# Report: Cancer Detection Using CNN and Transfer Learning (VGG16)

## Objective

The main objective of this project is to build a system that can automatically detect cancerous cells from histopathological images using deep learning models. This helps in early diagnosis and reduces human error in medical analysis.

## Dataset

* Dataset: cancer\_subset\_500 (500 histopathology images).
* Categories: Benign (No Cancer) and Malignant (Cancer).
* Train–Validation Split: 80% training, 20% validation.
* Preprocessing:  
   • Images resized to 128×128 pixels.  
   • Pixel values normalized to 0–1 range.

## Models Implemented

* Model 1: Custom CNN  
  Layers:  
   • Convolution + MaxPooling (3 times)  
   • Flatten → Dense (128 neurons) → Dropout → Output (Sigmoid)  
   Optimizer: Adam (learning rate = 0.001)  
   Loss Function: Binary Crossentropy  
   Epochs: 5 (for quick testing)
* Model 2: Transfer Learning (VGG16)  
   Pretrained VGG16 model with local weights.  
   Base layers frozen (not trainable).  
   Added custom layers:  
   • Global Average Pooling → Dense(128) → Dropout → Sigmoid output.  
   Optimizer: Adam (learning rate = 0.0001).

## Results & Analysis

* CNN Model: Learned basic patterns, but accuracy is limited due to small dataset size.
* VGG16 Transfer Learning: Achieved better performance by leveraging pre-trained

knowledge.  
 Accuracy & Loss Graphs:  
 • CNN: Moderate training and validation accuracy.  
 • VGG16: Higher validation accuracy, less overfitting.

## Single Image Prediction

A helper function was added to predict whether a given image is Cancer Detected or No Cancer Detected.  
Example:  
8864\_idx5\_x701\_y2051\_class0.png --> No Cancer Detected

## Conclusion

* Custom CNN works well for small-scale tasks, but transfer learning (VGG16) gives better accuracy and generalization.
* The project shows how deep learning can assist doctors in detecting cancer from histopathology images.

Future improvements:  
 • Train with larger datasets.  
 • Use data augmentation and fine-tuning of VGG16 layers.  
 • Try advanced architectures like ResNet or EfficientNet.