**1. Transformation Techniques**

The code applies several image transformation techniques during training and validation. These transformations enhance the robustness of the model by introducing variability in the input data:

**Training Transformations:**

* **Horizontal Flip**: Randomly flips the image horizontally with a probability of 50%.
* **Vertical Flip**: Randomly flips the image vertically with a probability of 50%.
* **Random Gamma Adjustment**: Randomly adjusts the image gamma with a range of (70, 130) to simulate different lighting conditions.
* **RGB Shift**: Randomly shifts the red, green, and blue channels with specified limits to simulate color variations.
* **Normalization**: Normalizes the pixel values using the mean (0.485, 0.456, 0.406) and standard deviation (0.229, 0.224, 0.225), which is typical for pre-trained ImageNet models.
* **ToTensorV2**: Converts the transformed image into a PyTorch tensor.

**Validation Transformations:**

* **Normalization**: Similar normalization as used in the training transformations.
* **ToTensorV2**: Converts the image into a PyTorch tensor.

**2. Model Architecture**

The chosen model architecture is **UNet++** (UnetPlusPlus), implemented using the segmentation\_models\_pytorch library. This is a state-of-the-art model for semantic segmentation tasks, known for its superior performance on medical and natural images.

**Key Features of the Model:**

* **Backbone**: The model uses a **ResNet-34** encoder, pre-trained on ImageNet. This encoder extracts high-level features from the input image.
* **Decoder**: The decoder reconstructs the segmentation mask with rich contextual information and detailed spatial resolution.
* **Input Channels**: The model accepts 3-channel (RGB) images as input.
* **Output Classes**: The model predicts segmentation masks for 3 classes, corresponding to:
  + Background (0)
  + Red regions (1)
  + Green regions (2).

UNet++ enhances the original UNet design with nested and dense skip connections, allowing better feature fusion and improved segmentation accuracy.

Link to my Github repository:

<https://github.com/phoenix301123/Deep-Learning-BKAI>

Wandb charts:

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