**A07 Assignment – Manual CNN**

**Activity**

* The primary goal of this assignment was to provide a hands-on exploration and conceptual understanding of the feature detection process in Convolutional Neural Networks (CNNs) by manually demonstrating the convolution operation.
* I utilized an 8x8 image matrix representing a square to manually demonstrate how CNNs perform feature detection.
* I applied vertical and horizontal edge detection filters (kernels) to the sample image.
* I calculated the output image for each cell in the matrix using the vertical and horizontal edge detection filters.
* I generated output images.

**Result**

**Vertical Edge Detection:**

* The grid showed the strength of vertical edges detected in the original image.
* Positive values indicated edges where the intensity increased from left to right.
* Negative values indicated edges where the intensity decreased from left to right.
* Values near 0 indicated areas with little to no vertical edge.

**Horizontal Edge Detection:**

* The grid showed the strength of horizontal edges detected in the original image.
* Positive values indicated edges where the intensity increased from top to bottom.
* Negative values indicated edges where the intensity decreased from top to bottom.
* Values near 0 indicated areas with little to no horizontal edge.

**Reflection:**

**Solution:**

* I gained a deeper understanding of how convolution operations work in CNNs to detect features like edges within an image.
* I gained insights into the underlying mechanics of CNNs, which is often abstracted away by high-level libraries.
* I observed firsthand how different filters can be used to detect various features such as vertical and horizontal edges.

**Challenges:**

* Manually calculating the convolution outputs for each cell was time-consuming and prone to errors, highlighting the efficiency of automated CNNs.

**Key Takeaways**: I learned how some simple calculations by hand can be used for edge detection. Edge detection is an important part of object detection and can improve its accuracy.

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