input\_chunk\_length = trial.suggest\_categorical('input\_chunk\_length', [168])

output\_chunk\_length = trial.suggest\_categorical('output\_chunk\_length', [48])

hidden\_size = trial.suggest\_categorical('hidden\_size', [20])

lstm\_layers = trial.suggest\_categorical('lstm\_layers', [2])

num\_attention\_heads = trial.suggest\_categorical('num\_attention\_heads', [1])

dropout = trial.suggest\_categorical('dropout', [0.3])

n\_epochs = trial.suggest\_categorical('n\_epochs', [70])

learning\_rate = trial.suggest\_categorical('lr', [0.0001])

batch\_size = trial.suggest\_categorical('batch\_size', [128])

🔍 DEBUG: Dataövergripande information:

▶️ train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00 (26256 timsteg)

✅ val: 2024-01-01 00:00:00 → 2024-12-31 23:00:00 (8784 timsteg)

⏪ past\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

⏪ past\_cov\_val: 2023-12-28 00:00:00 → 2024-12-31 23:00:00

⏩ future\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

⏩ future\_cov\_val: 2023-12-28 00:00:00 → 2024-12-31 23:00:00

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]

TPU available: False, using: 0 TPU cores

HPU available: False, using: 0 HPUs

LOCAL\_RANK: 0 - CUDA\_VISIBLE\_DEVICES: [0]

| Name | Type | Params | Mode

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

0 | train\_metrics | MetricCollection | 0 | train

1 | val\_metrics | MetricCollection | 0 | train

2 | input\_embeddings | \_MultiEmbedding | 0 | train

3 | static\_covariates\_vsn | \_VariableSelectionNetwork | 0 | train

4 | encoder\_vsn | \_VariableSelectionNetwork | 110 K | train

5 | decoder\_vsn | \_VariableSelectionNetwork | 55.4 K | train

6 | static\_context\_grn | \_GatedResidualNetwork | 1.7 K | train

7 | static\_context\_hidden\_encoder\_grn | \_GatedResidualNetwork | 1.7 K | train

8 | static\_context\_cell\_encoder\_grn | \_GatedResidualNetwork | 1.7 K | train

9 | static\_context\_enrichment | \_GatedResidualNetwork | 1.7 K | train

10 | lstm\_encoder | LSTM | 6.7 K | train

11 | lstm\_decoder | LSTM | 6.7 K | train

12 | post\_lstm\_gan | \_GateAddNorm | 880 | train

13 | static\_enrichment\_grn | \_GatedResidualNetwork | 2.1 K | train

14 | multihead\_attn | \_InterpretableMultiHeadAttention | 1.7 K | train

15 | post\_attn\_gan | \_GateAddNorm | 880 | train

16 | feed\_forward\_block | \_GatedResidualNetwork | 1.7 K | train

17 | pre\_output\_gan | \_GateAddNorm | 880 | train

18 | output\_layer | Linear | 63 | train

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

193 K Trainable params

0 Non-trainable params

193 K Total params

**TRÄNAD 2021-2023 & Validerad 2024**

0.775 Total estimated model params size (MB)

3056 Modules in train mode

0 Modules in eval mode

🚀 Startar ny gridsearch-körning med hyperparametrar:

input\_chunk\_length: 158

output\_chunk\_length: 48

hidden\_size: 20

lstm\_layers: 2

num\_attention\_heads: 1

dropout: 0.3

optimizer\_kwargs: {'lr': 0.0001}

Epoch 0: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=5.600, val\_loss=5.720]📉 Epoch 1: train\_loss=5.5994 | val\_loss=5.7227

Epoch 0: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=5.600, val\_loss=5.720]Metric val\_loss improved. New best score: 5.723

Epoch 1: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=4.660, val\_loss=4.940]📉 Epoch 2: train\_loss=4.6573 | val\_loss=4.9397

Epoch 1: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=4.660, val\_loss=4.940]Metric val\_loss improved by 0.783 >= min\_delta = 0.005. New best score: 4.940

Epoch 2: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=3.690, val\_loss=4.130]📉 Epoch 3: train\_loss=3.6868 | val\_loss=4.1310

Epoch 2: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=3.690, val\_loss=4.130]Metric val\_loss improved by 0.809 >= min\_delta = 0.005. New best score: 4.131

Epoch 3: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=3.010, val\_loss=3.300]📉 Epoch 4: train\_loss=3.0108 | val\_loss=3.3004

Epoch 3: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=3.010, val\_loss=3.300]Metric val\_loss improved by 0.831 >= min\_delta = 0.005. New best score: 3.300

Epoch 4: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=2.080, val\_loss=2.510]📉 Epoch 5: train\_loss=2.0769 | val\_loss=2.5078

Epoch 4: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=2.080, val\_loss=2.510]Metric val\_loss improved by 0.793 >= min\_delta = 0.005. New best score: 2.508

Epoch 5: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=1.520, val\_loss=1.840]📉 Epoch 6: train\_loss=1.5184 | val\_loss=1.8424

Epoch 5: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=1.520, val\_loss=1.840]Metric val\_loss improved by 0.665 >= min\_delta = 0.005. New best score: 1.842

Epoch 6: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=1.160, val\_loss=1.370]📉 Epoch 7: train\_loss=1.1580 | val\_loss=1.3654

Epoch 6: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=1.160, val\_loss=1.370]Metric val\_loss improved by 0.477 >= min\_delta = 0.005. New best score: 1.365

Epoch 7: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.842, val\_loss=1.070]📉 Epoch 8: train\_loss=0.8423 | val\_loss=1.0737

Epoch 7: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.842, val\_loss=1.070]Metric val\_loss improved by 0.292 >= min\_delta = 0.005. New best score: 1.074

Epoch 8: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.780, val\_loss=0.886]📉 Epoch 9: train\_loss=0.7798 | val\_loss=0.8857

Epoch 8: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.780, val\_loss=0.886]Metric val\_loss improved by 0.188 >= min\_delta = 0.005. New best score: 0.886

Epoch 9: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.711, val\_loss=0.765]📉 Epoch 10: train\_loss=0.7111 | val\_loss=0.7653

Epoch 9: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.711, val\_loss=0.765]Metric val\_loss improved by 0.120 >= min\_delta = 0.005. New best score: 0.765

Epoch 10: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.585, val\_loss=0.672]📉 Epoch 11: train\_loss=0.5846 | val\_loss=0.6720

Epoch 10: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.585, val\_loss=0.672]Metric val\_loss improved by 0.093 >= min\_delta = 0.005. New best score: 0.672

Epoch 11: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.576, val\_loss=0.600]📉 Epoch 12: train\_loss=0.5759 | val\_loss=0.5996

Epoch 11: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.576, val\_loss=0.600]Metric val\_loss improved by 0.072 >= min\_delta = 0.005. New best score: 0.600

Epoch 12: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.516, val\_loss=0.540]📉 Epoch 13: train\_loss=0.5157 | val\_loss=0.5401

Epoch 12: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.516, val\_loss=0.540]Metric val\_loss improved by 0.059 >= min\_delta = 0.005. New best score: 0.540

