U-net Segmentation(Pytorch)

Roofs in villages

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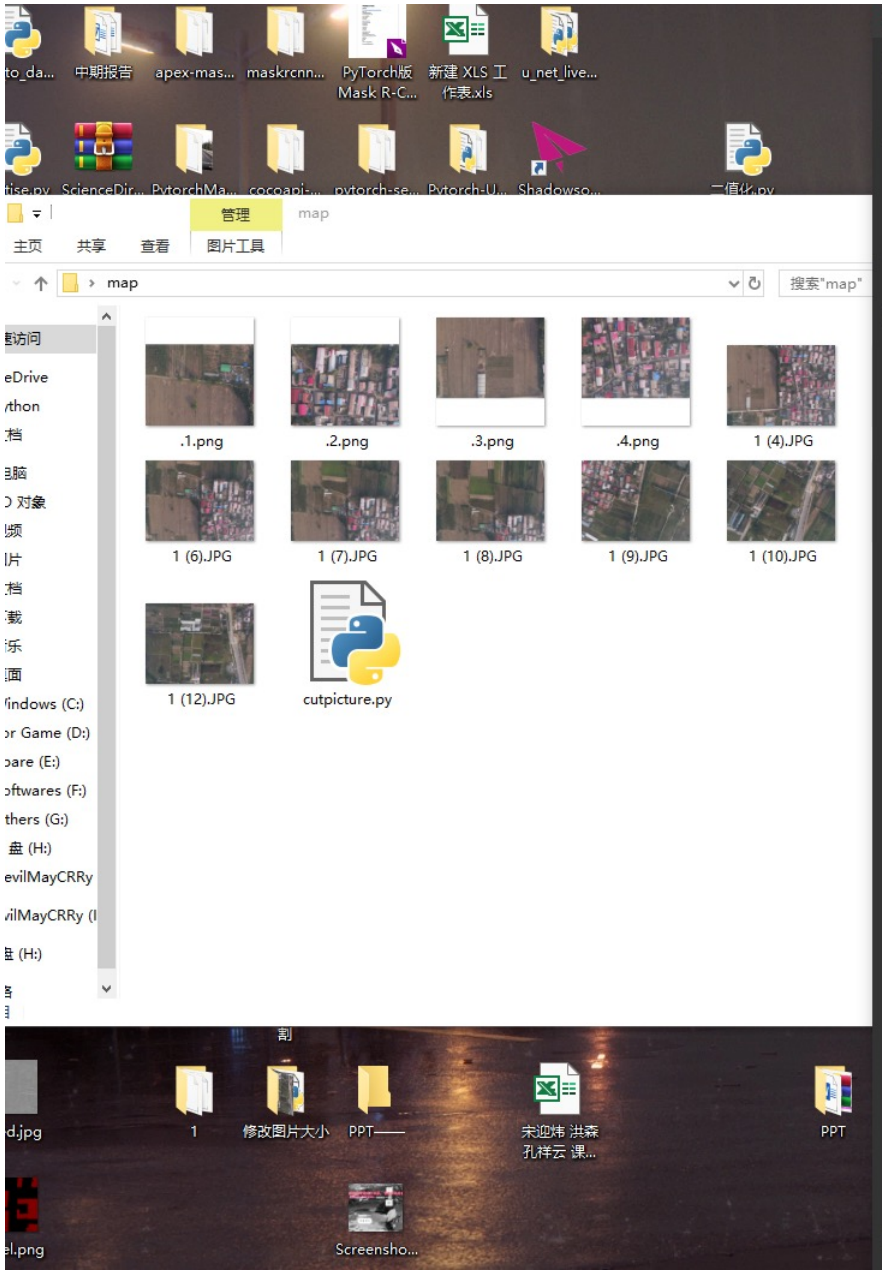
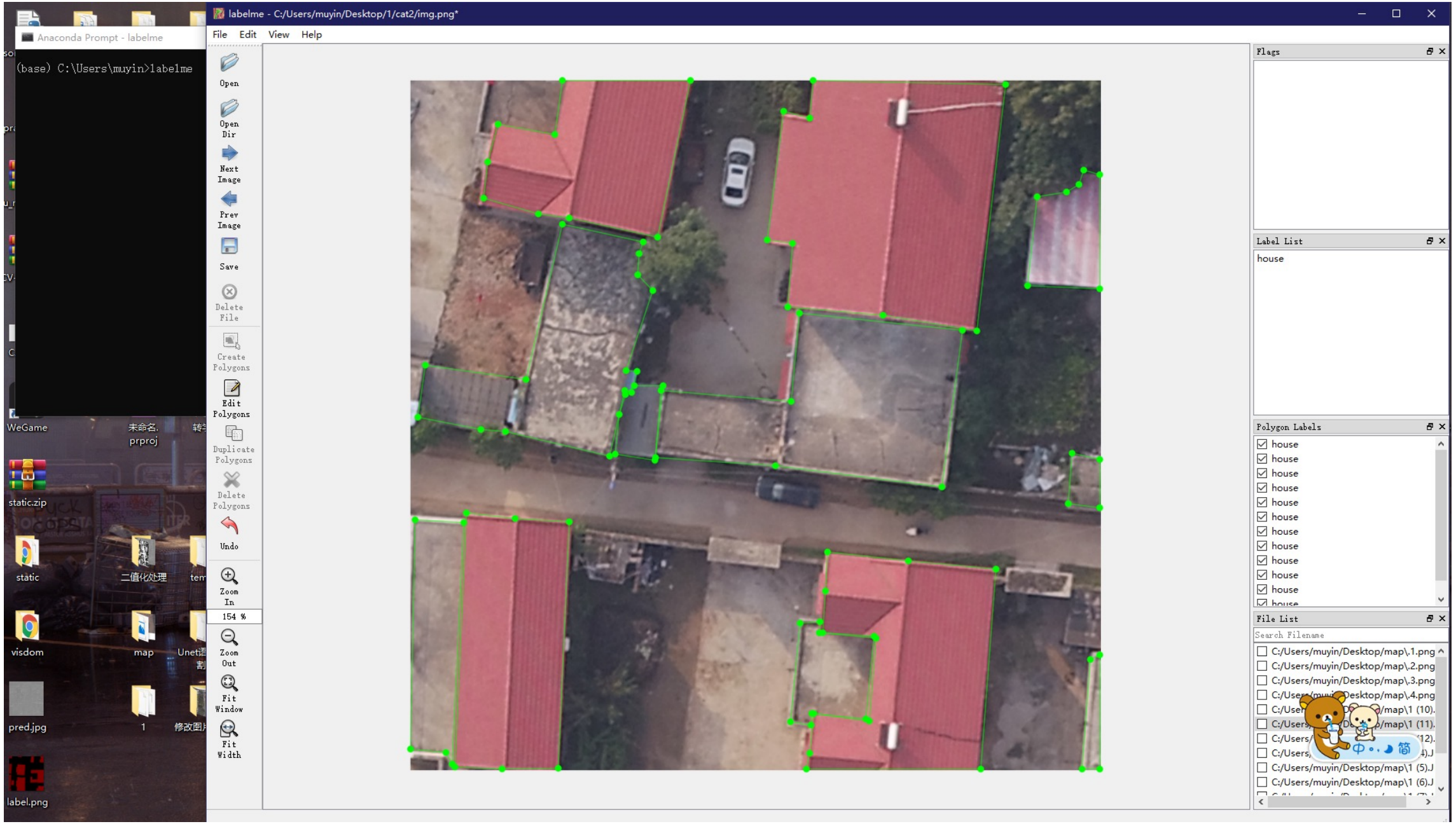
Divide the picture and divide it into nine equal parts for two times. Preliminary processing



