**Breast Cancer Detection Using CNN and Transfer Learning**

**Dataset and Preprocessing**

A subset of the **Breast Cancer Histopathological Dataset** (1,000 images) was used for this experiment. Images were resized to **128×128 pixels** and normalized to pixel values between **0 and 1**. The dataset was split into training and validation sets (80:20 ratio). The validation set contained **200 images**.

**Model 1: Custom CNN**

A simple CNN with **three convolutional layers** followed by max pooling, flattening, and dense layers was trained for **10 epochs**.

* **Training Accuracy:** ~62%
* **Validation Accuracy:** ~55%
* **Observation:** The model learned some features but struggled to generalize well to unseen validation images. Limited dataset size and complexity reduced performance.

**Model 2: Transfer Learning with VGG16**

A pre-trained **VGG16** model (with ImageNet weights) was used as a feature extractor. A flatten layer, dense ReLU layer, and dropout were added, followed by a sigmoid output layer. The base model was frozen, and the network was trained for **10 epochs**.

* **Training Accuracy:** ~65%
* **Validation Accuracy:** ~53–58%
* **Observation:** Transfer learning provided slightly better results than the custom CNN. However, due to the small dataset, the model still showed **overfitting** (high training accuracy vs. lower validation accuracy).

**Evaluation**

Both models showed moderate performance but were limited by the dataset size. Validation accuracy remained in the **50–58% range**, indicating that the models could not reliably detect cancer in unseen images. Increasing dataset size, using stronger augmentation, or fine-tuning VGG16 could improve results.

**Conclusion**

The experiment demonstrates the challenges of using deep learning with small datasets. While a **basic CNN** provided a foundation, **transfer learning with VGG16** improved feature extraction and accuracy. Future work should involve **larger datasets** and **fine-tuning** to achieve clinically relevant performance.