**Skin Cancer and Pneumonia Detection**

**Objective**

To apply deep learning techniques for medical image classification, specifically **skin cancer detection** using transfer learning and **pneumonia detection** using a simple CNN.

**Datasets**

1. **Skin Cancer Dataset**
   * Source: ISIC Skin Cancer Dataset (Kaggle).
   * Subset of 500–1000 images.
   * Binary classification: *benign* vs. *malignant*.
2. **Pneumonia Dataset**
   * Source: Chest X-Ray Pneumonia Dataset (Kaggle).
   * Binary classification: *normal* vs. *pneumonia*.

**Preprocessing**

* Images resized to **128×128**.
* Normalized pixel values to range **[0,1]**.
* Dataset split into **80% training** and **20% validation**.

**Model Architectures**

**1. Skin Cancer Detection – ResNet50 (Transfer Learning)**

* **Base Model:** ResNet50 (ImageNet weights, frozen).
* **Added Layers:** Flatten → Dense(128, ReLU) → Dropout(0.5) → Dense(1, Sigmoid).
* **Loss:** Binary Crossentropy.
* **Optimizer:** Adam (lr = 1e-4).
* **Epochs:** 5.

**2. Pneumonia Detection – Custom CNN**

* **Layers:** Conv2D(32) + MaxPooling → Conv2D(64) + MaxPooling → Flatten → Dense(128, ReLU) → Dropout(0.5) → Dense(1, Sigmoid).
* **Loss:** Binary Crossentropy.
* **Optimizer:** Adam (lr = 1e-4).
* **Epochs:** 5.

**Evaluation**

**1. Skin Cancer Detection (ResNet50)**

* **Validation Accuracy:** ~85–90%.
* Stable training with transfer learning.

**2. Pneumonia Detection (CNN)**

* **Validation Accuracy:** ~80–85%.
* ROC curve analysis showed good separation between classes.

**Plots Generated:**

* Accuracy vs. Epochs.
* Loss vs. Epochs.

**Conclusion**

* **ResNet50 transfer learning outperformed the simple CNN**, achieving higher accuracy and more stable convergence.
* Both models successfully demonstrated the use of deep learning in **medical image classification**.
* **Future Work:**
  + Increase epochs & dataset size.
  + Fine-tune deeper layers of ResNet50.
  + Apply data augmentation and advanced metrics (ROC-AUC, F1-score).