

# ADID-Model Usage and Results Verification

## Section 1: Dataset:

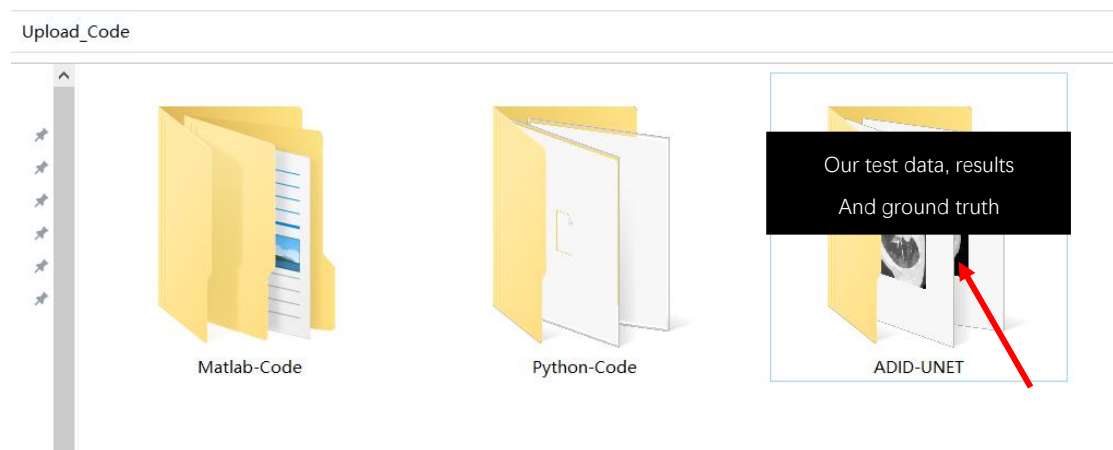
### 1. Datasets:

For training sets, validation sets, and test sets, original images, and labels are required. Example of the original picture and labels you need.

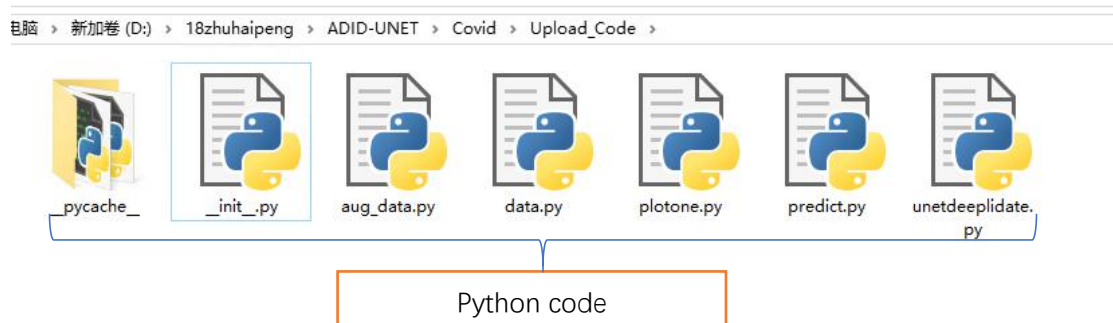


### 2. Code and Dataset and Results:

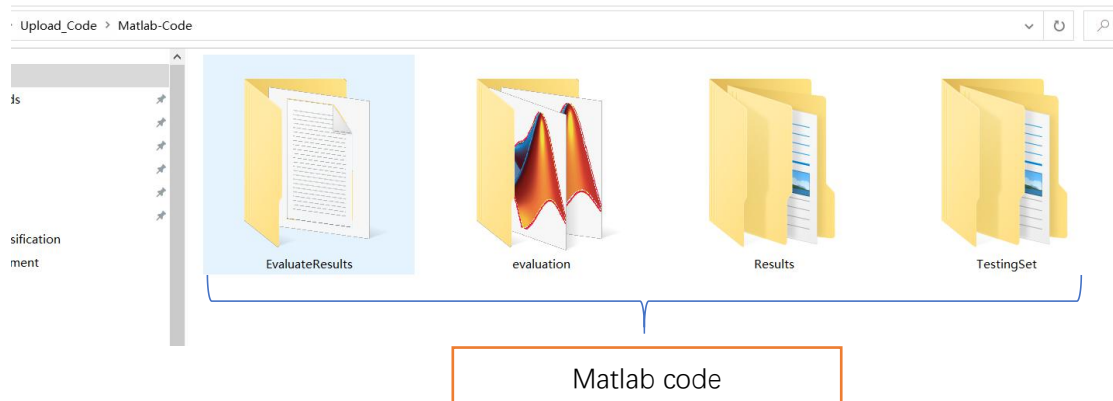
We've uploaded all the codes, datasets, and results as attachments to the PeerJ journal, which should look like this when you download all the folders.



