Documentation for Transposed Convolution and IoU Implementation

1. Transposed Convolution

Overview

Transposed Convolution (also known as Deconvolution) is an operation used in deep learning, particularly in Generative Adversarial Networks (GANs) and semantic segmentation. It upscales a given matrix (feature map) using a kernel and a stride parameter.

Function Definition

```
def transposed_convolution(matrix, kernel, stride=1, crop=0):
    """
    Performs transposed convolution (upsampling) on a 2D matrix.

    Parameters:
        matrix (numpy.ndarray): The input 2D matrix.
        kernel (numpy.ndarray): The convolution kernel.
        stride (int): The stride parameter for spacing the kernel
application.
        crop (int): The number of pixels to crop from the final
output.

    Returns:
        numpy.ndarray: The upsampled output matrix.
    """
```

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2. Intersection over Union (IoU)

Overview

The Intersection over Union (IoU) metric is used to evaluate the overlap between two binary masks. It is widely used in object detection and segmentation tasks.

Function Definition

```
def iou(matrix1, matrix2):
    """
    Computes the Intersection over Union (IoU) metric.

    Parameters:
        matrix1 (numpy.ndarray): First binary matrix.
```

```
        matrix2 (numpy.ndarray): Second binary matrix.

    Returns:
        float: IoU score, a value between 0 and 1.
    """
```

Colab link — HOMEWORK 4.ipynb