Epoch 13: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.560, val\_loss=0.509]📉 Epoch 14: train\_loss=0.5598 | val\_loss=0.5086

Epoch 13: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.560, val\_loss=0.509]Metric val\_loss improved by 0.032 >= min\_delta = 0.005. New best score: 0.509

Epoch 14: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.440, val\_loss=0.511]📉 Epoch 15: train\_loss=0.4399 | val\_loss=0.5114

Epoch 15: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.484, val\_loss=0.503]📉 Epoch 16: train\_loss=0.4840 | val\_loss=0.5026

Epoch 15: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.484, val\_loss=0.503]Metric val\_loss improved by 0.006 >= min\_delta = 0.005. New best score: 0.503

Epoch 16: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.453, val\_loss=0.484]📉 Epoch 17: train\_loss=0.4535 | val\_loss=0.4839

Epoch 16: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.453, val\_loss=0.484]Metric val\_loss improved by 0.019 >= min\_delta = 0.005. New best score: 0.484

Epoch 17: 100%|██████████| 204/204 [04:22<00:00, 0.78it/s, train\_loss=0.482, val\_loss=0.461]📉 Epoch 18: train\_loss=0.4818 | val\_loss=0.4614

Epoch 17: 100%|██████████| 204/204 [04:22<00:00, 0.78it/s, train\_loss=0.482, val\_loss=0.461]Metric val\_loss improved by 0.022 >= min\_delta = 0.005. New best score: 0.461

Epoch 18: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.515, val\_loss=0.452]📉 Epoch 19: train\_loss=0.5150 | val\_loss=0.4516

Epoch 18: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.515, val\_loss=0.452]Metric val\_loss improved by 0.010 >= min\_delta = 0.005. New best score: 0.452

Epoch 19: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.434, val\_loss=0.445]📉 Epoch 20: train\_loss=0.4336 | val\_loss=0.4450

Epoch 19: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.434, val\_loss=0.445]Metric val\_loss improved by 0.007 >= min\_delta = 0.005. New best score: 0.445

Epoch 20: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.377, val\_loss=0.441]📉 Epoch 21: train\_loss=0.3775 | val\_loss=0.4410

Epoch 21: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.438, val\_loss=0.436]📉 Epoch 22: train\_loss=0.4378 | val\_loss=0.4356

Epoch 21: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.438, val\_loss=0.436]Metric val\_loss improved by 0.009 >= min\_delta = 0.005. New best score: 0.436

Epoch 22: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.444, val\_loss=0.442]📉 Epoch 23: train\_loss=0.4441 | val\_loss=0.4422

Epoch 23: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.387, val\_loss=0.434]📉 Epoch 24: train\_loss=0.3867 | val\_loss=0.4339

Epoch 24: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.391, val\_loss=0.432]📉 Epoch 25: train\_loss=0.3906 | val\_loss=0.4318

Epoch 25: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.387, val\_loss=0.447]📉 Epoch 26: train\_loss=0.3870 | val\_loss=0.4473

Epoch 26: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.385, val\_loss=0.428]📉 Epoch 27: train\_loss=0.3854 | val\_loss=0.4284

Epoch 26: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.385, val\_loss=0.428]Metric val\_loss improved by 0.007 >= min\_delta = 0.005. New best score: 0.428

Epoch 27: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.395, val\_loss=0.441]📉 Epoch 28: train\_loss=0.3950 | val\_loss=0.4412

Epoch 28: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.413, val\_loss=0.414]📉 Epoch 29: train\_loss=0.4127 | val\_loss=0.4142

Epoch 28: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.413, val\_loss=0.414]Metric val\_loss improved by 0.014 >= min\_delta = 0.005. New best score: 0.414

Epoch 29: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.350, val\_loss=0.431]📉 Epoch 30: train\_loss=0.3499 | val\_loss=0.4313

Epoch 30: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.432, val\_loss=0.418]📉 Epoch 31: train\_loss=0.4321 | val\_loss=0.4179

Epoch 31: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.374, val\_loss=0.407]📉 Epoch 32: train\_loss=0.3739 | val\_loss=0.4069

Epoch 31: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.374, val\_loss=0.407]Metric val\_loss improved by 0.007 >= min\_delta = 0.005. New best score: 0.407

Epoch 32: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.350, val\_loss=0.401]📉 Epoch 33: train\_loss=0.3501 | val\_loss=0.4013

Epoch 32: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.350, val\_loss=0.401]Metric val\_loss improved by 0.006 >= min\_delta = 0.005. New best score: 0.401

Epoch 33: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.384, val\_loss=0.401]📉 Epoch 34: train\_loss=0.3837 | val\_loss=0.4015

Epoch 34: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.329, val\_loss=0.394]📉 Epoch 35: train\_loss=0.3288 | val\_loss=0.3944

Epoch 34: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.329, val\_loss=0.394]Metric val\_loss improved by 0.007 >= min\_delta = 0.005. New best score: 0.394

Epoch 35: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.334, val\_loss=0.393]📉 Epoch 36: train\_loss=0.3336 | val\_loss=0.3926

Epoch 36: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.353, val\_loss=0.396]📉 Epoch 37: train\_loss=0.3526 | val\_loss=0.3955

Epoch 37: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.361, val\_loss=0.390]📉 Epoch 38: train\_loss=0.3605 | val\_loss=0.3896

Epoch 38: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.395, val\_loss=0.404]📉 Epoch 39: train\_loss=0.3955 | val\_loss=0.4035

Epoch 39: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.391, val\_loss=0.402]📉 Epoch 40: train\_loss=0.3906 | val\_loss=0.4020

Epoch 40: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.325, val\_loss=0.395]📉 Epoch 41: train\_loss=0.3253 | val\_loss=0.3947

Epoch 41: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.378, val\_loss=0.403]📉 Epoch 42: train\_loss=0.3779 | val\_loss=0.4035

Epoch 42: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.365, val\_loss=0.386]📉 Epoch 43: train\_loss=0.3655 | val\_loss=0.3862

Epoch 42: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.365, val\_loss=0.386]Metric val\_loss improved by 0.008 >= min\_delta = 0.005. New best score: 0.386

Epoch 43: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.335, val\_loss=0.388]📉 Epoch 44: train\_loss=0.3351 | val\_loss=0.3881

Epoch 44: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.357, val\_loss=0.382]📉 Epoch 45: train\_loss=0.3565 | val\_loss=0.3820

Epoch 45: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.354, val\_loss=0.382]📉 Epoch 46: train\_loss=0.3536 | val\_loss=0.3821

Epoch 46: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.317, val\_loss=0.382]📉 Epoch 47: train\_loss=0.3173 | val\_loss=0.3825

Epoch 47: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.316, val\_loss=0.386]📉 Epoch 48: train\_loss=0.3163 | val\_loss=0.3857

Epoch 48: 100%|██████████| 204/204 [04:21<00:00, 0.78it/s, train\_loss=0.396, val\_loss=0.394]📉 Epoch 49: train\_loss=0.3959 | val\_loss=0.3939

Epoch 49: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.316, val\_loss=0.382]📉 Epoch 50: train\_loss=0.3165 | val\_loss=0.3815

Epoch 49: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.316, val\_loss=0.382]`Trainer.fit` stopped: `max\_epochs=50` reached.

