

Step 1: First, go to the preprocessing folder located in the codes folder. Navigate to the `main.m` file.

Step 2: Modify the directories for your input RGB images that require preprocessing, such as color fusion and enhancement.

Step 3: Save the enhanced images in the output directory specified in `main.m`.

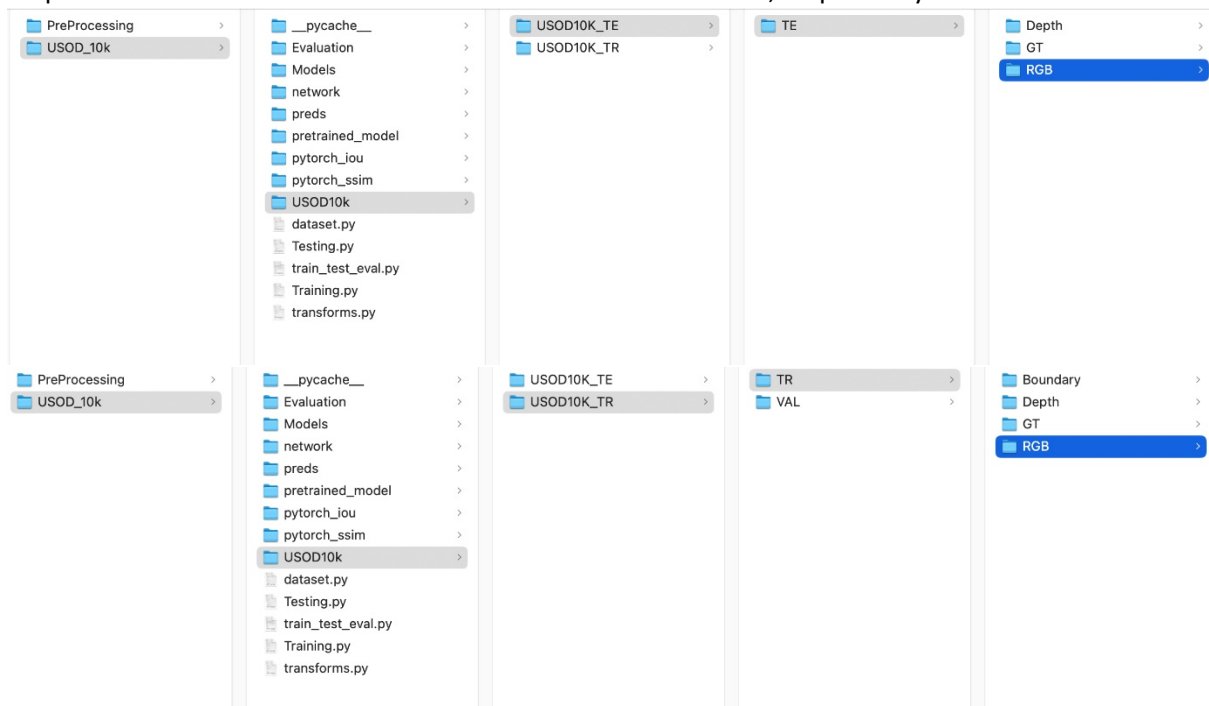
Step 4: Store the outputs as required for the USOD code, as illustrated below.

```
% Set input and output directories
```

```
inputFolder = '/Users/praneethreddy/Downloads/USOD10k/USOD10k/USOD10K_TE/TE/RGB';
```

```
outputFolder = '/Users/praneethreddy/Downloads/D1/output_te';
```

Step 5: Below are the RGB directories for test and train datasets, respectively.



