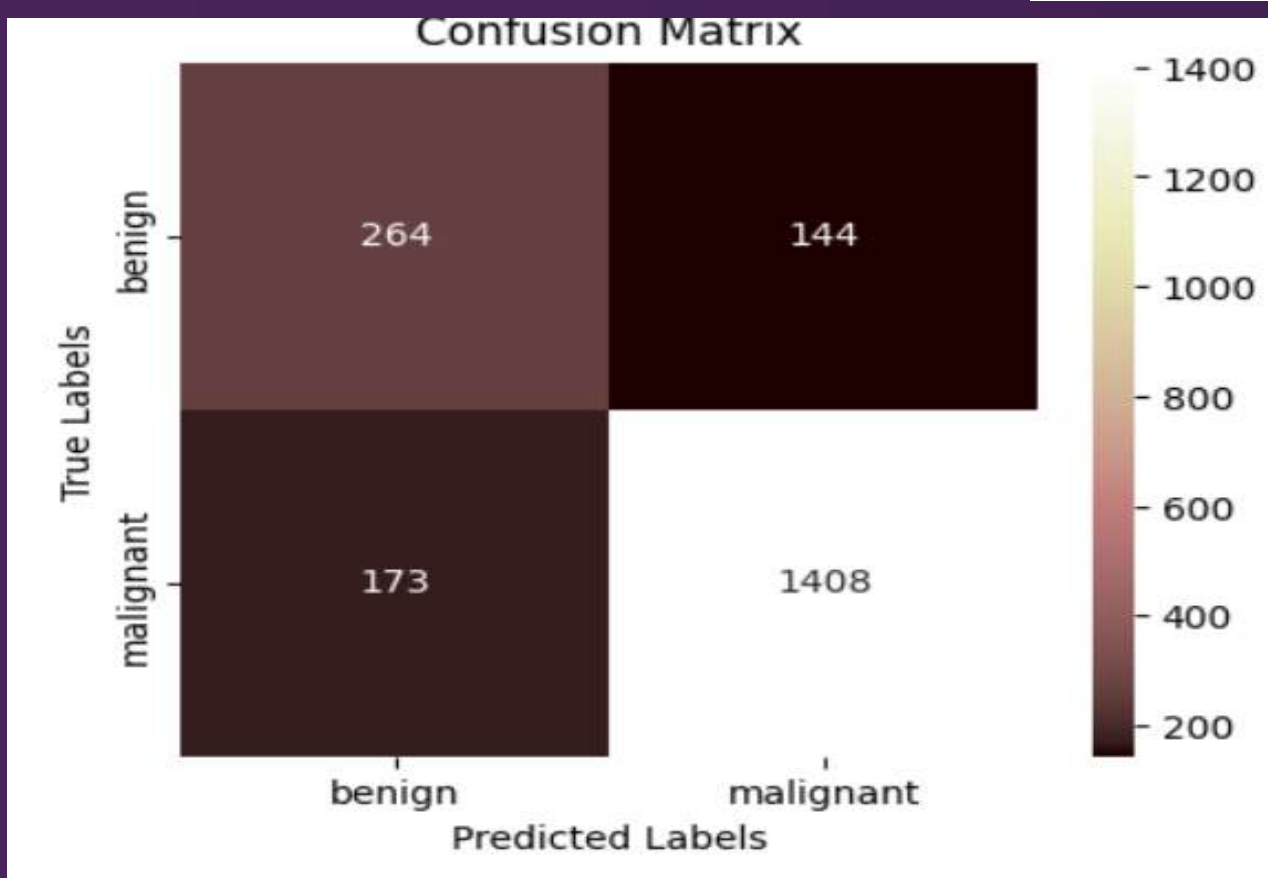


	precision	recall	f1-score	support
benign	0.6338	0.4546	0.5294	1938
malignant	0.8064	0.8964	0.8490	4913
accuracy			0.7714	6851
macro avg	0.7201	0.6755	0.6892	6851
weighted avg	0.7576	0.7714	0.7586	6851

Confusion Matrix: $\begin{bmatrix} 881 & 1057 \\ 509 & 4404 \end{bmatrix}$

Specificity: 1.0000,
Sensitivity: 0.0000,
AUC: 0.8084

test set:
Average loss: 0.6559
Accuracy: 5285/6851 (77.14%)

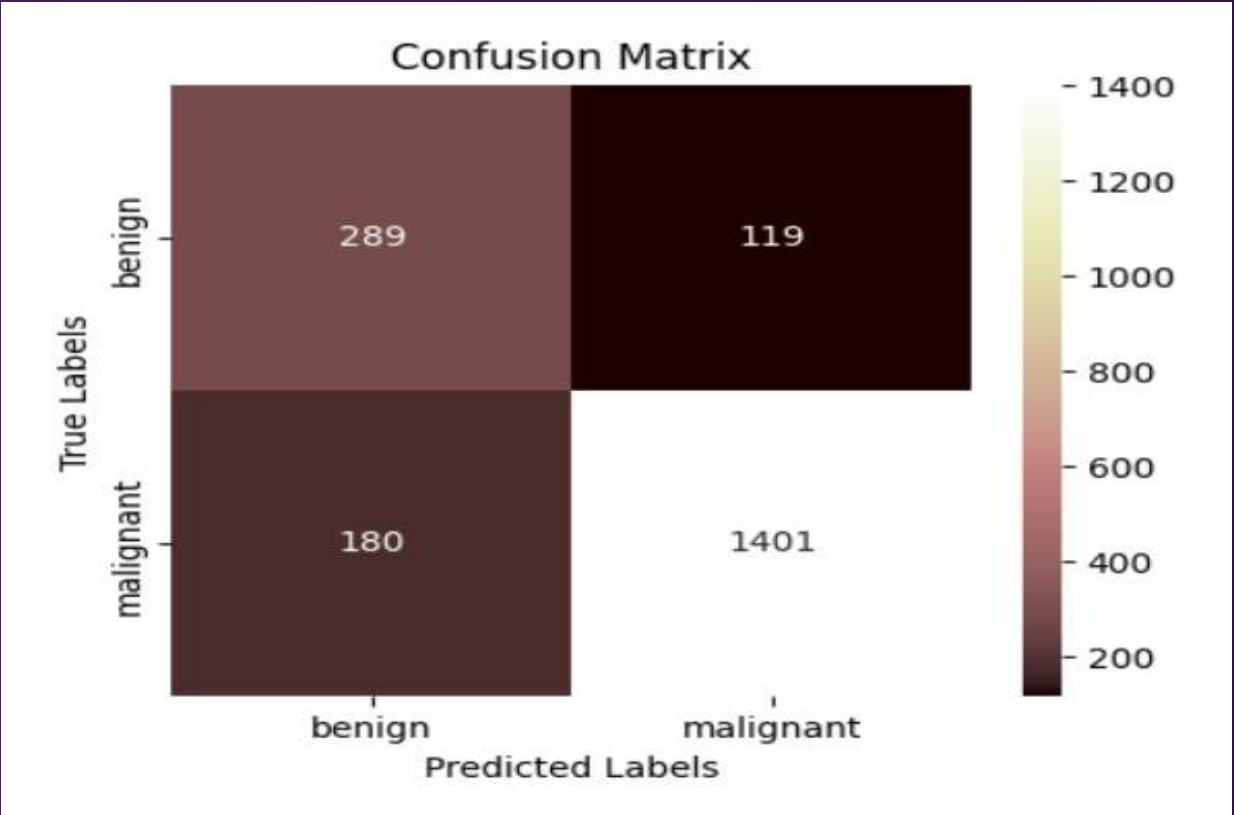
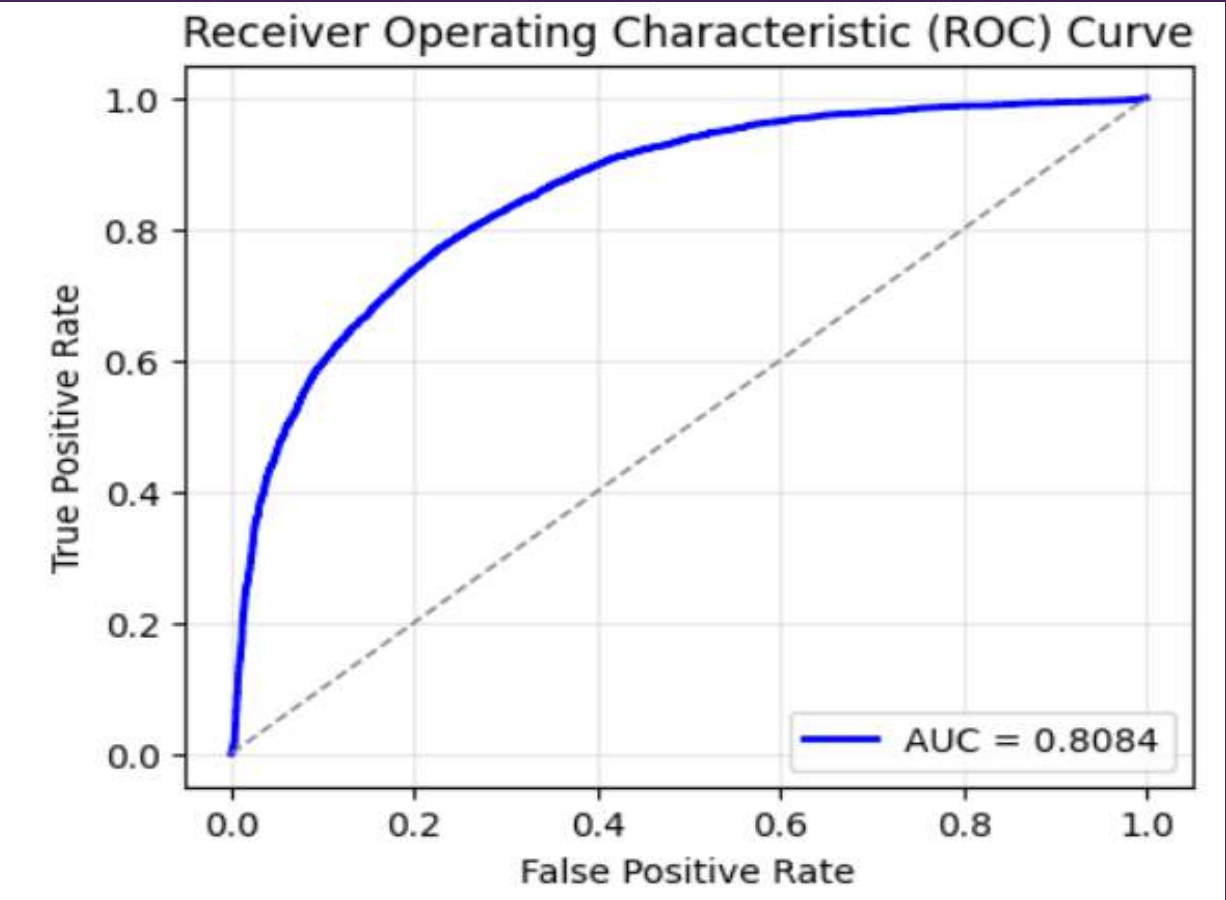