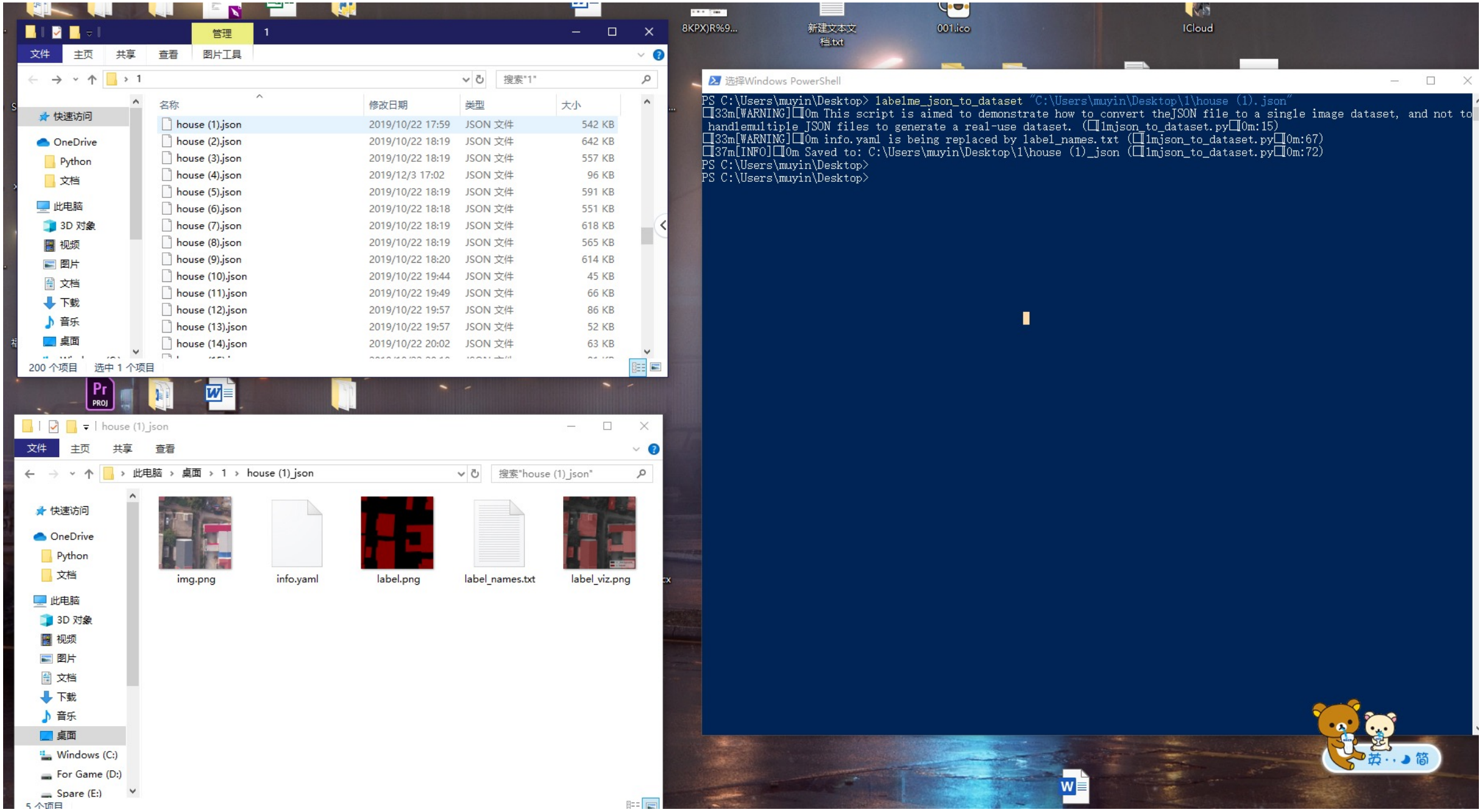

```python
    # (left, upper, right, lower)
    for i in range(0,2):#两重循环，生成9张图片基于原图的位置
        for j in range(0,2):
            #print((i*item_width,j*item_width,(i+1)*item_width,(j+1)*item_width))
            box = (j*item_width,i*item_width,(j+1)*item_width,(i+1)*item_width)
            box_list.append(box)

    image_list = [image.crop(box) for box in box_list]
    return image_list
#保存
def save_images(image_list):
    index = 1
    for image in image_list:
        image.save('.'+str(index) + '.png', 'PNG')
        index += 1

if __name__ == '__main__':
    file_path = "python.jpeg"
    image = Image.open("1 (5).jpg")

    image = fill_image(image)
    image_list = cut_image(image)
    save_images(image_list)
```

```
PROBLEMS 1  OUTPUT  DEBUG CONSOLE  TERMINAL                    2: Python

尝试新的跨平台 PowerShell https://aka.ms/pscore6

PS C:\Users\muyin\Desktop\map> conda activate base
PS C:\Users\muyin\Desktop\map> & E:/Work/Anaconda/file/python.exe c:/Users/muyin/Desktop/map/cutpicture.py
Traceback (most recent call last):
  File "c:/Users/muyin/Desktop/map/cutpicture.py", line 40, in <module>
    image = Image.open("1 (5).png")
  File "E:\Work\Anaconda\file\lib\site-packages\PIL\Image.py", line 2609, in open
    fp = builtins.open(filename, "rb")
FileNotFoundError: [Errno 2] No such file or directory: '1 (5).png'
PS C:\Users\muyin\Desktop\map> & E:/Work/Anaconda/file/python.exe c:/Users/muyin/Desktop/map/cutpicture.py
PS C:\Users\muyin\Desktop\map>
```