Step 6: Navigate to the directory containing `train_test_eval.py`. Open it and update the paths to your stored pretrained model, trainset, testset, and other required files.

```

21  0f 89c79d9e 40c cndv
22
23  79b2e()
24  fe
25
26  (,--29a6-q7t1,' fLb6=2f1' qei9nff=\\,' mefB=,b9f9 40c 29Atu0 Le2nff,cxf,)
27  (,--wefmoq2,' fLb6=2f1' qei9nff=,n200D0K,' mefB=,eA9fn9ieq wefmoq u9we,)
28  (,--E9fn9efrou,' qei9nff=,E9f2e' fLb6=2f1Spoo9' mefB=,E9fn9efrou ol uof,)
29  u9f
30
31  (,--f2e7-b9f92,' fLb6=2f1' qei9nff=,\\n2e12\\b19ue6f9leqq\\l\\domu9o9q2\\n200D0K\\n200D0K\\n200D0K\\LE,)
32  (,--29a6-f2e7-b9f9-100f,' qei9nff=,b1e92\\,' fLb6=2f1' mefB=,29a6-f2e7euc\\ w9be b9f9,)
33  (,--1e2fTu0,' qei9nff=,E9f2e' fLb6=2f1Spoo9' mefB=,1e2fTu0 ol uof,)
34
35  (,--29a6-w9qef-q7t1,' qei9nff=,c9ec9b0tu7\\,' fLb6=2f1' mefB=,29a6 w9qef b9f9,)
36  (,--f19tu2e9,' qei9nff=,\\n2e12\\b19ue6f9leqq\\l\\domu9o9q2\\n200D0K\\n200D0K\\n200D0K\\LE,' fLb6=2f1' mefB=,119tu2u0 2ef,)
37  (,--2f6ba9n92,' qei9nff=,e0000' fLb6=7uf' mefB=,f9e 2f6b 5 40c 9q1n2e7u0 fL,)
38  (,--2f6ba9n92,' qei9nff=,e0000' fLb6=7uf' mefB=,f9e 2f6b 7 40c 9q1n2e7u0 fL,)
39  (,--p9f9-27ze,' qei9nff=,0' fLb6=7uf' mefB=,p9f9-27ze,)
40  (,--eboc92,' qei9nff=,500' fLb6=7uf' mefB=,eboc92,)
41  (,--fL,' qei9nff=,7e-9' fLb6=7uf' mefB=,f9e1u2u0 19fe,)
42  (,--fL-qec9\\-d9u99,' qei9nff=,0' fLb6=7uf' mefB=,f9e1u2u0 19fe qec9\\,)
43  (,--b1e9f19tu0-q7t1,' qei9nff=,\\n2e12\\b19ue6f9leqq\\l\\domu9o9q2\\n200D0K\\b1e9f19tu0-q7t1' fLb6=2f1'
44  (,--7u0-27ze,' qei9nff=,559' fLb6=7uf' mefB=,uefmo9k 7u0n9 27ze,)
45  (,--f19tu-2f6ba,' qei9nff=,e0000' fLb6=7uf' mefB=,f19tu-2f6ba,)
46  (,--q9f9-100f,' qei9nff=,,' fLb6=2f1' mefB=,q9f9 b9f9,)
47  (,--7u7f-w9fmoq,' qei9nff=,fcb:\\\\75\\'0'0'7:3377,' fLb6=2f1' mefB=,7u7f-w9fmoq,)
48  (,--119tu2u0,' qei9nff=,E9f2e' fLb6=2f1Spoo9' mefB=,119tu2u0 ol uof,)
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96  2
97  2
98  2
99  2
100 2

```

Step 7: Once all directories and requirements for training, testing, and evaluation are set up, run the following command:

```
python3 train_test_eval.py --Training 1 --Testing 1 --Evaluation 1 > log/loss.log &
```

```
:/home/USOD10k_2# python3 train_test_eval.py --Training 1 --Testing 1 --Evaluation 1 > log/loss.log &
```

Step 8: Afterward, you will observe epochs running, as shown below.

