Implementing a SwinIR Block

Testing SwinIRBlock on CIFAR-10

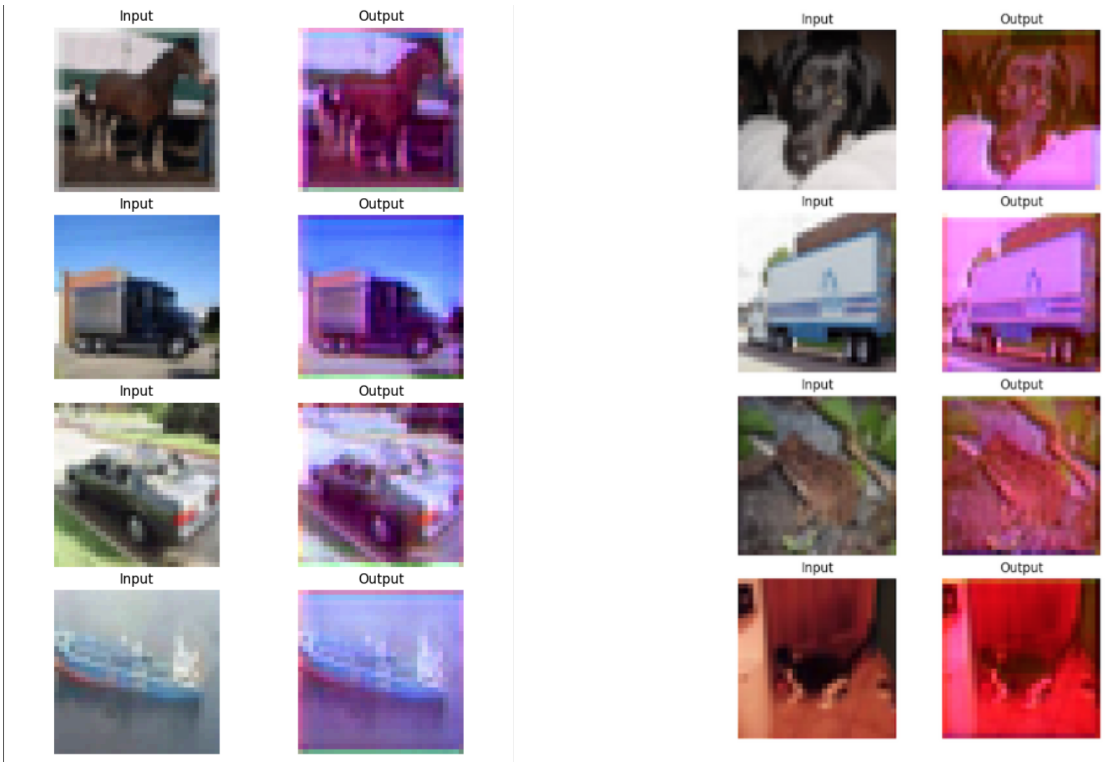
Objective

The purpose of this task was to validate the functionality of a single SwinIRBlock by applying it to images from the CIFAR-10 dataset. The focus was to ensure that the block performs a forward pass correctly, preserves tensor dimensions, and produces meaningful feature transformations.

Custom settings:

- Batch size: 8
- Window size: 4
- Single SwinIRBlock tested

Results



The output images retained their overall structure while showing subtle feature changes, indicating that local self-attention and shifted windows were applied.

```
Input tensor shape: torch.Size([8, 3, 32, 32])
Output tensor shape: torch.Size([8, 3, 32, 32])
```

The Input and Output Tensor shapes are the same

Conclusion

The test results, as shown in the figures above, demonstrate that the SwinIRBlock successfully processes CIFAR-10 images through a **forward pass**. The **input images (left column)** retain their recognizable structure, while the **outputs (right column)** display noticeable **color shifts and feature emphasis**. This occurs because the block applies window-based self-attention and residual connections, which alter pixel activations but preserve spatial layout.

Since no training was performed, the **weights remain unoptimized**, so the transformations appear as random distortions rather than task-specific improvements. If the model were trained, the SwinIRBlock would learn to emphasize **edges, textures, and object patterns**, producing representations that directly benefit classification or reconstruction tasks.

In summary, this experiment validates that the **forward pass functions correctly** and provides the groundwork for training a fully SwinIR-based model on CIFAR-10.