This is a guide for training and utilizing the [ControlNet](https://huggingface.co/docs/diffusers/en/using-diffusers/controlnet) pipeline provided in the HuggingFace Diffusers pipeline.

This guide serves to give an explainer on how to adapt this [guide](https://github.com/huggingface/diffusers/blob/main/examples/controlnet/README.md) to be able to train and run the ControlNet model on the SpaceNet dataset. Anyone wishing to implement the ControlNet model should first go through it and try to adapt it according to the nature of their data.

Follow the guide as it is to set up the diffusers library and prepare your environment with the necessary requirements.

**Replace Files**

In the accompanying repository to this guide, you will find two files by the name of *Spacenet.py* and *train\_controlnet.py*. Download both of these and navigate to *diffusers/examples/controlnet.* Now paste both files here, replacing any files of the same name.

The *Spacenet.py* file creates a HuggingFace Dataset template which has three things: images, conditions, and prompts. Since there are no prompts available for the Spacenet Dataset, they are treated as empty strings. This does not take away from the Stable Diffusion model’s own textual reasoning capabilities and you will be able to provide prompts when generating your own images.

**Dataset**

To prepare for training, create a *data* folder in the *controlnet* directory. This folder should have two subfolders, *conditions* and *images.* You should now add all your input images to the *images* folder and all the conditioning images (segmentation masks) to the *conditions* folder. It is vital that every unique image in the *images* folder and its corresponding mask in the *conditions* folder should have identical filenames. You are now ready to train your model.

**Training**

To train your model, follow the same instructions as given in the guide with minor changes. If you experience “CUDA out of memory” problems, use the instructions given for 12GB GPUs provided on the link. This may require your to install the *xformers* library if you haven’t already. The biggest change that you will have to make is to replace

--dataset\_name=fusing/fill50k

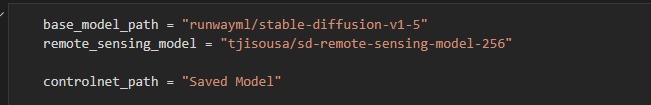
with

--dataset\_name=Spacenet.py

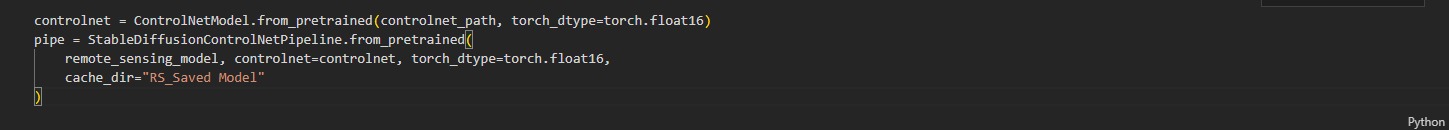
Make sure that you have replaced the *train\_controlnet.py* file.

**Using the Model**

The *test.ipynb* file demonstrates how you may use the trained model to generate your own images. Be sure to change the file directories according to your system configuration and provide prompts as required. There is one thing to note here. There are two versions of *Stable Diffusion* that can be used as a backbone:



*base\_model\_path* refers to a vanilla version of Stable Diffusion 1.5 whereas *remote\_sensing\_model* refers to a version of it that has been finetuned for remote sensing applications. You may choose either one of these for your experiments. To choose the vanilla version, simply replace *remote\_sensing\_model* with *base\_model\_path* in the next code cell:



Running this model requires around 5-10 GB to download all necessary weights for the pipeline.