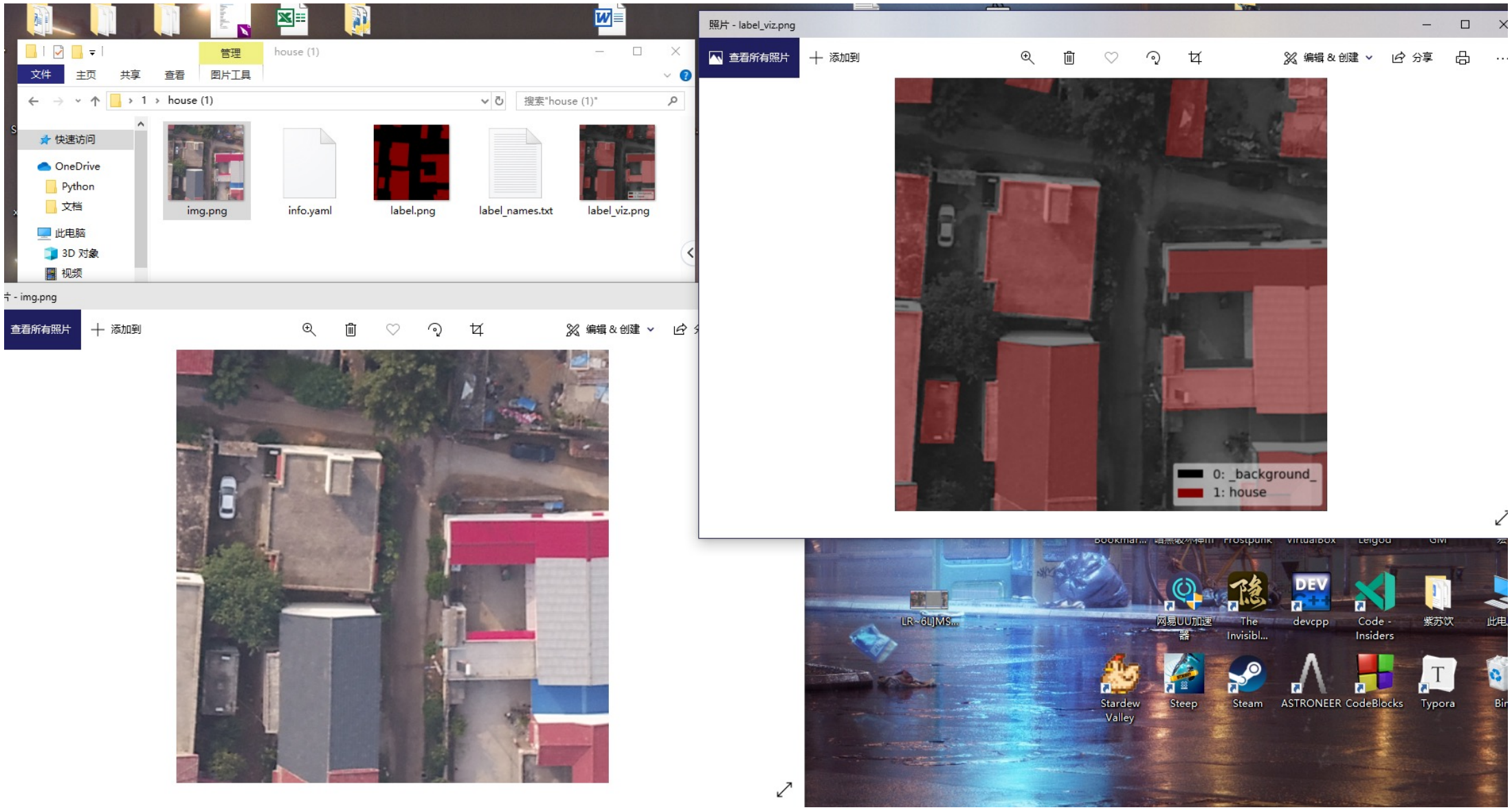
Using “labelme” to label datasets manually