Step 9: To check the last 300 lines of the log, use the following command:

```
tail -f -n 300 log/loss.log
```

```
root@iit:/home/USOD10k_2 -- ssh attunurip@10.250.101.55
whole_iter_num: 8918 --- 0.9420 --- total_loss: 13.414548 --- bce loss: 0.637312 --- e loss: 1.025336
whole_iter_num: 8919 --- 0.9431 --- total_loss: 13.333829 --- bce loss: 0.635137 --- e loss: 0.989778
whole_iter_num: 8920 --- 0.9443 --- total_loss: 13.658703 --- bce loss: 0.629851 --- e loss: 1.086867
whole_iter_num: 8921 --- 0.9454 --- total_loss: 15.403211 --- bce loss: 0.645419 --- e loss: 1.082643
whole_iter_num: 8922 --- 0.9465 --- total_loss: 13.813672 --- bce loss: 0.637168 --- e loss: 1.038928
whole_iter_num: 8923 --- 0.9476 --- total_loss: 13.903922 --- bce loss: 0.638468 --- e loss: 0.998111
whole_iter_num: 8924 --- 0.9487 --- total_loss: 14.135058 --- bce loss: 0.643960 --- e loss: 0.973196
whole_iter_num: 8925 --- 0.9498 --- total_loss: 14.162411 --- bce loss: 0.644136 --- e loss: 1.025945
whole_iter_num: 8926 --- 0.9509 --- total_loss: 14.050865 --- bce loss: 0.629310 --- e loss: 1.071784
whole_iter_num: 8927 --- 0.9521 --- total_loss: 13.576701 --- bce loss: 0.650803 --- e loss: 1.029453
whole_iter_num: 8928 --- 0.9532 --- total_loss: 13.897047 --- bce loss: 0.665165 --- e loss: 0.923846
whole_iter_num: 8929 --- 0.9543 --- total_loss: 13.132347 --- bce loss: 0.622499 --- e loss: 1.061176
whole_iter_num: 8930 --- 0.9554 --- total_loss: 12.655477 --- bce loss: 0.655339 --- e loss: 0.954601
whole_iter_num: 8931 --- 0.9565 --- total_loss: 12.853951 --- bce loss: 0.607709 --- e loss: 1.126025
whole_iter_num: 8932 --- 0.9576 --- total_loss: 14.163046 --- bce loss: 0.632499 --- e loss: 0.992172
whole_iter_num: 8933 --- 0.9588 --- total_loss: 12.898547 --- bce loss: 0.655339 --- e loss: 0.944192
whole_iter_num: 8934 --- 0.9599 --- total_loss: 13.127161 --- bce loss: 0.606922 --- e loss: 1.179002
whole_iter_num: 8935 --- 0.9610 --- total_loss: 13.635107 --- bce loss: 0.630832 --- e loss: 1.145011
whole_iter_num: 8936 --- 0.9621 --- total_loss: 12.726273 --- bce loss: 0.636041 --- e loss: 1.032131
whole_iter_num: 8937 --- 0.9632 --- total_loss: 13.888435 --- bce loss: 0.607990 --- e loss: 1.126148
whole_iter_num: 8938 --- 0.9643 --- total_loss: 13.376040 --- bce loss: 0.639473 --- e loss: 0.947499
whole_iter_num: 8939 --- 0.9654 --- total_loss: 14.605342 --- bce loss: 0.621514 --- e loss: 1.071147
whole_iter_num: 8940 --- 0.9665 --- total_loss: 14.210673 --- bce loss: 0.654725 --- e loss: 1.153964
whole_iter_num: 8941 --- 0.9677 --- total_loss: 13.625788 --- bce loss: 0.652847 --- e loss: 0.909877
whole_iter_num: 8942 --- 0.9688 --- total_loss: 14.680649 --- bce loss: 0.609236 --- e loss: 0.934726