Epoch 49: 100%|██████████| 204/204 [04:20<00:00, 0.78it/s, train\_loss=0.316, val\_loss=0.382]

**Tränad 2021-2024**

🔍 DEBUG: Dataövergripande information:

▶️ train: 2021-01-02 00:00:00 → 2024-12-31 23:00:00 (35040 timsteg)

❌ val: None

⏪ past\_cov\_train: 2021-01-02 00:00:00 → 2024-12-31 23:00:00

⏩ future\_cov\_train: 2021-01-02 00:00:00 → 2024-12-31 23:00:00

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]

| Name | Type | Params | Mode

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

0 | train\_metrics | MetricCollection | 0 | train

1 | val\_metrics | MetricCollection | 0 | train

2 | input\_embeddings | \_MultiEmbedding | 0 | train

3 | static\_covariates\_vsn | \_VariableSelectionNetwork | 0 | train

4 | encoder\_vsn | \_VariableSelectionNetwork | 400 K | train

5 | decoder\_vsn | \_VariableSelectionNetwork | 190 K | train

6 | static\_context\_grn | \_GatedResidualNetwork | 28.1 K | train

7 | static\_context\_hidden\_encoder\_grn | \_GatedResidualNetwork | 28.1 K | train

8 | static\_context\_cell\_encoder\_grn | \_GatedResidualNetwork | 28.1 K | train

9 | static\_context\_enrichment | \_GatedResidualNetwork | 28.1 K | train

10 | lstm\_encoder | LSTM | 55.8 K | train

11 | lstm\_decoder | LSTM | 55.8 K | train

12 | post\_lstm\_gan | \_GateAddNorm | 14.1 K | train

13 | static\_enrichment\_grn | \_GatedResidualNetwork | 34.9 K | train

14 | multihead\_attn | \_InterpretableMultiHeadAttention | 16.8 K | train

15 | post\_attn\_gan | \_GateAddNorm | 14.1 K | train

16 | feed\_forward\_block | \_GatedResidualNetwork | 28.1 K | train

17 | pre\_output\_gan | \_GateAddNorm | 14.1 K | train

18 | output\_layer | Linear | 252 | train

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936 K Trainable params

0 Non-trainable params

936 K Total params

3.744 Total estimated model params size (MB)

3062 Modules in train mode

0 Modules in eval mode

🚀 Startar ny gridsearch-körning med hyperparametrar:

input\_chunk\_length: 96

output\_chunk\_length: 48

hidden\_size: 83

lstm\_layers: 1

num\_attention\_heads: 4

dropout: 0.3

optimizer\_kwargs: {'lr': 0.01}

Epoch 0: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.629]📉 Epoch 1: train\_loss=0.6290

Epoch 1: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.567]📉 Epoch 2: train\_loss=0.5666

Epoch 2: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.363]📉 Epoch 3: train\_loss=0.3627

Epoch 3: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.345]📉 Epoch 4: train\_loss=0.3449

Epoch 4: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.287]📉 Epoch 5: train\_loss=0.2871

Epoch 5: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.288]📉 Epoch 6: train\_loss=0.2876

Epoch 6: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.230]📉 Epoch 7: train\_loss=0.2297

Epoch 7: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.196]📉 Epoch 8: train\_loss=0.1961

Epoch 8: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.163]📉 Epoch 9: train\_loss=0.1629

Epoch 9: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.170]📉 Epoch 10: train\_loss=0.1698

Epoch 10: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.148]📉 Epoch 11: train\_loss=0.1483

Epoch 11: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.142]📉 Epoch 12: train\_loss=0.1420

Epoch 12: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.141]📉 Epoch 13: train\_loss=0.1414

Epoch 13: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.139]📉 Epoch 14: train\_loss=0.1387

Epoch 14: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.132]📉 Epoch 15: train\_loss=0.1320

Epoch 15: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.127]📉 Epoch 16: train\_loss=0.1266

Epoch 16: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.117]📉 Epoch 17: train\_loss=0.1169

Epoch 17: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.121]📉 Epoch 18: train\_loss=0.1213

Epoch 18: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.117]📉 Epoch 19: train\_loss=0.1171

Epoch 19: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.117]📉 Epoch 20: train\_loss=0.1166

Epoch 20: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.117]📉 Epoch 21: train\_loss=0.1171

Epoch 21: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.111]📉 Epoch 22: train\_loss=0.1110

Epoch 22: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.102] 📉 Epoch 23: train\_loss=0.1016

Epoch 23: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.208] 📉 Epoch 24: train\_loss=0.2082

Epoch 24: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.106]📉 Epoch 25: train\_loss=0.1058

Epoch 25: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0978]📉 Epoch 26: train\_loss=0.0978

Epoch 26: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.111] 📉 Epoch 27: train\_loss=0.1108

Epoch 27: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.101] 📉 Epoch 28: train\_loss=0.1009

Epoch 28: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.105] 📉 Epoch 29: train\_loss=0.1050

Epoch 29: 100%|██████████| 273/273 [03:42<00:00, 1.23it/s, train\_loss=0.0946]📉 Epoch 30: train\_loss=0.0946

Epoch 30: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.106] 📉 Epoch 31: train\_loss=0.1057

Epoch 31: 100%|██████████| 273/273 [03:42<00:00, 1.23it/s, train\_loss=0.0936]📉 Epoch 32: train\_loss=0.0936

Epoch 32: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0974]📉 Epoch 33: train\_loss=0.0974

Epoch 33: 100%|██████████| 273/273 [03:42<00:00, 1.23it/s, train\_loss=0.0946]📉 Epoch 34: train\_loss=0.0946

Epoch 34: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0922]📉 Epoch 35: train\_loss=0.0922

Epoch 35: 100%|██████████| 273/273 [03:42<00:00, 1.23it/s, train\_loss=0.0889]📉 Epoch 36: train\_loss=0.0889

Epoch 36: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0945]📉 Epoch 37: train\_loss=0.0945

Epoch 37: 100%|██████████| 273/273 [03:42<00:00, 1.23it/s, train\_loss=0.0959]📉 Epoch 38: train\_loss=0.0959

Epoch 38: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0831]📉 Epoch 39: train\_loss=0.0831

Epoch 39: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.088] 📉 Epoch 40: train\_loss=0.0880

Epoch 40: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0996]📉 Epoch 41: train\_loss=0.0996

Epoch 41: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0913]📉 Epoch 42: train\_loss=0.0913

Epoch 42: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0912]📉 Epoch 43: train\_loss=0.0912

Epoch 43: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0903]📉 Epoch 44: train\_loss=0.0903

Epoch 44: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0785]📉 Epoch 45: train\_loss=0.0785

Epoch 45: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.231] 📉 Epoch 46: train\_loss=0.2309

Epoch 46: 100%|██████████| 273/273 [03:42<00:00, 1.23it/s, train\_loss=0.145]📉 Epoch 47: train\_loss=0.1454

Epoch 47: 100%|██████████| 273/273 [03:42<00:00, 1.23it/s, train\_loss=0.118]📉 Epoch 48: train\_loss=0.1184

Epoch 48: 100%|██████████| 273/273 [03:42<00:00, 1.23it/s, train\_loss=0.0974]📉 Epoch 49: train\_loss=0.0974

Epoch 49: 100%|██████████| 273/273 [03:42<00:00, 1.23it/s, train\_loss=0.0948]📉 Epoch 50: train\_loss=0.0948

Epoch 50: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.102] 📉 Epoch 51: train\_loss=0.1024

Epoch 51: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0944]📉 Epoch 52: train\_loss=0.0944

Epoch 52: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0883]📉 Epoch 53: train\_loss=0.0883

Epoch 53: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0843]📉 Epoch 54: train\_loss=0.0843

Epoch 54: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0808]📉 Epoch 55: train\_loss=0.0808

Epoch 55: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0823]📉 Epoch 56: train\_loss=0.0823

Epoch 56: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0794]📉 Epoch 57: train\_loss=0.0794

Epoch 57: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0827]📉 Epoch 58: train\_loss=0.0827

Epoch 58: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0754]📉 Epoch 59: train\_loss=0.0754

Epoch 59: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0741]📉 Epoch 60: train\_loss=0.0741

Epoch 60: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0749]📉 Epoch 61: train\_loss=0.0749

Epoch 61: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0768]📉 Epoch 62: train\_loss=0.0768

Epoch 62: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0746]📉 Epoch 63: train\_loss=0.0746

Epoch 63: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0747]📉 Epoch 64: train\_loss=0.0747

Epoch 64: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0787]📉 Epoch 65: train\_loss=0.0787

Epoch 65: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0739]📉 Epoch 66: train\_loss=0.0739

Epoch 66: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0771]📉 Epoch 67: train\_loss=0.0771

Epoch 67: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0726]📉 Epoch 68: train\_loss=0.0726

Epoch 68: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0721]📉 Epoch 69: train\_loss=0.0721

Epoch 69: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0716]📉 Epoch 70: train\_loss=0.0716

Epoch 69: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0716]`Trainer.fit` stopped: `max\_epochs=70` reached.

Epoch 69: 100%|██████████| 273/273 [03:41<00:00, 1.23it/s, train\_loss=0.0716]

`predict()` was called with `n > output\_chunk\_length`: using auto-regression to forecast the values after `output\_chunk\_length` points. The model will access `(n - output\_chunk\_length)` future values of your `past\_covariates` (relative to the first predicted time step). To hide this warning, set `show\_warnings=False`.

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]

Predicting DataLoader 0: 100%|██████████| 1/1 [00:12<00:00, 0.08it/s]

GPU available: True (cuda), used: True

🔍 DEBUG: Dataövergripande information:

▶️ train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00 (26256 timsteg)

✅ val: 2024-01-01 00:00:00 → 2024-12-31 23:00:00 (8784 timsteg)

⏪ past\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

⏪ past\_cov\_val: 2023-12-28 00:00:00 → 2024-12-31 23:00:00

⏩ future\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

⏩ future\_cov\_val: 2023-12-28 00:00:00 → 2024-12-31 23:00:00

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]

🚀 Startar ny gridsearch-körning med hyperparametrar:

input\_chunk\_length: 72

output\_chunk\_length: 48

hidden\_size: 40

lstm\_layers: 2

num\_attention\_heads: 1

dropout: 0.2

optimizer\_kwargs: {'lr': 0.01}. => **TESTA 0.005**

Epoch 0: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.627, val\_loss=0.687]📉 Epoch 1: train\_loss=0.6270 | val\_loss=0.6866

Epoch 0: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.627, val\_loss=0.687]

Metric val\_loss improved. New best score: 0.687

Epoch 1: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.426, val\_loss=0.462]📉 Epoch 2: train\_loss=0.4258 | val\_loss=0.4621

Epoch 1: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.426, val\_loss=0.462]

Metric val\_loss improved by 0.224 >= min\_delta = 0.01. New best score: 0.462

Epoch 2: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.361, val\_loss=0.447]📉 Epoch 3: train\_loss=0.3609 | val\_loss=0.4465

Epoch 2: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.361, val\_loss=0.447]

Metric val\_loss improved by 0.016 >= min\_delta = 0.01. New best score: 0.447

Epoch 3: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.328, val\_loss=0.551]📉 Epoch 4: train\_loss=0.3284 | val\_loss=0.5508

Epoch 4: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.281, val\_loss=0.578]📉 Epoch 5: train\_loss=0.2809 | val\_loss=0.5780

Epoch 5: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.225, val\_loss=0.447]📉 Epoch 6: train\_loss=0.2252 | val\_loss=0.4466

Epoch 5: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.225, val\_loss=0.447]

Monitored metric val\_loss did not improve in the last 3 records. Best score: 0.447. Signaling Trainer to stop.

Epoch 5: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.225, val\_loss=0.447]

`predict()` was called with `n > output\_chunk\_length`: using auto-regression to forecast the values after `output\_chunk\_length` points. The model will access `(n - output\_chunk\_length)` future values of your `past\_covariates` (relative to the first predicted time step). To hide this warning, set `show\_warnings=False`.

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]

Predicting DataLoader 0: 100%|██████████| 1/1 [00:11<00:00, 0.08it/s]

[I 2025-05-10 21:18:01,076] Trial 19 finished with value: 270.6866760253906 and parameters: {'input\_chunk\_length': 72, 'output\_chunk\_length': 48, 'hidden\_size': 40, 'lstm\_layers': 2, 'num\_attention\_heads': 1, 'dropout': 0.2, 'n\_epochs': 30, 'lr': 0.01, 'batch\_size': 128}. Best is trial 19 with value: 270.6866760253906.

🔍 DEBUG: Dataövergripande information:

▶️ train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00 (26256 timsteg)

✅ val: 2024-01-01 00:00:00 → 2024-12-31 23:00:00 (8784 timsteg)

⏪ past\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

⏪ past\_cov\_val: 2023-12-28 00:00:00 → 2024-12-31 23:00:00

⏩ future\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

⏩ future\_cov\_val: 2023-12-28 00:00:00 → 2024-12-31 23:00:00

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]

| Name | Type | Params | Mode

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

0 | train\_metrics | MetricCollection | 0 | train

1 | val\_metrics | MetricCollection | 0 | train

2 | input\_embeddings | \_MultiEmbedding | 0 | train

3 | static\_covariates\_vsn | \_VariableSelectionNetwork | 0 | train

4 | encoder\_vsn | \_VariableSelectionNetwork | 110 K | train

5 | decoder\_vsn | \_VariableSelectionNetwork | 55.4 K | train

6 | static\_context\_grn | \_GatedResidualNetwork | 1.7 K | train

7 | static\_context\_hidden\_encoder\_grn | \_GatedResidualNetwork | 1.7 K | train

8 | static\_context\_cell\_encoder\_grn | \_GatedResidualNetwork | 1.7 K | train

9 | static\_context\_enrichment | \_GatedResidualNetwork | 1.7 K | train

10 | lstm\_encoder | LSTM | 6.7 K | train

11 | lstm\_decoder | LSTM | 6.7 K | train

12 | post\_lstm\_gan | \_GateAddNorm | 880 | train

13 | static\_enrichment\_grn | \_GatedResidualNetwork | 2.1 K | train

14 | multihead\_attn | \_InterpretableMultiHeadAttention | 1.7 K | train

15 | post\_attn\_gan | \_GateAddNorm | 880 | train

16 | feed\_forward\_block | \_GatedResidualNetwork | 1.7 K | train

17 | pre\_output\_gan | \_GateAddNorm | 880 | train

18 | output\_layer | Linear | 63 | train

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

193 K Trainable params

0 Non-trainable params

193 K Total params

0.775 Total estimated model params size (MB)

3056 Modules in train mode

0 Modules in eval mode

🚀 Startar ny gridsearch-körning med hyperparametrar:

input\_chunk\_length: 48

output\_chunk\_length: 48

hidden\_size: 20

lstm\_layers: 2

num\_attention\_heads: 1

dropout: 0.5

optimizer\_kwargs: {'lr': 0.0001}

Epoch 0: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=5.600, val\_loss=5.740]📉 Epoch 1: train\_loss=5.5996 | val\_loss=5.7369

Epoch 0: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=5.600, val\_loss=5.740]Metric val\_loss improved. New best score: 5.737

Epoch 1: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=5.080, val\_loss=4.910]📉 Epoch 2: train\_loss=5.0814 | val\_loss=4.9072

Epoch 1: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=5.080, val\_loss=4.910]Metric val\_loss improved by 0.830 >= min\_delta = 0.01. New best score: 4.907

Epoch 2: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=3.730, val\_loss=4.080]📉 Epoch 3: train\_loss=3.7276 | val\_loss=4.0754

Epoch 2: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=3.730, val\_loss=4.080]Metric val\_loss improved by 0.832 >= min\_delta = 0.01. New best score: 4.075

Epoch 3: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=2.970, val\_loss=3.230]📉 Epoch 4: train\_loss=2.9690 | val\_loss=3.2327

Epoch 3: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=2.970, val\_loss=3.230]Metric val\_loss improved by 0.843 >= min\_delta = 0.01. New best score: 3.233

Epoch 4: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=2.110, val\_loss=2.440]📉 Epoch 5: train\_loss=2.1061 | val\_loss=2.4423

Epoch 4: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=2.110, val\_loss=2.440]Metric val\_loss improved by 0.790 >= min\_delta = 0.01. New best score: 2.442

Epoch 5: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=1.630, val\_loss=1.790]📉 Epoch 6: train\_loss=1.6286 | val\_loss=1.7892

Epoch 5: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=1.630, val\_loss=1.790]Metric val\_loss improved by 0.653 >= min\_delta = 0.01. New best score: 1.789

Epoch 6: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=1.220, val\_loss=1.330]📉 Epoch 7: train\_loss=1.2221 | val\_loss=1.3321

Epoch 6: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=1.220, val\_loss=1.330]Metric val\_loss improved by 0.457 >= min\_delta = 0.01. New best score: 1.332

Epoch 7: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.941, val\_loss=1.060]📉 Epoch 8: train\_loss=0.9411 | val\_loss=1.0609

Epoch 7: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.941, val\_loss=1.060]Metric val\_loss improved by 0.271 >= min\_delta = 0.01. New best score: 1.061

Epoch 8: 100%|██████████| 205/205 [01:48<00:00, 1.88it/s, train\_loss=0.785, val\_loss=0.915]📉 Epoch 9: train\_loss=0.7846 | val\_loss=0.9151

Epoch 8: 100%|██████████| 205/205 [01:48<00:00, 1.88it/s, train\_loss=0.785, val\_loss=0.915]Metric val\_loss improved by 0.146 >= min\_delta = 0.01. New best score: 0.915

Epoch 9: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.741, val\_loss=0.812]📉 Epoch 10: train\_loss=0.7406 | val\_loss=0.8124

Epoch 9: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.741, val\_loss=0.812]Metric val\_loss improved by 0.103 >= min\_delta = 0.01. New best score: 0.812

Epoch 10: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.714, val\_loss=0.733]📉 Epoch 11: train\_loss=0.7137 | val\_loss=0.7329

Epoch 10: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.714, val\_loss=0.733]Metric val\_loss improved by 0.080 >= min\_delta = 0.01. New best score: 0.733

Epoch 11: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.548, val\_loss=0.724]📉 Epoch 12: train\_loss=0.5477 | val\_loss=0.7237

Epoch 12: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.529, val\_loss=0.606]📉 Epoch 13: train\_loss=0.5285 | val\_loss=0.6057

Epoch 12: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.529, val\_loss=0.606]Metric val\_loss improved by 0.127 >= min\_delta = 0.01. New best score: 0.606

Epoch 13: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.502, val\_loss=0.631]📉 Epoch 14: train\_loss=0.5016 | val\_loss=0.6308

Epoch 14: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.489, val\_loss=0.575]📉 Epoch 15: train\_loss=0.4889 | val\_loss=0.5747

Epoch 14: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.489, val\_loss=0.575]Metric val\_loss improved by 0.031 >= min\_delta = 0.01. New best score: 0.575

Epoch 15: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.464, val\_loss=0.551]📉 Epoch 16: train\_loss=0.4638 | val\_loss=0.5508

Epoch 15: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.464, val\_loss=0.551]Metric val\_loss improved by 0.024 >= min\_delta = 0.01. New best score: 0.551

Epoch 16: 100%|██████████| 205/205 [01:48<00:00, 1.88it/s, train\_loss=0.436, val\_loss=0.540]📉 Epoch 17: train\_loss=0.4357 | val\_loss=0.5401

Epoch 16: 100%|██████████| 205/205 [01:48<00:00, 1.88it/s, train\_loss=0.436, val\_loss=0.540]Metric val\_loss improved by 0.011 >= min\_delta = 0.01. New best score: 0.540

Epoch 17: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.426, val\_loss=0.533]📉 Epoch 18: train\_loss=0.4260 | val\_loss=0.5325

Epoch 18: 100%|██████████| 205/205 [01:48<00:00, 1.88it/s, train\_loss=0.384, val\_loss=0.496]📉 Epoch 19: train\_loss=0.3843 | val\_loss=0.4960

Epoch 18: 100%|██████████| 205/205 [01:48<00:00, 1.88it/s, train\_loss=0.384, val\_loss=0.496]Metric val\_loss improved by 0.044 >= min\_delta = 0.01. New best score: 0.496

Epoch 19: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.430, val\_loss=0.478]📉 Epoch 20: train\_loss=0.4298 | val\_loss=0.4783

Epoch 19: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.430, val\_loss=0.478]Metric val\_loss improved by 0.018 >= min\_delta = 0.01. New best score: 0.478

Epoch 20: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.395, val\_loss=0.491]📉 Epoch 21: train\_loss=0.3949 | val\_loss=0.4912

Epoch 21: 100%|██████████| 205/205 [01:48<00:00, 1.88it/s, train\_loss=0.455, val\_loss=0.472]📉 Epoch 22: train\_loss=0.4547 | val\_loss=0.4720