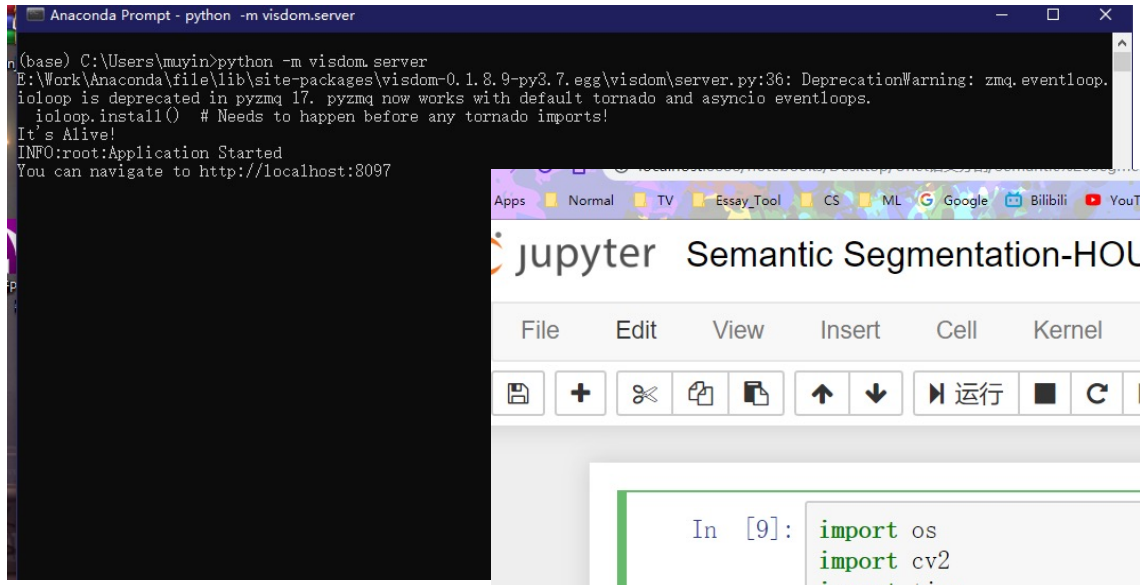
Parse the .json file

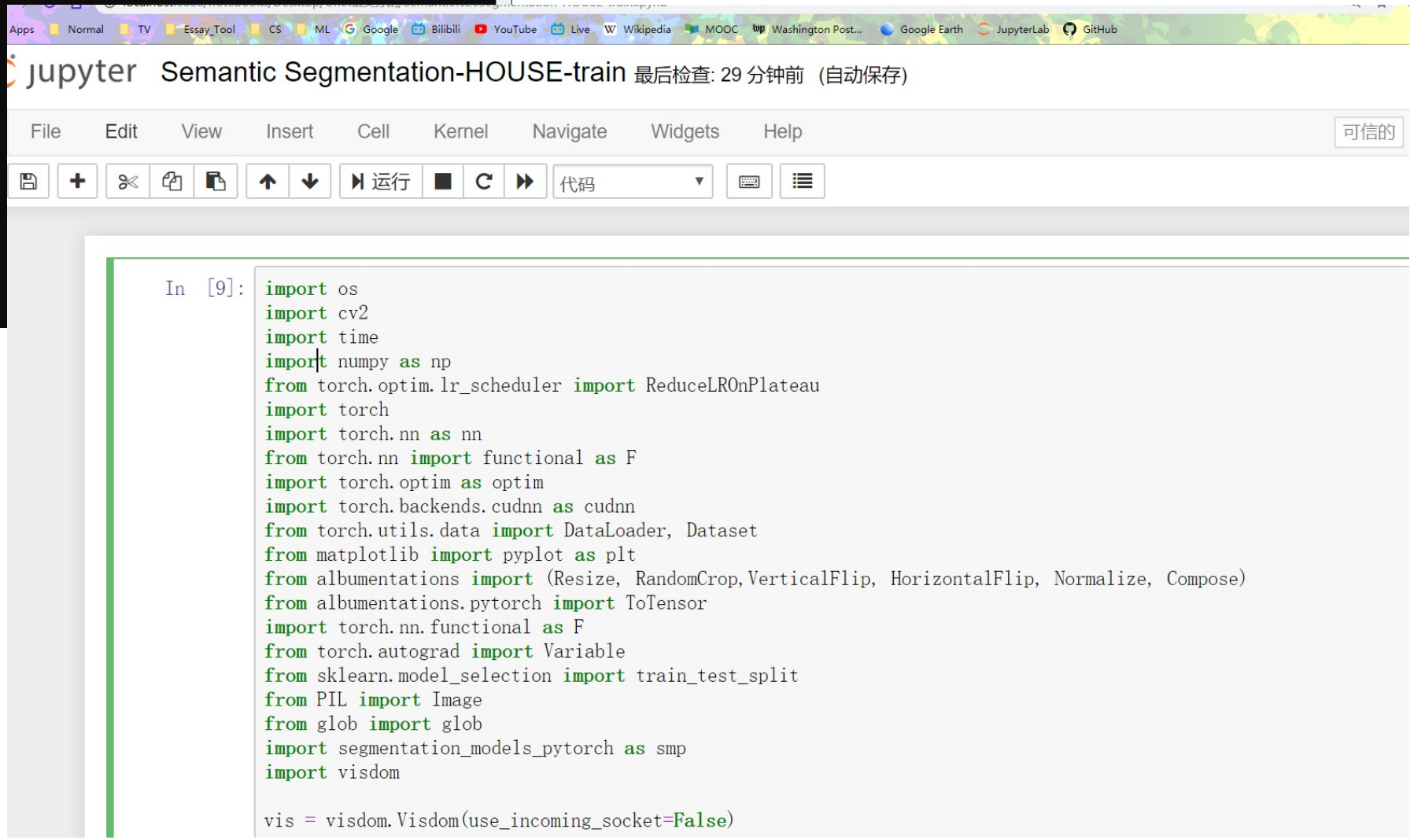


Outcomes


house (1)
文件
主页
共享
查看
图片工具
管理
1 › house (1)
搜索"house (1)"
快速访问
OneDrive
Python
文档
此电脑
3D 对象
视频
img.png
info.yaml
label.png
label_names.txt
label_viz.png
查看所有照片
添加到
编辑 & 创建
照片 - label_viz.png
分享
0: _background_
1: house
LR~6L]MS...
网易UU加速器
The Invisibl...
devcpp
Code - Insiders
紫苏饮
Stardew Valley
Steep
Steam
ASTRONEER
CodeBlocks
Typora

Set up the environment





Data enhancement:
Flip horizontally and vertically

[11]:
```
def get_transforms(phase, mean=(0.485, 0.456, 0.406), std=(0.229, 0.224, 0.225)):
    list_transforms = []
    if phase == "train":
        list_transforms.extend(
            [
                HorizontalFlip(),
                VerticalFlip()
            ]
        )
```

39]:
```
class Trainer(object):
    '''This class takes care of training and validation of our model'''
    def __init__(self, model):
        self.num_workers = 0
        self.batch_size = {"train": 8, "val":1}
        self.accumulation_steps = 32 // self.batch_size['train']
        self.lr = 1e-3
        self.num_epochs = 50
        self.best_loss = float("inf")
        self.best_dice = float(0)
        self.phases = ["train", "val"]
        self.device = torch.device("cuda:0")
        torch.set_default_tensor_type("torch.cuda.FloatTensor")
        self.net = model
        self.criterion = nn.BCEWithLogitsLoss()
        self.optimizer = optim.Adam(self.net.parameters(), lr=self.lr)
        self.scheduler = ReduceLROnPlateau(self.optimizer, mode="min", patience=4, verbose=True)
        self.net = self.net.to(self.device)
        cudnn.benchmark = True
```

- batch size=8
- lr=1e-3
- optimizer=Adam
- loss=BCEWithLogitsLoss
- epoch=50

Train:


```
[*]: model_trainer = Trainer(model)
     model_trainer.start()
```

```
Starting epoch: 0 | phase: train | ⏰: 20:41:26
Loss: 0.638610 | IoU: 0.2651 | dice: 0.3997 | dice_neg: 0.0000 | dice_pos: 0.3997
Starting epoch: 0 | phase: val | ⏰: 20:41:31
Loss: 2.471894 | IoU: 0.2841 | dice: 0.4293 | dice_neg: 0.0000 | dice_pos: 0.4293
******** New optimal found, saving state ********

Starting epoch: 1 | phase: train | ⏰: 20:41:33
Loss: 0.483489 | IoU: 0.4683 | dice: 0.6192 | dice_neg: 0.0000 | dice_pos: 0.6192
Starting epoch: 1 | phase: val | ⏰: 20:41:39
Loss: 0.721443 | IoU: 0.3587 | dice: 0.5139 | dice_neg: 0.0000 | dice_pos: 0.5139
******** New optimal found, saving state ********

Starting epoch: 2 | phase: train | ⏰: 20:41:41
Loss: 0.426659 | IoU: 0.4948 | dice: 0.6348 | dice_neg: 0.0000 | dice_pos: 0.6348
Starting epoch: 2 | phase: val | ⏰: 20:41:47
Loss: 0.454439 | IoU: 0.4610 | dice: 0.5923 | dice_neg: 0.0000 | dice_pos: 0.5923
******** New optimal found, saving state ********

Starting epoch: 3 | phase: train | ⏰: 20:41:49
Loss: 0.385652 | IoU: 0.5588 | dice: 0.6938 | dice_neg: 0.0000 | dice_pos: 0.6938
Starting epoch: 3 | phase: val | ⏰: 20:41:55
Loss: 0.501673 | IoU: 0.4748 | dice: 0.6104 | dice_neg: 0.0000 | dice_pos: 0.6104
```

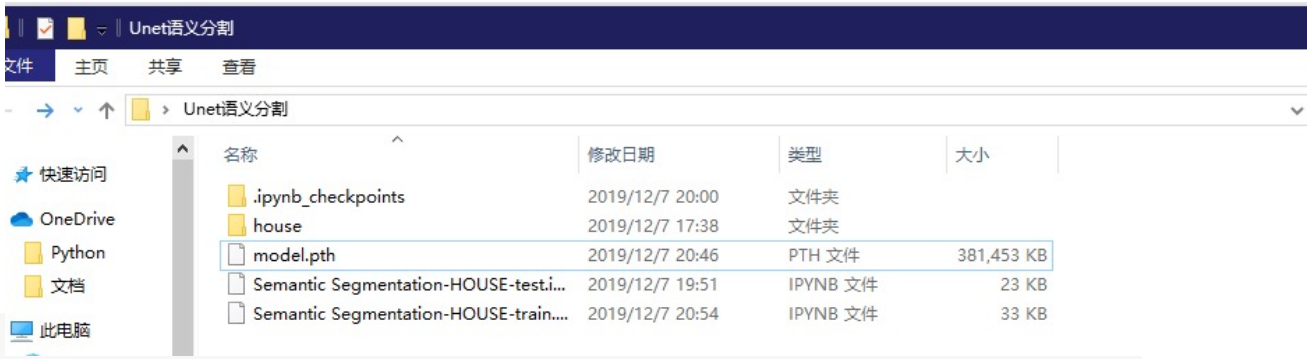
After 50 iterations:

```
Loss: 0.155410 | IoU: 0.8101 | dice: 0.8897 | dice_neg: 0.0000 | dice_pos: 0.8897
Starting epoch: 44 | phase: val | ⏰: 20:46:49
Loss: 0.204534 | IoU: 0.7118 | dice: 0.8259 | dice_neg: 0.0000 | dice_pos: 0.8259

Starting epoch: 45 | phase: train | ⏰: 20:46:50
Loss: 0.156369 | IoU: 0.7942 | dice: 0.8802 | dice_neg: 0.0000 | dice_pos: 0.8802
Starting epoch: 45 | phase: val | ⏰: 20:46:56
Loss: 0.209885 | IoU: 0.7027 | dice: 0.8153 | dice_neg: 0.0000 | dice_pos: 0.8153

Starting epoch: 46 | phase: train | ⏰: 20:46:57
Loss: 0.148625 | IoU: 0.8246 | dice: 0.9007 | dice_neg: 0.0000 | dice_pos: 0.9007
Starting epoch: 46 | phase: val | ⏰: 20:47:03
Loss: 0.217943 | IoU: 0.6911 | dice: 0.8049 | dice_neg: 0.0000 | dice_pos: 0.8049

Starting epoch: 47 | phase: train | ⏰: 20:47:04
Loss: 0.147558 | IoU: 0.8140 | dice: 0.8932 | dice_neg: 0.0000 | dice_pos: 0.8932
Starting epoch: 47 | phase: val | ⏰: 20:47:10
Loss: 0.212451 | IoU: 0.6969 | dice: 0.8111 | dice_neg: 0.0000 | dice_pos: 0.8111

Starting epoch: 48 | phase: train | ⏰: 20:47:11
Loss: 0.149801 | IoU: 0.8203 | dice: 0.8978 | dice_neg: 0.0000 | dice_pos: 0.8978
Starting epoch: 48 | phase: val | ⏰: 20:47:16
Loss: 0.198635 | IoU: 0.7146 | dice: 0.8272 | dice_neg: 0.0000 | dice_pos: 0.8272
Epoch    48: reducing learning rate of group 0 to 1.0000e-04.

Starting epoch: 49 | phase: train | ⏰: 20:47:17
Loss: 0.136240 | IoU: 0.8406 | dice: 0.9106 | dice_neg: 0.0000 | dice_pos: 0.9106
Starting epoch: 49 | phase: val | ⏰: 20:47:23
Loss: 0.194541 | IoU: 0.7197 | dice: 0.8305 | dice_neg: 0.0000 | dice_pos: 0.8305
```

50+20 iterations (overfitting)

```
Loss: 0.192592 | IoU: 0.7088 | dice: 0.8182 | dice_neg: 0.0000 | dice_

Starting epoch: 17 | phase: train | ⏰: 21:34:13
Loss: 0.133003 | IoU: 0.8201 | dice: 0.8983 | dice_neg: 0.0000 | dice_
Starting epoch: 17 | phase: val | ⏰: 21:34:18
Loss: 0.189890 | IoU: 0.7115 | dice: 0.8207 | dice_neg: 0.0000 | dice_
******** New optimal found, saving state ********

Starting epoch: 18 | phase: train | ⏰: 21:34:20
Loss: 0.134696 | IoU: 0.8054 | dice: 0.8877 | dice_neg: 0.0000 | dice_
Starting epoch: 18 | phase: val | ⏰: 21:34:25
Loss: 0.187460 | IoU: 0.7170 | dice: 0.8252 | dice_neg: 0.0000 | dice_
******** New optimal found, saving state ********

Starting epoch: 19 | phase: train | ⏰: 21:34:27
Loss: 0.141069 | IoU: 0.8253 | dice: 0.9014 | dice_neg: 0.0000 | dice_
Starting epoch: 19 | phase: val | ⏰: 21:34:32
Loss: 0.186447 | IoU: 0.7184 | dice: 0.8273 | dice_neg: 0.0000 | dice_
******** New optimal found, saving state ********
```

Read the trained model




```
    iou = np.nanmean(ious)
    return iou
```

[38]:

```
ckpt_path = "./model.pth"
device = torch.device("cuda")
model = smp.Unet("resnet50", encoder_weights=None, classes=1, activation=None)
model.to(device)
state = torch.load(ckpt_path, map_location=lambda storage, loc: storage)
model.load_state_dict(state["state_dict"])

#model = smp.Unet('resnet50', classes=1, activation=None)
```