whole_iter_num: 8943 --- 0.9699 --- total_loss: 12.912962 --- bce loss: 0.629162 --- e loss: 1.062717
whole_iter_num: 8944 --- 0.9710 --- total_loss: 13.776265 --- bce loss: 0.671412 --- e loss: 0.869234
whole_iter_num: 8945 --- 0.9721 --- total_loss: 14.397865 --- bce loss: 0.608355 --- e loss: 1.110623
whole_iter_num: 8946 --- 0.9732 --- total_loss: 12.600859 --- bce loss: 0.647085 --- e loss: 0.943581
whole_iter_num: 8947 --- 0.9744 --- total_loss: 14.006679 --- bce loss: 0.614404 --- e loss: 1.128945
whole_iter_num: 8948 --- 0.9755 --- total_loss: 13.179414 --- bce loss: 0.653069 --- e loss: 0.995957
whole_iter_num: 8949 --- 0.9766 --- total_loss: 14.669308 --- bce loss: 0.617117 --- e loss: 1.089267
whole_iter_num: 8950 --- 0.9777 --- total_loss: 13.749640 --- bce loss: 0.648656 --- e loss: 0.934289
whole_iter_num: 8951 --- 0.9788 --- total_loss: 13.350132 --- bce loss: 0.653440 --- e loss: 0.957429
whole_iter_num: 8952 --- 0.9799 --- total_loss: 14.409875 --- bce loss: 0.596373 --- e loss: 1.185593
whole_iter_num: 8953 --- 0.9810 --- total_loss: 12.952044 --- bce loss: 0.608477 --- e loss: 1.125404
whole_iter_num: 8954 --- 0.9821 --- total_loss: 13.031050 --- bce loss: 0.609637 --- e loss: 1.139660
whole_iter_num: 8955 --- 0.9832 --- total_loss: 13.100767 --- bce loss: 0.659637 --- e loss: 0.886041
whole_iter_num: 8956 --- 0.9844 --- total_loss: 13.249066 --- bce loss: 0.650787 --- e loss: 0.952846
whole_iter_num: 8957 --- 0.9855 --- total_loss: 13.928114 --- bce loss: 0.645708 --- e loss: 1.068918
whole_iter_num: 8958 --- 0.9866 --- total_loss: 14.088411 --- bce loss: 0.619952 --- e loss: 1.020259
whole_iter_num: 8959 --- 0.9877 --- total_loss: 12.975608 --- bce loss: 0.630197 --- e loss: 1.043094
whole_iter_num: 8960 --- 0.9888 --- total_loss: 13.339904 --- bce loss: 0.630474 --- e loss: 1.083778
whole_iter_num: 8961 --- 0.9899 --- total_loss: 13.125684 --- bce loss: 0.617722 --- e loss: 1.074192
whole_iter_num: 8962 --- 0.9910 --- total_loss: 13.138375 --- bce loss: 0.620256 --- e loss: 0.931327
whole_iter_num: 8963 --- 0.9921 --- total_loss: 12.979497 --- bce loss: 0.656875 --- e loss: 1.074460
whole_iter_num: 8964 --- 0.9932 --- total_loss: 14.034346 --- bce loss: 0.621133 --- e loss: 0.919252
whole_iter_num: 8965 --- 0.9944 --- total_loss: 13.482658 --- bce loss: 0.652144 --- e loss: 0.986993
whole_iter_num: 8966 --- 0.9955 --- total_loss: 13.572515 --- bce loss: 0.628968 --- e loss: 1.040812
whole_iter_num: 8967 --- 0.9966 --- total_loss: 13.466271 --- bce loss: 0.628968 --- e loss: 1.040812
Epoch finished! Loss: 13.719990100520767
Starting epoch 11/200.
epoch: 11 --- 1.19.0001
root@iit:/home/USOD10k_2#
```

