

Python 3.13.7 | packaged by Anaconda, Inc. | (main, Sep 9 2025, 19:54:37) [MSC v.1929 64 bit (AMD64)]
Type "copyright", "credits" or "license" for more information.

IPython 8.30.0 -- An enhanced Interactive Python. Type '?' for help.

```
In [1]: %runfile 'D:/PhD/Paper 3/GCNN Test/geometric_regressor_training_and_prediction.py' --wdir
```

GPU available: True (cuda), used: True

TPU available: False, using: 0 TPU cores

HPU available: False, using: 0 HPUs

#####

gcnn regression (volume)

#####

LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0,1]

	Name	Type	Params	Mode
0	lifting_layer	GLiftingConvSE3	2.0 K	train
1	encoder1	geometric_conv_block	9.2 K	train
2	maxpooler1	GMaxSpatialPool3d_fixed	0	train
3	encoder2	geometric_conv_block	24.5 K	train
4	maxpooler2	GMaxSpatialPool3d_fixed	0	train
5	encoder3	geometric_conv_block	73.5 K	train
6	maxpooler3	GMaxSpatialPool3d_fixed	0	train
7	encoder4	geometric_conv_block	245 K	train
8	global_pool	GAvgGlobalPool	0	train
9	regressor	Sequential	66.6 K	train

Trainable params: 421 K

Non-trainable params: 0

Total params: 421 K

Total estimated model params size (MB): 1

Modules in train mode: 49

Modules in eval mode: 0

```
Epoch 0/99 ----- 296/296 0:09:28 • 0.51it/s v_num: 1
Epoch 0/99 ----- 296/296 0:09:28 • 0.51it/s v_num: 1
                                0:00:00
                                train_loss: 0.086
                                train_mape:
                                24.945
                                valid_loss_step:
                                0.046
                                valid_mape_step:
                                36.978
                                valid_loss_epoch:
                                0.214
                                valid_mape_epoch:
                                170.170

Epoch 1/99 ----- 296/296 0:09:26 • 0.54it/s v_num: 1
Epoch 1/99 ----- 296/296 0:09:26 • 0.54it/s v_num: 1
                                0:00:00
                                train_loss: 1.002
                                train_mape:
                                51.620
                                valid_loss_step:
                                0.023
                                valid_mape_step:
                                11.105
                                valid_loss_epoch:
                                0.115
                                valid_mape_epoch:
                                227.469

Epoch 2/99 ----- 296/296 0:09:19 • 0.51it/s v_num: 1
                                0:00:00
                                train_loss: 0.009
                                train_mape:
                                12.507
                                valid_loss_step:
                                0.432
                                valid_mape_step:
                                38.872
                                valid_loss_epoch:
                                0.143
                                valid_mape_epoch:
                                181.877

Epoch 3/99 ----- 296/296 0:09:31 • 0.58it/s v_num: 1
                                0:00:00
                                train_loss: 0.101
                                train_mape:
                                58.816
                                valid_loss_step:
                                0.054
                                valid_mape_step:
                                26.532
                                valid_loss_epoch:
                                0.191
                                valid_mape_epoch:
                                211.424

Epoch 4/99 ----- 296/296 0:09:24 • 0.57it/s v_num: 1
                                0:00:00
                                train_loss: 0.093
```

```
train_mape:
46.503
valid_loss_step:
0.022
valid_mape_step:
16.153
valid_loss_epoch:
0.139
valid_mape_epoch:
203.235
Epoch 5/99 ----- 296/296 0:09:32 • 0.55it/s v_num: 1
Epoch 5/99 ----- 296/296 0:09:32 • 0.55it/s v_num: 1
0:00:00 train_loss: 0.021
train_mape:
16.807
valid_loss_step:
0.004
valid_mape_step:
7.848
valid_loss_epoch:
0.089
valid_mape_epoch:
178.572
Epoch 6/99 ----- 296/296 0:09:27 • 0.60it/s v_num: 1
0:00:00 train_loss: 0.000
train_mape: 1.918
valid_loss_step:
0.016
valid_mape_step:
15.178
valid_loss_epoch:
0.140
valid_mape_epoch:
165.690
Epoch 7/99 ----- 296/296 0:09:48 • 0.55it/s v_num: 1
0:00:00 train_loss: 0.016
train_mape:
16.921
valid_loss_step:
0.022
valid_mape_step:
18.187
valid_loss_epoch:
0.122
valid_mape_epoch:
190.416
Epoch 8/99 ----- 296/296 0:09:27 • 0.54it/s v_num: 1
0:00:00 train_loss: 0.738
train_mape:
365.693
valid_loss_step:
0.185
valid_mape_step:
37.674
valid_loss_epoch:
0.107
valid_mape_epoch:
167.448
Epoch 9/99 ----- 296/296 0:09:13 • 0.58it/s v_num: 1
0:00:00 train_loss: 0.052
train_mape:
20.997
valid_loss_step:
0.039
valid_mape_step:
24.792
valid_loss_epoch:
0.148
valid_mape_epoch:
162.025
Epoch 10/99 ----- 296/296 0:09:42 • 0.52it/s v_num: 1
Epoch 10/99 ----- 296/296 0:09:42 • 0.52it/s v_num: 1
0:00:00 train_loss: 0.056
train_mape:
19.185
valid_loss_step:
0.017
valid_mape_step:
10.720
valid_loss_epoch:
0.155
valid_mape_epoch:
175.513

100%|██████████| 1737/1737 [03:33<00:00, 8.15it/s]
GPU available: True (cuda), used: True
TPU available: False, using: 0 TPU cores
```

