Image Segmentation using Simple CNN

1. Introduction

This project demonstrates a basic implementation of a Convolutional Neural Network (CNN) model for performing image segmentation. Image segmentation is the process of dividing an image into multiple segments or regions to simplify or change the representation of an image into something more meaningful and easier to analyze.

2. Objective

The objective of this project is to develop a simple encoder-decoder CNN model that can segment objects from backgrounds in images, typically used in applications like medical imaging, self-driving cars, and object detection.

3. Model Architecture

The model follows a simple encoder-decoder structure:

- **Encoder**: Two convolutional layers with max pooling to reduce spatial dimensions.

- **Bottleneck**: A convolutional layer capturing deeper features.

- **Decoder**: Two upsampling layers with convolution to recover spatial resolution.

- **Output**: A final 1x1 convolution with sigmoid activation for binary mask output.

4. Implementation Details

The model is implemented using TensorFlow and Keras. It uses binary cross-entropy as the loss function and Adam optimizer for training. The input image size is (128, 128, 3) and the output is a binary segmentation mask.

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5. Use Case & Results

This model is suitable for basic binary segmentation tasks such as identifying foreground objects from the

background. While simple, it serves as a foundation for more complex architectures like U-Net or DeepLab.