

TUMORTRACE: MRI-BASED AI FOR BREAST CANCER DETECTION

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PROBLEM

BACKGROUND:

- Breast cancer is a critical global health challenge
- Early detection significantly improves patient survival rates

KEY CHALLENGES:

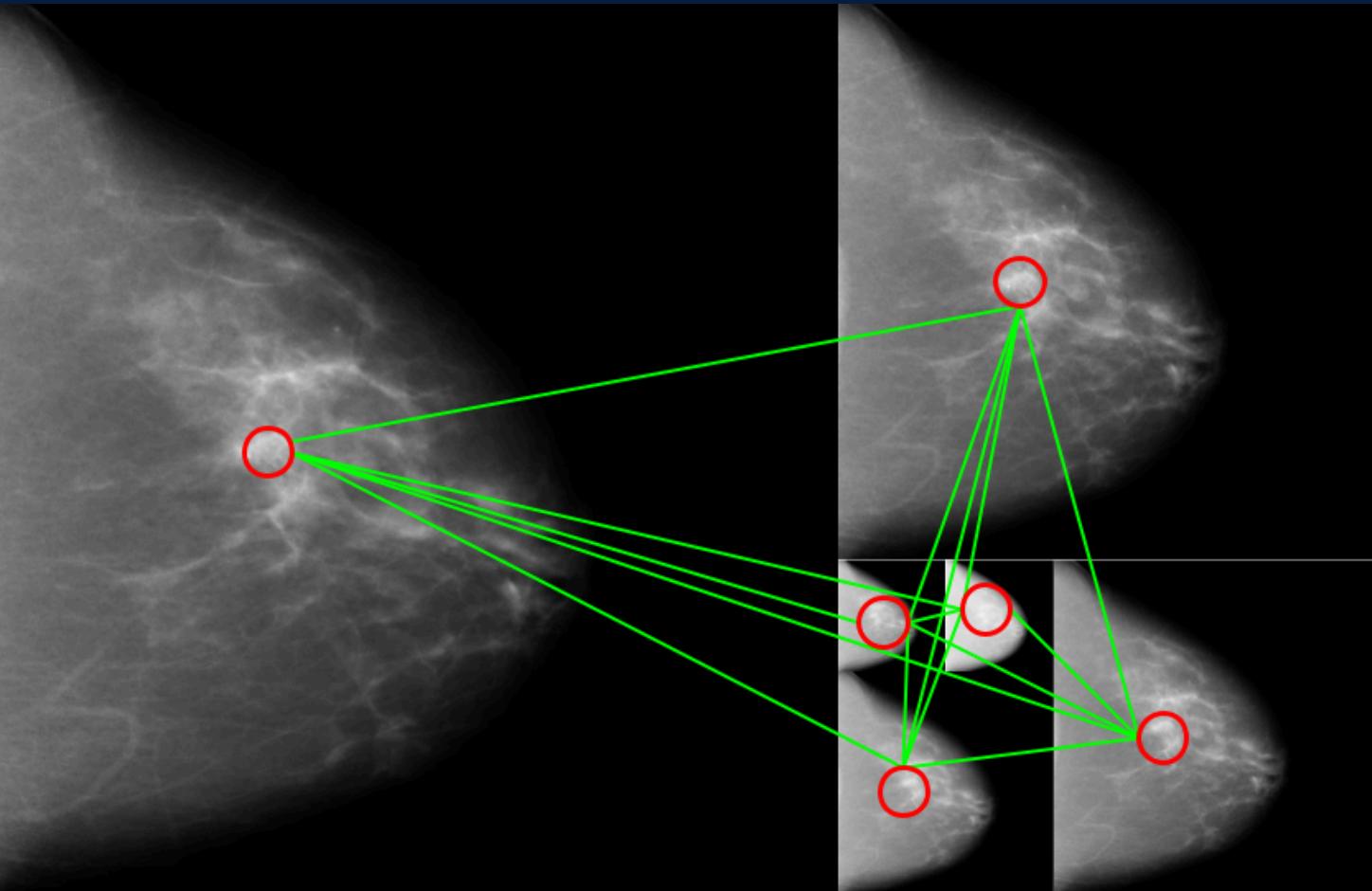
- Accurate differentiation between benign and malignant tumors
- High dependency on radiologist's interpretation
- Potential for human error in medical image analysis

RESEARCH OBJECTIVE:

- Develop machine learning models for automated MRI tumor classification
- Improve diagnostic accuracy and early detection rates
- Reduce variability in tumor identification

SIGNIFICANCE

- Potentially save lives through earlier and more precise detection
- Provide a supportive tool for medical professionals
- Leverage advanced machine learning techniques in medical diagnostics



DATA COLLECTION AND PREPROCESSING

Dataset :

- Content: MRI images labeled as either benign or malignant.
- Source of

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

Preprocessing Steps :

1. Grayscale Conversion: Convert images to grayscale format.
2. Resizing: Resize images to standard dimensions (e.g., 224x224).
3. Normalization: Normalize pixel values for compatibility with neural network inputs.
4. Augmentation: Apply data augmentation techniques (e.g., rotation, flipping).
5. Handling Class Imbalance: Use techniques like oversampling, undersampling, or applying class weights.