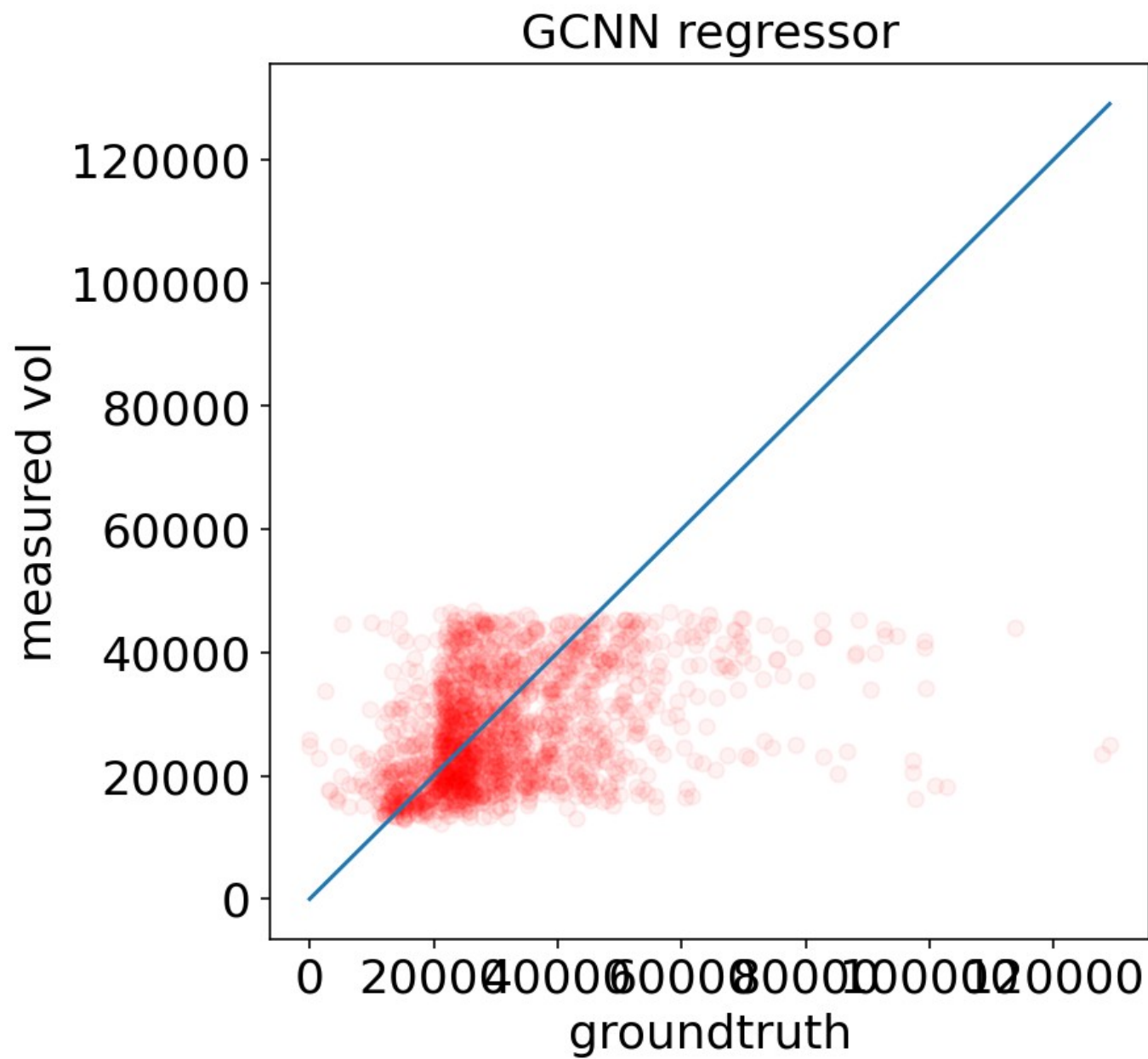
HPU available: False, using: 0 HPUs
LOCAL_RANK: 0 - CUDA_VISIBLE_DEVICES: [0,1]