[39]:

```
class Trainer(object):
```

Inspect using visdom

Test new data using trained network

```
        self.iterate("test")
```

In [12]:
```
MODELPATH = ".\model.pth"  # 模型路径
IMAGEPATH = r".\test" # 图片路径
```

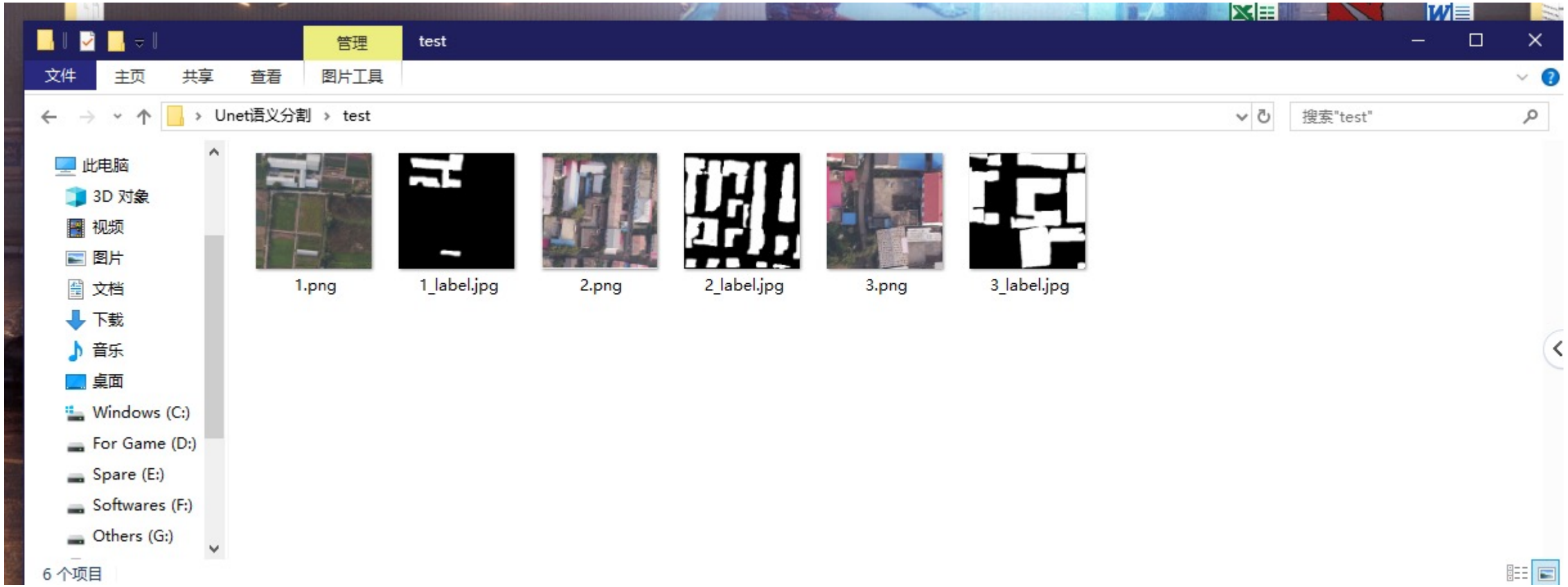
In [13]:
```
if os.path.exists(MODELPATH):

    model = smp.Unet('resnet50', classes=1, activation=None)
    state = torch.load(MODELPATH, map_location=lambda storage, loc: storage)

    model.load_state_dict(state["state_dict"])
else:
    model = smp.Unet('resnet50', classes=1, activation=None)

device = torch.device("cuda")
model.to(device)
model_trainer = Trainer(model)
model_trainer.start()
```

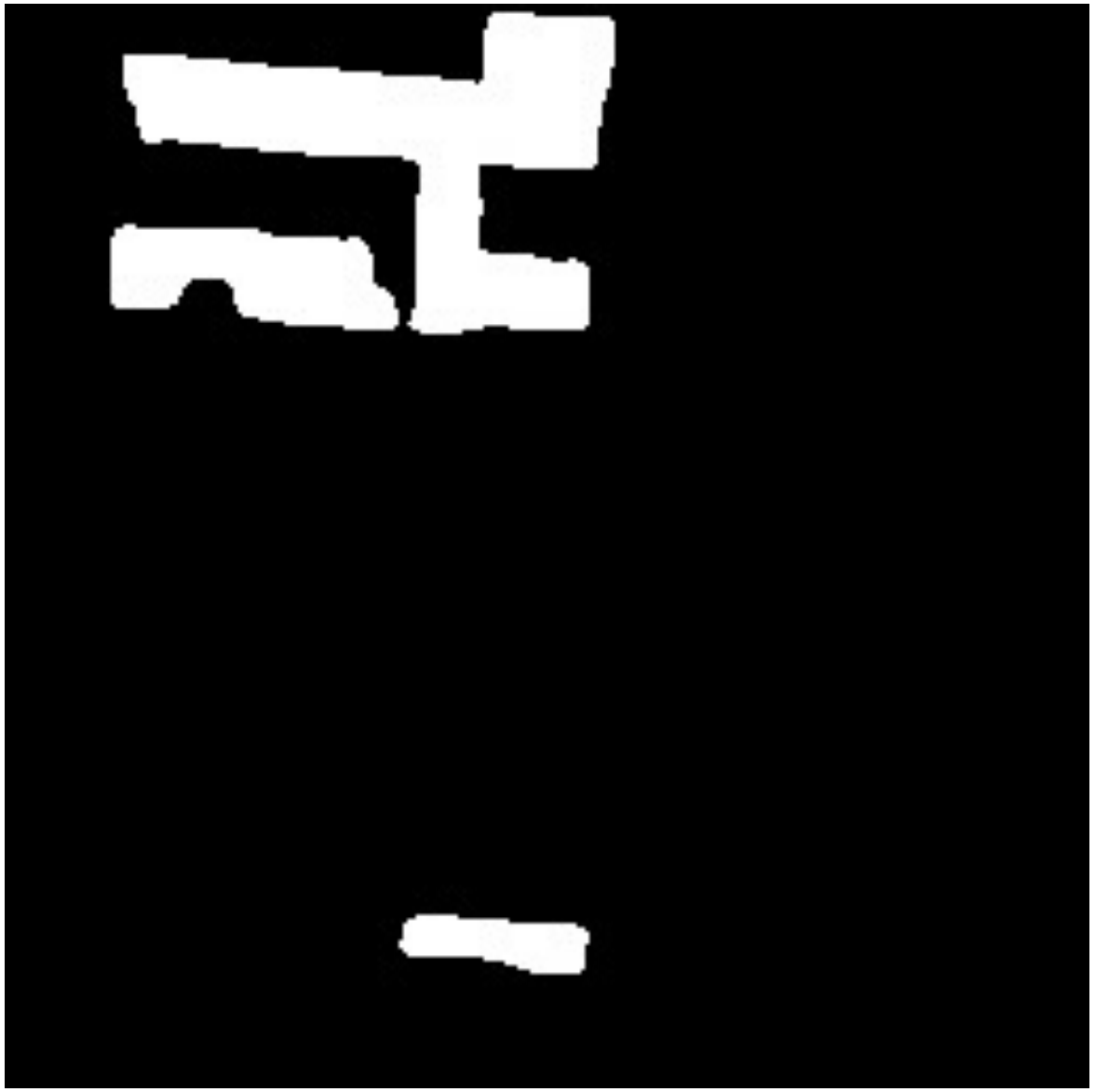
```
total images: 1
Starting epoch: 0 | phase: test | ⏰: 21:23:43
```

