

Model Report: SimpleNN

18/12/2024

Introduction

This is an automated report for the Experiment with neural networks on traffic volume dataset; the SimpleNN model.

This report will first introduce the model setup, including the hyperparameters and search algorithms used. Hereafter the base dataset will be described, and the differently created training datasets will be listed. After that, the results for the different forecast types will be presented, and the best results will be shown in plots.

Experiment description:

Experiment with neural networks on traffic volume dataset

Model setup

The model has been used for the following forecast purposes:

- ☐ one_step
- ☐ multistep
- ☐ recursive

The model has been optimized using the following hyperparameters:

- optimizer: ['adam', 'sgd']
- epochs: [100, 200]
- batch_size: [32, 64]
- scaler: [None, StandardScaler(), MinMaxScaler(), RobustScaler(), PowerTransformer()]

And with the following search algorithms:

- ☐ grid
- ☐ random

The used performance measure is the neg_mean_absolute_error measure.

Dataset setup

The baseline dataset used for these forecasts is

the 'Metro Interstate Traffic Volume with hourly features and holiday markings.' dataset: *'Metro Interstate Traffic Volume with hourly features and holiday markings.'*

The test size used for the forecasts is 0.2.

○ Dataset 1

- name: univariate_lagged
- dataset_type: univariate
- prediction_type: one_step
- components: ['one_step_target', 'lagged_target']

○ Dataset 2

- name: univariate_temporal
- dataset_type: univariate
- prediction_type: one_step
- components: ['one_step_target', 'temporal_features']

○ Dataset 3

- name: multivariate_lagged
- dataset_type: multivariate
- prediction_type: one_step
- components: ['one_step_target', 'lagged_target', 'feature_columns']

○ Dataset 4

- name: multivariate_lagged_temporal
- dataset_type: multivariate
- prediction_type: one_step
- components: ['one_step_target', 'temporal_features', 'feature_columns', 'lagged_target']

○ Dataset 5

- name: univariate_lagged_multistep
- dataset_type: univariate
- prediction_type: multistep
- components: ['multistep_target', 'lagged_target']

○ Dataset 6

- name: multivariate_lagged_temporal_multistep
- dataset_type: multivariate
- prediction_type: multistep
- components: ['multistep_target', 'temporal_features', 'feature_columns', 'lagged_target']

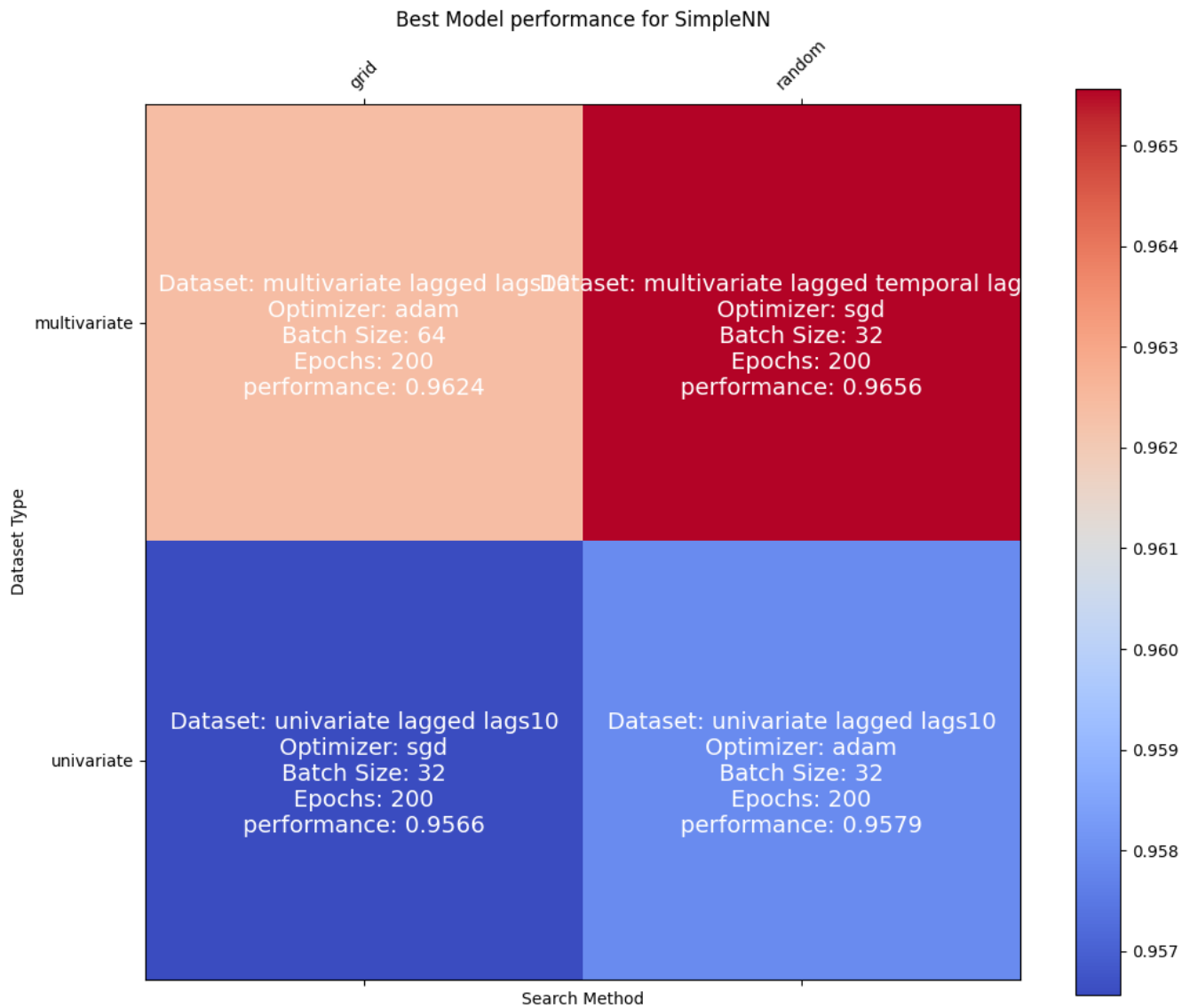
Results: SimpleNN

The presentation of the results follows this system: For each prediction type, the best and worst results for each combination of search method and dataset type are presented in heat plots along with the corresponding model setup.

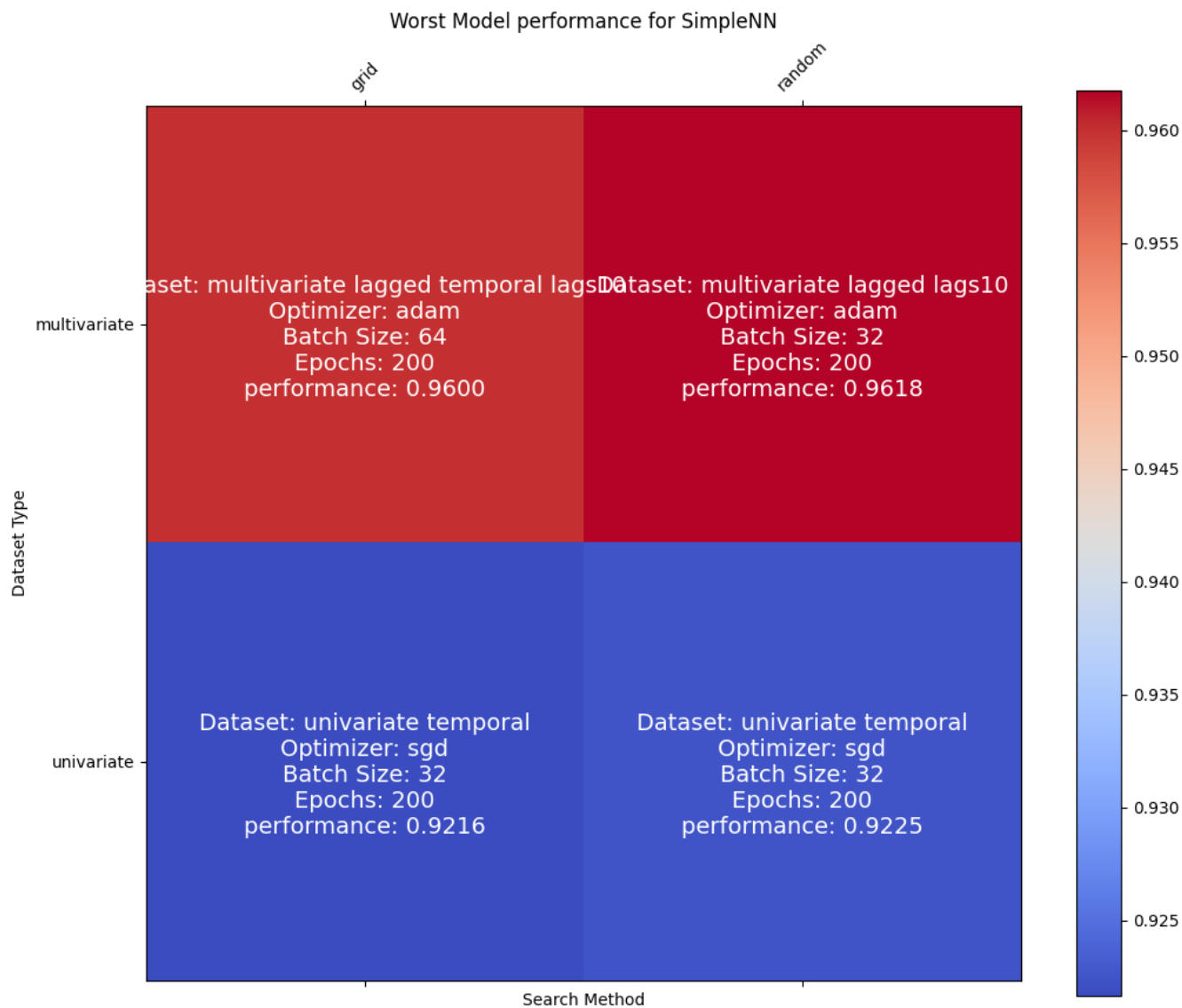
- Then, if the prediction type is one-step forecasts, the best prediction over time is visualized in a line plot.
- If the prediction type is a multi-step forecast, either direct or recursive, the model with the average best r^2 score is chosen, and the three best and worst predictions are visualized in a line plot. Furthermore, three steps of the forecasts are plotted.

Results for the one_step forecast.

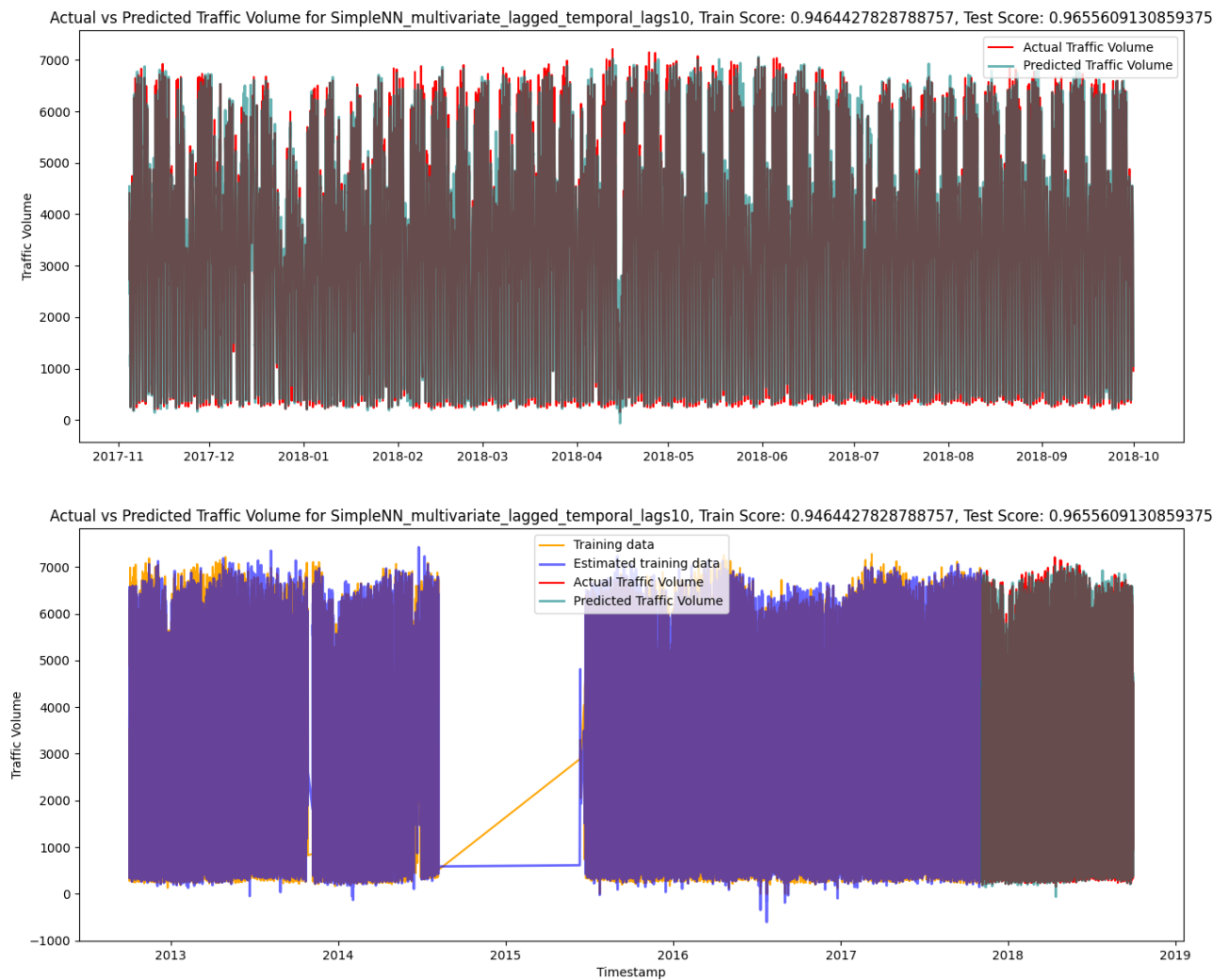
The best results (one_step) for the different setup combinations are as follows:



The worst results (one_step) for the different setup combinations are as follows:

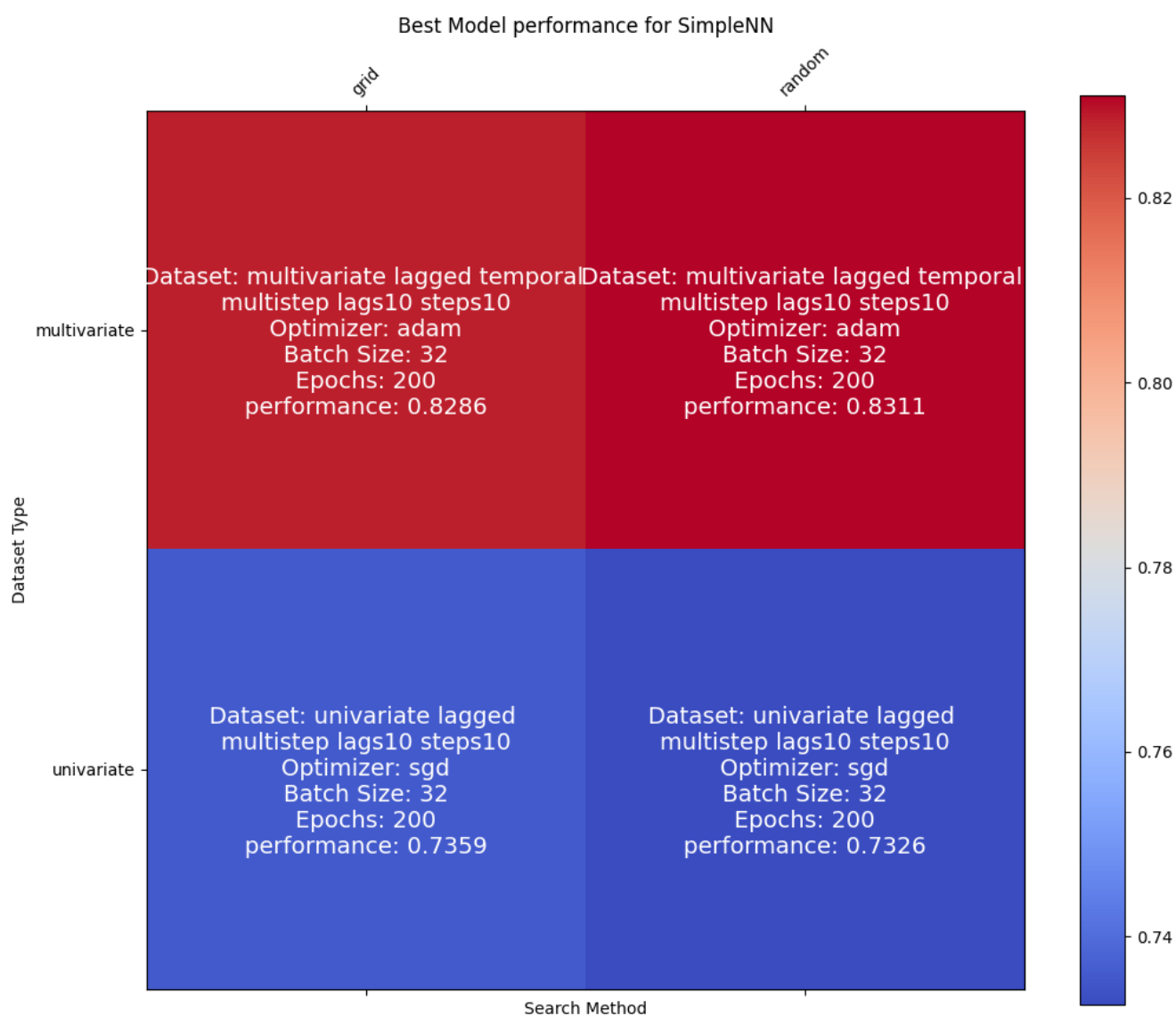


Best one_step forecast over time

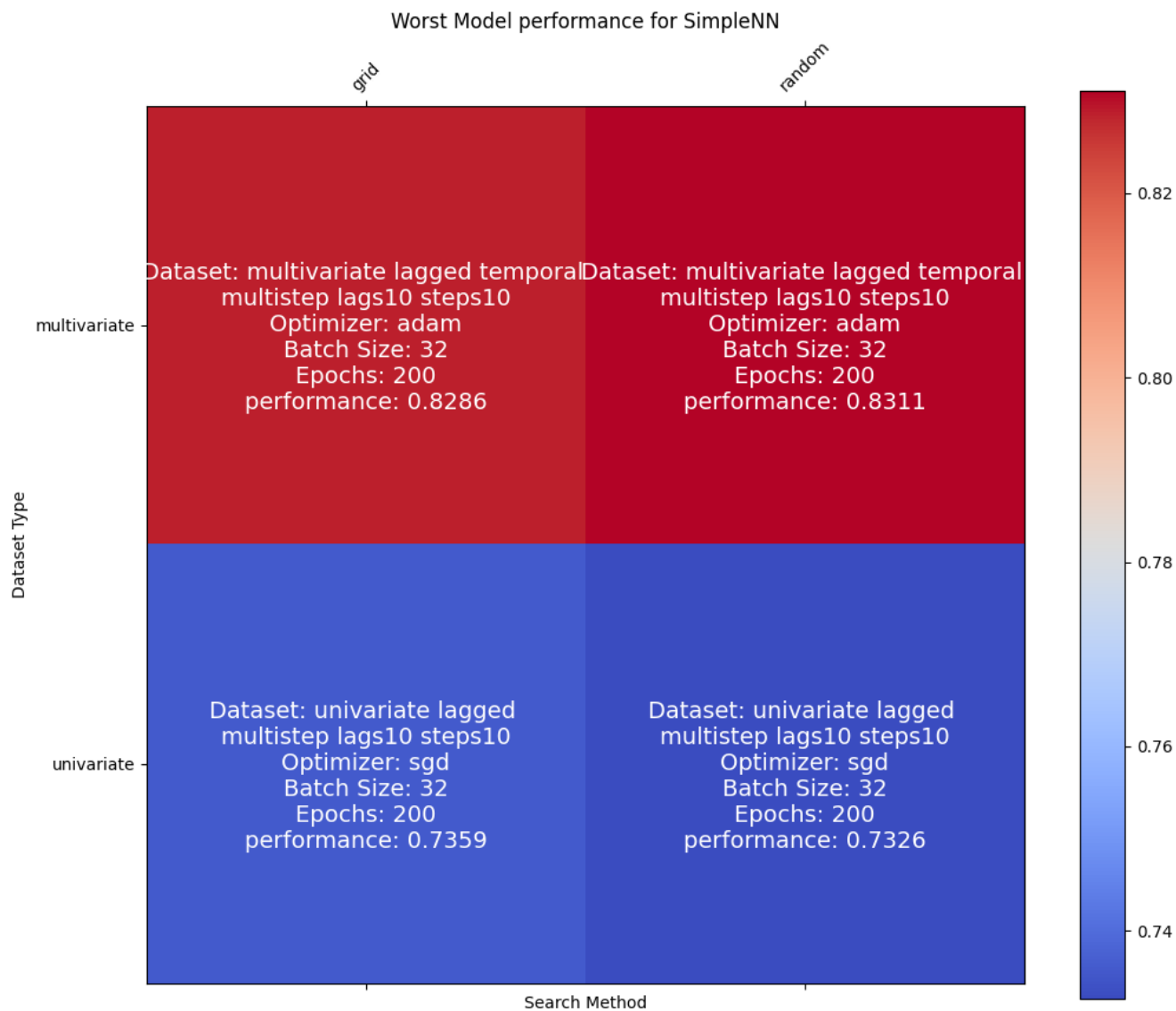


Results for the multistep forecast.

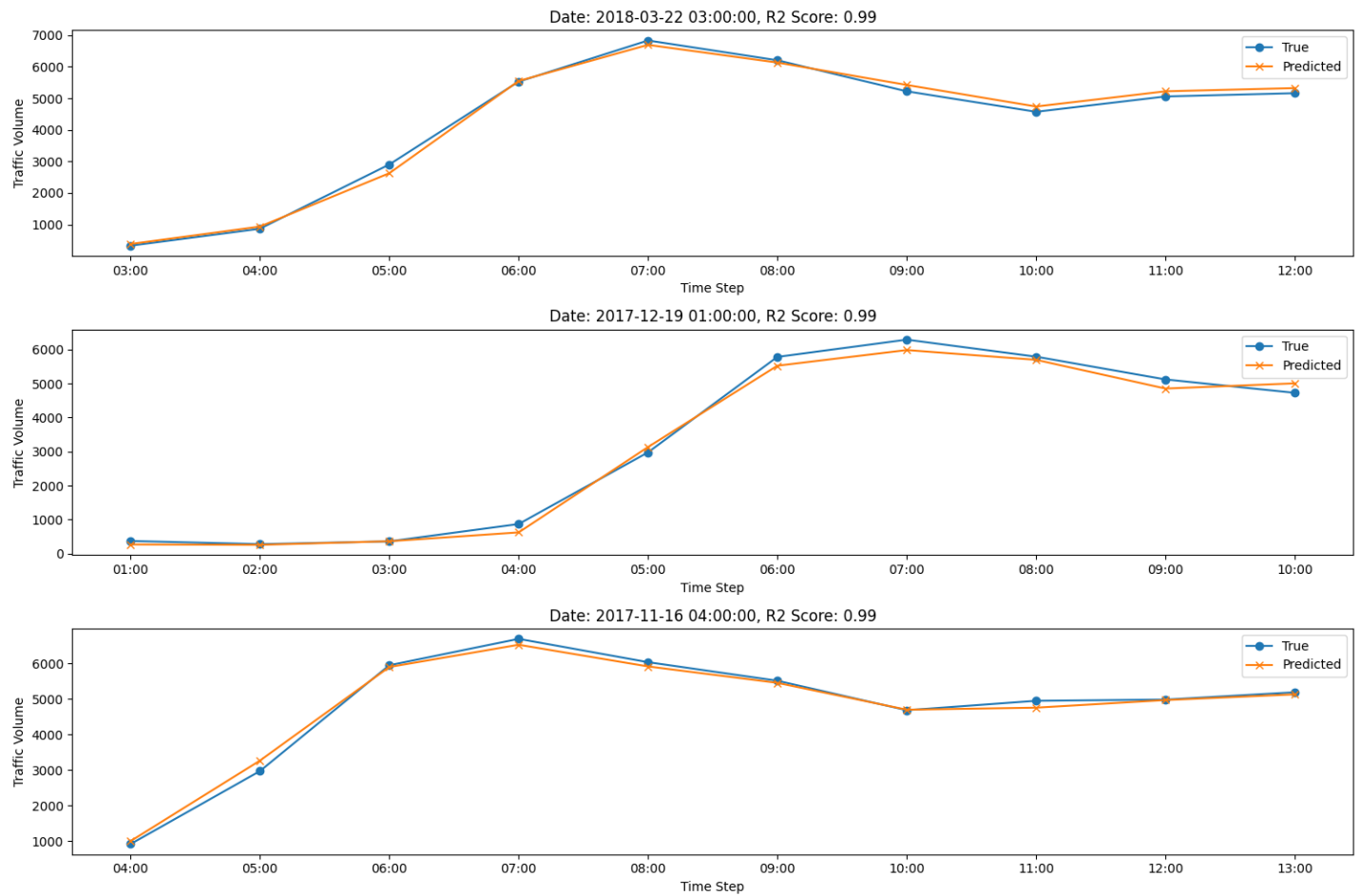
The best results (multistep) for the different setup combinations are as follows:



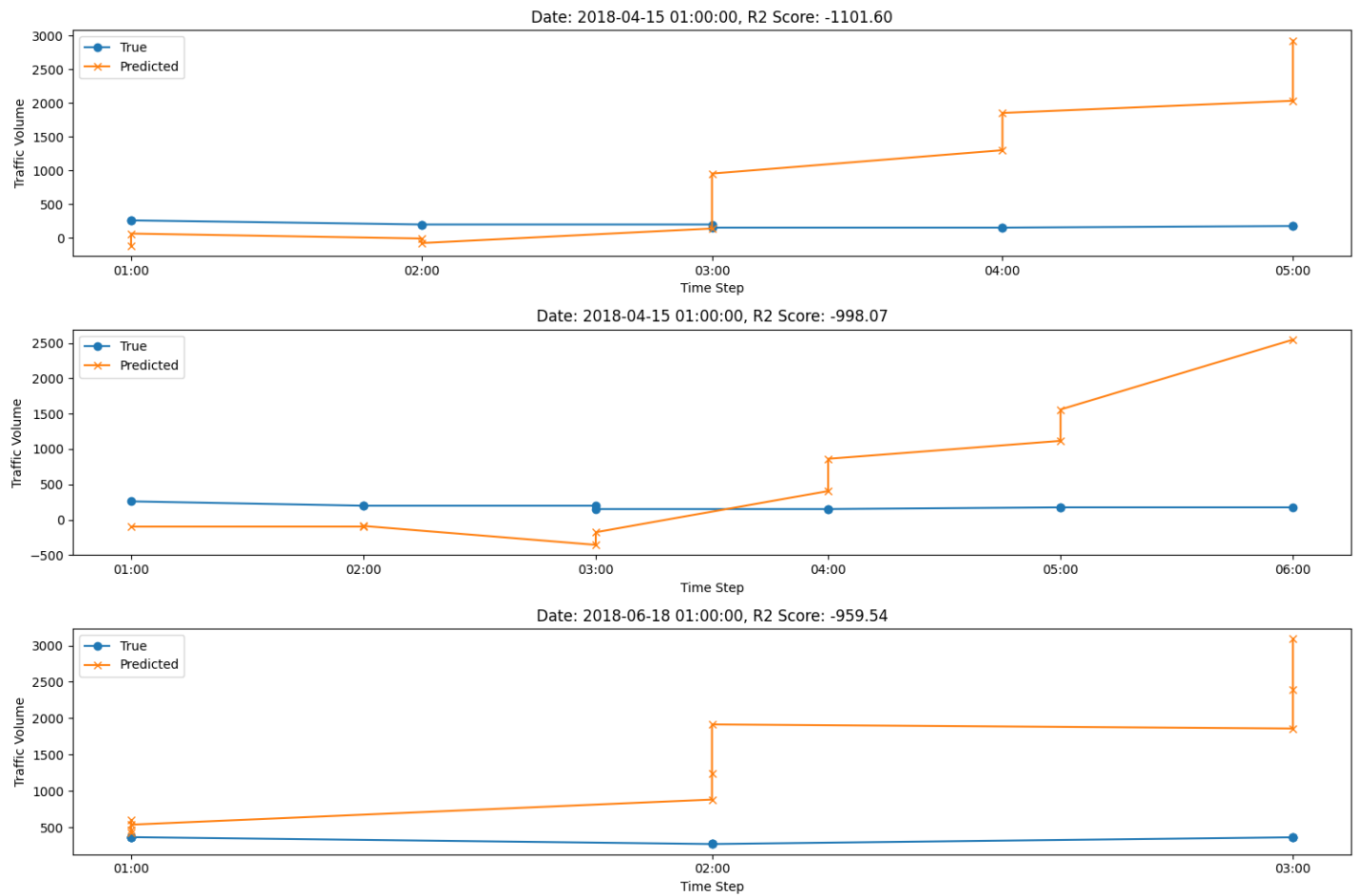
The worst results (multistep) for the different setup combinations are as follows:



Best predicted days for SimpleNN.

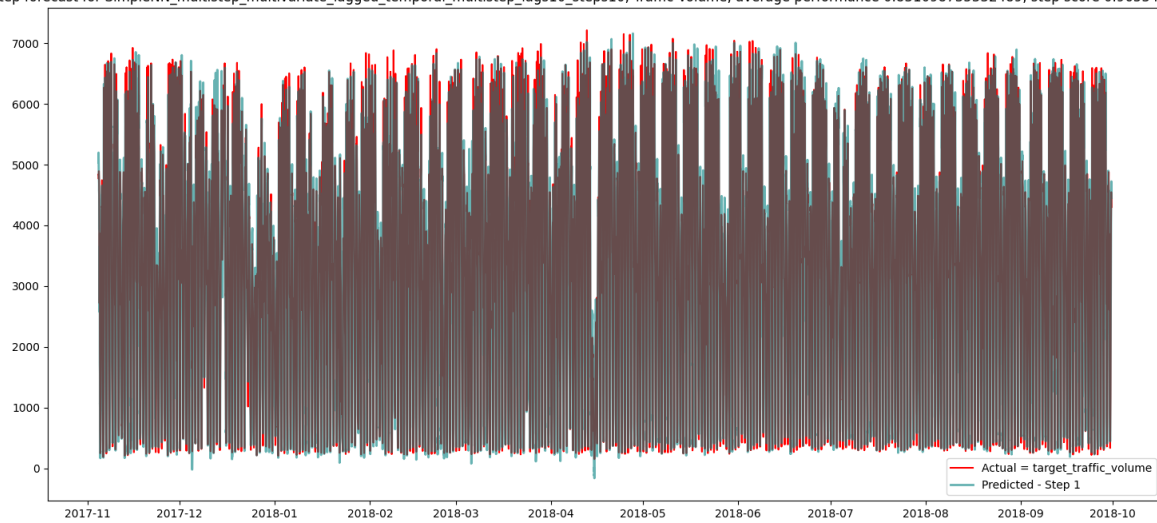


Worst predicted days for SimpleNN.



Steps plots for SimpleNN forecasts over time

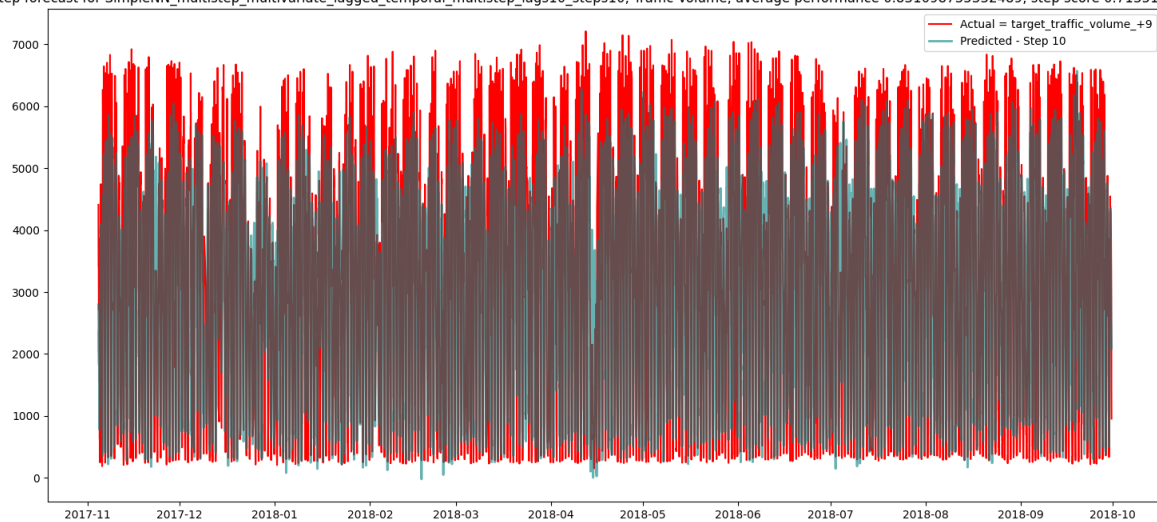
Multistep forecast for SimpleNN_multistep_multivariate_lagged_temporal_multistep_lags10_steps10, Traffic Volume, average performance 0.831098735332489, step score 0.9653412112708417



Multistep forecast for SimpleNN_multistep_multivariate_lagged_temporal_multistep_lags10_steps10, Traffic Volume, average performance 0.831098735332489, step score 0.8429925644038828

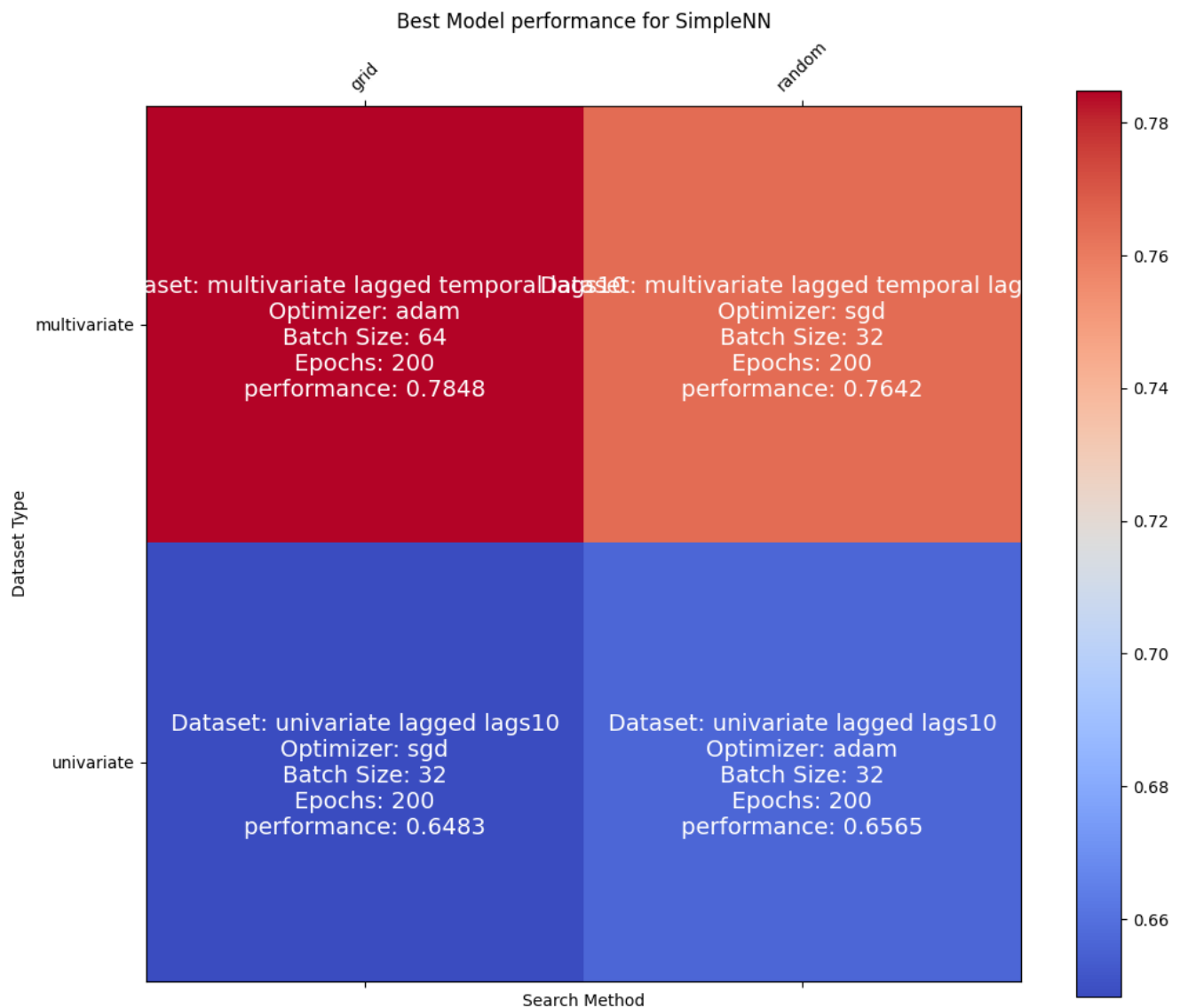


Multistep forecast for SimpleNN_multistep_multivariate_lagged_temporal_multistep_lags10_steps10, Traffic Volume, average performance 0.831098735332489, step score 0.7135114734661652

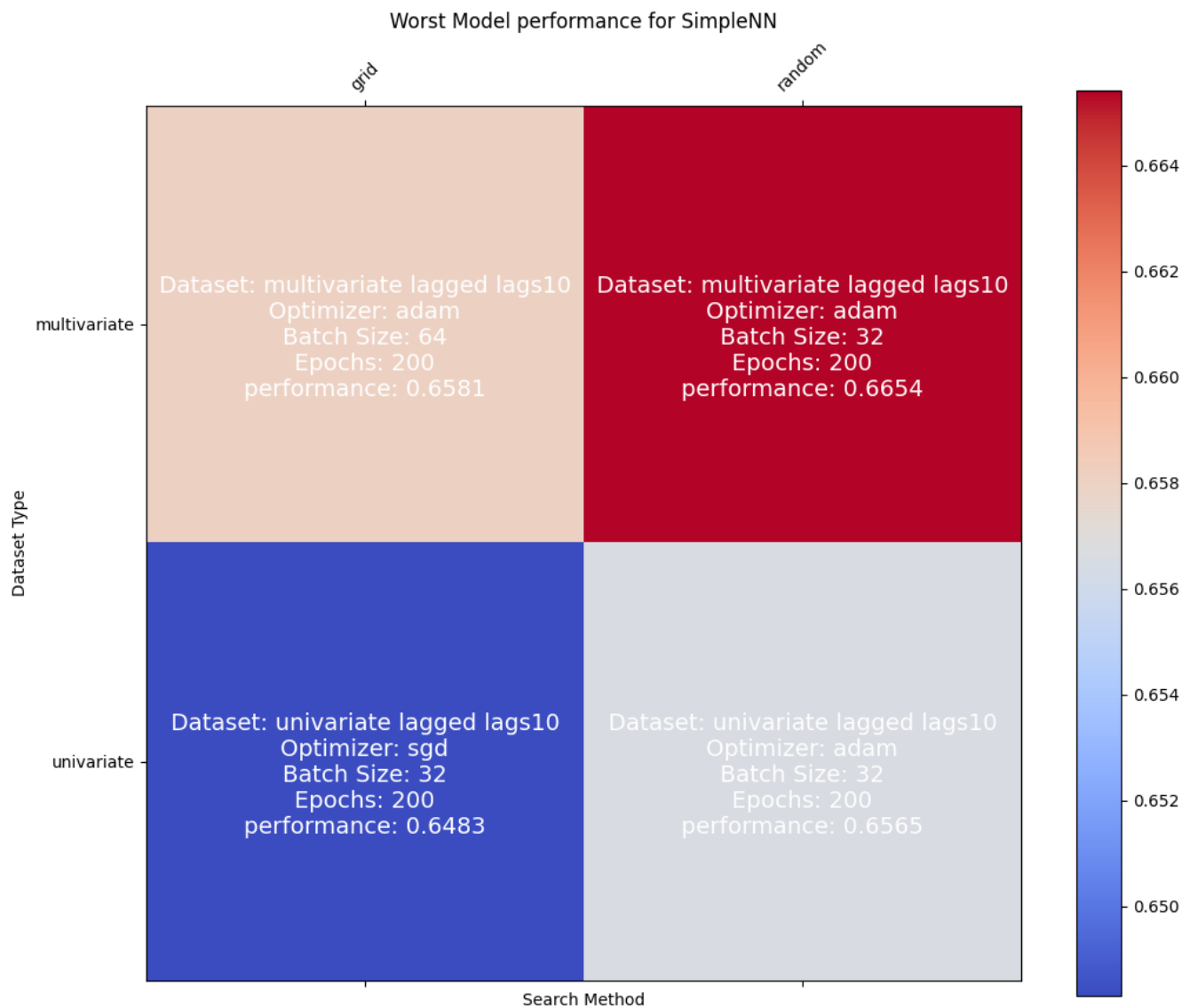


Results for the recursive forecast.