Step 10: After 200 epochs, the testing procedure begins, as seen below.

Step 11: At the 60,000th iteration, a checkpoint will be saved as `UVST.pth`.

```
whole_iter_num: 59969 --- 0.8540 --- total_loss: 13.095423 --- bce loss: 0.647074 --- e loss: 0.930612
whole_iter_num: 59970 --- 0.8551 --- total_loss: 13.434415 --- bce loss: 0.642506 --- e loss: 0.940327
whole_iter_num: 59971 --- 0.8562 --- total_loss: 12.964916 --- bce loss: 0.636328 --- e loss: 1.011239
whole_iter_num: 59972 --- 0.8573 --- total_loss: 13.126073 --- bce loss: 0.644217 --- e loss: 0.932376
whole_iter_num: 59973 --- 0.8584 --- total_loss: 13.091476 --- bce loss: 0.643306 --- e loss: 0.944087
whole_iter_num: 59974 --- 0.8595 --- total_loss: 12.616143 --- bce loss: 0.647721 --- e loss: 0.914696
whole_iter_num: 59975 --- 0.8606 --- total_loss: 13.592005 --- bce loss: 0.618860 --- e loss: 1.056448
whole_iter_num: 59976 --- 0.8617 --- total_loss: 13.175953 --- bce loss: 0.654542 --- e loss: 0.894322
whole_iter_num: 59977 --- 0.8628 --- total_loss: 12.408484 --- bce loss: 0.644199 --- e loss: 0.960803
whole_iter_num: 59978 --- 0.8639 --- total_loss: 12.371378 --- bce loss: 0.619662 --- e loss: 1.063060
whole_iter_num: 59979 --- 0.8650 --- total_loss: 12.529736 --- bce loss: 0.600626 --- e loss: 1.106589
whole_iter_num: 59980 --- 0.8661 --- total_loss: 12.723641 --- bce loss: 0.630848 --- e loss: 1.048669
whole_iter_num: 59981 --- 0.8672 --- total_loss: 12.893566 --- bce loss: 0.620801 --- e loss: 0.974994
whole_iter_num: 59982 --- 0.8683 --- total_loss: 13.435351 --- bce loss: 0.654828 --- e loss: 1.060935
whole_iter_num: 59983 --- 0.8694 --- total_loss: 12.481985 --- bce loss: 0.630569 --- e loss: 0.902659
whole_iter_num: 59984 --- 0.8705 --- total_loss: 12.574064 --- bce loss: 0.609164 --- e loss: 0.955349
whole_iter_num: 59985 --- 0.8716 --- total_loss: 13.087758 --- bce loss: 0.654538 --- e loss: 1.084653
whole_iter_num: 59986 --- 0.8727 --- total_loss: 12.506569 --- bce loss: 0.627092 --- e loss: 0.893528
whole_iter_num: 59987 --- 0.8738 --- total_loss: 12.957270 --- bce loss: 0.635282 --- e loss: 1.005303
whole_iter_num: 59988 --- 0.8749 --- total_loss: 13.783867 --- bce loss: 0.678635 --- e loss: 0.999608
whole_iter_num: 59989 --- 0.8760 --- total_loss: 12.726444 --- bce loss: 0.602325 --- e loss: 0.782651
whole_iter_num: 59990 --- 0.8771 --- total_loss: 13.291338 --- bce loss: 0.646401 --- e loss: 1.173597
whole_iter_num: 59991 --- 0.8782 --- total_loss: 12.696916 --- bce loss: 0.613832 --- e loss: 0.845025
whole_iter_num: 59992 --- 0.8793 --- total_loss: 12.631577 --- bce loss: 0.609863 --- e loss: 1.022253
whole_iter_num: 59993 --- 0.8804 --- total_loss: 12.273543 --- bce loss: 0.594778 --- e loss: 1.117195
whole_iter_num: 59994 --- 0.8815 --- total_loss: 12.304924 --- bce loss: 0.607905 --- e loss: 1.102849
whole_iter_num: 59995 --- 0.8826 --- total_loss: 13.379293 --- bce loss: 0.622105 --- e loss: 0.983930
whole_iter_num: 59996 --- 0.8837 --- total_loss: 13.206519 --- bce loss: 0.620804 --- e loss: 1.054705
whole_iter_num: 59997 --- 0.8848 --- total_loss: 12.614048 --- bce loss: 0.632852 --- e loss: 1.075474
whole_iter_num: 59998 --- 0.8859 --- total_loss: 13.363996 --- bce loss: 0.654844 --- e loss: 1.084897
whole_iter_num: 59999 --- 0.8870 --- total_loss: 12.840129 --- bce loss: 0.624722 --- e loss: 0.982638
whole_iter_num: 60000 --- 0.8881 --- total_loss: 12.785737 --- bce loss: 0.620825 --- e loss: 0.902679
adopt transformer encoder for tokens-to-token
Model loaded from /home/USOD10k_2/pretrained_model/80_7_T2T_ViT_t_14.pth.tar
adopt transformer encoder for tokens-to-token
Model loaded from /home/USOD10k_2/pretrained_model/80_7_T2T_ViT_t_14.pth.tar
checkpoint/UVST.pth
Model loaded from checkpoint/UVST.pth

Starting testing:
dataset:
Testing size: 1026

dataset: cost:76.8113129320803
eval[MAE]:/home/USOD10k_2/USOD10k_USOD10k_TE/TE dataset with USOD10k_2 method.
eval[Measure]:/home/USOD10k_2/USOD10k_USOD10k_TE/TE dataset with USOD10k_2 method.
eval[AP]:/home/USOD10k_2/USOD10k_USOD10k_TE/TE dataset with USOD10k_2 method.
eval[AUC]:/home/USOD10k_2/USOD10k_USOD10k_TE/TE dataset with USOD10k_2 method.
eval[EMeasure]:/home/USOD10k_2/USOD10k_USOD10k_TE/TE dataset with USOD10k_2 method.
eval[EMeasure]:/home/USOD10k_2/USOD10k_USOD10k_TE/TE dataset with USOD10k_2 method.
[cost:2576.84626] /home/USOD10k_2/USOD10k_USOD10k_TE/TE (USOD10k_2): 0.0238 mae || 0.9087 max-fn || 0.8946 mean-fn || 0.9561 max-EMeasure || 0.9516 mean-EMeasure || 0.9110 S-measure || 0.89
63 AP || 0.9638 AUC.
root@iit:/home/USOD10k_2#
```

