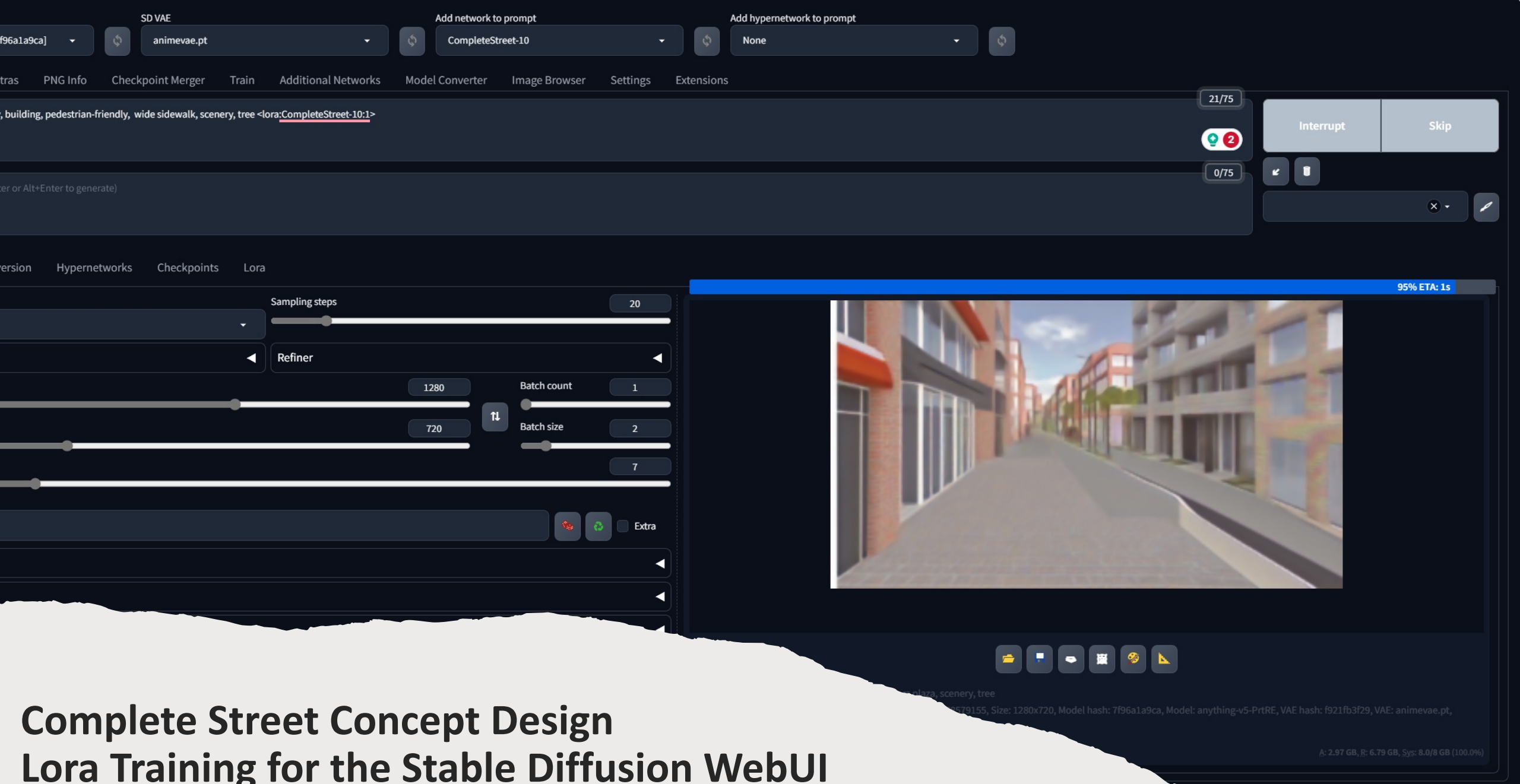