100%|██████████| 1/1 [00:00<00:00, 19.28it/s]

In [ ]:

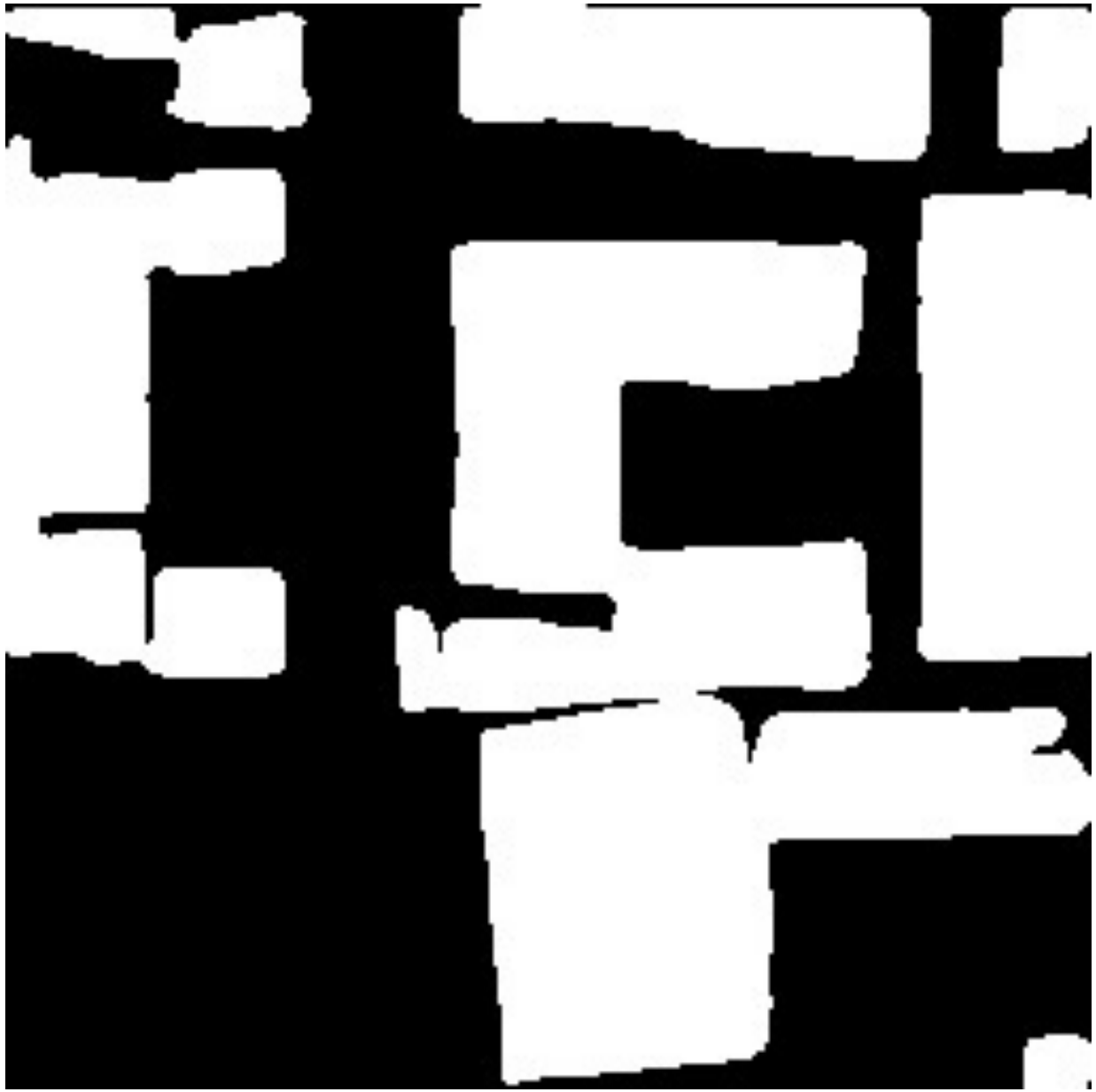
Get the labeled image





Sample 1

Sample 2



Sample 3

Learning from：

- Andrew NgDeep Learning
- Udacity – AI Programming with Python (Nanodegree Program)
- Udacity – Deep Learning course
- Yudi Tang’s Tensorflow series
- Pytorch tutorials
- Resources on github

Acknowledgment:

-All blogs & codes in Github

Thanks for your time