RESNET80

0
2

0
0
0
0
1



	precision	recall	f1-score	support
benign	0.5913	0.4912	0.5366	1938
malignant	0.8119	0.8661	0.8381	4913
accuracy			0.7600	6851
macro avg	0.7016	0.6786	0.6874	6851
weighted avg	0.7495	0.7600	0.7528	6851

CLIENT Confusion Matrix:
[[952 986]
[658 4255]]

Specificity: 1.0000,
Sensitivity: 0.0000,
AUC: 0.7912

test set: Average loss: 0.6254,
Accuracy: 5207/6851 (76.00%)

google colab - Yahoo India Search - gradio.ipynb - Colab Binary Classification

← → ↻ <https://055ee33e9988adce41.gradio.live> ☆ 📁 All Bookmarks

📧 Gmail 📺 YouTube 📍 Maps

⏸ 00:00:00 Select Area Audio Record Pointer

Binary Classification with Custom ResNet18

Upload an image to classify it as 'Benign' or 'Malignant' using a pretrained ResNet18 model.

image

⬆

Drop Image Here

- or -

Click to Upload

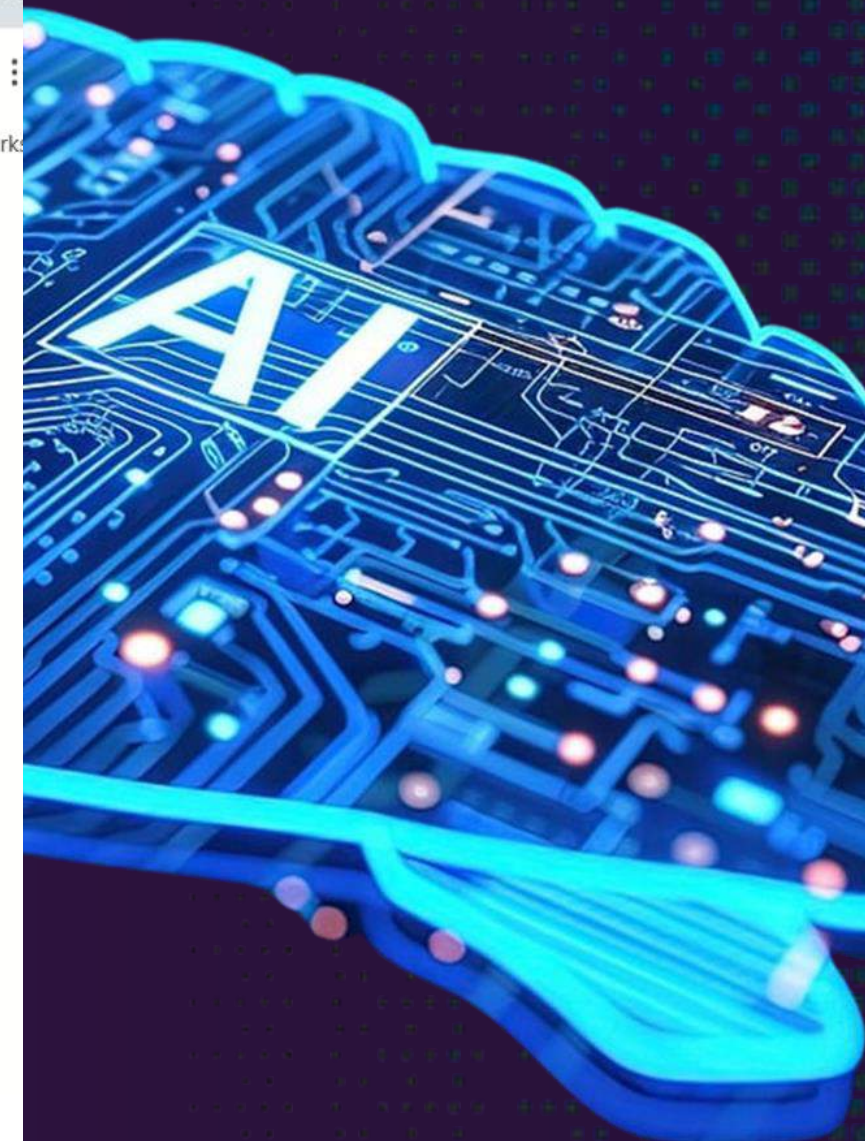
📁 📷 📄

Clear

Submit

output

Flag



Project : MRI-Based AI for Breast Cancer Detection

BY

MU DARSHAN

Infosys AI/ML Intern

<https://www.linkedin.com/in/mu-darshan>

<https://github.com/DARSHANVIT>

