**Report on Environment Setup and Model Execution**

### **1. Instructions for Setting Up the Environment**

To run the notebook successfully, follow these steps:

#### **Installation of Required Libraries**

The following libraries are necessary for execution:

pip install diffusers transformers torch torchvision pillow

These libraries are used for model execution, image processing, and transformations.

#### **Importing Required Libraries**

The key libraries included in the notebook are:

from diffusers import StableDiffusionPipeline

import torch

from PIL import Image

import torchvision.transforms as transforms

These libraries facilitate deep learning model execution, image processing, and tensor operations.

### **2. Approach for Each Part of the Task**

#### **Image Generation Using Stable Diffusion**

1. Load the StableDiffusionPipeline model from diffusers.
2. Use the "runwayml/stable-diffusion-v1-5" pretrained model.
3. Set the pipeline to utilize a GPU (pipe.to("cuda")).
4. Define the text prompt: **"a serene sunset over a futuristic city"**.
5. Generate three images using the pipeline and save them as PNG files.

#### **Image Preprocessing**

1. Define a preprocessing pipeline using torchvision.transforms:
   * Resize the image to **224x224** pixels.
   * Convert the image to a tensor.
   * Normalize the image using ImageNet mean and standard deviation.
2. Apply the preprocessing steps to the generated images.
3. Save the preprocessed images as .pt files.

### **3. Challenges Encountered and Assumptions Made**

#### **Challenges**

1. **GPU Requirement:** The model is set to run on a GPU (pipe.to("cuda")). If a GPU is unavailable, execution may fail or require modifications.
2. **Model Weights Download:** The notebook assumes internet access to fetch pretrained model weights, which may cause issues in offline environments.
3. **File Handling:** The preprocessing step assumes that the image generation step successfully created PNG files before processing.

#### **Assumptions**

1. The system has a GPU available for efficient execution.
2. The user has internet access to download the necessary model weights.
3. The generated images are correctly saved and exist before the preprocessing step.

### **Conclusion**

This report provides an overview of the environment setup, methodology, and challenges. The notebook successfully generates images using Stable Diffusion and preprocesses them for further analysis. Ensuring GPU availability and managing dependencies are crucial for smooth execution.

GITHUB LINK: [https://github.com/sibixjoy/Synthetic-Image-Generation-Preprocessing-and-Flux-Model-Forward-Pass.git\](https://github.com/sibixjoy/Synthetic-Image-Generation-Preprocessing-and-Flux-Model-Forward-Pass.git%5C)