MODELS USED AND DEVELOPMENT

Models

- VGG16: A convolutional neural network with 16 layers, chosen for simplicity and effectiveness in image classification.
- ResNet18 & ResNet50: Deeper architectures using residual connections for improved performance.

Development Steps

1. Initialize pre-trained models.
2. Fine-tune models on the breast cancer dataset.
3. Train and validate models.

Evaluation Metrics

1. Accuracy: Measures percentage of correct predictions.
2. Precision: Evaluates the model's ability to avoid false positives.
3. Recall (Sensitivity): Assesses the model's ability to identify actual positive cases.
4. F1 Score: Harmonic mean of precision and recall.
5. AUC (Area Under Curve): Indicates how well the model distinguishes between benign and malignant tumors.
6. Confusion Matrix: Provides counts of true positives, true negatives, false positives, and false negatives.

PROJECT CONCEPT

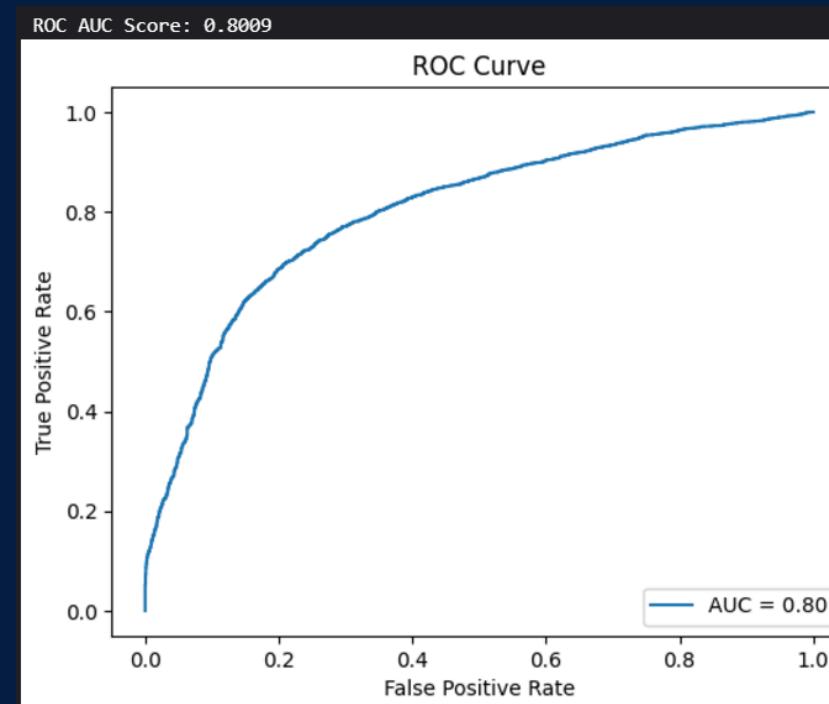
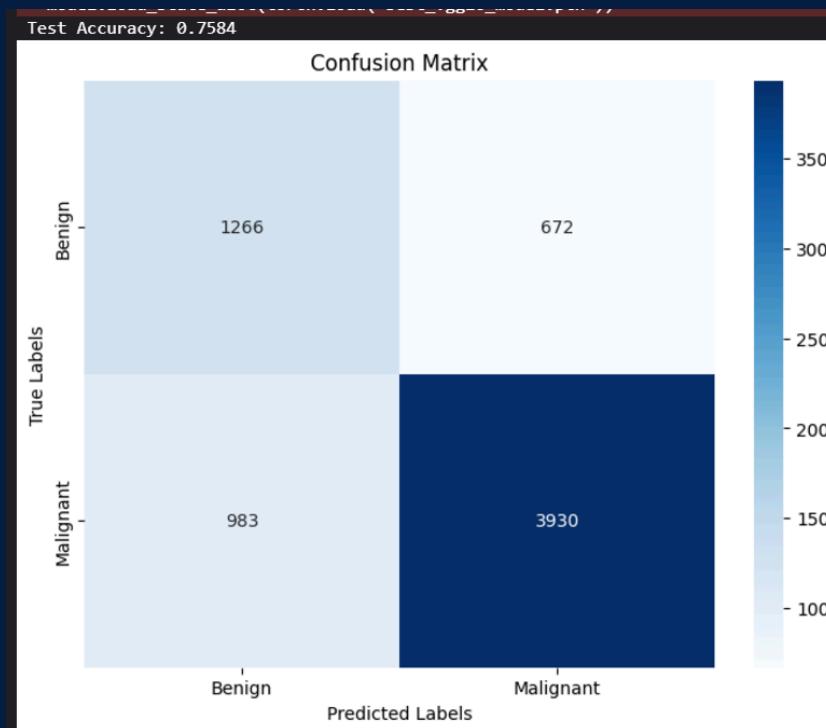
- Accuracy: Percentage of correct predictions.
- Precision: Ability of the model to avoid false positives.
- Recall: Ability of the model to identify actual positive cases (sensitivity).
- F1 Score: Harmonic mean of precision and recall.
- AUC (Area Under Curve): Measures how well the model distinguishes between benign and malignant tumors.
- Confusion Matrix: Table that helps you understand the performance of your classification. It shows the counts of true positives, true negatives, false positives, and false negatives.