Epoch 22: 100%|██████████| 205/205 [01:48<00:00, 1.88it/s, train\_loss=0.441, val\_loss=0.451]📉 Epoch 23: train\_loss=0.4410 | val\_loss=0.4511

Epoch 22: 100%|██████████| 205/205 [01:48<00:00, 1.88it/s, train\_loss=0.441, val\_loss=0.451]Metric val\_loss improved by 0.027 >= min\_delta = 0.01. New best score: 0.451

Epoch 23: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.437, val\_loss=0.447]📉 Epoch 24: train\_loss=0.4365 | val\_loss=0.4469

Epoch 24: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.410, val\_loss=0.461]📉 Epoch 25: train\_loss=0.4101 | val\_loss=0.4605

Epoch 25: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.424, val\_loss=0.460]📉 Epoch 26: train\_loss=0.4241 | val\_loss=0.4599

Epoch 25: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.424, val\_loss=0.460]Monitored metric val\_loss did not improve in the last 3 records. Best score: 0.451. Signaling Trainer to stop.

Epoch 25: 100%|██████████| 205/205 [01:48<00:00, 1.89it/s, train\_loss=0.424, val\_loss=0.460]

`predict()` was called with `n > output\_chunk\_length`: using auto-regression to forecast the values after `output\_chunk\_length` points. The model will access `(n - output\_chunk\_length)` future values of your `past\_covariates` (relative to the first predicted time step). To hide this warning, set `show\_warnings=False`.

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]

Predicting DataLoader 0: 100%|██████████| 1/1 [00:11<00:00, 0.08it/s][I 2025-05-11 03:39:44,577] Trial 36 finished with value: 358.80511474609375 and parameters: {'input\_chunk\_length': 48, 'output\_chunk\_length': 48, 'hidden\_size': 20, 'lstm\_layers': 2, 'num\_attention\_heads': 1, 'dropout': 0.5, 'n\_epochs': 30, 'lr': 0.0001, 'batch\_size': 128}. Best is trial 19 with value: 270.6866760253906.

✅ Saved new best params with score 284.9240417480469 to best\_params.json

🔍 DEBUG: Dataövergripande information:

▶️ train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00 (26256 timsteg)

✅ val: 2024-01-01 00:00:00 → 2024-12-31 23:00:00 (8784 timsteg)

⏪ past\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

⏪ past\_cov\_val: 2023-12-28 00:00:00 → 2024-12-31 23:00:00

⏩ future\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

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]

| Name | Type | Params | Mode

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

0 | train\_metrics | MetricCollection | 0 | train

1 | val\_metrics | MetricCollection | 0 | train

2 | input\_embeddings | \_MultiEmbedding | 0 | train

3 | static\_covariates\_vsn | \_VariableSelectionNetwork | 0 | train

4 | encoder\_vsn | \_VariableSelectionNetwork | 201 K | train

5 | decoder\_vsn | \_VariableSelectionNetwork | 101 K | train

6 | static\_context\_grn | \_GatedResidualNetwork | 6.6 K | train

7 | static\_context\_hidden\_encoder\_grn | \_GatedResidualNetwork | 6.6 K | train

8 | static\_context\_cell\_encoder\_grn | \_GatedResidualNetwork | 6.6 K | train

9 | static\_context\_enrichment | \_GatedResidualNetwork | 6.6 K | train

10 | lstm\_encoder | LSTM | 39.4 K | train

11 | lstm\_decoder | LSTM | 39.4 K | train

12 | post\_lstm\_gan | \_GateAddNorm | 3.4 K | train

13 | static\_enrichment\_grn | \_GatedResidualNetwork | 8.2 K | train

14 | multihead\_attn | \_InterpretableMultiHeadAttention | 4.1 K | train

15 | post\_attn\_gan | \_GateAddNorm | 3.4 K | train

16 | feed\_forward\_block | \_GatedResidualNetwork | 6.6 K | train

17 | pre\_output\_gan | \_GateAddNorm | 3.4 K | train

18 | output\_layer | Linear | 123 | train

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

435 K Trainable params

0 Non-trainable params

435 K Total params

1.743 Total estimated model params size (MB)

3062 Modules in train mode

0 Modules in eval mode

🚀 Startar ny gridsearch-körning med hyperparametrar:

input\_chunk\_length: 72

output\_chunk\_length: 48

hidden\_size: 40

lstm\_layers: 3

num\_attention\_heads: 4

dropout: 0.4

optimizer\_kwargs: {'lr': 0.001}

Epoch 0: 100%|██████████| 205/205 [05:16<00:00, 0.65it/s, train\_loss=0.725, val\_loss=0.757]📉 Epoch 1: train\_loss=0.7250 | val\_loss=0.7568

Epoch 0: 100%|██████████| 205/205 [05:16<00:00, 0.65it/s, train\_loss=0.725, val\_loss=0.757]Metric val\_loss improved. New best score: 0.757

Epoch 1: 100%|██████████| 205/205 [05:16<00:00, 0.65it/s, train\_loss=0.418, val\_loss=0.543]📉 Epoch 2: train\_loss=0.4179 | val\_loss=0.5429

Epoch 1: 100%|██████████| 205/205 [05:16<00:00, 0.65it/s, train\_loss=0.418, val\_loss=0.543]Metric val\_loss improved by 0.214 >= min\_delta = 0.01. New best score: 0.543

Epoch 2: 100%|██████████| 205/205 [05:16<00:00, 0.65it/s, train\_loss=0.541, val\_loss=0.585]📉 Epoch 3: train\_loss=0.5412 | val\_loss=0.5849

Epoch 3: 100%|██████████| 205/205 [05:15<00:00, 0.65it/s, train\_loss=0.346, val\_loss=0.510]📉 Epoch 4: train\_loss=0.3462 | val\_loss=0.5103

Epoch 3: 100%|██████████| 205/205 [05:15<00:00, 0.65it/s, train\_loss=0.346, val\_loss=0.510]Metric val\_loss improved by 0.033 >= min\_delta = 0.01. New best score: 0.510

Epoch 4: 100%|██████████| 205/205 [05:15<00:00, 0.65it/s, train\_loss=0.279, val\_loss=0.401]📉 Epoch 5: train\_loss=0.2794 | val\_loss=0.4011

Epoch 4: 100%|██████████| 205/205 [05:15<00:00, 0.65it/s, train\_loss=0.279, val\_loss=0.401]Metric val\_loss improved by 0.109 >= min\_delta = 0.01. New best score: 0.401

Epoch 5: 100%|██████████| 205/205 [02:34<00:00, 1.33it/s, train\_loss=0.380, val\_loss=0.404]📉 Epoch 6: train\_loss=0.3797 | val\_loss=0.4042

Epoch 6: 100%|██████████| 205/205 [02:24<00:00, 1.42it/s, train\_loss=0.305, val\_loss=0.392]📉 Epoch 7: train\_loss=0.3051 | val\_loss=0.3918

Epoch 7: 100%|██████████| 205/205 [02:24<00:00, 1.42it/s, train\_loss=0.340, val\_loss=0.393]📉 Epoch 8: train\_loss=0.3403 | val\_loss=0.3930

Epoch 7: 100%|██████████| 205/205 [02:24<00:00, 1.42it/s, train\_loss=0.340, val\_loss=0.393]Monitored metric val\_loss did not improve in the last 3 records. Best score: 0.401. Signaling Trainer to stop.