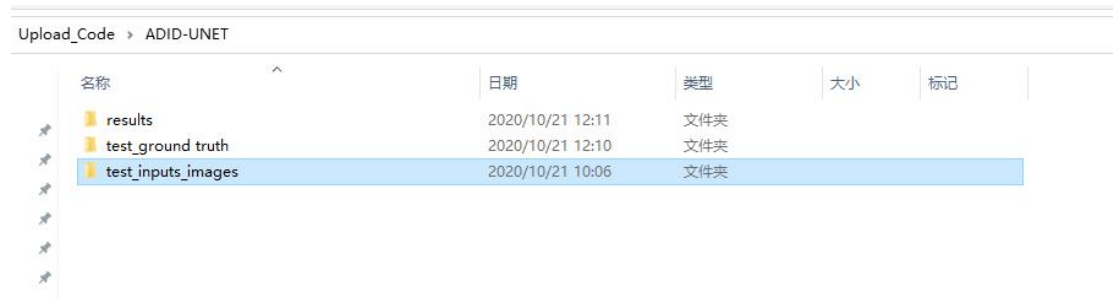
Next, We will explain the contents of each folder. The "Python-Code" folder mainly contains Python codes, as shown in the following figure:



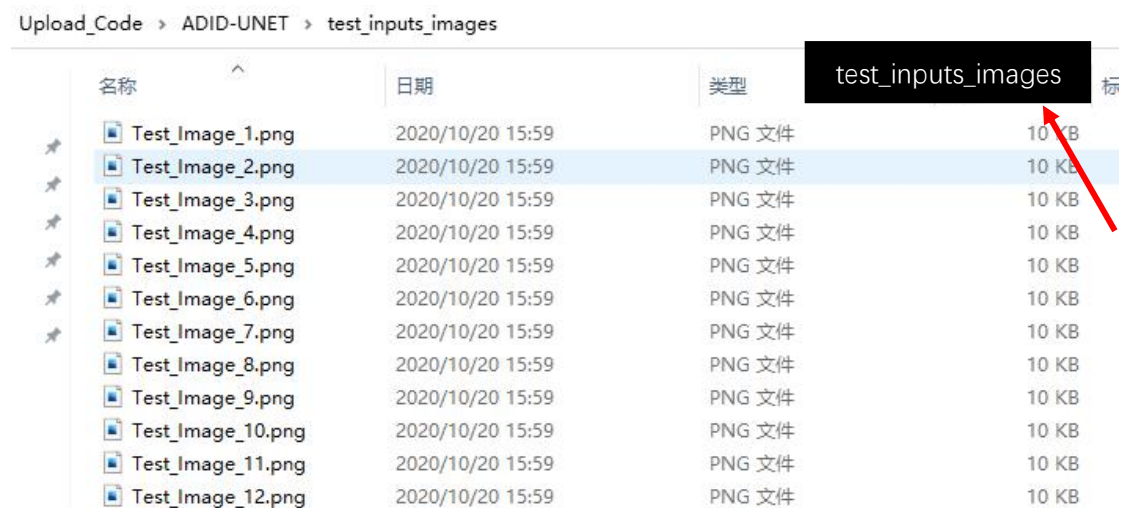
The “Matlab-Code” folder, contains “EvaluateResults”, “evaluation”, “Results” and “TestingSet” four folders, as shown in the following figure. Also, we have explained the contents of each folder and how to run the code in Section 2.3.



The “ADID-UNET” folder includes the “test\_inputs\_images”, “test\_ground\_truth” and “results” folders, as shown below:



There are the contents of the “test\_inputs\_images”, “test\_ground\_truth” and “results” folders:



Upload\_Code > ADID-UNET > test\_ground truth

名称	日期	类型	test_ground_truth
Test_Image_1_OriginalM...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_2_OriginalM...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_3_OriginalM...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_4_OriginalM...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_5_OriginalM...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_6_OriginalM...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_7_OriginalM...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_8_OriginalM...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_9_OriginalM...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_10_Original...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_11_Original...	2020/10/20 12:53	PNG 文件	2 KB
Test_Image_12_Original...	2020/10/20 12:53	PNG 文件	1 KB

Upload\_Code > ADID-UNET > results

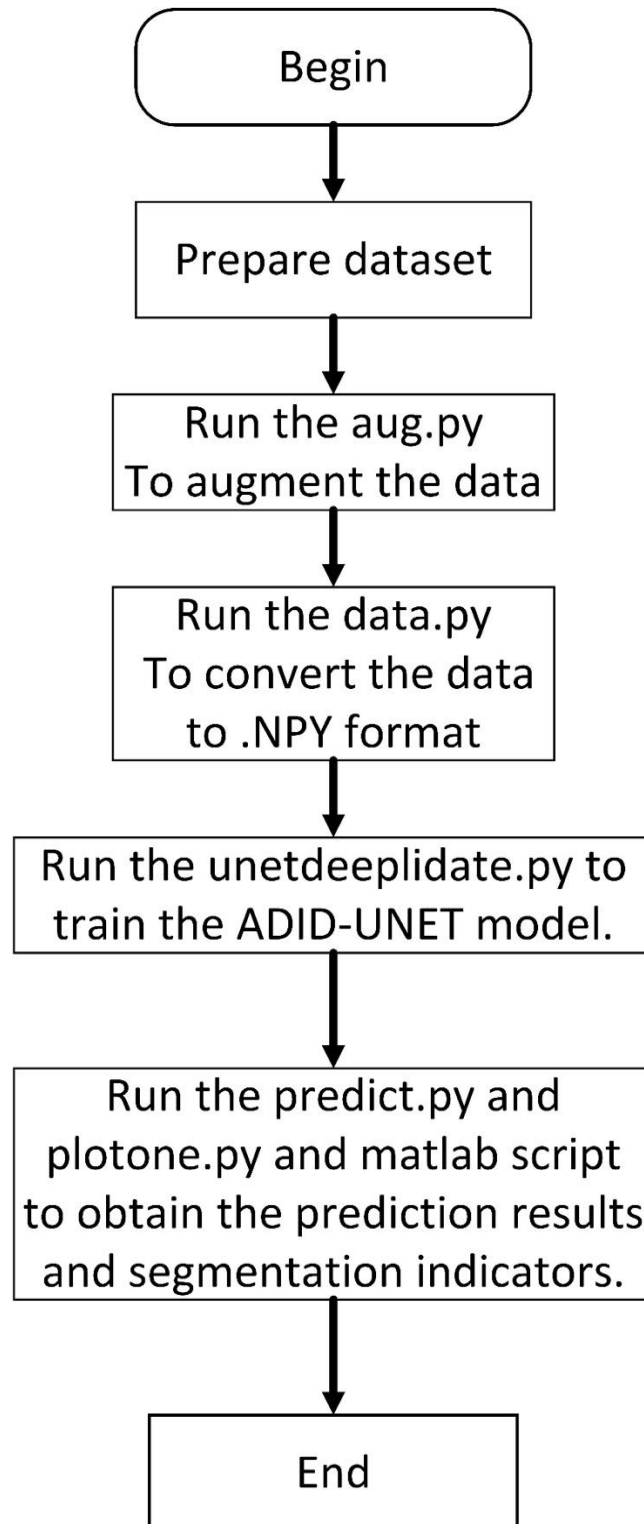
名称	日期	类型	results
Test_Image_1_Predict.png	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_2_Predict.png	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_3_Predict.png	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_4_Predict.png	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_5_Predict.png	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_6_Predict.png	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_7_Predict.png	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_8_Predict.png	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_9_Predict.png	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_10_Predict.p...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_11_Predict.p...	2020/10/20 12:53	PNG 文件	1 KB
Test_Image_12_Predict.p...	2020/10/20 12:53	PNG 文件	1 KB