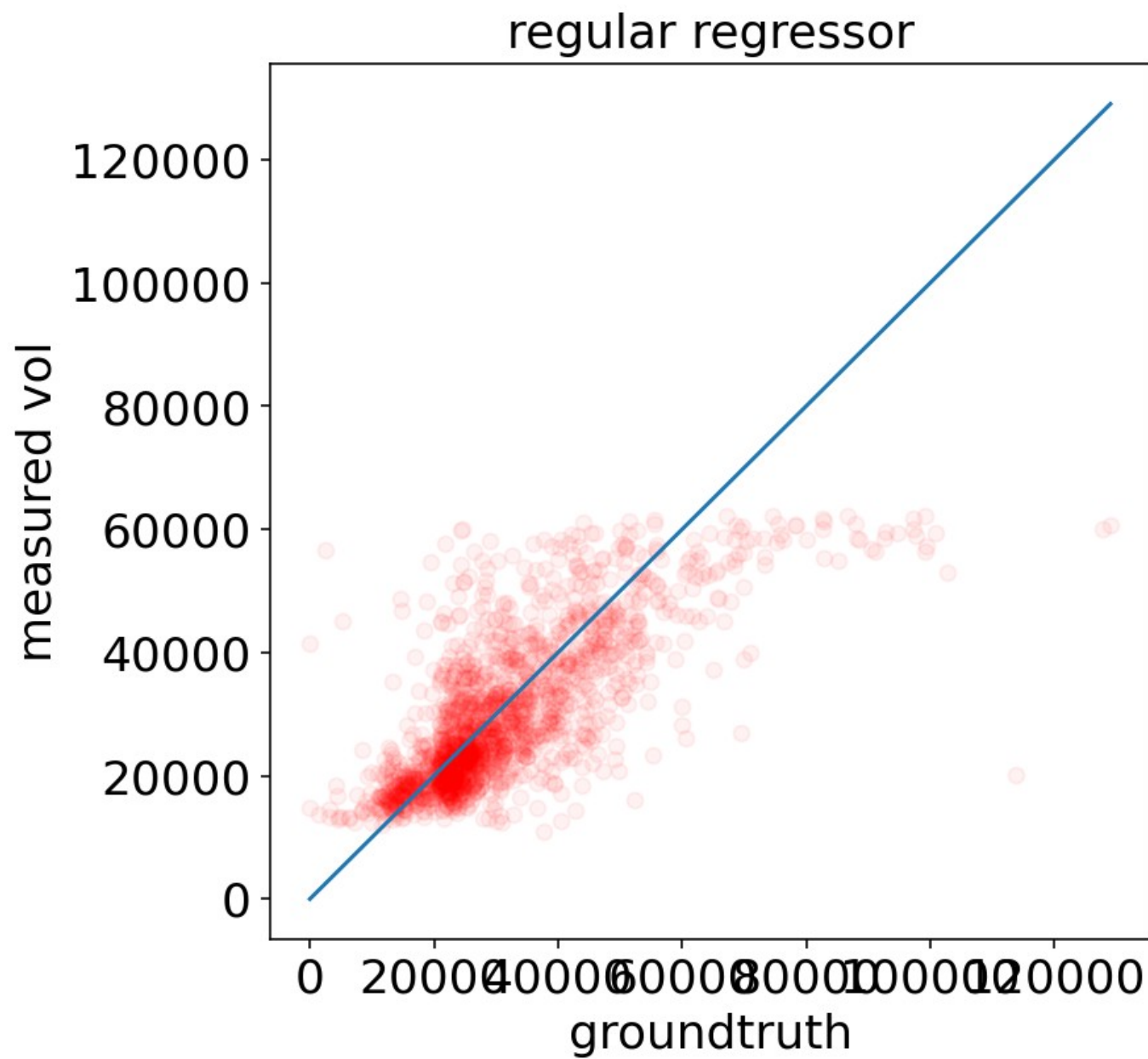
	Name	Type	Params	Mode
0	encoder1	Sequential	14.4 K	train
1	maxpooler1	MaxPool3d	0	train
2	encoder2	Sequential	83.2 K	train
3	maxpooler2	MaxPool3d	0	train
4	encoder3	Sequential	332 K	train
5	maxpooler3	MaxPool3d	0	train
6	encoder4	Sequential	1.3 M	train
7	gap	AdaptiveAvgPool3d	0	train
8	regressor	Sequential	66.6 K	train

