Google Colab

!git clone <https://github.com/19ankita/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction.git>

cd /content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction

!python run\_imputation.py --config config/grin/traffic\_block.yaml --dataset-name traffic\_block --in-sample True

!pip install pytorch\_lightning

!pip install torch\_geometric

!pip install tensorboardX

!pip install tensorboard

T4c22\_config.json

{

  "BASEDIR": "/content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction/Traffic4Cast\_new"

}

T4c22\_dataset\_geometric.py

config\_path = '/content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction/t4c22/t4c22\_config.json'

TPU usage:

!pip install torch\_xla

import torch\_xla

import torch\_xla.core.xla\_model as xm

trainer = pl.Trainer(

max\_epochs=args.epochs,

logger=logger,

default\_root\_dir=logdir,

devices=args.gpus if torch.cuda.is\_available() else "auto",

accelerator="gpu" if torch.cuda.is\_available() else "tpu" if "xla" in str(xm.xla\_device()) else "cpu",

gradient\_clip\_val=args.grad\_clip\_val,

gradient\_clip\_algorithm=args.grad\_clip\_algorithm,

callbacks=[early\_stop\_callback, checkpoint\_callback]

)

Plain GRIN Run

Seed set to 249895645

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[Main script] Loading dataset...

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Sparse distance matrix saved to distance\_matrix\_london

Sparse distance matrix calculated. Shape: (500, 500)

df\_edges: (132414, 11), df\_nodes: (59110, 5)

Total number of time steps: 7040

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Splitting the dataset....

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Total dataset size: 500

Training samples: 362, Validation samples: 63, Test samples: 75

training mask shape: torch.Size([500, 500, 4]), eval mask shape: torch.Size([500, 500, 4])

train\_dataset: 362, val\_dataset: 63, test\_dataset: 75

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[Main script] Dataset loaded.

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train\_mask: torch.Size([500, 500, 4]), eval\_mask: torch.Size([500, 500, 4])

Overlap between train\_mask and eval\_mask: 0

train\_idxs: 362, val\_idxs: 63, test\_idxs: 75

train\_data\_list: 362, val\_data\_list: 63, test\_data\_list: 75

/content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction/lib/datasets/t4c22\_dataset\_geometric.py:452: RuntimeWarning: invalid value encountered in divide

exp\_dist = np.exp(-np.square(self.dist.data / sigma))

adj\_dense shape: (500, 500)

adj\_dense sample:

[[nan 0. 0. 0. 0.]

[ 0. nan 0. 0. 0.]

[ 0. 0. nan 0. 0.]

[ 0. 0. 0. 0. 0.]

[ 0. 0. 0. 0. 0.]]

adj\_sparse shape: (500, 500)

adj\_sparse sample:

[[0. 0. 0. 0. 0.]

[0. 0. 0. 0. 0.]

[0. 0. 0. 0. 0.]

[0. 0. 0. 0. 0.]

[0. 0. 0. 0. 0.]]

/content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction/run\_imputation.py:217: UserWarning: Creating a tensor from a list of numpy.ndarrays is extremely slow. Please consider converting the list to a single numpy.ndarray with numpy.array() before converting to a tensor. (Triggered internally at /pytorch/torch/csrc/utils/tensor\_new.cpp:254.)

indices = torch.tensor([coo.row, coo.col], dtype=torch.int64)

adj\_single shape: torch.Size([500, 500])

adj\_single indices sample:

tensor([[0, 1, 2, 3, 4],

[0, 1, 2, 3, 4]])

adj\_single values sample:

tensor([0., 0., 0., 0., 0.])

batched\_adj shape: torch.Size([16000, 16000])

batched\_adj indices sample:

tensor([[0, 1, 2, 3, 4],

[0, 1, 2, 3, 4]])

batched\_adj values sample:

tensor([0., 0., 0., 0., 0.])

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SequentialGraphDataset................

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SequentialGraphDataset................

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SequentialGraphDataset................

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train\_dataset: 315, val\_dataset: 16, test\_dataset: 28

train\_loader: 9, val\_loader: 1, test\_loader: 1

[Main script] Adjacency matrix (before GraphFiller): torch.Size([16000, 16000])

[Main script] Mask keys in filler\_kwargs: dict\_keys(['train\_mask', 'eval\_mask'])

[GRINet] Expanded adj shape: torch.Size([16000, 16000])

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Starting GRINet....

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d\_in at layer 0: 8

d\_in at layer 0: 8

GPU available: False, used: False

TPU available: True, using: 0 TPU cores

HPU available: False, using: 0 HPUs

/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/trainer/setup.py:183: TPU available but not used. You can set it by doing `Trainer(accelerator='tpu')`.

