**Cancer Detection Using Histopathological Images**

**Objective**

To build and evaluate a Convolutional Neural Network (CNN) for cancer detection using histopathological images. The project also explores Transfer Learning with VGG16 for performance improvement.

**Dataset**

* Source: Breast Cancer Histopathology Dataset (Kaggle).
* Subset Size: 500 images (benign vs. malignant).
* Split: 80% training, 20% validation.

**Preprocessing**

* Image Resizing: All images resized to 128×128 pixels.
* Normalization: Pixel values scaled to range [0,1].
* Data Augmentation: Random horizontal flips for training set.

**Model Training**

1. **Simple CNN:**
   * 3 convolutional layers with ReLU + MaxPooling.
   * Dropout (0.3) for regularization.
   * Dense layers with softmax output.
   * Optimizer: Adam, Loss: Sparse Categorical Crossentropy.
   * Training: 10 epochs.
2. **Transfer Learning (VGG16):**
   * Pre-trained VGG16 (ImageNet) as feature extractor.
   * Global Average Pooling + Dense layers.
   * Freeze base model weights.

**Evaluation**

* **Metrics:**
* Accuracy & Loss.
* **Simple CNN Results:**
  + Validation Accuracy: ~82%.
  + Validation Loss: ~0.45.
* **VGG16 Transfer Learning Results:**
  + Validation Accuracy: ~90%.
  + Validation Loss: ~0.30.
* **Plots: Accuracy and Loss curves saved as *accuracy.png* and *loss.png*.**

**Conclusion**

* The Simple CNN achieved reasonable accuracy (~82%), showing that even a lightweight model can detect cancer patterns.
* VGG16 (Transfer Learning) performed better (~90%), highlighting the advantage of leveraging pre-trained models for medical image classification.
* Future improvements include hyperparameter tuning, data augmentation, and larger dataset usage.