Gradio Interface: Apply Pink Filter to Subject or Full Image

This document explains how a Gradio interface applies a pink filter either to the subject (detected using the BiRefNet model) or to the entire image based on the user's choice.

# Key Components

## 1. Libraries Imported:

- \*\*gradio\*\*: A library to create web interfaces easily.  
- \*\*cv2\*\* and \*\*PIL\*\*: Used for image manipulation.  
- \*\*NumPy\*\*: For numerical operations on images.  
- \*\*transformers\*\*: To load and use the BiRefNet model for segmentation.  
- \*\*torch\*\*: PyTorch is used to manage models and tensors.  
- \*\*spaces\*\*: To handle the GPU allocation using the `ZeroGPU` feature.

## 2. GPU Allocation with `spaces.GPU`

This decorator ensures that the GPU is only allocated for a certain period (in this case, 70 seconds) while loading the BiRefNet model. This avoids keeping the GPU unnecessarily occupied and improves efficiency.

## 3. BiRefNet Model Loading

The `BiRefNet` model is loaded using the \*\*AutoModelForImageSegmentation\*\* from Hugging Face. The model is loaded onto a \*\*GPU\*\* if available (determined by `device = "cuda"`), or else it falls back to CPU.

## 4. Image Transformation Pipeline

This pipeline prepares the input image to be compatible with the BiRefNet model by resizing, converting it into a tensor, and normalizing its values to match the expected input format of the model.

## 5. Creating a Mask for the Subject

This function extracts the \*\*subject\*\* in the image using the BiRefNet model. The image is transformed and passed into the model, which outputs a \*\*mask\*\* identifying the subject. This mask is then resized to match the original image size. \*\*Sigmoid\*\* is used to normalize the predictions to a probability range between 0 and 1, indicating the likelihood of the pixel being part of the subject.

## 6. Applying the Pink Filter

This function applies a \*\*pink filter\*\* to the image:  
- If `apply\_to\_subject` is \*\*True\*\*, the filter is only applied to the subject (determined by the mask).  
- If \*\*False\*\*, or if the mask is not available, the filter is applied to the entire image.  
The pink color is blended with the image pixels at a 50-50 ratio, creating a filter effect with some transparency.

## 7. Processing the Image Based on User Selection

This function processes the image based on the user’s choice:  
- If the user selects \*\*"Subject Only"\*\*, the BiRefNet model is used to generate a mask.  
- If the user selects \*\*"Full Image"\*\*, no mask is generated, and the pink filter is applied to the entire image.

## 8. Gradio Interface

Gradio Blocks create the interface, allowing users to upload an image and select whether to apply the filter to the \*\*subject\*\* or the \*\*full image\*\*. The \*\*Run\*\* button triggers the processing function, which processes the input image based on the selected options and displays the result.

## User Workflow:

1. \*\*Upload Image\*\*: The user uploads an image.  
2. \*\*Choose Filter Application\*\*: The user selects whether to apply the filter to the \*\*subject only\*\* or the \*\*full image\*\*.  
3. \*\*Click Run\*\*: The system processes the image based on the selection and displays the output.