**WEEK 3: Skin Cancer and Pneumonia Detection**

# Objective

The objective of this project is to apply Deep Learning techniques to detect Skin Cancer and Pneumonia from medical images. Both models are designed to classify images into healthy or diseased, providing a simple tool for medical diagnosis.

# Dataset

* Skin Cancer: Subset of the ISIC dataset containing 700 images, categorized as benign or malignant.
* Pneumonia: Subset of Kaggle Chest X-Ray dataset with 700 images, categorized as normal or pneumonia.

All images were resized to 128×128 pixels and normalized to values between 0 and 1.

# Preprocessing

* Images were preprocessed using ImageDataGenerator with rescaling (1./255) and a training-validation split of 80/20.
* Validation data for Pneumonia detection was loaded with shuffle=False to correctly generate the ROC curve.

# Model Architecture

Skin Cancer Model:

* Base: ResNet50 pretrained on ImageNet (transfer learning).
* Frozen layers: All base layers frozen to prevent retraining.
* Classifier: GlobalAveragePooling2D → Dense(128, ReLU) → Dense(1, Sigmoid)
* Loss: Binary Crossentropy
* Optimizer: Adam (learning rate 1e-4)

Pneumonia Model:

* Architecture: Simple CNN  
   Conv2D(32) → MaxPooling2D → Conv2D(64) → MaxPooling2D → Flatten → Dense(128, ReLU) → Dense(1, Sigmoid)
* Loss: Binary Crossentropy
* Optimizer: Adam (learning rate 1e-4)

# Training

* Epochs: 5
* Batch size: 16
* Training and validation accuracy and loss were monitored for both models.

# Evaluation

Accuracy & Loss:

* Both models showed reasonable training and validation accuracy given the small dataset.
* Training history was visualized using plots for accuracy and loss.

ROC Curve (Pneumonia):

* ROC curve plotted for the Pneumonia model to measure classification performance.
* AUC: [insert AUC score here]
* The curve illustrates the trade-off between true positive rate and false positive rate.

# Prediction Function

* Users can input an image path for prediction.
* The function safely handles missing or corrupted images.
* Outputs Healthy or Disease with class name.

# Conclusion

* Both models achieved satisfactory accuracy for their respective tasks.
* ROC/AUC evaluation adds insight into Pneumonia detection reliability.
* Further improvements could include:  
   Training on the full datasets  
   Data augmentation  
   Hyperparameter tuning  
   Increasing image resolution for better feature extraction  
  Note: This summary is based on a subset of images; results may vary with larger datasets.