1.8 M Trainable params
0 Non-trainable params
1.8 M Total params
7.299 Total estimated model params size (MB)
39 Modules in train mode
0 Modules in eval mode

cnn regression (volume)
#####

Epoch 0: 100%|██████████| 296/296 [06:44<00:00, 0.73it/s, v_num=0, train_loss=0.0864, train_mape=23.60, valid_loss_step=0.0408, valid_mape_step=44.60, valid_loss_epoch=0.119, valid_mape_epoch=172.0]Metric valid_loss improved. New best score: 0.119
Epoch 1: 100%|██████████| 296/296 [06:14<00:00, 0.79it/s, v_num=0, train_loss=0.215, train_mape=97.90, valid_loss_step=0.0734, valid_mape_step=14.20, valid_loss_epoch=0.0889, valid_mape_epoch=192.0]Metric valid_loss improved by 0.030 >= min delta = 0.0. New best score: 0.089
Epoch 2: 100%|██████████| 296/296 [06:26<00:00, 0.77it/s, v_num=0, train_loss=0.00758, train_mape=9.890, valid_loss_step=0.0801, valid_mape_step=17.10, valid_loss_epoch=0.0819, valid_mape_epoch=188.0]Metric valid_loss improved by 0.007 >= min delta = 0.0. New best score: 0.082
Epoch 3: 100%|██████████| 296/296 [06:19<00:00, 0.78it/s, v_num=0, train_loss=0.00932, train_mape=9.440, valid_loss_step=0.0697, valid_mape_step=20.90, valid_loss_epoch=0.0805, valid_mape_epoch=158.0]Metric valid_loss improved by 0.001 >= min delta = 0.0. New best score: 0.080
Epoch 5: 100%|██████████| 296/296 [06:25<00:00, 0.77it/s, v_num=0, train_loss=0.108, train_mape=23.80, valid_loss_step=0.0988, valid_mape_step=19.60, valid_loss_epoch=0.0611, valid_mape_epoch=175.0]Metric valid_loss improved by 0.019 >= min delta = 0.0. New best score: 0.061
Epoch 6: 100%|██████████| 296/296 [06:36<00:00, 0.75it/s, v_num=0, train_loss=0.0179, train_mape=17.60, valid_loss_step=0.0171, valid_mape_step=19.80, valid_loss_epoch=0.0473, valid_mape_epoch=147.0]Metric valid_loss improved by 0.014 >= min delta = 0.0. New best score: 0.047
Epoch 8: 100%|██████████| 296/296 [06:28<00:00, 0.76it/s, v_num=0, train_loss=0.355, train_mape=36.10, valid_loss_step=0.041, valid_mape_step=34.60, valid_loss_epoch=0.0465, valid_mape_epoch=167.0]Metric valid_loss improved by 0.001 >= min delta = 0.0. New best score: 0.046
Epoch 11: 100%|██████████| 296/296 [06:29<00:00, 0.76it/s, v_num=0, train_loss=0.0751, train_mape=37.50, valid_loss_step=0.00101, valid_mape_step=3.390, valid_loss_epoch=0.0431, valid_mape_epoch=172.0]Metric valid_loss improved by 0.003 >= min delta = 0.0. New best score: 0.043
Epoch 12: 100%|██████████| 296/296 [06:47<00:00, 0.73it/s, v_num=0, train_loss=0.00823, train_mape=7.400, valid_loss_step=0.0442, valid_mape_step=17.30, valid_loss_epoch=0.0374, valid_mape_epoch=125.0]Metric valid_loss improved by 0.006 >= min delta = 0.0. New best score: 0.037
Epoch 17: 100%|██████████| 296/296 [06:31<00:00, 0.76it/s, v_num=0, train_loss=4.88e-5, train_mape=0.720, valid_loss_step=0.0609, valid_mape_step=24.50, valid_loss_epoch=0.0495, valid_mape_epoch=106.0]Monitored metric valid_loss did not improve in the last 5 records. Best score: 0.037. Signaling Trainer to stop.
Epoch 17: 100%|██████████| 296/296 [06:31<00:00, 0.76it/s, v_num=0, train_loss=4.88e-5, train_mape=0.720, valid_loss_step=0.0609, valid_mape_step=24.50, valid_loss_epoch=0.0495, valid_mape_epoch=106.0]
100%|██████████| 1737/1737 [00:36<00:00, 48.03it/s]





In [2]: