

In [54]:

```
from google.colab import drive
drive.mount("/content/drive")
import os
path = "/content/drive/My Drive/review"
os.chdir(path)
os.listdir(path)
```

Drive already mounted at /content/drive; to attempt to forcibly remount, call drive.mount("/content/drive", force_remount=True).

Out[54]: ['src', 'data', 'save', 'tensorboard']

Here are the results of the model applied to the epidemic data from Japan and Australia. Each table displayed at the end of the cell presents critical metrics for evaluating the model's performance.

In [55]:

```
!python src/train.py --data japan --sim_mat japan-adj
```

----- Parameters -----

Namespace(dataset='japan', sim_mat='japan-adj', n_layer=1, n_hidden=20, seed=42, epochs=1500, lr=0.001, weight_decay=0.0005, dropout=0.2, batch=128, check_point=1, shuffle=False, train=0.5, val=0.2, test=0.3, mylog=True, cuda=False, window=20, horizon=5, save_dir='save', gpu=0, lamda=0.01, patience=100, k=8, hidR=64, hidA=64, hidP=1, hw=0, extra='', label='', pcc='', n=2, res=0, s=2, result=0, ablation=None, eval='', record='', model='EpiGNN')

data shape (348, 47)
(348, 47)
size of train/val/test sets 150 69 105
2023-04-10 19:03:59,821 Model: EpiGNN(
(dropout): Dropout(p=0.2, inplace=False)
(backbone): RegionAwareConv(
(conv_l1): ConvBranch(
(conv): Conv2d(1, 8, kernel_size=(3, 1), stride=(1, 1))
(batchnorm): BatchNorm2d(8, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(pooling): AdaptiveMaxPool2d(output_size=(1, 47))
)
(conv_l2): ConvBranch(
(conv): Conv2d(1, 8, kernel_size=(5, 1), stride=(1, 1))
(batchnorm): BatchNorm2d(8, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(pooling): AdaptiveMaxPool2d(output_size=(1, 47))
)
(conv_p1): ConvBranch(
(conv): Conv2d(1, 8, kernel_size=(3, 1), stride=(1, 1), dilation=(2, 1))
(batchnorm): BatchNorm2d(8, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(pooling): AdaptiveMaxPool2d(output_size=(1, 47))
)
(conv_p2): ConvBranch(
(conv): Conv2d(1, 8, kernel_size=(5, 1), stride=(1, 1), dilation=(2, 1))
(batchnorm): BatchNorm2d(8, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
(pooling): AdaptiveMaxPool2d(output_size=(1, 47))
)
(conv_g): ConvBranch(
(conv): Conv2d(1, 8, kernel_size=(20, 1), stride=(1, 1))
(batchnorm): BatchNorm2d(8, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
)
(activate): Tanh()
)
(WQ): Linear(in_features=40, out_features=64, bias=True)
(WK): Linear(in_features=40, out_features=64, bias=True)
(leakyrelu): LeakyReLU(negative_slope=0.01, inplace=True)
(t_enc): Linear(in_features=1, out_features=40, bias=True)
(s_enc): Linear(in_features=1, out_features=40, bias=True)
(graphGen): GraphLearner(
(linear1): Linear(in_features=40, out_features=40, bias=True)
(linear2): Linear(in_features=40, out_features=40, bias=True)
)
(GNNBlocks): ModuleList(
(0): GraphConvLayer(
(act): ELU(alpha=1.0)
)
(1): GraphConvLayer(
(act): ELU(alpha=1.0)
)
)
(output): Linear(in_features=80, out_features=1, bias=True)
)
2023-04-10 19:03:59,821 # of model parameters: 16875
Begin training
Best validation epoch so far: 1 at Mon Apr 10 19:04:00 2023
Epoch 1 | Time: 0.33s | Train loss: 0.00020800 | Val loss: 0.00005342
TEST MAE: 1526.6133 std: 1415.1971 RMSE: 2778.9876 RMSEs: 2126.0090 PCC: 0.0080 PCCs: -0.0556 MAPE: 0.5244 R2: -0.8340
R2s: -1.4741 Var: -0.7491 Vars: -0.3025 Peak: 751.9292
Best validation epoch so far: 3 at Mon Apr 10 19:04:01 2023
Epoch 3 | Time: 0.21s | Train loss: 0.00018684 | Val loss: 0.00004842
TEST MAE: 1382.7311 std: 1295.2001 RMSE: 2629.6140 RMSEs: 2009.0314 PCC: 0.0126 PCCs: -0.0466 MAPE: 0.4725 R2: -0.6422
R2s: -1.1768 Var: -0.5412 Vars: -0.1395 Peak: 726.0485
Best validation epoch so far: 4 at Mon Apr 10 19:04:01 2023
Epoch 4 | Time: 0.21s | Train loss: 0.00020252 | Val loss: 0.00003350
TEST MAE: 1329.2455 std: 1259.9366 RMSE: 2341.6767 RMSEs: 1773.2915 PCC: 0.1577 PCCs: 0.1283 MAPE: 0.5632 R2: -0.3022
R2s: -0.5566 Var: -0.2995 Vars: 0.0045 Peak: 557.9371
Best validation epoch so far: 7 at Mon Apr 10 19:04:01 2023
Epoch 7 | Time: 0.16s | Train loss: 0.00017279 | Val loss: 0.00003244
TEST MAE: 1532.3419 std: 1246.8752 RMSE: 2377.1855 RMSEs: 1841.2408 PCC: 0.2765 PCCs: 0.2036 MAPE: 0.8057 R2: -0.3420
R2s: -0.6712 Var: -0.3365 Vars: -0.2765 Peak: 514.8798
Best validation epoch so far: 8 at Mon Apr 10 19:04:02 2023
Epoch 8 | Time: 0.16s | Train loss: 0.00018535 | Val loss: 0.00002967
TEST MAE: 1397.4122 std: 1152.0396 RMSE: 2264.4471 RMSEs: 1747.2018 PCC: 0.2623 PCCs: 0.2054 MAPE: 0.6796 R2: -0.2177
R2s: -0.5013 Var: -0.2177 Vars: -0.1330 Peak: 529.8265
Best validation epoch so far: 9 at Mon Apr 10 19:04:02 2023
Epoch 9 | Time: 0.15s | Train loss: 0.00014900 | Val loss: 0.00002773
TEST MAE: 1258.7238 std: 1065.4233 RMSE: 2198.4003 RMSEs: 1690.1622 PCC: 0.2096 PCCs: 0.1322 MAPE: 0.5316 R2: -0.1477
R2s: -0.3959 Var: -0.1462 Vars: -0.0513 Peak: 557.9666
Best validation epoch so far: 25 at Mon Apr 10 19:04:04 2023
Epoch 25 | Time: 0.15s | Train loss: 0.00012472 | Val loss: 0.00002208
TEST MAE: 855.6798 std: 699.5499 RMSE: 1916.6354 RMSEs: 1452.4968 PCC: 0.3924 PCCs: 0.3455 MAPE: 0.2744 R2: 0.1276 R2s: 0.0400 Var: 0.1532 Vars: 0.1157 Peak: 528.0016
Best validation epoch so far: 26 at Mon Apr 10 19:04:04 2023

Epoch 26 | Time: 0.15s | Train loss: 0.00010886 | Val loss: 0.00001980
TEST MAE: 920.7162 std: 738.9091 RMSE: 1877.9095 RMSEs: 1427.4164 PCC: 0.4041 PCCs: 0.3304 MAPE: 0.3538 R2: 0.1625 R2s: 0.0704 Var: 0.1633 Vars: 0.1057 Peak: 487.3413
Best validation epoch so far: 39 at Mon Apr 10 19:04:06 2023
Epoch 39 | Time: 0.15s | Train loss: 0.00009823 | Val loss: 0.00001715