## Section 2: Instruction for executing the codes:

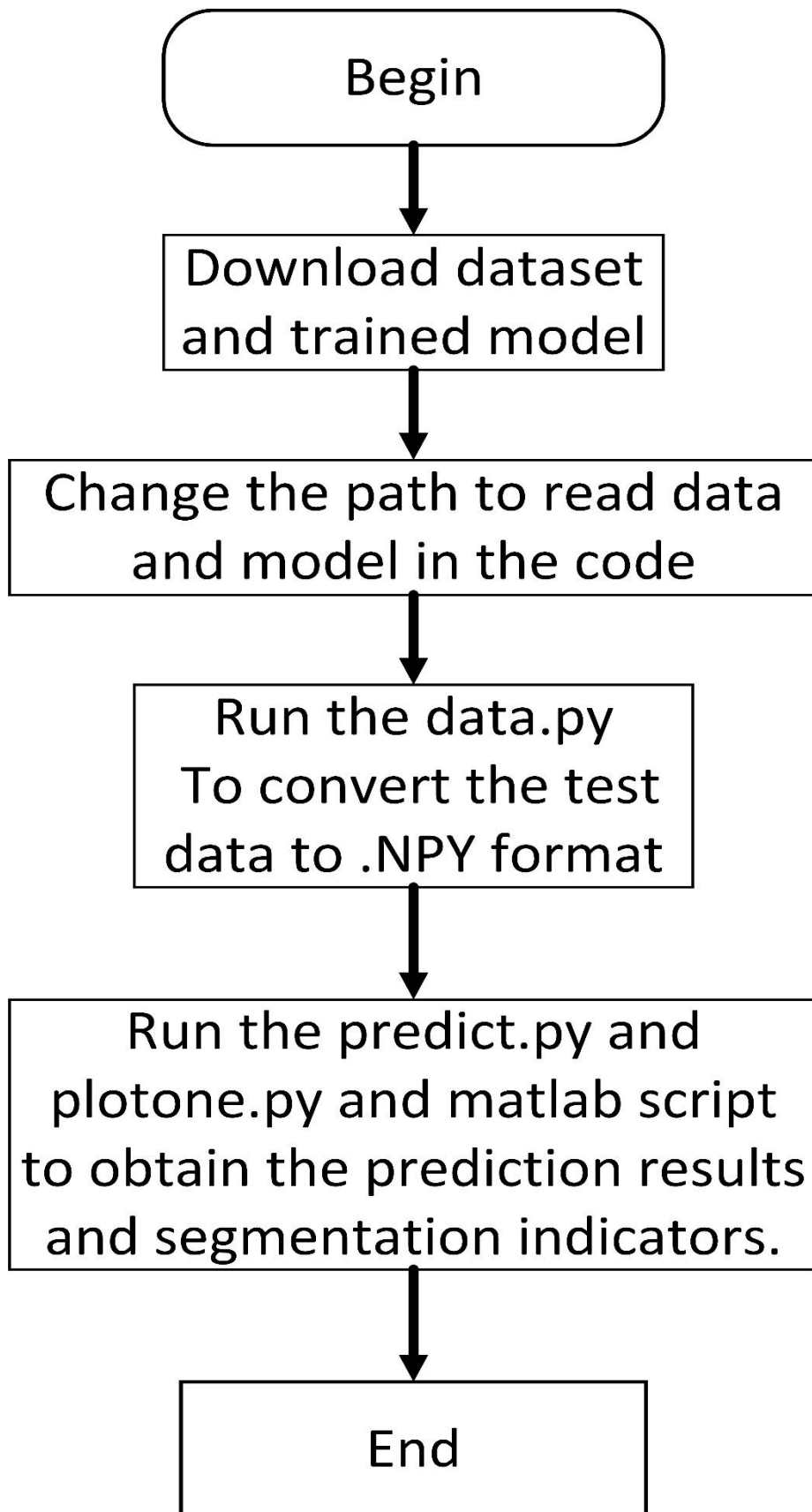
### Procedure Summary:

- Use **aug.py** to augment the data, and then use the **data.py** to convert the data to **.NPY** format.
- Use **unetdeeplidate.py** to train the ADID-UNET model.
- Use **predict.py** and **plotone.py** to obtain the prediction results and segmentation indicators, such as accuracy, precision, Dice coefficient, sensitivity, specificity and F1 score.
- Use **matlab script** to obtain the other three segmentation indexes, Structural metric (Sm), Enhance alignment metric (E $\alpha$ ), Mean Absolute Error (MAE).