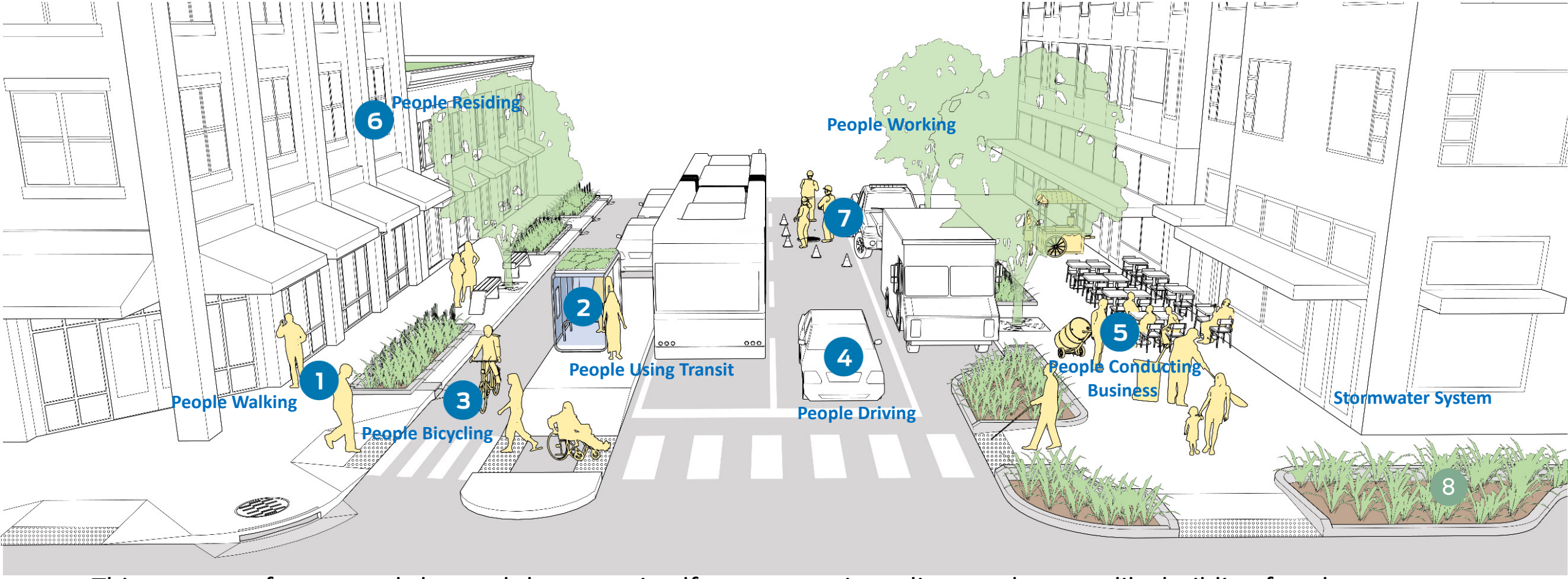


Complete Street Concept Design
Lora Training for the Stable Diffusion WebUI

Cenqi Zhu, Final Project of 2023Fall-Topical Seminar AI in the Built Environment

Introduction: Complete Streets

Complete Streets are streets for everyone.



This concept often extends beyond the street itself, encompassing adjacent elements like building facades, street plazas, and sidewalk landscaping.

Gaps

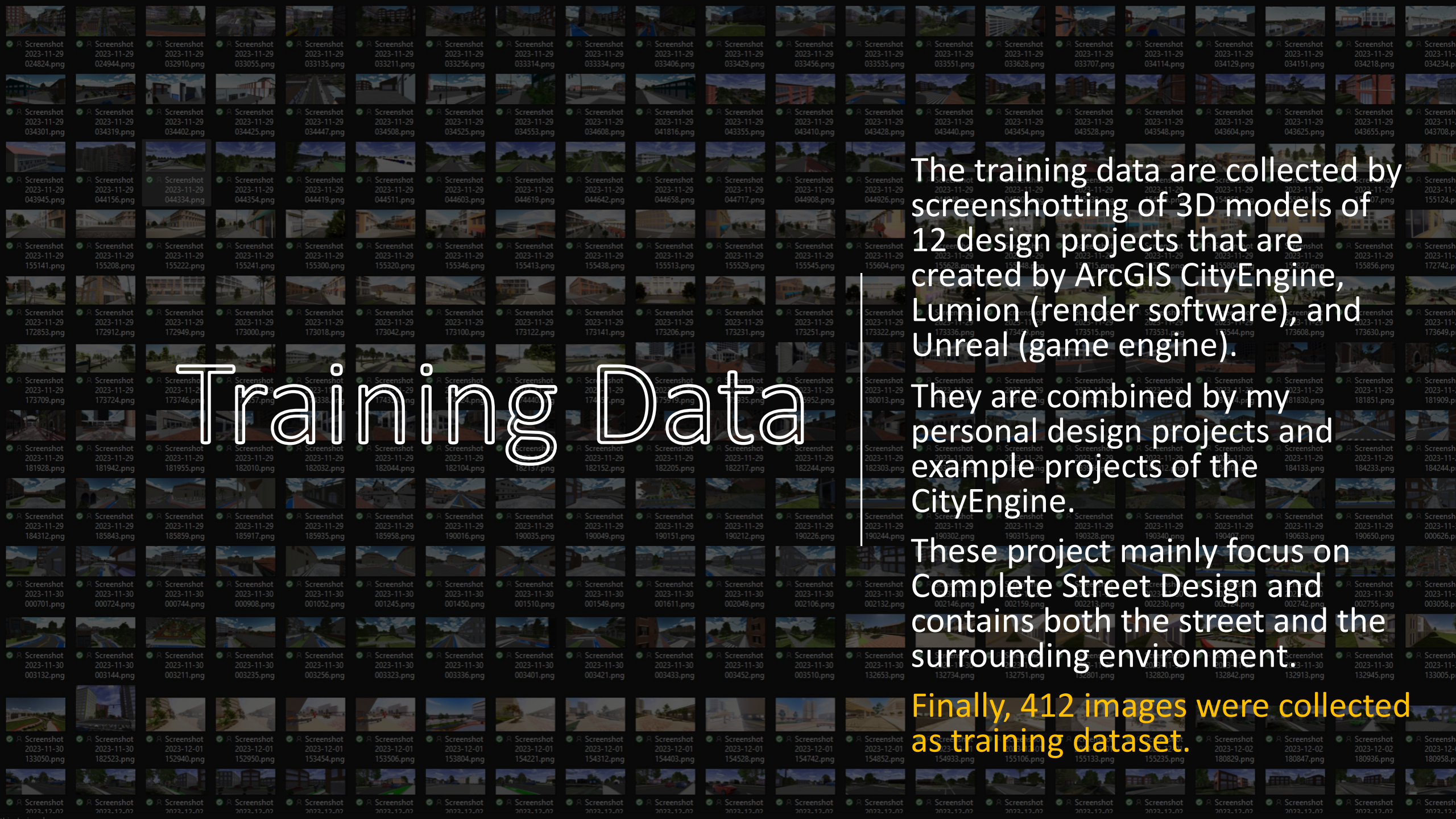
- Developing concept designs for Complete Streets efficiently poses a significant challenge, typically requiring extensive effort to create detailed 3D models that fully represent the surround environment.
- The traditional modeling process, based on mature design plans, can be costly and time-consuming, especially if revisions are needed during the concept stage.
- The advent of Generative AI tools offers a novel solution for rapidly producing images to convey design ideas. However, these tools' pre-trained models often yield photo-realistic results that may too much detail for concept visualization, resembling real-world images rather than design concepts.

Stable Diffusion WebUI

To achieve a specific image style suitable for conceptual design, custom training of personal models is recommended. Stable Diffusion provides an open port for applying personally trained models, setting it apart from other generative tools.

Aim: train a LoRA model for Stable Diffusion WebUI, specifically for generate images in a style representative of Complete Street designs.

	Checkpoint Models	Variational Autoencoder (VAE) Model	Low Rank Adaptation (LoRA), advanced version: LoCon and LoHa
Usage	Pre-trained Stable Diffusion weights intended for generating general or a particular genre of images	Amplify the quality of the generated images	A training technique that is used for fine-tuning Stable Diffusion models. They serve as a bridge between large model files and textual inversions, providing a balanced blend of manageable file sizes and substantial training power.
Suffix	Checkpoint; safetensors	Vae	Checkpoint; safetensors
Used Models	(1) anything-v5.PrtRE (2) Counterfeit-V3.0_fp16	(1) animevae.pt (2) Counterfeit-V2.5 (3) vae-ft-mse-840000-ema-pruned	Personal trained Lora: CompleteStreet-10.safetensors



Training Data

The training data are collected by screenshotting of 3D models of 12 design projects that are created by ArcGIS CityEngine, Lumion (render software), and Unreal (game engine).

They are combined by my personal design projects and example projects of the CityEngine.

These project mainly focus on Complete Street Design and contains both the street and the surrounding environment.