TEST MAE: 968.6265 std: 771.1889 RMSE: 1840.0709 RMSEs: 1396.9921 PCC: 0.4524 PCCs: 0.3984 MAPE: 0.3491 R2: 0.1959 R2s: 0.1050 Var: 0.2021 Vars: 0.1567 Peak: 430.5537
Best validation epoch so far: 40 at Mon Apr 10 19:04:07 2023
Epoch 40 | Time: 0.15s | Train loss: 0.00008894 | Val loss: 0.00001657
TEST MAE: 948.9078 std: 758.1611 RMSE: 1823.6440 RMSEs: 1382.2144 PCC: 0.4642 PCCs: 0.4203 MAPE: 0.3284 R2: 0.2102 R2s: 0.1281 Var: 0.2146 Vars: 0.1736 Peak: 431.8389
Best validation epoch so far: 52 at Mon Apr 10 19:04:08 2023
Epoch 52 | Time: 0.15s | Train loss: 0.00006833 | Val loss: 0.00001521
TEST MAE: 906.6150 std: 744.8054 RMSE: 1732.9553 RMSEs: 1313.1361 PCC: 0.5410 PCCs: 0.5046 MAPE: 0.2679 R2: 0.2868 R2s: 0.2122 Var: 0.2889 Vars: 0.2434 Peak: 423.4306
Best validation epoch so far: 121 at Mon Apr 10 19:04:21 2023
Epoch 121 | Time: 0.15s | Train loss: 0.00003574 | Val loss: 0.00001294
TEST MAE: 685.7661 std: 562.6644 RMSE: 1508.6971 RMSEs: 1131.2607 PCC: 0.7044 PCCs: 0.6915 MAPE: 0.1811 R2: 0.4595 R2s: 0.4270 Var: 0.4711 Vars: 0.4576 Peak: 388.5564
Best validation epoch so far: 128 at Mon Apr 10 19:04:22 2023
Epoch 128 | Time: 0.15s | Train loss: 0.00003241 | Val loss: 0.00001286
TEST MAE: 655.9500 std: 564.0033 RMSE: 1669.6816 RMSEs: 1245.5028 PCC: 0.6965 PCCs: 0.7216 MAPE: 0.1588 R2: 0.3379 R2s: 0.3147 Var: 0.3918 Vars: 0.4217 Peak: 455.3871
Best validation epoch so far: 130 at Mon Apr 10 19:04:22 2023
Epoch 130 | Time: 0.17s | Train loss: 0.00002828 | Val loss: 0.00001233
TEST MAE: 692.1784 std: 565.1931 RMSE: 1597.1813 RMSEs: 1195.2944 PCC: 0.6647 PCCs: 0.6563 MAPE: 0.1669 R2: 0.3942 R2s: 0.3639 Var: 0.3990 Vars: 0.3824 Peak: 404.6172
Best validation epoch so far: 140 at Mon Apr 10 19:04:23 2023
Epoch 140 | Time: 0.15s | Train loss: 0.00002858 | Val loss: 0.00001209
TEST MAE: 684.1658 std: 565.4355 RMSE: 1461.3337 RMSEs: 1096.5951 PCC: 0.7596 PCCs: 0.7680 MAPE: 0.2819 R2: 0.4929 R2s: 0.4588 Var: 0.5426 Vars: 0.5570 Peak: 373.0912
Best validation epoch so far: 145 at Mon Apr 10 19:04:24 2023
Epoch 145 | Time: 0.15s | Train loss: 0.00002255 | Val loss: 0.00001062
TEST MAE: 658.3906 std: 569.6704 RMSE: 1504.4786 RMSEs: 1120.3439 PCC: 0.7876 PCCs: 0.8198 MAPE: 0.2124 R2: 0.4625 R2s: 0.4430 Var: 0.5374 Vars: 0.5925 Peak: 403.0253
Best validation epoch so far: 146 at Mon Apr 10 19:04:24 2023
Epoch 146 | Time: 0.16s | Train loss: 0.00002277 | Val loss: 0.00001005
TEST MAE: 619.8069 std: 535.4443 RMSE: 1492.9483 RMSEs: 1110.5835 PCC: 0.7917 PCCs: 0.8170 MAPE: 0.1640 R2: 0.4707 R2s: 0.4557 Var: 0.5307 Vars: 0.5763 Peak: 410.4854
Best validation epoch so far: 162 at Mon Apr 10 19:04:27 2023
Epoch 162 | Time: 0.16s | Train loss: 0.00001812 | Val loss: 0.00000839