Epoch 7: 100%|██████████| 205/205 [02:24<00:00, 1.42it/s, train\_loss=0.340, val\_loss=0.393]

`predict()` was called with `n > output\_chunk\_length`: using auto-regression to forecast the values after `output\_chunk\_length` points. The model will access `(n - output\_chunk\_length)` future values of your `past\_covariates` (relative to the first predicted time step). To hide this warning, set `show\_warnings=False`.

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]

Predicting DataLoader 0: 100%|██████████| 1/1 [00:12<00:00, 0.08it/s][I 2025-05-10 12:41:01,214] Trial 0 finished with value: 284.9240417480469 and parameters: {'input\_chunk\_length': 72, 'output\_chunk\_length': 48, 'hidden\_size': 40, 'lstm\_layers': 3, 'num\_attention\_heads': 4, 'dropout': 0.4, 'n\_epochs': 30, 'lr': 0.001, 'batch\_size': 128}. Best is trial 0 with value: 284.9240417480469.

🔍 DEBUG: Dataövergripande information:

▶️ train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00 (26256 timsteg)

✅ val: 2024-01-01 00:00:00 → 2024-12-31 23:00:00 (8784 timsteg)

⏪ past\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

⏪ past\_cov\_val: 2023-12-28 00:00:00 → 2024-12-31 23:00:00

⏩ future\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

⏩ future\_cov\_val: 2023-12-28 00:00:00 → 2024-12-31 23:00:00

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]

| Name | Type | Params | Mode

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

0 | train\_metrics | MetricCollection | 0 | train

1 | val\_metrics | MetricCollection | 0 | train

2 | input\_embeddings | \_MultiEmbedding | 0 | train

3 | static\_covariates\_vsn | \_VariableSelectionNetwork | 0 | train

4 | encoder\_vsn | \_VariableSelectionNetwork | 201 K | train

5 | decoder\_vsn | \_VariableSelectionNetwork | 101 K | train

6 | static\_context\_grn | \_GatedResidualNetwork | 6.6 K | train

7 | static\_context\_hidden\_encoder\_grn | \_GatedResidualNetwork | 6.6 K | train

8 | static\_context\_cell\_encoder\_grn | \_GatedResidualNetwork | 6.6 K | train

9 | static\_context\_enrichment | \_GatedResidualNetwork | 6.6 K | train

10 | lstm\_encoder | LSTM | 13.1 K | train

11 | lstm\_decoder | LSTM | 13.1 K | train

12 | post\_lstm\_gan | \_GateAddNorm | 3.4 K | train

13 | static\_enrichment\_grn | \_GatedResidualNetwork | 8.2 K | train

14 | multihead\_attn | \_InterpretableMultiHeadAttention | 6.5 K | train

15 | post\_attn\_gan | \_GateAddNorm | 3.4 K | train

16 | feed\_forward\_block | \_GatedResidualNetwork | 6.6 K | train

17 | pre\_output\_gan | \_GateAddNorm | 3.4 K | train

18 | output\_layer | Linear | 123 | train

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385 K Trainable params

0 Non-trainable params

385 K Total params

1.543 Total estimated model params size (MB)

3056 Modules in train mode

0 Modules in eval mode

🚀 Startar ny gridsearch-körning med hyperparametrar:

input\_chunk\_length: 72

output\_chunk\_length: 48

hidden\_size: 40

lstm\_layers: 1

num\_attention\_heads: 1

dropout: 0.3

optimizer\_kwargs: {'lr': 0.001}

Epoch 0: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.803, val\_loss=0.794]📉 Epoch 1: train\_loss=0.8027 | val\_loss=0.7944

Epoch 0: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.803, val\_loss=0.794]Metric val\_loss improved. New best score: 0.794

Epoch 1: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.437, val\_loss=0.523]📉 Epoch 2: train\_loss=0.4365 | val\_loss=0.5226

Epoch 1: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.437, val\_loss=0.523]Metric val\_loss improved by 0.272 >= min\_delta = 0.01. New best score: 0.523

Epoch 2: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.426, val\_loss=0.477]📉 Epoch 3: train\_loss=0.4259 | val\_loss=0.4767

Epoch 2: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.426, val\_loss=0.477]Metric val\_loss improved by 0.046 >= min\_delta = 0.01. New best score: 0.477

Epoch 3: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.350, val\_loss=0.521]📉 Epoch 4: train\_loss=0.3497 | val\_loss=0.5210

Epoch 4: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.374, val\_loss=0.518]📉 Epoch 5: train\_loss=0.3743 | val\_loss=0.5177

Epoch 5: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.339, val\_loss=0.434]📉 Epoch 6: train\_loss=0.3389 | val\_loss=0.4337

Epoch 5: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.339, val\_loss=0.434]Metric val\_loss improved by 0.043 >= min\_delta = 0.01. New best score: 0.434

Epoch 6: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.305, val\_loss=0.448]📉 Epoch 7: train\_loss=0.3047 | val\_loss=0.4482

Epoch 7: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.353, val\_loss=0.404]📉 Epoch 8: train\_loss=0.3531 | val\_loss=0.4040

Epoch 7: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.353, val\_loss=0.404]Metric val\_loss improved by 0.030 >= min\_delta = 0.01. New best score: 0.404

Epoch 8: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.304, val\_loss=0.391]📉 Epoch 9: train\_loss=0.3041 | val\_loss=0.3909

Epoch 8: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.304, val\_loss=0.391]Metric val\_loss improved by 0.013 >= min\_delta = 0.01. New best score: 0.391

Epoch 9: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.288, val\_loss=0.383]📉 Epoch 10: train\_loss=0.2880 | val\_loss=0.3827

Epoch 10: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.291, val\_loss=0.409]📉 Epoch 11: train\_loss=0.2910 | val\_loss=0.4090

Epoch 11: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.255, val\_loss=0.414]📉 Epoch 12: train\_loss=0.2554 | val\_loss=0.4139

Epoch 11: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.255, val\_loss=0.414]Monitored metric val\_loss did not improve in the last 3 records. Best score: 0.391. Signaling Trainer to stop.

Epoch 11: 100%|██████████| 205/205 [02:23<00:00, 1.43it/s, train\_loss=0.255, val\_loss=0.414]

`predict()` was called with `n > output\_chunk\_length`: using auto-regression to forecast the values after `output\_chunk\_length` points. The model will access `(n - output\_chunk\_length)` future values of your `past\_covariates` (relative to the first predicted time step). To hide this warning, set `show\_warnings=False`.

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]

Predicting DataLoader 0: 100%|██████████| 1/1 [00:11<00:00, 0.09it/s][I 2025-05-10 19:36:22,110] Trial 14 finished with value: 312.9854736328125 and parameters: {'input\_chunk\_length': 72, 'output\_chunk\_length': 48, 'hidden\_size': 40, 'lstm\_layers': 1, 'num\_attention\_heads': 1, 'dropout': 0.3, 'n\_epochs': 30, 'lr': 0.001, 'batch\_size': 128}. Best is trial 0 with value: 284.9240417480469.

✅ Memory cleaned!

🔍 DEBUG: Dataövergripande information:

▶️ train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00 (26256 timsteg)

✅ val: 2024-01-01 00:00:00 → 2024-12-31 23:00:00 (8784 timsteg)

⏪ past\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

⏪ past\_cov\_val: 2023-12-28 00:00:00 → 2024-12-31 23:00:00

⏩ future\_cov\_train: 2021-01-02 00:00:00 → 2023-12-31 23:00:00

⏩ future\_cov\_val: 2023-12-28 00:00:00 → 2024-12-31 23:00:00

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]

Startar ny gridsearch-körning med hyperparametrar:

input\_chunk\_length: 72

output\_chunk\_length: 48

hidden\_size: 80

lstm\_layers: 3

num\_attention\_heads: 4

dropout: 0.3

optimizer\_kwargs: {'lr': 0.001}

Epoch 0: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.467, val\_loss=0.615]📉 Epoch 1: train\_loss=0.4670 | val\_loss=0.6145

Epoch 0: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.467, val\_loss=0.615]

Metric val\_loss improved. New best score: 0.615

Epoch 1: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.492, val\_loss=0.490]📉 Epoch 2: train\_loss=0.4924 | val\_loss=0.4905

Epoch 1: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.492, val\_loss=0.490]

Metric val\_loss improved by 0.124 >= min\_delta = 0.01. New best score: 0.490

Epoch 2: 100%|██████████| 205/205 [02:33<00:00, 1.34it/s, train\_loss=0.383, val\_loss=0.416]📉 Epoch 3: train\_loss=0.3828 | val\_loss=0.4158

Epoch 2: 100%|██████████| 205/205 [02:33<00:00, 1.34it/s, train\_loss=0.383, val\_loss=0.416]

Metric val\_loss improved by 0.075 >= min\_delta = 0.01. New best score: 0.416

Epoch 3: 100%|██████████| 205/205 [02:33<00:00, 1.34it/s, train\_loss=0.353, val\_loss=0.460]📉 Epoch 4: train\_loss=0.3530 | val\_loss=0.4599

Epoch 4: 100%|██████████| 205/205 [02:32<00:00, 1.34it/s, train\_loss=0.395, val\_loss=0.418]📉 Epoch 5: train\_loss=0.3953 | val\_loss=0.4177

Epoch 5: 100%|██████████| 205/205 [02:32<00:00, 1.34it/s, train\_loss=0.347, val\_loss=0.414]📉 Epoch 6: train\_loss=0.3468 | val\_loss=0.4144

Epoch 5: 100%|██████████| 205/205 [02:32<00:00, 1.34it/s, train\_loss=0.347, val\_loss=0.414]

Monitored metric val\_loss did not improve in the last 3 records. Best score: 0.416. Signaling Trainer to stop.

Epoch 5: 100%|██████████| 205/205 [02:32<00:00, 1.34it/s, train\_loss=0.347, val\_loss=0.414]

`predict()` was called with `n > output\_chunk\_length`: using auto-regression to forecast the values after `output\_chunk\_length` points. The model will access `(n - output\_chunk\_length)` future values of your `past\_covariates` (relative to the first predicted time step). To hide this warning, set `show\_warnings=False`.

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]

Predicting DataLoader 0: 100%|██████████| 1/1 [00:12<00:00, 0.08it/s]

[I 2025-05-10 18:47:08,168] Trial 12 finished with value: 314.4595642089844 and parameters: {'input\_chunk\_length': 72, 'output\_chunk\_length': 48, 'hidden\_size': 80, 'lstm\_layers': 3, 'num\_attention\_heads': 4, 'dropout': 0.3, 'n\_epochs': 30, 'lr': 0.001, 'batch\_size': 128}. Best is trial 0 with value: 284.9240417480469.

Startar ny gridsearch-körning med hyperparametrar:

input\_chunk\_length: 72

output\_chunk\_length: 48

hidden\_size: 80

lstm\_layers: 2

num\_attention\_heads: 4

dropout: 0.4

optimizer\_kwargs: {'lr': 0.001}

Epoch 0: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.671, val\_loss=0.578]📉 Epoch 1: train\_loss=0.6712 | val\_loss=0.5777

Epoch 0: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.671, val\_loss=0.578]

Metric val\_loss improved. New best score: 0.578

Epoch 1: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.414, val\_loss=0.592]📉 Epoch 2: train\_loss=0.4137 | val\_loss=0.5918

Epoch 2: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.463, val\_loss=0.566]📉 Epoch 3: train\_loss=0.4635 | val\_loss=0.5661

Epoch 2: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.463, val\_loss=0.566]

Metric val\_loss improved by 0.012 >= min\_delta = 0.01. New best score: 0.566

Epoch 3: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.395, val\_loss=0.446]📉 Epoch 4: train\_loss=0.3946 | val\_loss=0.4457

Epoch 3: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.395, val\_loss=0.446]

Metric val\_loss improved by 0.120 >= min\_delta = 0.01. New best score: 0.446

Epoch 4: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.367, val\_loss=0.397]📉 Epoch 5: train\_loss=0.3674 | val\_loss=0.3971

Epoch 4: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.367, val\_loss=0.397]

Metric val\_loss improved by 0.049 >= min\_delta = 0.01. New best score: 0.397

Epoch 5: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.411, val\_loss=0.473]📉 Epoch 6: train\_loss=0.4105 | val\_loss=0.4731

Epoch 6: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.340, val\_loss=0.459]📉 Epoch 7: train\_loss=0.3402 | val\_loss=0.4590

Epoch 7: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.322, val\_loss=0.433]📉 Epoch 8: train\_loss=0.3217 | val\_loss=0.4331

Epoch 7: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.322, val\_loss=0.433]

Monitored metric val\_loss did not improve in the last 3 records. Best score: 0.397. Signaling Trainer to stop.

Epoch 7: 100%|██████████| 205/205 [02:31<00:00, 1.35it/s, train\_loss=0.322, val\_loss=0.433]

`predict()` was called with `n > output\_chunk\_length`: using auto-regression to forecast the values after `output\_chunk\_length` points. The model will access `(n - output\_chunk\_length)` future values of your `past\_covariates` (relative to the first predicted time step). To hide this warning, set `show\_warnings=False`.

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]

Predicting DataLoader 0: 100%|██████████| 1/1 [00:12<00:00, 0.08it/s]

[I 2025-05-10 19:56:49,541] Trial 15 finished with value: 308.0473327636719 and parameters: {'input\_chunk\_length': 72, 'output\_chunk\_length': 48, 'hidden\_size': 80, 'lstm\_layers': 2, 'num\_attention\_heads': 4, 'dropout': 0.4, 'n\_epochs': 30, 'lr': 0.001, 'batch\_size': 128}. Best is trial 0 with value: 284.9240417480469.