RESULTS : VGG16

Classification Report of Test

Precision recall f1-score support

		Precision	recall	f1-score	support
BENIGN		0.7061	0.4933	0.5808	1938
MALIGNANT		0.8213	0.9189	0.8674	4910
ACCURACY				0.7985	6848
MACRO AVG		0.7637	0.7061	0.7241	6848
WEIGHTED AVG		0.7887	0.7985	0.7863	6848



Specificity : 1.0000, Sensitivity : 0.00000 , AUC : 0.8663

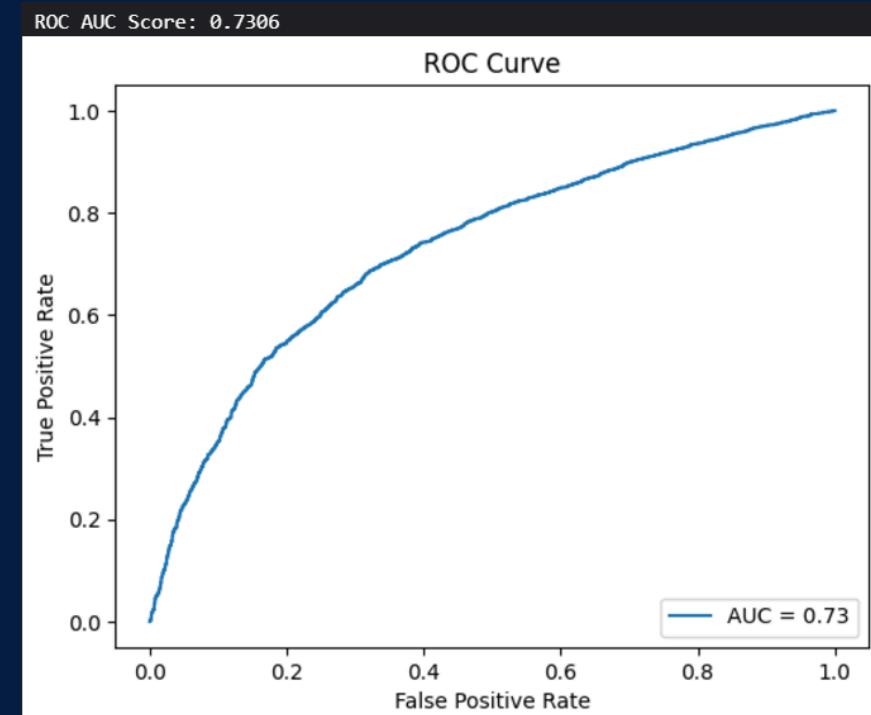
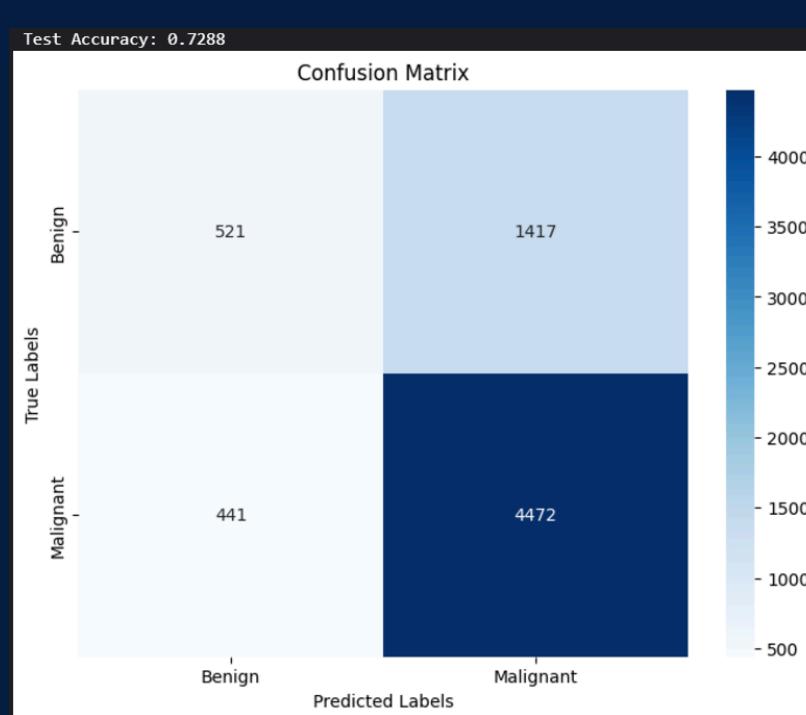
test set: Average loss : 0.9104 , Accuracy : 5496/6851 (80.09%)

RESULTS : VGG16

Classification Report of Test

Precision recall f1-score support

		Precision	recall	f1-score	support
BENIGN		0.7061	0.4933	0.5808	1938
MALIGNANT		0.8213	0.9189	0.8674	4910
ACCURACY				0.7985	6848
MACRO AVG		0.7637	0.7061	0.7241	6848
WEIGHTED AVG		0.7887	0.7985	0.7863	6848



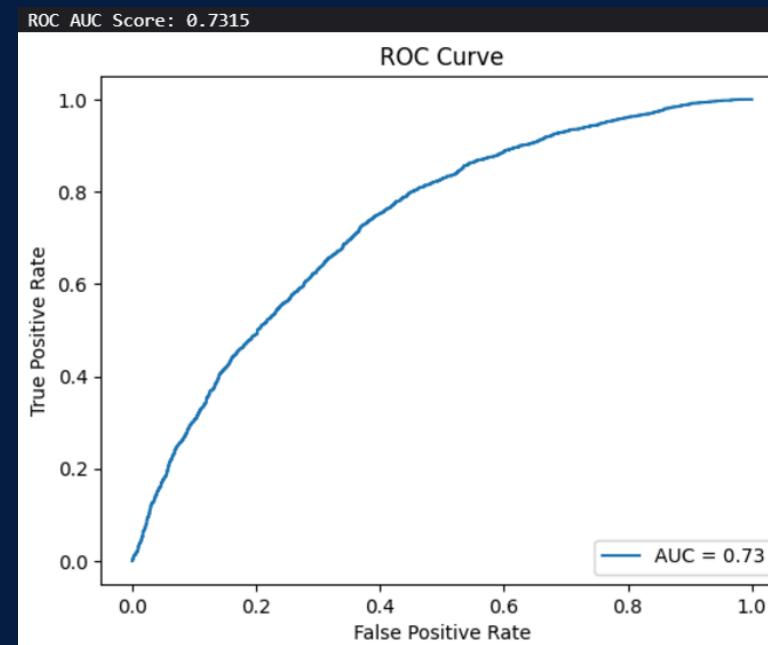
Specificity : 1.0000,Sensitivity : 0.00000 ,AUC : 0.7306

test set: Average loss : 0.9104 ,Accuracy :5516/6851(72.88%)

RESULTS :RESNET18

Classification Report of Test

Precision recall f1-score support



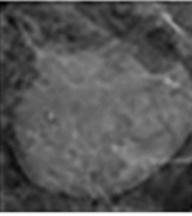
BENIGN	0.7061	0.4933	0.5808	1938
MALIGNANT	0.8213	0.9189	0.8674	4910
ACCURACY			0.7985	6848
MACRO AVG	0.7637	0.7061	0.7241	6848
WEIGHTED AVG	0.7887	0.7985	0.7863	6848

Specificity : 1.0000,Sensitivity : 0.00000 ,AUC : 0.7315

test set: Average loss : 0.9104 ,Accuracy :5496/6851 (74.69%)

FINAL RESULTS

Upload Image



Model: ResNet50
Predicted Class: benign
Benign Probability: 0.85
Malignant Probability: 0.15

Select Model

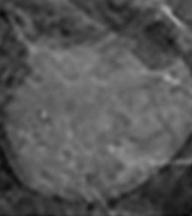
ResNet18 ResNet50

Clear Submit

Flag

Upload an image and select a model (ResNet18 or ResNet50) to classify it as benign or malignant.

Upload Image



Model: ResNet18
Predicted Class: benign
Benign Probability: 0.88
Malignant Probability: 0.12

Select Model

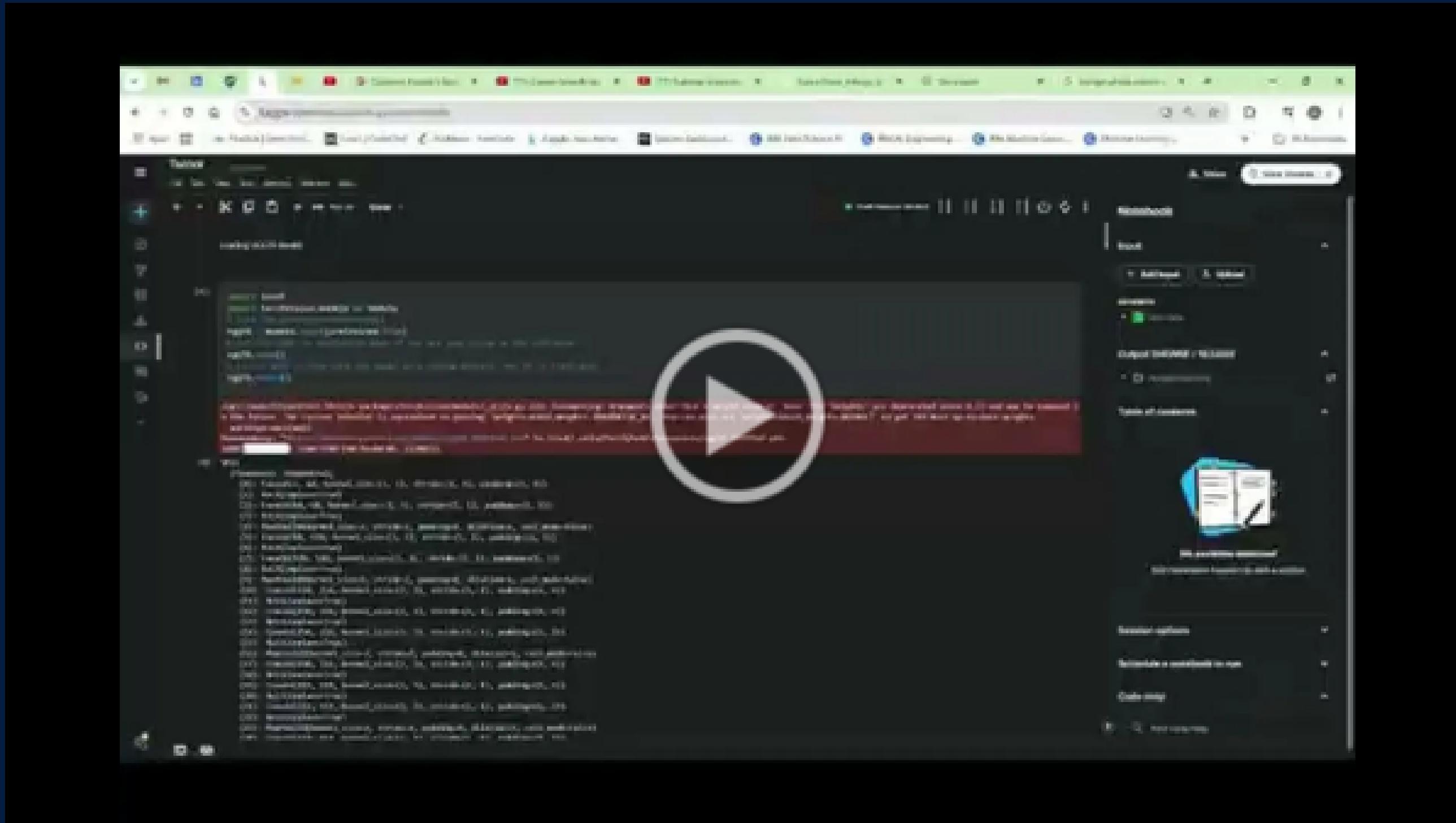
ResNet18 ResNet50

Clear Submit

Flag

Video Presentation

<https://drive.google.com/file/d/1yZcJJELpZbkHbC-p-ohCo297NL0SuU7b/view>



THANK YOU