Finally, 412 images were collected as training dataset.

```
COLAB = True

if COLAB:
    from google.colab.output import clear as clear_output
else:
    from IPython.display import clear_output

#@title ## 🚩 Start Here

#@markdown ### 1️⃣ Setup
#@markdown This cell will load some requirements and create the necessary folders in your
#@markdown Your project name can't contain spaces but it can contain a single / to make
project_name = "CompleteStreet" #@param {type:"string"}
project_name = project_name.strip()
#@markdown The folder structure doesn't matter and is purely for comfort. Make sure to al
folder_structure = "Organize by project (MyDrive/Loras/project_name/dataset)" #@param ["Organize

if not project_name or any(c in project_name for c in " .()\"'\\") or project_name.count("
    print("Please write a valid project_name.")
else:
    if COLAB and not os.path.exists('/content/drive'):
        from google.colab import drive
```

Your project name can't contain spaces but it can contain a single / to make a subfolder in your dataset.

project_name: " CompleteStreet "

The folder structure doesn't matter and is purely for comfort. Make sure to always pick the same one. I like organizing by project.

folder_structure: Organize by project (MyDrive/Loras/project_name/dataset)

Training Process

- I applied an online opensource code that can be run in Google Colab for training my LoRA, the original webpage of the resource is https://civitai.com/models/22530.
- The training has two main process

1) Auto-labled the images;

2) use the labeled images to train the Lora

CompleteStreet-10

Description

Filename:	CompleteStreet-10.safetensors
File size:	18MB
Hash:	c557d781f67d
Modified:	2023-12-03 14:43
Output name:	CompleteStreet
Model:	animefull-final-pruned-fp16.safetensors
Clip skip:	2
Kohya module:	networks.lora
Date trained:	2023-12-03 18:10
Dataset size:	412

Stable Diffusion version

SD1

Training dataset tags

completestreet 412 | outdoors 412 | scenery 411 | day 396 | sky 395 | building 394 | no humans 375 | tree 371 | road 366 | blue sky 357 | cloud 352 | street 242 | window 223 | shadow 147 | ground vehicle 147 | motor vehicle 127 | cloudy sky 122 | car 119 | city 118 | lamppost 115 | grass 111 | crosswalk 104 | watermark 85 | bush 85

Activation text

Will be added to prompt along with Lora

Preferred weight

Set to 0 to disable

0

Random prompt

blue sky, building, bush, cloud, completestreet, crosswalk, day, lamppost, outdoors, road, road sign, scenery, sky, tree, window