Step 12: Evaluation metrics will be available in `result.txt`. Below are attached results for the model.

```
root@lit: /home/USOD10k_2 — ssh attunurip@10.250.101.55
/home/USOD10k_2/USOD10k/USOD10K_TE/TE (USOD10K_2): 0.1527 mae || 0.8682 max-fm || 0.7171 mean-fm || 0.9419 max-Emeasure || 0.8247 mean-Emeasure || 0.7358 S-measure || 0.8348 AP || 0.96
0.4 AUC.
/home/USOD10k_2/USOD10k/USOD10K_TE/TE (USOD10K_2): 0.0228 mae || 0.9147 max-fm || 0.9821 mean-fm || 0.9613 max-Emeasure || 0.9568 mean-Emeasure || 0.9269 S-measure || 0.8953 AP || 0.968
7 AUC.
/home/USOD10k_2/USOD10k/USOD10K_TE/TE (USOD10K_2): 0.0238 mae || 0.9887 max-fm || 0.8946 mean-fm || 0.9561 max-Emeasure || 0.9516 mean-Emeasure || 0.9116 S-measure || 0.8963 AP || 0.9638 AU
C.
```

Step 13: In the zip file `30\_dl\_code`, I have included preprocessing and `USOD\_10k` code. Preprocessing comprises color enhancement Matlab code, while `USOD\_10k` contains datasets, pretrained models, and Python files for evaluation, testing, and training.