TEST MAE: 565.4493 std: 484.5740 RMSE: 1366.1373 RMSEs: 1010.8762 PCC: 0.8090 PCCs: 0.8253 MAPE: 0.1650 R2: 0.5568 R2s: 0.5561 Var: 0.5919 Vars: 0.6254 Peak: 371.3256
Best validation epoch so far: 191 at Mon Apr 10 19:04:32 2023
Epoch 191 | Time: 0.21s | Train loss: 0.00001953 | Val loss: 0.00000803
TEST MAE: 545.0195 std: 469.5343 RMSE: 1375.1947 RMSEs: 1015.3752 PCC: 0.8321 PCCs: 0.8447 MAPE: 0.1330 R2: 0.5509 R2s: 0.5548 Var: 0.5754 Vars: 0.6046 Peak: 376.7180
Best validation epoch so far: 200 at Mon Apr 10 19:04:34 2023
Epoch 200 | Time: 0.21s | Train loss: 0.00001859 | Val loss: 0.00000719
TEST MAE: 510.5643 std: 418.6705 RMSE: 1197.7129 RMSEs: 891.6951 PCC: 0.8328 PCCs: 0.8346 MAPE: 0.1754 R2: 0.6593 R2s: 0.6486 Var: 0.6637 Vars: 0.6665 Peak: 315.5449
Best validation epoch so far: 201 at Mon Apr 10 19:04:35 2023
Epoch 201 | Time: 0.21s | Train loss: 0.00001378 | Val loss: 0.00000676
TEST MAE: 497.8332 std: 427.2199 RMSE: 1231.8493 RMSEs: 908.9167 PCC: 0.8426 PCCs: 0.8542 MAPE: 0.1618 R2: 0.6396 R2s: 0.6436 Var: 0.6568 Vars: 0.6807 Peak: 329.6801
Best validation epoch so far: 208 at Mon Apr 10 19:04:36 2023
Epoch 208 | Time: 0.15s | Train loss: 0.00001285 | Val loss: 0.00000659
TEST MAE: 503.3971 std: 436.9259 RMSE: 1199.3448 RMSEs: 886.3611 PCC: 0.8499 PCCs: 0.8610 MAPE: 0.1904 R2: 0.6584 R2s: 0.6601 Var: 0.6769 Vars: 0.6991 Peak: 323.0698
Best validation epoch so far: 218 at Mon Apr 10 19:04:37 2023
Epoch 218 | Time: 0.15s | Train loss: 0.00001525 | Val loss: 0.00000631
TEST MAE: 474.8288 std: 408.7501 RMSE: 1152.8259 RMSEs: 854.4959 PCC: 0.8496 PCCs: 0.8579 MAPE: 0.1836 R2: 0.6844 R2s: 0.6817 Var: 0.6915 Vars: 0.7026 Peak: 302.7009
Best validation epoch so far: 232 at Mon Apr 10 19:04:39 2023
Epoch 232 | Time: 0.15s | Train loss: 0.00000999 | Val loss: 0.00000627
TEST MAE: 478.6299 std: 403.7496 RMSE: 1141.8416 RMSEs: 844.6900 PCC: 0.8552 PCCs: 0.8660 MAPE: 0.1519 R2: 0.6904 R2s: 0.6929 Var: 0.6928 Vars: 0.7074 Peak: 305.5601
Figure(640x480)
-----Final evaluation-----

Metric	Overall	States/Places Adjusted
MAE	478.6299	403.7496
RMSE	1141.8416	844.6900
PCC	0.8552	0.8660
MAPE	0.1519	0.1519
R2	0.6904	0.6929
Var	0.6928	0.7074
peak_mae	305.5601	305.5601

In [56]: !python src/train.py --data australia-covid --sim_mat australia-adj

```
----- Parameters -----  

Namespace(dataset='australia-covid', sim_mat='australia-adj', n_layer=1, n_hidden=20, seed=42, epochs=1500, lr=0.001, weight_decay=0.0005, dropout=0.2, batch=128, check_point=1, shuffle=False, train=0.5, val=0.2, test=0.3, mylog=True, cuda=False, window=20, horizon=5, save_dir='save', gpu=0, lamda=0.01, patience=100, k=8, hidR=64, hidA=64, hidP=1, hw=0, extra='', label='', pcc='', n=2, res=0, s=2, result=0, ablation=None, eval='', record='', model='EpiGNN')  

-----  

data shape (556, 8)  

(556, 8)  

size of train/val/test sets 254 111 167  

2023-04-10 19:04:58,636 Model: EpiGNN(  

(dropout): Dropout(p=0.2, inplace=False)  

(backbone): RegionAwareConv(  

(conv_11): ConvBranch(  

(conv): Conv2d(1, 8, kernel_size=(3, 1), stride=(1, 1))  

(batchnorm): BatchNorm2d(8, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)  

(pooling): AdaptiveMaxPool2d(output_size=(1, 8))  

)  

(conv_12): ConvBranch(  

(conv): Conv2d(1, 8, kernel_size=(5, 1), stride=(1, 1))  

(batchnorm): BatchNorm2d(8, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)  

(pooling): AdaptiveMaxPool2d(output_size=(1, 8))  

)  

(conv_p1): ConvBranch(  

(conv): Conv2d(1, 8, kernel_size=(3, 1), stride=(1, 1), dilation=(2, 1))  

(batchnorm): BatchNorm2d(8, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
```

```

        (pooling): AdaptiveMaxPool2d(output_size=(1, 8))
    )
    (conv_p2): ConvBranch(
        (conv): Conv2d(1, 8, kernel_size=(5, 1), stride=(1, 1), dilation=(2, 1))
        (batchnorm): BatchNorm2d(8, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
        (pooling): AdaptiveMaxPool2d(output_size=(1, 8))
    )
    (conv_g): ConvBranch(
        (conv): Conv2d(1, 8, kernel_size=(20, 1), stride=(1, 1))
        (batchnorm): BatchNorm2d(8, eps=1e-05, momentum=0.1, affine=True, track_running_stats=True)
    )
    (activate): Tanh()
)
(WQ): Linear(in_features=40, out_features=64, bias=True)
(WK): Linear(in_features=40, out_features=64, bias=True)
(leakyrelu): LeakyReLU(negative_slope=0.01, inplace=True)
(t_enc): Linear(in_features=1, out_features=40, bias=True)
(s_enc): Linear(in_features=1, out_features=40, bias=True)
(graphGen): GraphLearner(
    (linear1): Linear(in_features=40, out_features=40, bias=True)
    (linear2): Linear(in_features=40, out_features=40, bias=True)
)
(GNNBlocks): ModuleList(
    (0): GraphConvLayer(
        (act): ELU(alpha=1.0)
    )
    (1): GraphConvLayer(
        (act): ELU(alpha=1.0)
    )
)
(output): Linear(in_features=80, out_features=1, bias=True)
)
2023-04-10 19:04:58,637 # of model parameters: 12585
Begin training
Best validation epoch so far: 1 at Mon Apr 10 19:04:59 2023
Epoch 1 | Time: 0.12s | Train loss: 0.00207186 | Val loss: 0.00063310
TEST MAE: 1563.5751 std: 2795.8328 RMSE: 3222.3810 RMSEs: 1571.6465 PCC: -0.5560 PCCs: 0.0146 MAPE: 0.2317 R2: -1.7704
R2s: -2136.3669 Var: -1.1198 Vars: -31.8604 Peak: 1069.3662
Best validation epoch so far: 2 at Mon Apr 10 19:04:59 2023
Epoch 2 | Time: 0.05s | Train loss: 0.00080543 | Val loss: 0.00026270
TEST MAE: 958.3052 std: 1944.5421 RMSE: 2195.5815 RMSEs: 970.9308 PCC: -0.3014 PCCs: 0.0735 MAPE: 0.1793 R2: -0.2861 R
2s: -94397.6787 Var: -0.2057 Vars: -61.2736 Peak: 749.4511
Best validation epoch so far: 7 at Mon Apr 10 19:04:59 2023
Epoch 7 | Time: 0.07s | Train loss: 0.00059344 | Val loss: 0.00017153
TEST MAE: 744.9520 std: 1177.7003 RMSE: 1431.1654 RMSEs: 763.6960 PCC: 0.6863 PCCs: 0.3161 MAPE: 0.2712 R2: 0.4535 R
s: -117820.3350 Var: 0.4539 Vars: -431.5392 Peak: 395.2134
Best validation epoch so far: 13 at Mon Apr 10 19:04:59 2023
Epoch 13 | Time: 0.05s | Train loss: 0.00035029 | Val loss: 0.00013959
TEST MAE: 701.3906 std: 1401.5598 RMSE: 1616.7093 RMSEs: 736.5206 PCC: 0.8199 PCCs: 0.2791 MAPE: 0.0817 R2: 0.3026 R2
s: -28622.0937 Var: 0.4327 Vars: -23937.8570 Peak: 546.8304
Best validation epoch so far: 14 at Mon Apr 10 19:04:59 2023
Epoch 14 | Time: 0.05s | Train loss: 0.00026831 | Val loss: 0.00009886
TEST MAE: 606.6745 std: 1299.7906 RMSE: 1475.9256 RMSEs: 627.6652 PCC: 0.9245 PCCs: 0.2697 MAPE: 0.0815 R2: 0.4188 R
s: -24453.0293 Var: 0.5059 Vars: -20780.4047 Peak: 505.4741
Best validation epoch so far: 15 at Mon Apr 10 19:04:59 2023
Epoch 15 | Time: 0.07s | Train loss: 0.00030600 | Val loss: 0.00008010
TEST MAE: 536.5350 std: 1232.0358 RMSE: 1389.0809 RMSEs: 567.9100 PCC: 0.9547 PCCs: 0.2520 MAPE: 0.0541 R2: 0.4852 R
s: -18677.4886 Var: 0.5466 Vars: -14666.2190 Peak: 476.3992
Best validation epoch so far: 16 at Mon Apr 10 19:04:59 2023
Epoch 16 | Time: 0.06s | Train loss: 0.00031164 | Val loss: 0.00007592
TEST MAE: 523.3196 std: 1206.7013 RMSE: 1364.3055 RMSEs: 562.0416 PCC: 0.9499 PCCs: 0.2530 MAPE: 0.0602 R2: 0.5034 R2
s: -12810.0543 Var: 0.5510 Vars: -10963.8916 Peak: 465.3596
Best validation epoch so far: 30 at Mon Apr 10 19:05:00 2023
Epoch 30 | Time: 0.05s | Train loss: 0.00034835 | Val loss: 0.00006293
TEST MAE: 515.1301 std: 1110.5361 RMSE: 1259.2812 RMSEs: 529.5830 PCC: 0.9729 PCCs: 0.4920 MAPE: 0.0429 R2: 0.5769 R2
s: -3225.5888 Var: 0.6476 Vars: -5.2600 Peak: 431.2882
Best validation epoch so far: 31 at Mon Apr 10 19:05:00 2023
Epoch 31 | Time: 0.05s | Train loss: 0.00026117 | Val loss: 0.00005520
TEST MAE: 478.3251 std: 1064.4506 RMSE: 1203.4331 RMSEs: 493.6082 PCC: 0.9817 PCCs: 0.5021 MAPE: 0.0346 R2: 0.6136 R
s: -2730.6599 Var: 0.6745 Vars: -5.5910 Peak: 412.5293
Best validation epoch so far: 32 at Mon Apr 10 19:05:00 2023
Epoch 32 | Time: 0.05s | Train loss: 0.00031618 | Val loss: 0.00005388
TEST MAE: 477.7379 std: 1057.0380 RMSE: 1196.2364 RMSEs: 492.8290 PCC: 0.9811 PCCs: 0.5152 MAPE: 0.0352 R2: 0.6182 R2
s: -2580.6848 Var: 0.6790 Vars: -4.4114 Peak: 409.6941
Best validation epoch so far: 37 at Mon Apr 10 19:05:00 2023
Epoch 37 | Time: 0.05s | Train loss: 0.00016938 | Val loss: 0.00005005
TEST MAE: 457.2556 std: 1036.6980 RMSE: 1167.6416 RMSEs: 471.9460 PCC: 0.9864 PCCs: 0.5431 MAPE: 0.0292 R2: 0.6362 R
s: -2129.6821 Var: 0.6919 Vars: -8.0684 Peak: 400.9948
Best validation epoch so far: 38 at Mon Apr 10 19:05:01 2023
Epoch 38 | Time: 0.05s | Train loss: 0.00025721 | Val loss: 0.00004578
TEST MAE: 427.0677 std: 1008.1223 RMSE: 1130.1588 RMSEs: 442.6319 PCC: 0.9910 PCCs: 0.5461 MAPE: 0.0216 R2: 0.6592 R
s: -1830.3336 Var: 0.7076 Vars: -9.6969 Peak: 388.4698
Best validation epoch so far: 39 at Mon Apr 10 19:05:01 2023
Epoch 39 | Time: 0.06s | Train loss: 0.00016523 | Val loss: 0.00004526
TEST MAE: 428.4271 std: 1004.4844 RMSE: 1126.9800 RMSEs: 443.7298 PCC: 0.9906 PCCs: 0.5532 MAPE: 0.0226 R2: 0.6611 R2
s: -1800.0721 Var: 0.7099 Vars: -10.3595 Peak: 387.2857
Best validation epoch so far: 48 at Mon Apr 10 19:05:01 2023
Epoch 48 | Time: 0.05s | Train loss: 0.00025625 | Val loss: 0.00004098
TEST MAE: 483.2149 std: 884.9334 RMSE: 1041.8853 RMSEs: 496.9568 PCC: 0.9567 PCCs: 0.6018 MAPE: 0.0744 R2: 0.7104 R2s:
-3419.8974 Var: 0.7726 Vars: -6.2281 Peak: 338.6096
Best validation epoch so far: 49 at Mon Apr 10 19:05:01 2023
Epoch 49 | Time: 0.05s | Train loss: 0.00023564 | Val loss: 0.00003188
TEST MAE: 418.0813 std: 813.0394 RMSE: 950.0893 RMSEs: 432.6697 PCC: 0.9761 PCCs: 0.6016 MAPE: 0.0540 R2: 0.7592 R2s:
-2750.4261 Var: 0.8058 Vars: -7.5831 Peak: 313.9818
Best validation epoch so far: 50 at Mon Apr 10 19:05:01 2023
Epoch 50 | Time: 0.06s | Train loss: 0.00021849 | Val loss: 0.00002843
TEST MAE: 380.5422 std: 780.2880 RMSE: 904.2024 RMSEs: 395.3976 PCC: 0.9848 PCCs: 0.5980 MAPE: 0.0410 R2: 0.7819 R2s:
-2390.5223 Var: 0.8205 Vars: -8.5990 Peak: 302.1737
Best validation epoch so far: 51 at Mon Apr 10 19:05:01 2023
Epoch 51 | Time: 0.05s | Train loss: 0.00019628 | Val loss: 0.00002815
TEST MAE: 375.1684 std: 771.8376 RMSE: 893.0002 RMSEs: 389.6317 PCC: 0.9859 PCCs: 0.5944 MAPE: 0.0407 R2: 0.7872 R2s:
-2531.5851 Var: 0.8247 Vars: -10.0760 Peak: 298.8632
Best validation epoch so far: 55 at Mon Apr 10 19:05:02 2023
Epoch 55 | Time: 0.08s | Train loss: 0.00028058 | Val loss: 0.00002665
TEST MAE: 403.9240 std: 697.3931 RMSE: 841.5521 RMSEs: 419.0120 PCC: 0.9674 PCCs: 0.5996 MAPE: 0.0759 R2: 0.8110 R2s:
-3837.5888 Var: 0.8545 Vars: -16.3229 Peak: 260.4403
Best validation epoch so far: 56 at Mon Apr 10 19:05:02 2023
Epoch 56 | Time: 0.08s | Train loss: 0.00018954 | Val loss: 0.00001491
TEST MAE: 300.1638 std: 554.7875 RMSE: 675.4602 RMSEs: 318.6789 PCC: 0.9849 PCCs: 0.6014 MAPE: 0.0467 R2: 0.8783 R2s:
-2366.5245 Var: 0.9023 Vars: -19.7768 Peak: 211.5806

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Best validation epoch so far: 57 at Mon Apr 10 19:05:02 2023
Epoch 57 | Time: 0.07s | Train loss: 0.00011107 | Val loss: 0.00000984
TEST MAE: 201.3104 std: 433.4926 RMSE: 535.2579 RMSEs: 225.1281 PCC: 0.9928 PCCs: 0.6034 MAPE: 0.0171 R2: 0.9236 R2s: -1314.2032 Var: 0.9341 Vars: -24.4717 Peak: 167.6664
Best validation epoch so far: 133 at Mon Apr 10 19:05:07 2023
Epoch 133 | Time: 0.08s | Train loss: 0.00007619 | Val loss: 0.00000962
TEST MAE: 174.5540 std: 416.2415 RMSE: 503.8062 RMSEs: 196.1259 PCC: 0.9950 PCCs: 0.6291 MAPE: 0.0090 R2: 0.9323 R2s: -176.4905 Var: 0.9395 Vars: -1.7694 Peak: 160.2887
Best validation epoch so far: 149 at Mon Apr 10 19:05:08 2023
Epoch 149 | Time: 0.05s | Train loss: 0.00009598 | Val loss: 0.00000824
TEST MAE: 157.1179 std: 376.7204 RMSE: 469.3591 RMSEs: 181.9894 PCC: 0.9944 PCCs: 0.6280 MAPE: 0.0076 R2: 0.9412 R2s: -14.4734 Var: 0.9467 Vars: -1.9469 Peak: 145.1833
Best validation epoch so far: 150 at Mon Apr 10 19:05:08 2023
Epoch 150 | Time: 0.07s | Train loss: 0.00006588 | Val loss: 0.00000772
TEST MAE: 176.9335 std: 380.4366 RMSE: 480.1501 RMSEs: 201.2400 PCC: 0.9934 PCCs: 0.6232 MAPE: 0.0108 R2: 0.9385 R2s: -17.2220 Var: 0.9465 Vars: -1.7618 Peak: 147.0991
Best validation epoch so far: 212 at Mon Apr 10 19:05:11 2023
Epoch 212 | Time: 0.07s | Train loss: 0.00004601 | Val loss: 0.00000751
TEST MAE: 162.5120 std: 352.0082 RMSE: 448.9351 RMSEs: 187.2579 PCC: 0.9940 PCCs: 0.6343 MAPE: 0.0108 R2: 0.9462 R2s: -81.2478 Var: 0.9529 Vars: -0.3564 Peak: 136.3172
Best validation epoch so far: 213 at Mon Apr 10 19:05:11 2023
Epoch 213 | Time: 0.05s | Train loss: 0.00004807 | Val loss: 0.00000731
TEST MAE: 170.2637 std: 339.3585 RMSE: 442.1275 RMSEs: 195.2469 PCC: 0.9930 PCCs: 0.6328 MAPE: 0.0189 R2: 0.9478 R2s: -170.6219 Var: 0.9553 Vars: -1.2819 Peak: 130.7181
Best validation epoch so far: 214 at Mon Apr 10 19:05:11 2023
Epoch 214 | Time: 0.06s | Train loss: 0.00006786 | Val loss: 0.00000693
TEST MAE: 158.8053 std: 315.3181 RMSE: 419.0155 RMSEs: 185.1655 PCC: 0.9931 PCCs: 0.6310 MAPE: 0.0178 R2: 0.9532 R2s: -175.2229 Var: 0.9596 Vars: -1.5160 Peak: 121.5652
Best validation epoch so far: 230 at Mon Apr 10 19:05:12 2023
Epoch 230 | Time: 0.05s | Train loss: 0.00005922 | Val loss: 0.00000629
TEST MAE: 130.1199 std: 258.0569 RMSE: 365.4074 RMSEs: 160.4934 PCC: 0.9936 PCCs: 0.6398 MAPE: 0.0141 R2: 0.9644 R2s: -111.1503 Var: 0.9686 Vars: -5.6901 Peak: 99.9588
Best validation epoch so far: 231 at Mon Apr 10 19:05:12 2023
Epoch 231 | Time: 0.05s | Train loss: 0.00004841 | Val loss: 0.00000607
TEST MAE: 109.8047 std: 204.4411 RMSE: 323.1200 RMSEs: 145.9612 PCC: 0.9932 PCCs: 0.6368 MAPE: 0.0146 R2: 0.9721 R2s: -117.9320 Var: 0.9750 Vars: -5.8498 Peak: 78.6816
Best validation epoch so far: 291 at Mon Apr 10 19:05:15 2023
Epoch 291 | Time: 0.06s | Train loss: 0.00002726 | Val loss: 0.00000597
TEST MAE: 108.3688 std: 210.5290 RMSE: 324.6173 RMSEs: 143.1446 PCC: 0.9937 PCCs: 0.6615 MAPE: 0.0119 R2: 0.9719 R2s: -105.6654 Var: 0.9747 Vars: -42.8859 Peak: 81.8486
Figure(640x480)
-----Final evaluation-----

Metric	Overall	States/Places Adjusted
MAE	108.3688	210.5290
RMSE	324.6173	143.1446
PCC	0.9937	0.6615
MAPE	0.0119	0.0119
R2	0.9719	-105.6654
Var	0.9747	-42.8859
peak_mae	81.8486	81.8486