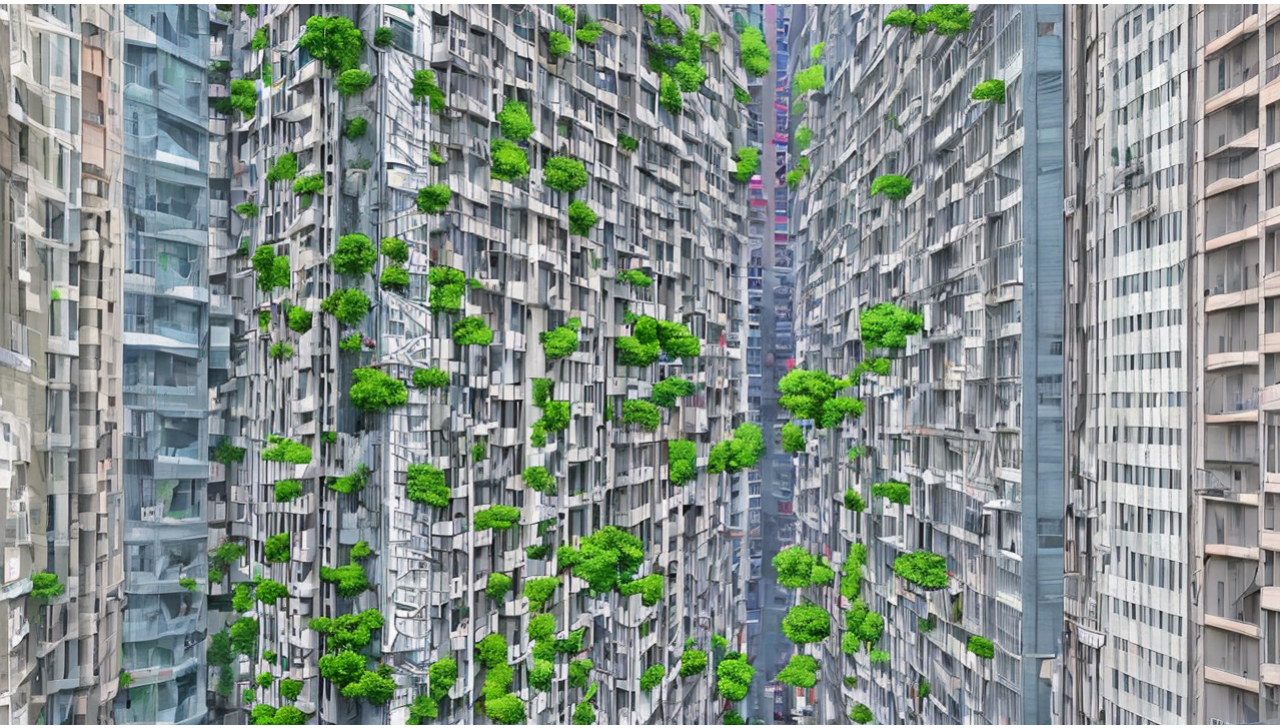
Generate

Trained Lora and Top 50 Labels

```
Tagging complete. Here are the top 50 tags in your dataset:
outdoors (412)
scenery (411)
day (396)
sky (395)
building (394)
no humans (375)
tree (371)
road (366)
blue sky (357)
cloud (352)
street (242)
window (223)
shadow (147)
ground vehicle (147)
motor vehicle (127)
cloudy sky (122)
car (119)
city (118)
lamppost (115)
grass (111)
crosswalk (104)
watermark (85)
bush (85)
house (78)
fence (69)
palm tree (53)
cityscape (53)
artist name (48)
plant (45)
sign (44)
door (34)
road sign (21)
```

Stable Diffusion checkpoint	VAE
anything-v5.PrtRE	vae-ft-mse-840000-ema-pruned

Not apply Trained Lora



complete street, high-density area

Apply Trained Lora

completestreet, high density area,<lora:CompleteStreet-10:1>

Stable Diffusion checkpoint	VAE
anything-v5.PrtRE	vae-ft-mse-840000-ema-pruned

Not apply Trained Lora

complete street, suburbs street, low-density area

Apply Trained Lora

completestreet, suburbs street, low-density area
<lora:CompleteStreet-10:1>

Stable Diffusion checkpoint	VAE
anything-v5.PrtRE	vae-ft-mse-840000-ema-pruned

Not apply Trained Lora

complete street, beautiful landscape, low surrounded buildings

Apply Trained Lora

completestreet, beautiful landscape, low surrounded buildings
<lora:CompleteStreet-10:1>

Stable Diffusion checkpoint	VAE
anything-v5.PrtRE	Counterfeit-V2.5

Not apply Trained Lora

Complete street, suburbs street, low density area

Apply Trained Lora

completestreet, suburbs street, low density area
<lora:CompleteStreet-10:1>

Stable Diffusion checkpoint	VAE
anything-v5.PrtRE	Counterfeit-V2.5

Not apply Trained Lora

complete street, street view, eye-level

Apply Trained Lora

completestreet, street view, eye-level <lora:CompleteStreet-10:1>

Stable Diffusion checkpoint	VAE
anything-v5.PrtRE	Counterfeit-V2.5

Not apply Trained Lora

complete street, bird-view of street

Apply Trained Lora

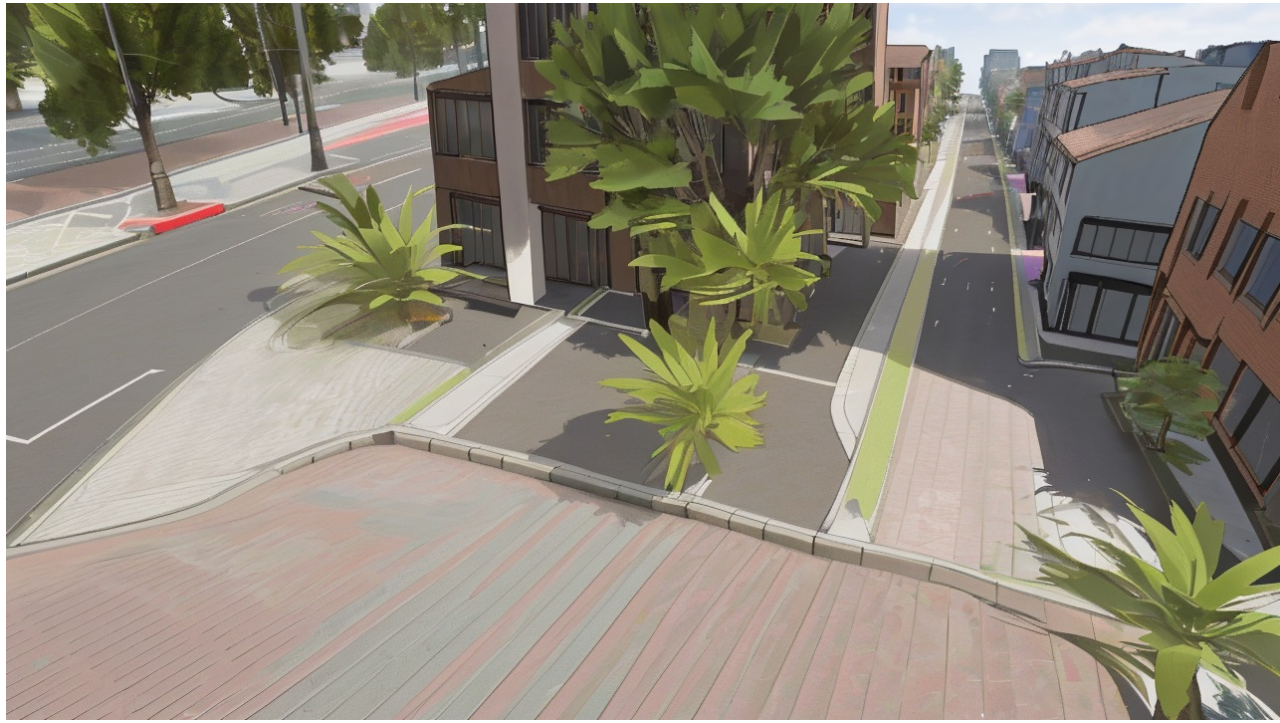
completestreet, bird-view of street <lora:CompleteStreet-10:1>

Stable Diffusion checkpoint	VAE
Counterfeit-V3.0_fp16	vae-ft-mse-840000-ema-pruned

Not apply Trained Lora

complete street, street view, urban street

Apply Trained Lora



completestreet, street view, urban street <lora:CompleteStreet-10:1>

Stable Diffusion checkpoint	VAE
anything-v5.PrtRE	animevae.pt

Not apply Trained Lora

complete street, blue sky, cityscape

Apply Trained Lora

Completestreet, blue sky, cityscape <lora:CompleteStreet-10:1>

Stable Diffusion checkpoint	VAE
anything-v5.PrtRE	animevae.pt

Random Prompt from LoRA

Not apply Trained Lora

blue sky, building, car, city, cloud, complete street, day, ground vehicle, no humans, outdoors, road, road sign, scenery, shadow, street, tree, window

Apply Trained Lora

blue sky, building, car, city, cloud, completestreet, day, ground vehicle, no humans, outdoors, road, road sign, scenery, shadow, street, tree, window <lora:CompleteStreet-10:1>

Stable Diffusion checkpoint	VAE
anything-v5.PrtRE	animevae.pt

Random Prompt from LoRA

Not apply Trained Lora

complete street, street, blue sky, building, outdoors plaza, scenery, tree

Apply Trained Lora

completestreet, street, blue sky, building, outdoors plaza, scenery, tree<lora:CompleteStreet-10:1>

Stable Diffusion checkpoint	VAE
anything-v5.PrtRE	animevae.pt

Random Prompt from LoRA

Not apply Trained Lora

complete street, street, blue sky, building, pedestrian-friendly, wide sidewalk, scenery, tree

Apply Trained Lora

completestreet, street, blue sky, building, pedestrian-friendly, wide sidewalk, scenery, tree <lora:CompleteStreet-10:1>

Discussion

- 1. The model consistently generates images with normal perspectives, effectively reducing occurrences of unconventional or 'weird' perspectives that might detract from the design's realism and practical applicability.
- 2. The buildings in these scenes display a consistent style, with reduced randomness in their architectural variations. It suggests that the model has effectively learned to maintain stylistic coherence.
- 3. While the textures of buildings appear clearer and more defined, they lean towards a model-like appearance rather than a photorealistic representation.
- 4. The generation of the street segment is not stable, such as the not continuity on the lanes and road signal. This need to be fixed by photoshop or other images edit tools.