Sat2Density: Step-by-Step Instructions for Google Colab

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Overview

This guide provides step-by-step instructions on how to implement and run the **Sat2Density** code from the GitHub repository on Google Colab. **Sat2Density** is a novel method for generating ground-view panoramas from satellite images using density field representations. We will cover how to set up the environment, download the required checkpoints, run demos, and test the model.

1 Requirements

You will need access to Google Colab to execute this guide. Below are the key tools used in the project:

- Python 3.8 or higher

- CUDA-compatible GPU (provided in Colab)

- PyTorch 1.7 or higher

- Required libraries (automatically installed in the setup)

2 Step-by-Step Instructions

2.1 1. Setup Google Colab Environment

1. Open Google Colab: `https://colab.research.google.com`

2. Create a new notebook.

3. Make sure to enable GPU: Go to `Runtime` → `Change runtime type`, and select `GPU` as the hardware accelerator.

2.2 2. Clone the Repository

Execute the following command to clone the Sat2Density repository:

```
!git clone https://github.com/qianmingduowan/Sat2Density.git
```

2.3 3. Install Required Dependencies

Navigate to the Sat2Density directory and install the required dependencies:

```
% Change to the Sat2Density directory
% Install required Python libraries
!cd Sat2Density && pip install -r requirements.txt
```

2.4   4. Download Pre-trained Checkpoints

Run the following command to download the checkpoints for the CVACT and CVUSA datasets:

```
# Run the script to download the pretrained weights
!bash Sat2Density/scripts/download_weights.sh
```

2.5   5. Run Demo: Video Synthesis

Run the video synthesis demo using the following command:

```
!python Sat2Density/test.py --yaml=sat2density_cvact \
  --test_ckpt_path=2u87bj8w \
  --task=test_vid \
  --demo_img=Sat2Density/demo_img/case1/satview-input.png  \
  --sty_img=Sat2Density/demo_img/case1/groundview.image.png  \
  --save_dir=Sat2Density/results/case1
```

The output will be saved in the `results/case1` directory.

2.6   6. Run Demo: Illumination Interpolation

To test illumination interpolation between different ground views, use the following command:

```
!python Sat2Density/test.py --task=test_interpolation \
  --yaml=sat2density_cvact \
  --test_ckpt_path=2u87bj8w \
  --sty_img1=Sat2Density/demo_img/case9/groundview.image.png \
  --sty_img2=Sat2Density/demo_img/case7/groundview.image.png \
  --demo_img=Sat2Density/demo_img/case3/satview-input.png \
  --save_dir=Sat2Density/results/case2
```

2.7   7. Run Model Training

To train the model on a Google Colab GPU, use the following command:

```
# For CVACT dataset
!CUDA_VISIBLE_DEVICES=0 python Sat2Density/train.py --yaml=sat2density_cvact

# For CVUSA dataset
!CUDA_VISIBLE_DEVICES=0 python Sat2Density/train.py --yaml=sat2density_cvusa
```

2.8   8. Inference: Test Center Ground-View Synthesis

To test the model for center ground-view synthesis, use the following command:

```
# CVACT dataset
!python Sat2Density/offline_train_test.py --yaml=sat2density_cvact --test_ckpt_path=2u87bj8w

# CVUSA dataset
!python Sat2Density/offline_train_test.py --yaml=sat2density_cvusa --test_ckpt_path=2cqv8uh4
```

2.9   9. Inference: Ground Video Synthesis

To synthesize ground videos from satellite images:

```
!bash Sat2Density/inference/synthesis_video.sh
```

2.10 10. Inference: Different Illumination Settings

To test different illumination styles, run:

```
# CVACT dataset
!bash Sat2Density/inference/single_style_test_cvact.sh

# CVUSA dataset
!bash Sat2Density/inference/single_style_test_cvusa.sh
```