/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/callbacks/model\_checkpoint.py:654: Checkpoint directory /content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction/logs/traffic\_block/grin/2025-03-17\_21-24-51\_249895645 exists and is not empty.

| Name | Type | Params | Mode

-----------------------------------------------------------

0 | loss\_fn | MaskedMetric | 0 | train

1 | train\_metrics | MetricCollection | 0 | train

2 | val\_metrics | MetricCollection | 0 | train

3 | test\_metrics | MetricCollection | 0 | train

4 | model | GRINet | 2.4 M | train

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2.4 M Trainable params

0 Non-trainable params

2.4 M Total params

9.504 Total estimated model params size (MB)

63 Modules in train mode

0 Modules in eval mode

Sanity Checking: | | 0/? [00:00<?, ?it/s]/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/trainer/connectors/data\_connector.py:425: The 'val\_dataloader' does not have many workers which may be a bottleneck. Consider increasing the value of the `num\_workers` argument` to `num\_workers=95` in the `DataLoader` to improve performance.

Sanity Checking DataLoader 0: 0% 0/1 [00:00<?, ?it/s]Batch `window`: [[Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), 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Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4])]]

[Warning] Target (y) contains NaN values!

Batch `window`: [[Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4])], [Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], mask=[500, 4]), Data(x=[500, 4], edge\_index=[2, 97], y=[97], 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mask=[500, 4])]]

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GRIN forward....

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Batch size: 32, Steps: 24, Num nodes: 192000, Channels: 4

Mask shape: torch.Size([192000, 4])

[GRIN forward] Using adjacency shape: torch.Size([192000, 192000])

Traceback (most recent call last):

File "/content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction/run\_imputation.py", line 414, in <module>

run\_experiment(args)

File "/content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction/run\_imputation.py", line 382, in run\_experiment

trainer.fit(filler, train\_dataloaders=train\_loader, val\_dataloaders=val\_loader)

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

File "/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/trainer/trainer.py", line 539, in fit

call.\_call\_and\_handle\_interrupt(

File "/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/trainer/call.py", line 47, in \_call\_and\_handle\_interrupt

return trainer\_fn(\*args, \*\*kwargs)

^^^^^^^^^^^^^^^^^^^^^^^^^^^

File "/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/trainer/trainer.py", line 575, in \_fit\_impl

self.\_run(model, ckpt\_path=ckpt\_path)

File "/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/trainer/trainer.py", line 982, in \_run

results = self.\_run\_stage()

^^^^^^^^^^^^^^^^^

File "/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/trainer/trainer.py", line 1024, in \_run\_stage

self.\_run\_sanity\_check()

File "/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/trainer/trainer.py", line 1053, in \_run\_sanity\_check

val\_loop.run()

File "/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/loops/utilities.py", line 179, in \_decorator

return loop\_run(self, \*args, \*\*kwargs)

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

File "/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/loops/evaluation\_loop.py", line 144, in run

self.\_evaluation\_step(batch, batch\_idx, dataloader\_idx, dataloader\_iter)

File "/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/loops/evaluation\_loop.py", line 433, in \_evaluation\_step

output = call.\_call\_strategy\_hook(trainer, hook\_name, \*step\_args)

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

File "/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/trainer/call.py", line 323, in \_call\_strategy\_hook

output = fn(\*args, \*\*kwargs)

^^^^^^^^^^^^^^^^^^^

File "/usr/local/lib/python3.11/dist-packages/pytorch\_lightning/strategies/strategy.py", line 412, in validation\_step

return self.lightning\_module.validation\_step(\*args, \*\*kwargs)

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

File "/content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction/lib/fillers/graphfiller.py", line 169, in validation\_step

imputation = self.predict\_batch(batch, preprocess=False, postprocess=False)

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

File "/content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction/lib/fillers/filler.py", line 211, in predict\_batch

y\_hat = self.forward(x=x, edge\_index=edge\_index, mask=mask)

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

File "/content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction/lib/fillers/filler.py", line 108, in forward

return self.model(\*args, \*\*kwargs)

^^^^^^^^^^^^^^^^^^^^^^^^^^^

File "/usr/local/lib/python3.11/dist-packages/torch/nn/modules/module.py", line 1739, in \_wrapped\_call\_impl

return self.\_call\_impl(\*args, \*\*kwargs)

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

File "/usr/local/lib/python3.11/dist-packages/torch/nn/modules/module.py", line 1750, in \_call\_impl

return forward\_call(\*args, \*\*kwargs)

^^^^^^^^^^^^^^^^^^^^^^^^^^^^^

File "/content/Missing-spatial-temporal-multimodal-traffic-data-imputation-and-prediction/lib/nn/models/grin.py", line 127, in forward

raise ValueError(f"[GRIN] Invalid reshape dimensions for x. Expected {expected\_elements}, got {total\_elements}.")

ValueError: [GRIN] Invalid reshape dimensions for x. Expected 18432000, got 768000.