**THE FLOW CHART FOR TRAINING THE MODEL AND TESTING IT**



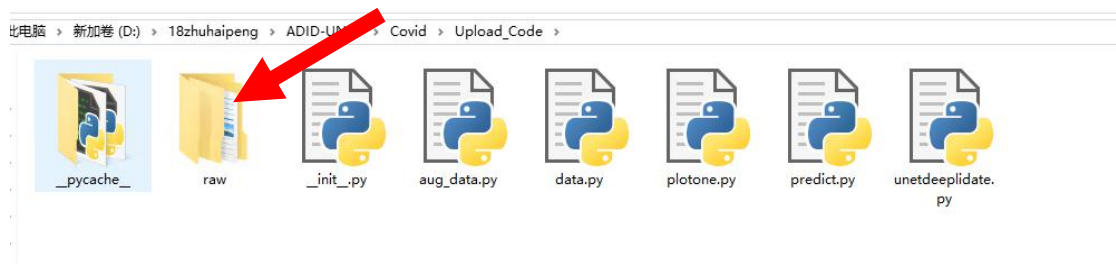
FLOW CHART FOR USING THE TRAINED MODEL



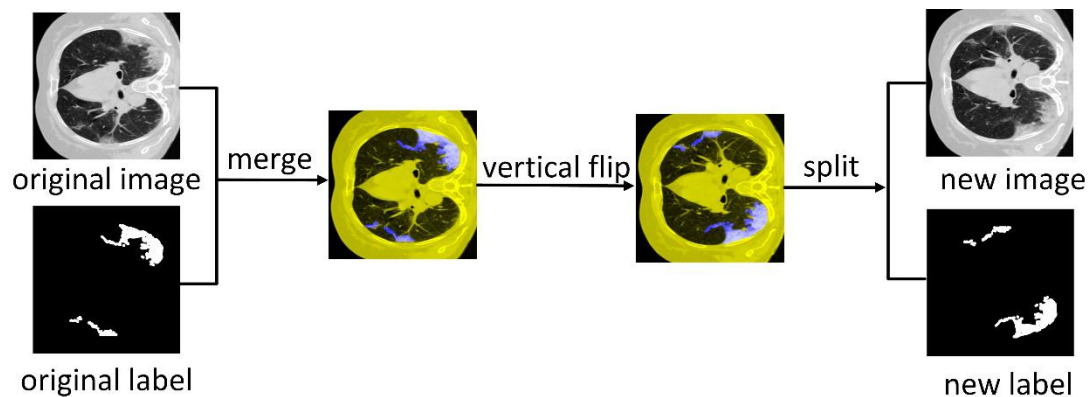
## Detailed Information about the codes

### 2.1 Information about Python codes of the ADID-UNET model.

(1) Here, you need to build a “raw” file to store datasets, including training sets, validation sets, test sets, as well as automatically segmented images of models. As shown in the following figure:



(2) Aug\_data.py is mainly to expand training set images. The process is as follows.



(3) Data.py is mainly about training set, validation set, and test set images saved as .NPY.

(4) Predict.py is used for obtaining the segmentation result of the model.

(5) Plotone.py is used for test AUC and ROC curve

(6) Unetdeeplidate.py is the ADID-UNET models code.

As shown in the following figure:

```
id\9229samples\change_original_result4_bz=32_dp=0.2_2dense_again\code\plotone.py
aug_data.py x data.py x unetdeeplidate.py x predict.py x plotone.py x
1 2 3 4 5
from sklearn.metrics import roc_curve
from sklearn.metrics import roc_auc_score
from sklearn.metrics import confusion_matrix
from sklearn.metrics import precision_recall_curve
from sklearn.metrics import jaccard_similarity_score
from sklearn.metrics import f1_score

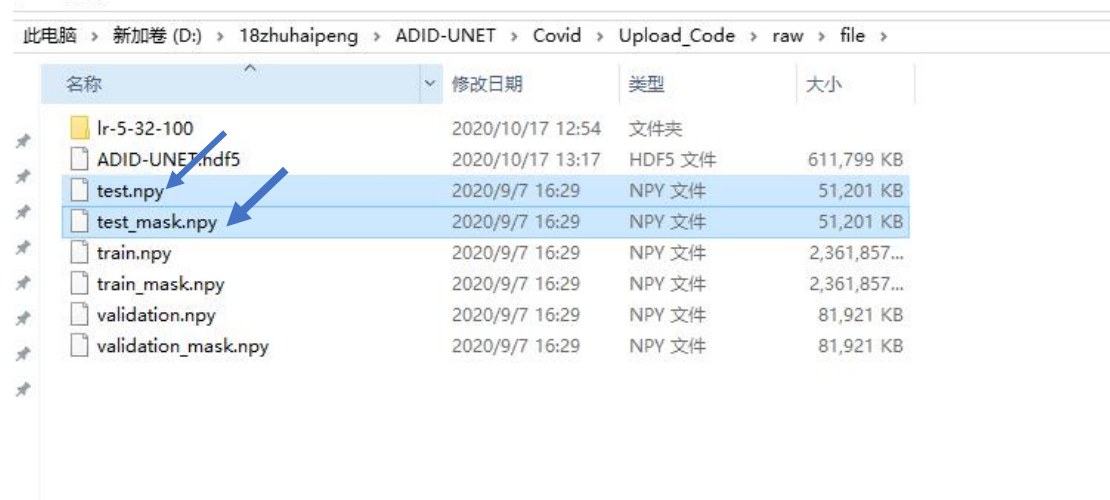
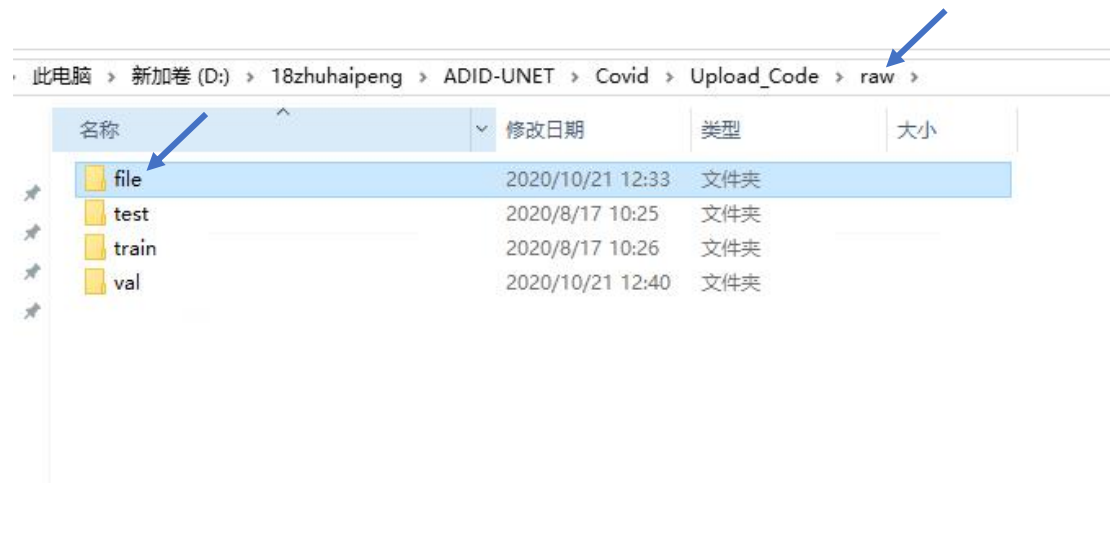
/18zhuhaipeng/ADID-Net/Covid/9229samples/change_original_result4_bz=32_dp=0.2_2dense_again/raw/file
masks = np.load(path + 'predict.npy')
imgs_test_mask = load_test_data()
gt = preprocess(imgs_test_mask)
masks_flat = predicted_masks.flatten()
sks_flat = imgs_test_gt.flatten()

# Draw the ROC curve
thresholds = roc_curve(test_gt_masks_flat, predicted_masks_flat, pos_label=255)
auc = roc_auc_score(fpr, tpr)
print(auc)
plt.plot(fpr, tpr, 'b', label='ADID-ROC (AUC = %0.4f)' % auc)
(handles=[line1], loc=4, prop={'size':12})
plt.plot(fpr, list(tpr))
plt.plot([0,1], [0,1], 'k--')
plt.xlabel("False Positive Rate (1-Specificity)")
plt.ylabel("True Positive Rate (Sensitivity)")
plt.savefig(path+'roc')
```

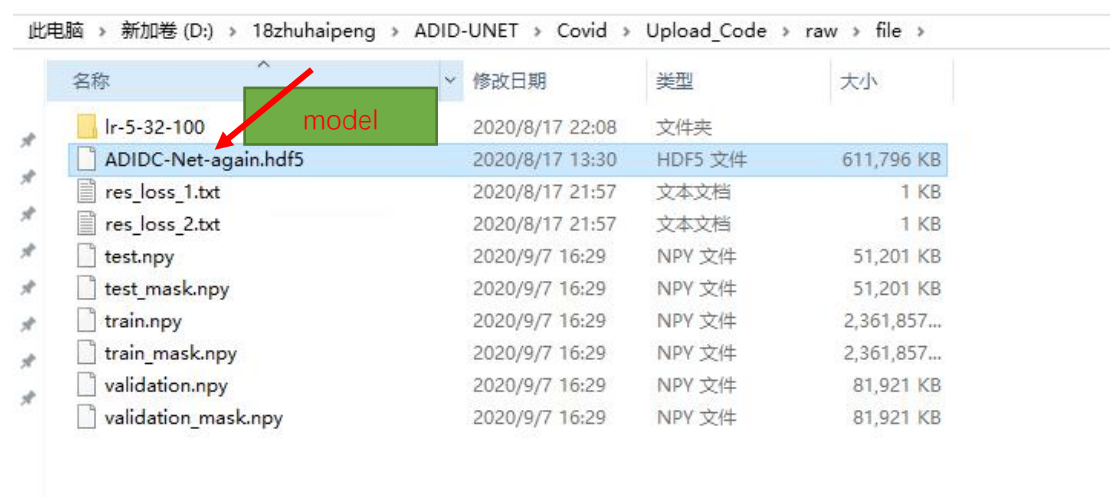
## 2.2 Obtaining results of ADID-NET model after executing the Python Model.