The best results (recursive) for the different setup combinations are as follows:

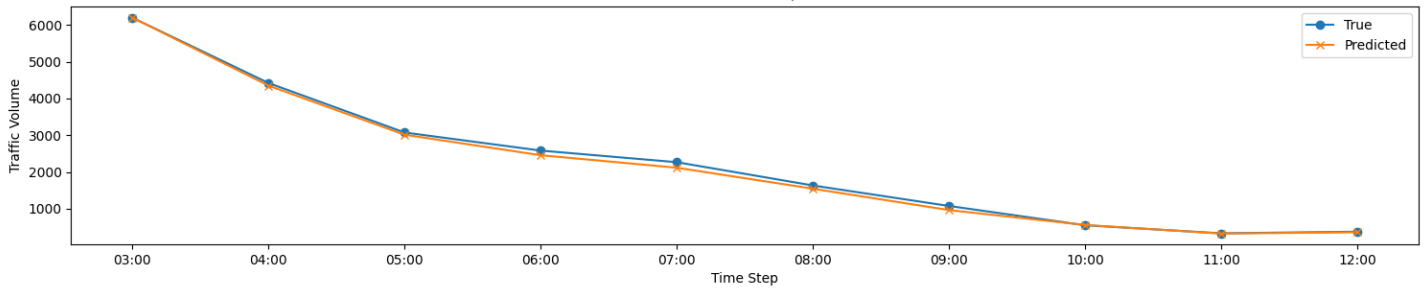


The worst results (recursive) for the different setup combinations are as follows:

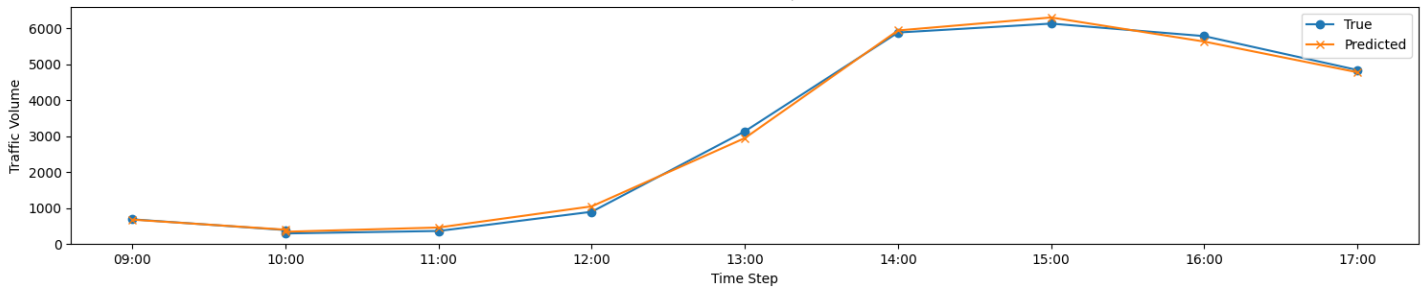


Best predicted days for SimpleNN.

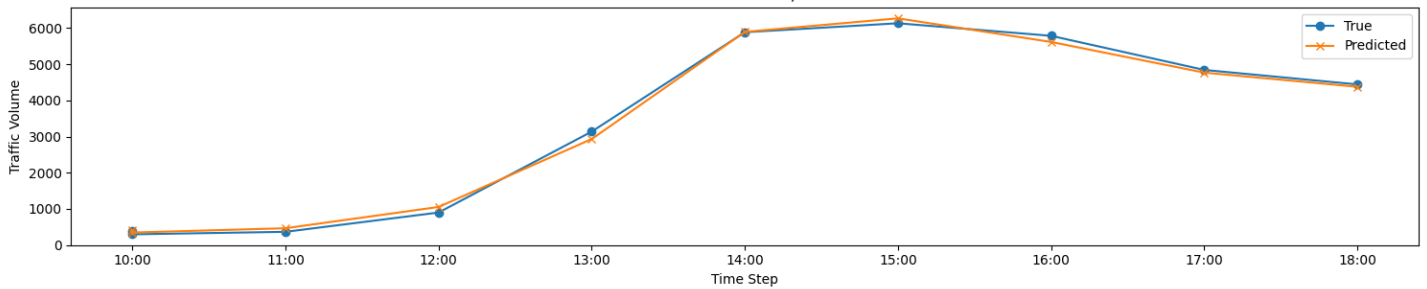
Date: 2017-11-08 03:00:00, R2 Score: 1.00



