Combined Analysis of CNN Notebooks

# 1. Pneumonia Detection using CNN

## Problem Definition

Pneumonia is an inflammatory condition of the lungs that can be detected using chest X-ray images. Early and accurate detection is critical for patient care.

## Dataset

- Source: Guangzhou Women and Children’s Medical Center.  
- Size: 5,863 chest X-ray images (JPEG).  
- Categories: Pneumonia and Normal.  
- Split: Training, validation, and testing folders.

## Methodology

1. Data Preprocessing:  
 - Image resizing.  
 - Normalization.  
 - Train/validation/test split.  
  
2. Model:  
 - CNN architecture with convolutional, pooling, and dense layers.  
 - Dropout used to reduce overfitting.  
  
3. Training:  
 - Optimizer: Adam.  
 - Loss: Binary crossentropy.  
 - Metrics: Accuracy.

## Results

- Achieved 92.6% accuracy.  
- Model generalizes well on unseen test data.

# 2. Skin Cancer Detection using CNN

## Problem Definition

Skin cancer is one of the most common cancers worldwide. Early detection via automated systems can save lives by supporting dermatologists in diagnosis.

## Dataset

- Images of different skin lesions (likely melanoma and non-melanoma).  
- Images were categorized into malignant and benign cases.  
- Dataset split into training, validation, and testing.

## Methodology

1. Data Preprocessing:  
 - Image resizing and scaling.  
 - Augmentation for handling imbalance.  
  
2. Model:  
 - CNN architecture with convolution, max pooling, and dense layers.  
 - Activation: ReLU and softmax (for classification).  
  
3. Training:  
 - Optimizer: Adam/SGD.  
 - Loss: Categorical crossentropy.  
 - Metrics: Accuracy.

## Results

- CNN achieved strong performance on validation data.  
- Helps in classification of skin cancer images effectively.

# 3. Comparative Insights

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| Aspect | Pneumonia Detection | Skin Cancer Detection |
| Domain | Medical Imaging (Chest X-rays) | Medical Imaging (Dermatology) |
| Data Type | X-ray scans | Skin lesion photos |
| Classes | Binary (Pneumonia/Normal) | Binary/Multiclass (Malignant/Benign types) |
| Accuracy | ~92.6% | High (value not explicitly stated) |
| Model | Custom CNN | RestNet50 |
| Preprocessing | Normalization, split | Normalization, augmentation |

## Key Learnings

- CNNs are effective in both radiology and dermatology tasks.  
- Preprocessing (augmentation, normalization) plays a crucial role in performance.  
- Validation with expert input (as in the pneumonia dataset) improves trust in results.