We have uploaded the test data as an attachment to PeerJ journal, and also uploaded the trained model to GitHub website <https://github.com/jalexnoel/ADID-UNET.git>.

- (1) Download the test data and save it in the "raw" file.
- (2) Then change the path of the "data.py" code and then run it, then test data will save as test.npy and test\_mask.npy. Of course, you need to create a "file" folder in the "raw" folder. like this:



(3) We have downloaded the trained model to the "file" folder, as shown in the figure:



(4) Next, we just need to change the relevant path of predict.py and plotone.py. Then execute it to obtain the relevant prediction results and indicators. As shown in the figure below:



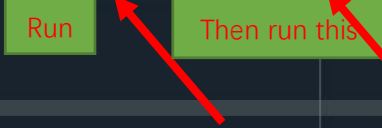
```

d:\9229samples\change_original_result4_bz=32_dp=0.2_2dense_again\code\plotone.py
aug_data.py x data.py x unetdeeplidate.py x predict.py x plotone.py x
py as np
ct import load_test_data
eeplidate import preprocess
import interp
plotlib.pyplot as plt
import metrics
metrics import roc_curve
metrics import roc_auc_score
metrics import confusion_matrix
metrics import precision_recall_curve
metrics import jaccard_similarity_score
metrics import f1_score

/18zhuhaipeng/ADIDC-Net/Covid/9229samples/change_original_result4_bz=32_dp=0.2_2dense_again/raw
masks = np.load(path + 'predict.npy')
imgs_test_mask = load_test_data()
gt = preprocess(imgs_test_mask)
masks_flat = predicted_masks.flatten()
sks_flat = imgs_test_gt.flatten()

r the ROC curve
thresholds = roc_curve(test_gt_masks_flat, predicted_masks_flat, pos_label=255)
s_auc(fpr,tpr)
: ".auc)
plotlib.pyplot as plt
list(fpr),list(tpr))
0,1],[0,1], 'k--')

```



Here are some predicted results and indexes:

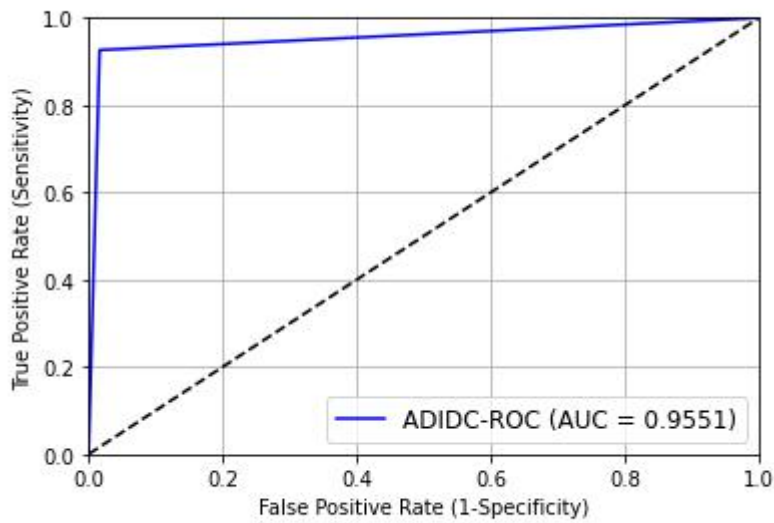
IDC-Net > Covid > 9229samples > change\_original\_result4\_bz=32\_dp=0.2\_2dense\_again > code > raw > file > lr-5-32-100 > UNET\_PREDICTIONS

名称	日期	类型	大小	标记
Test_Image_1.png	2020/8/17 22:06	PNG 文件	10 KB	
Test_Image_1_OriginalMask.png	2020/8/17 22:06	PNG 文件	1 KB	
Test_Image_1_Predict.png	2020/8/17 22:06	PNG 文件	1 KB	
Test_Image_2.png	2020/8/17 22:06	PNG 文件	10 KB	
Test_Image_2_OriginalMask.png	2020/8/17 22:06	PNG 文件	1 KB	
Test_Image_2_Predict.png	2020/8/17 22:06	PNG 文件	1 KB	
Test_Image_3.png	2020/8/17 22:06	PNG 文件	10 KB	
Test_Image_3_OriginalMask.png	2020/8/17 22:06	PNG 文件	1 KB	
Test_Image_3_Predict.png	2020/8/17 22:06	PNG 文件	1 KB	
Test_Image_4.png	2020/8/17 22:06	PNG 文件	10 KB	
Test_Image_4_OriginalMask.png	2020/8/17 22:06	PNG 文件	1 KB	
Test_Image_4_Predict.png	2020/8/17 22:06	PNG 文件	1 KB	
Test_Image_5.png	2020/8/17 22:06	PNG 文件	10 KB	
Test_Image_5_OriginalMask.png	2020/8/17 22:06	PNG 文件	1 KB	
Test_Image_5_Predict.png	2020/8/17 22:06	PNG 文件	1 KB	
Test_Image_6.png	2020/8/17 22:06	PNG 文件	10 KB	
Test_Image_6_OriginalMask.png	2020/8/17 22:06	PNG 文件	1 KB	

```

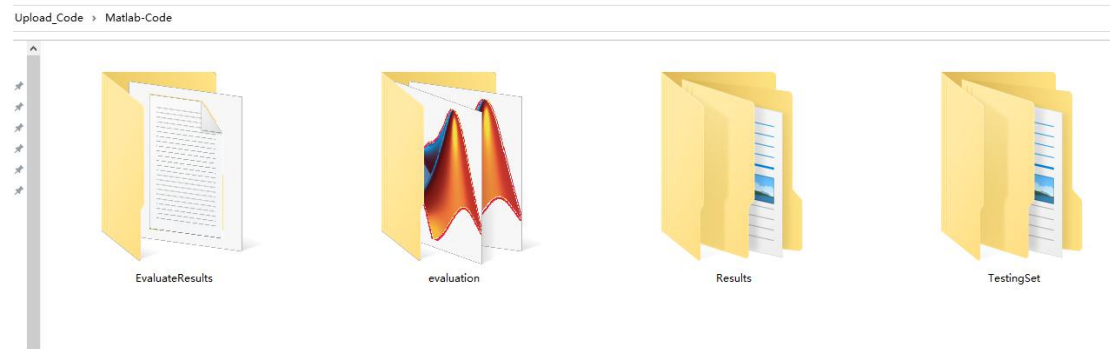
In [2]: runfile('D:/18zhuhaipeng/ADIDC-Net/Covid/Upload_Code/predict.py', wdir='D:/18zhuhaipeng/ADIDC-Net/
Covid/Upload_Code')
Reloaded modules: unetdeeplidate
Loading saved weights...
-----
Predicting masks on test data...
-----
200/200 [=====] - 2s 9ms/step
200/200 [=====] - 2s 9ms/step
Test loss: 0.19689014196395874
Test accuracy: 0.9700958251953125
Test dice_coef: 0.8031098580360413
Test sensitivity: 0.7973741674423218
Test specificity: 0.9965815877914429
Test f1score: 0.8200092744827271
Test precision: 0.8475865983963012
Successfully Saved Results to D:/18zhuhaipeng/ADIDC-Net/Covid/9229samples/
change_original_result4_bz=32_dp=0.2_2dense_again/raw/file/lr-5-32-100/UNET_PREDICTIONS/
In [3]:

```



### 2.3 Information about the Matlab Scripts used to analyze the indicators of $S_m$ , $E_\alpha$ and MAE

We can get other indicators of  $S_m$ ,  $E_\alpha$  and MAE following the “Matlab-Code” folder:



There are some Subfolders in the “EvaluateResults” folder, as shown below. The subfolders just are used to save the values after running the “main.m” code.

Upload\_Code > Matlab-Code > EvaluateResults

名称	修改日期	类型	大小
GT-1-mat	2020/10/20 16:07	文件夹	
GT-1_result.txt	2020/10/20 16:13	文本文档	1 KB

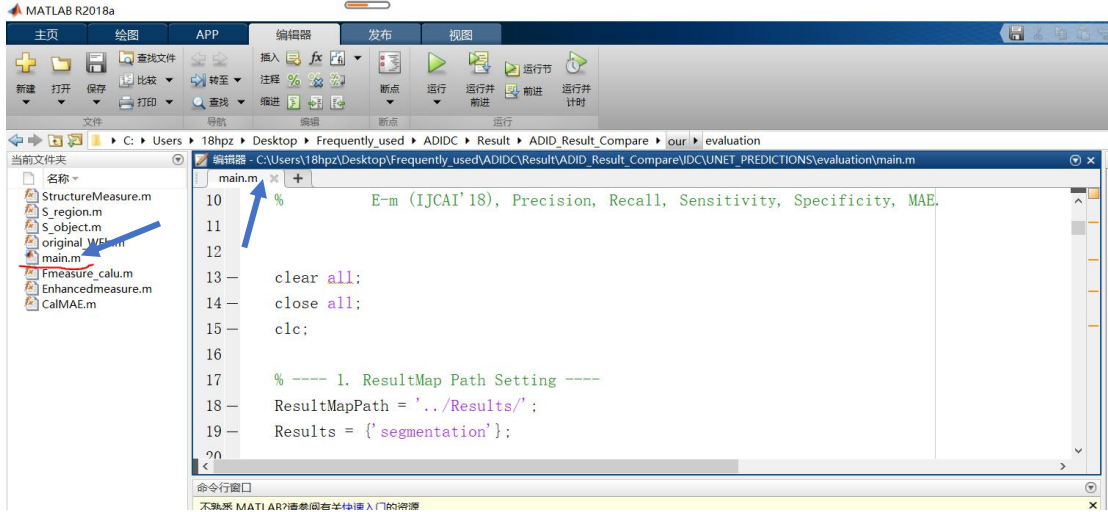
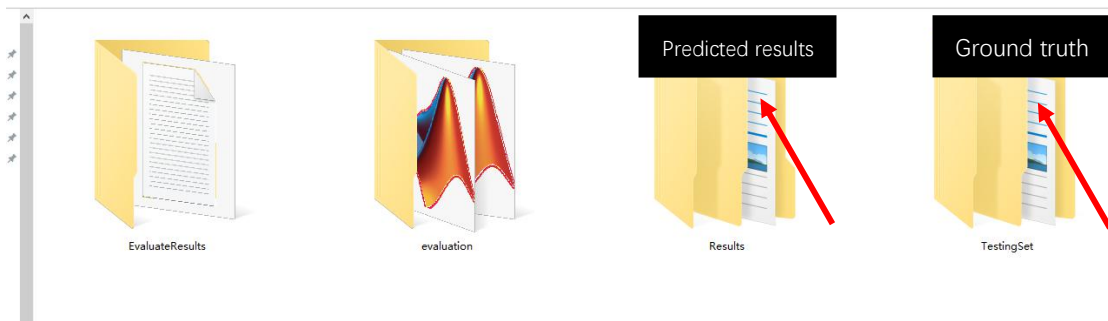
The Matlab scripts in the “evaluation” folder, as shown in the flowing figures:

Upload\_Code > Matlab-Code > evaluation

名称	修改日期	类型	大小
CalMAE.m	2020/7/20 20:26	M 文件	1 KB
Enhancedmeasure.m	2020/7/20 20:26	M 文件	3 KB
Fmeasure_calu.m	2020/7/20 20:26	M 文件	2 KB
main.m	2020/10/16 20:09	M 文件	7 KB
original_WFb.m	2020/7/20 20:26	M 文件	2 KB
S_object.m	2020/7/20 20:26	M 文件	2 KB
S_region.m	2020/7/20 20:26	M 文件	4 KB
StructureMeasure.m	2020/7/20 20:26	M 文件	2 KB

Please use "main.m" to get the evaluation results as shown below

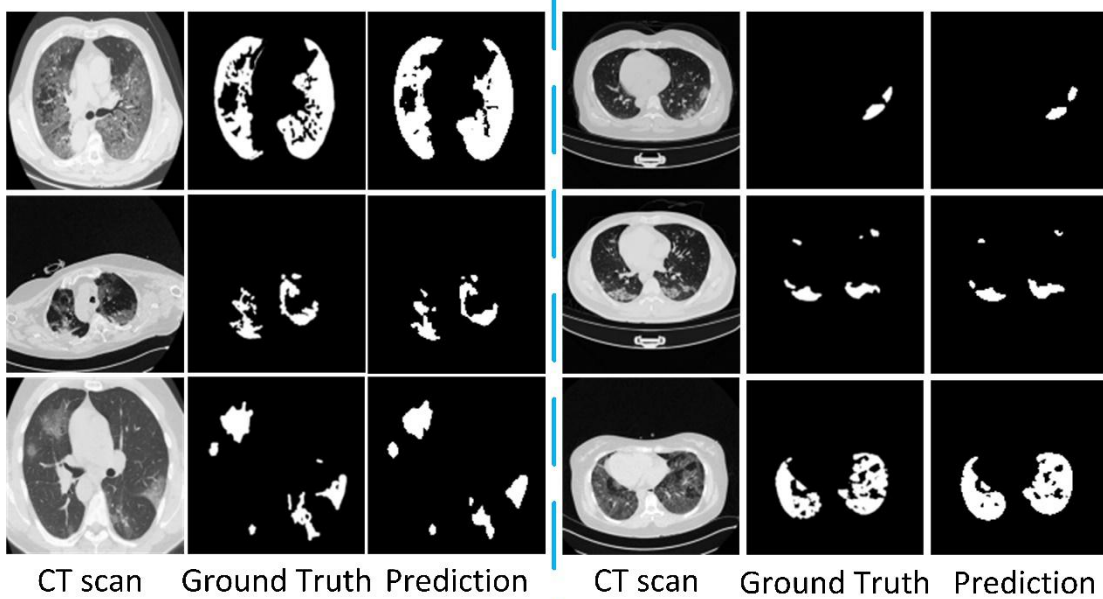
Upload\_Code > Matlab-Code



```

编辑器 - C:\Users\18hpz\Desktop\Upload_Code\Matlab-Code\evaluation\main.m
mean2.m  visual_general_mat.m  main.m  +
4  %Homepage: http://dpfan.net/
5  %Projectpage: https://github.com/DengPingFan/Inf-Net
6  %First version: 2020-4-15
7  %Any questions please contact with dengpfan@gmail.com.
8  %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
9  %Function: Providing several important metrics: Dice, IoU, F1, S-m (ICCV'17),
10 %      E-m (IJCAI'18), Precision, Recall, Sensitivity, Specificity, MAE.
11
命令窗口
不熟悉 MATLAB? 请参阅有关快速入门的资源。
Evaluating(GT Dataset, OURUNet Model, Test_Image_92_Predict.png Image): 192/200
Evaluating(GT Dataset, OURUNet Model, Test_Image_93_Predict.png Image): 193/200
Evaluating(GT Dataset, OURUNet Model, Test_Image_94_Predict.png Image): 194/200
Evaluating(GT Dataset, OURUNet Model, Test_Image_95_Predict.png Image): 195/200
Evaluating(GT Dataset, OURUNet Model, Test_Image_96_Predict.png Image): 196/200
Evaluating(GT Dataset, OURUNet Model, Test_Image_97_Predict.png Image): 197/200
Evaluating(GT Dataset, OURUNet Model, Test_Image_98_Predict.png Image): 198/200
Evaluating(GT Dataset, OURUNet Model, Test_Image_99_Predict.png Image): 199/200
Evaluating(GT Dataset, OURUNet Model, Test_Image_9_Predict.png Image): 200/200
(Dataset:GT: Model:OURUNet) Sm:0.8509;meanEm:0.9449;MAE:0.0082.
时间已过 21.757974 秒。

```



Our results are obtained through experiments and believe by submitting the codes and the usage document our works would add information to existing literature. If you have any questions, please contact us through email:

Mr. Haipenng at [18hpzhu@stu.edu.cn](mailto:18hpzhu@stu.edu.cn)

Or

Dr. Alex Noel Joseph Raj [jalexnoel@stu.edu.cn](mailto:jalexnoel@stu.edu.cn).