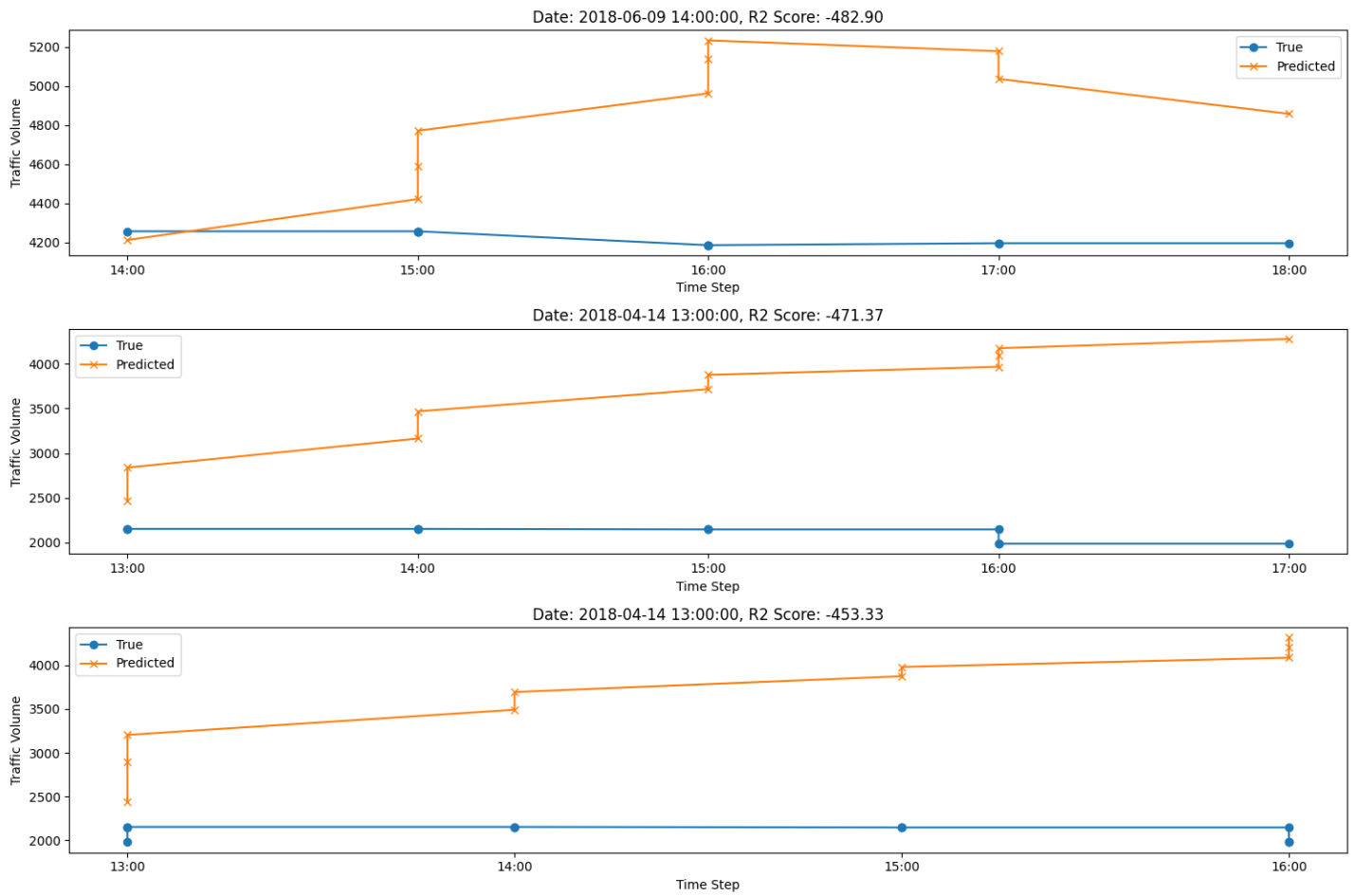
Date: 2018-07-10 09:00:00, R2 Score: 1.00



Date: 2018-07-10 10:00:00, R2 Score: 1.00

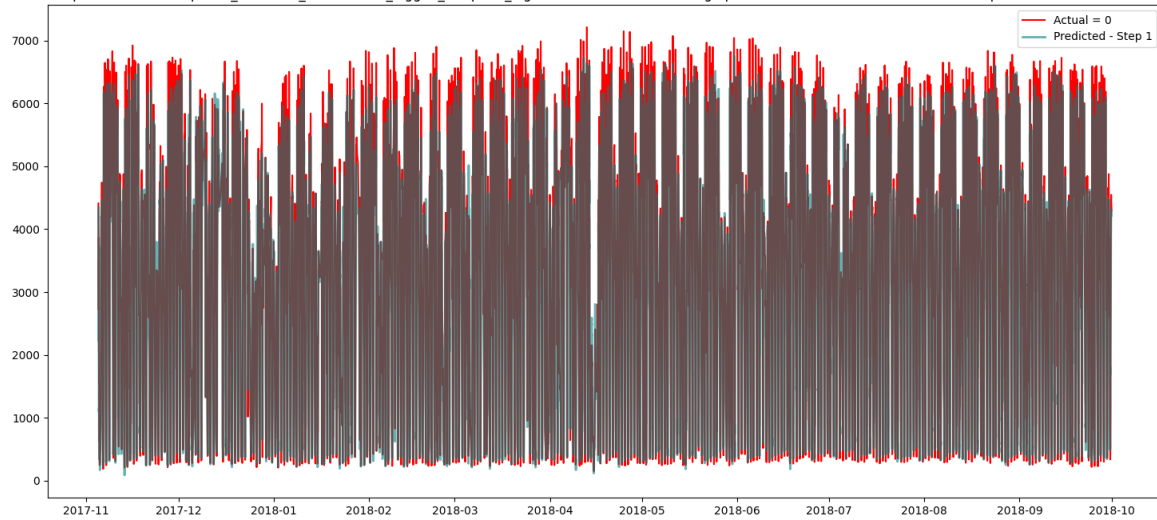


Worst predicted days for SimpleNN.

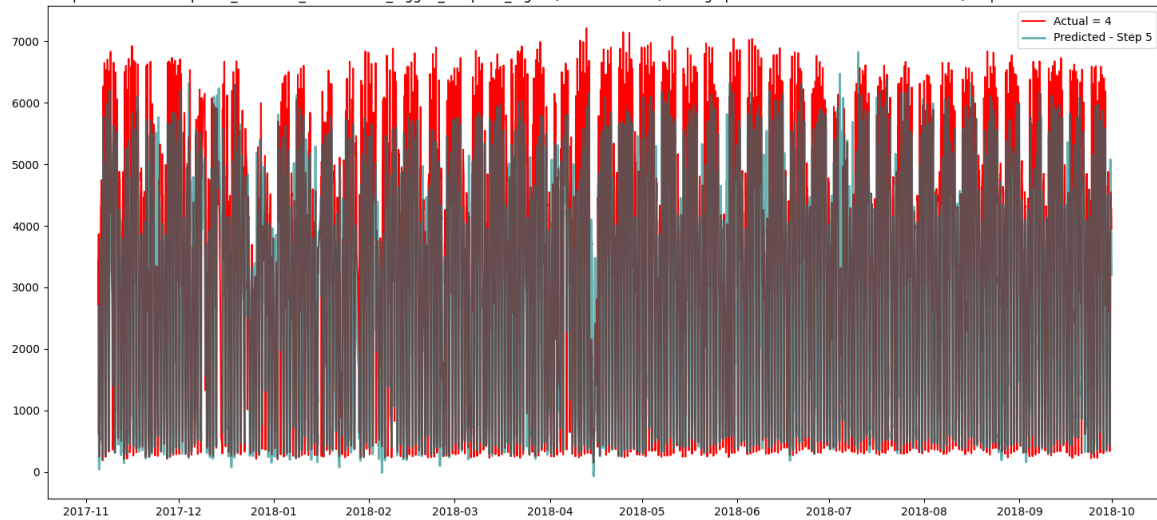


Steps plots for SimpleNN forecasts over time

Multistep forecast for SimpleNN_recursive_multivariate_lagged_temporal_lags10, Traffic Volume, average performance 0.7848464846611023, step score 0.9600137118136772



Multistep forecast for SimpleNN_recursive_multivariate_lagged_temporal_lags10, Traffic Volume, average performance 0.7848464846611023, step score 0.7821477442272087



Multistep forecast for SimpleNN_recursive_multivariate_lagged_temporal_lags10, Traffic Volume, average performance 0.7848464846611023, step score 0.6522462060785515

