SDU ENERGY INFORMATICS

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Model Report: RandomForest

15/02/2025

Introduction

This is an automated report for the Experiment with tree models on traffic volume dataset; the RandomForest 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 tree models 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:

- max_depth: [2, 4, 6, 8, 10, 15, 20]
- criterion: ['squared_error']
- random_state: [42]
- min_samples_split: [5, 10, 50, 150, 200, 250]
- min_samples_leaf: [5, 10, 25, 50, 100]
- scaler: [None, StandardScaler(), MinMaxScaler(), RobustScaler(), PowerTransformer()]

And with the following search algorithms:

- grid
- random

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The used performance measure is the r2 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']

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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']

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Results: RandomForest

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 r2 score is chosen, and the three best and worst predictions are visualized in a line plot. Furthermore, three steps of the forecasts are plotted.

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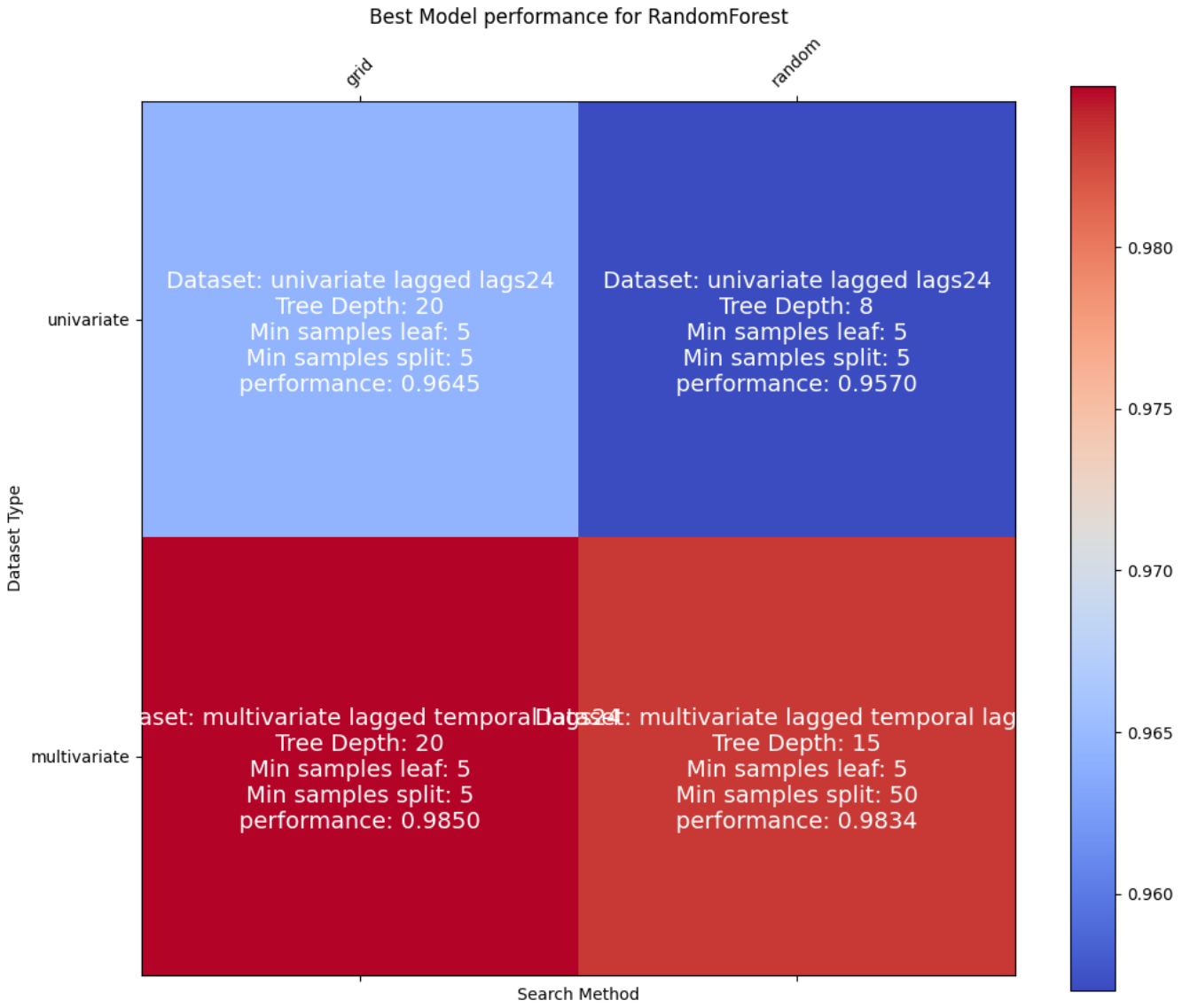
Results for the one_step forecast.

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



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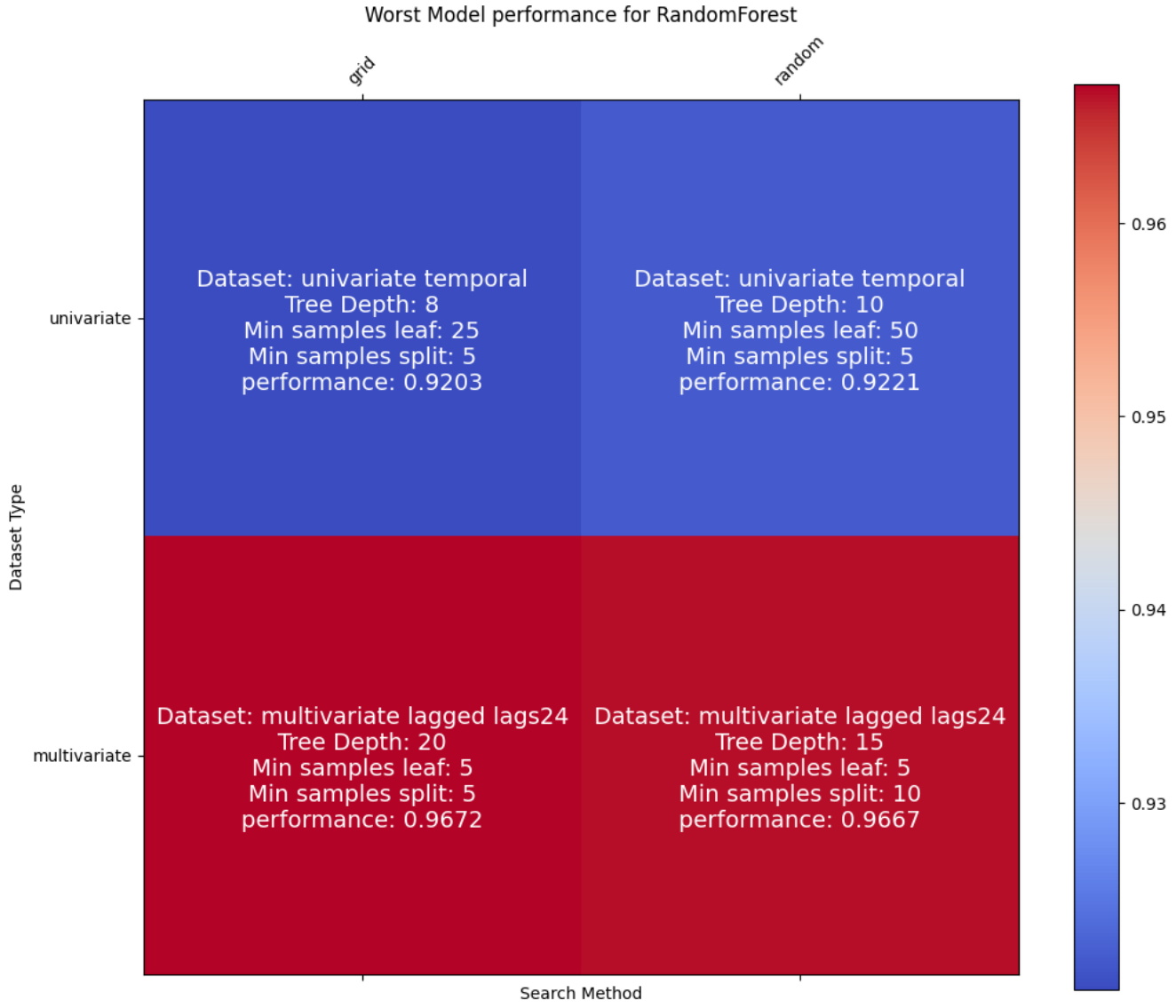
The worst results (one_step) for the different setup combinations are as follows:



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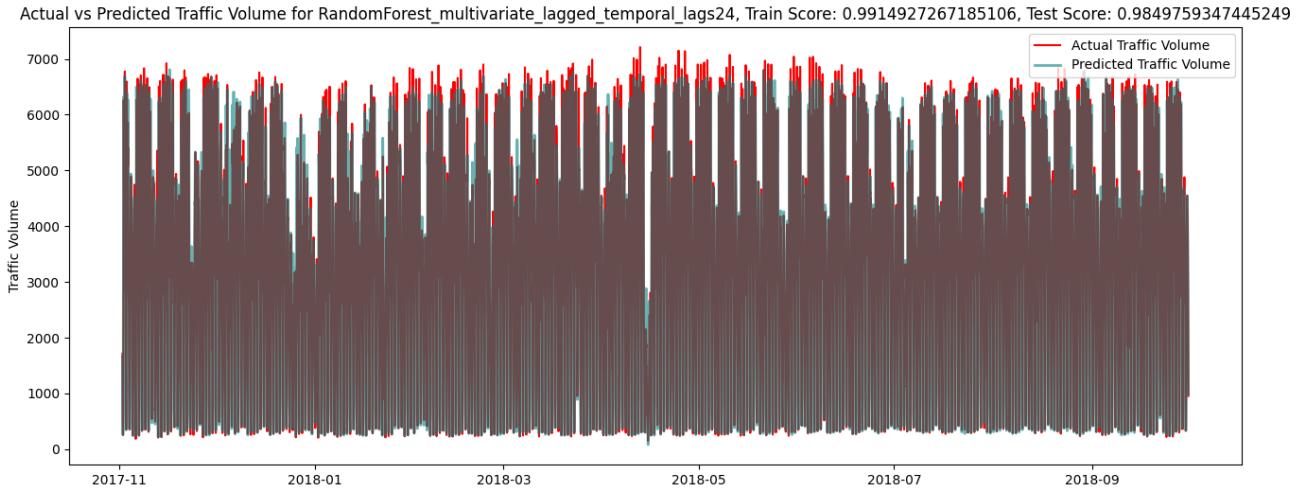
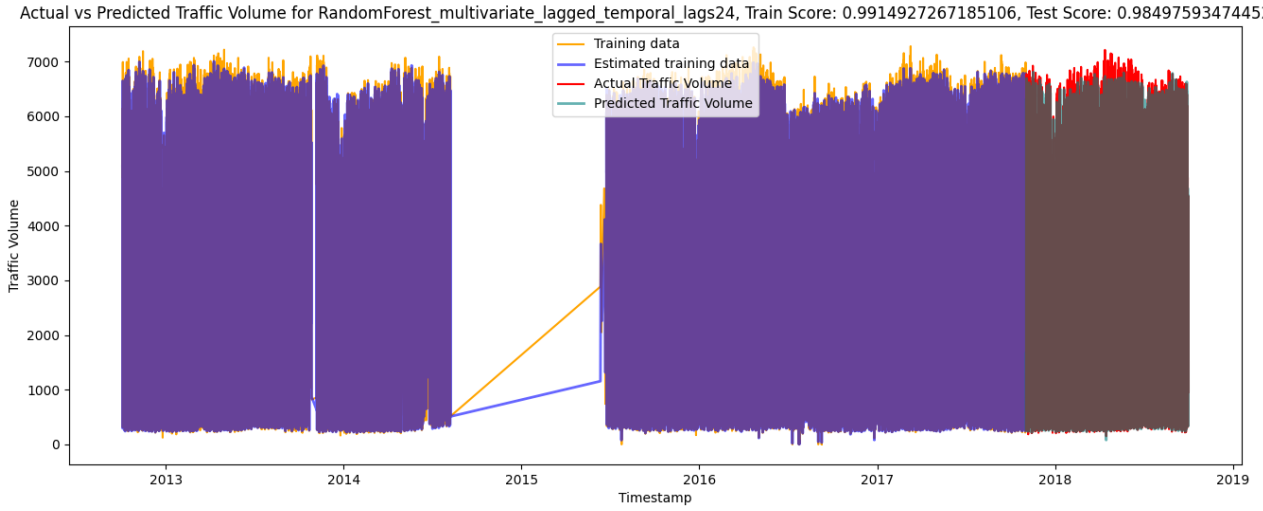
Best one_step forecast over time





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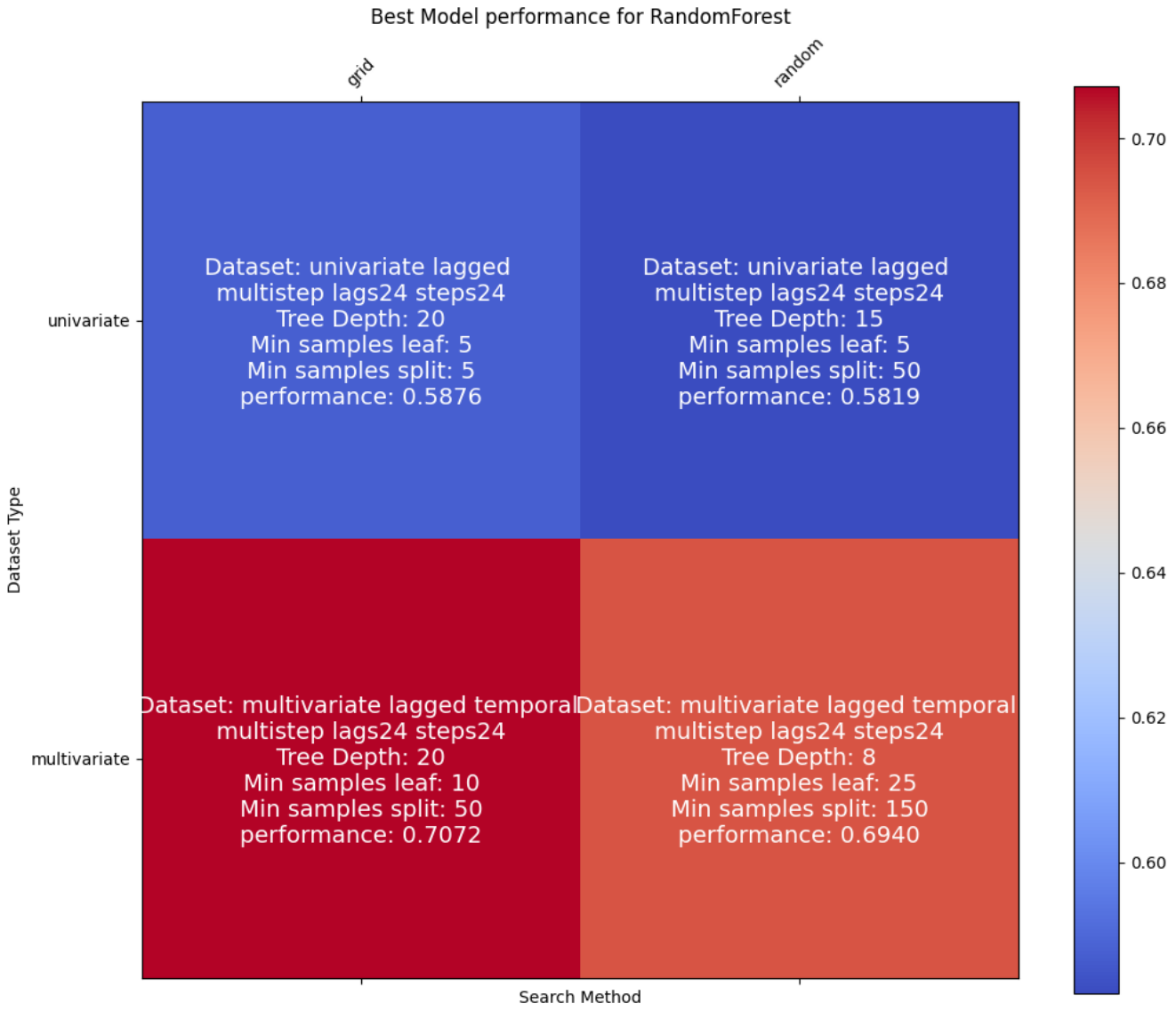
Results for the multistep forecast.

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



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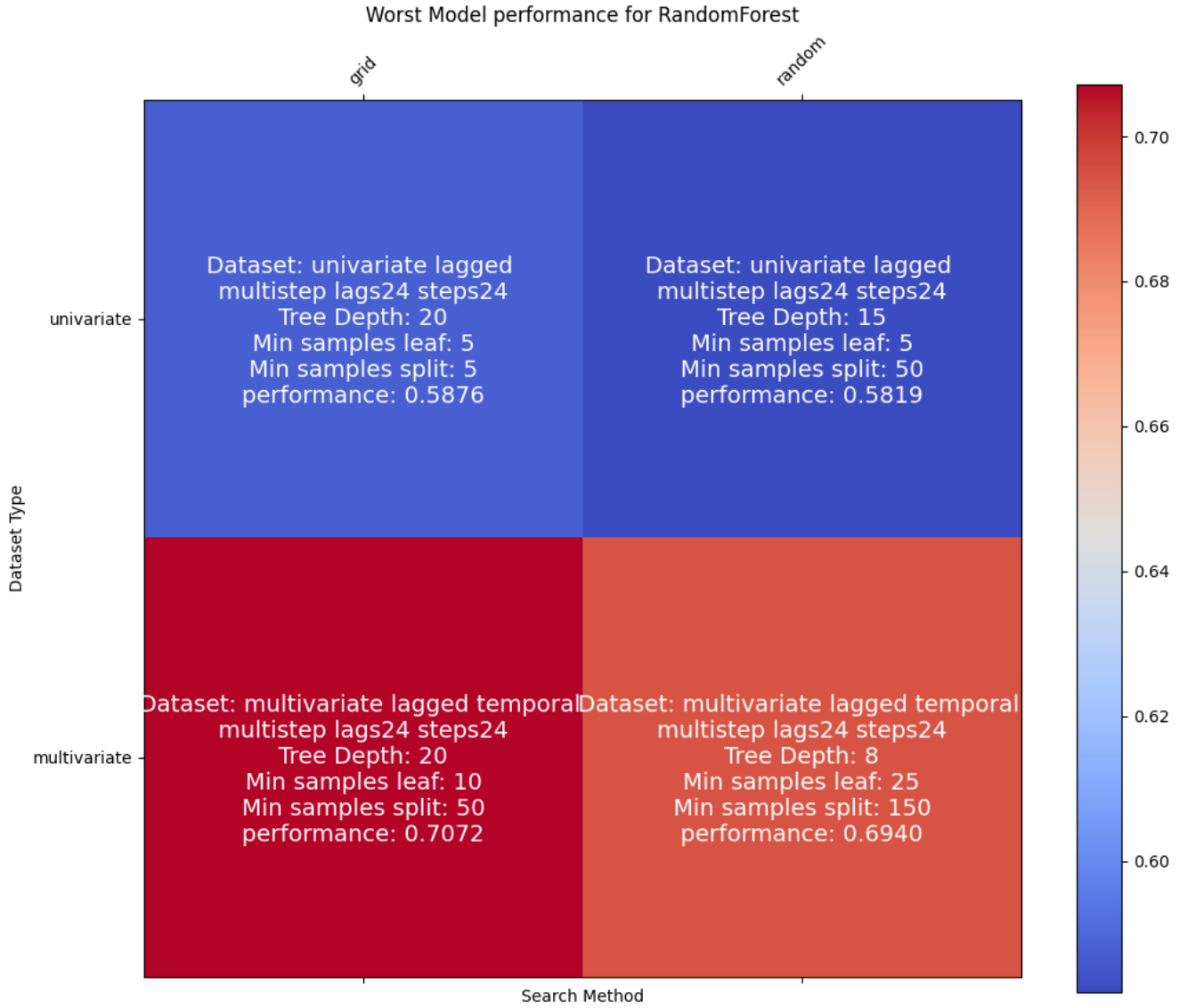
The worst results (multistep) for the different setup combinations are as follows:



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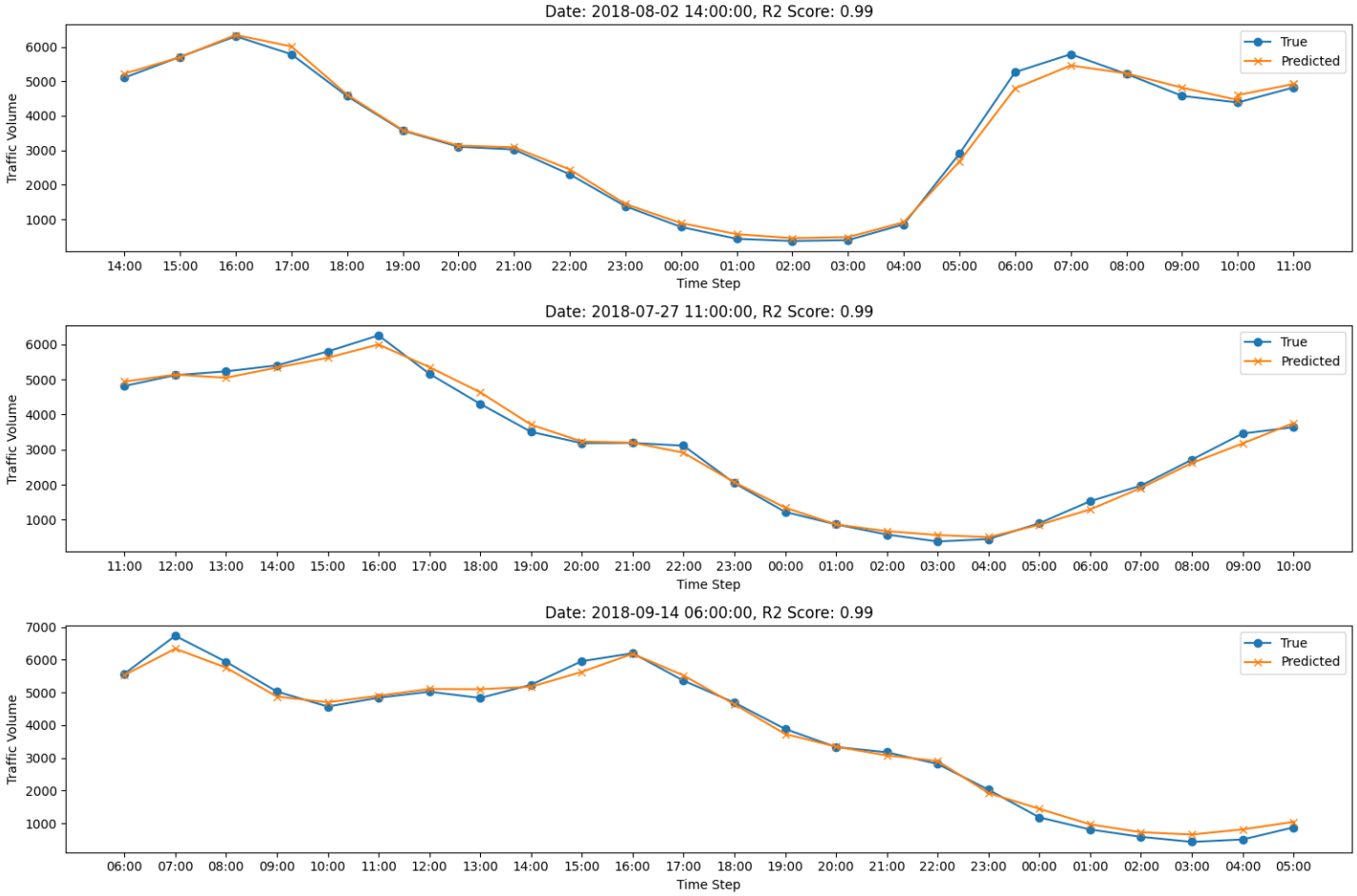
Best predicted days for RandomForest.



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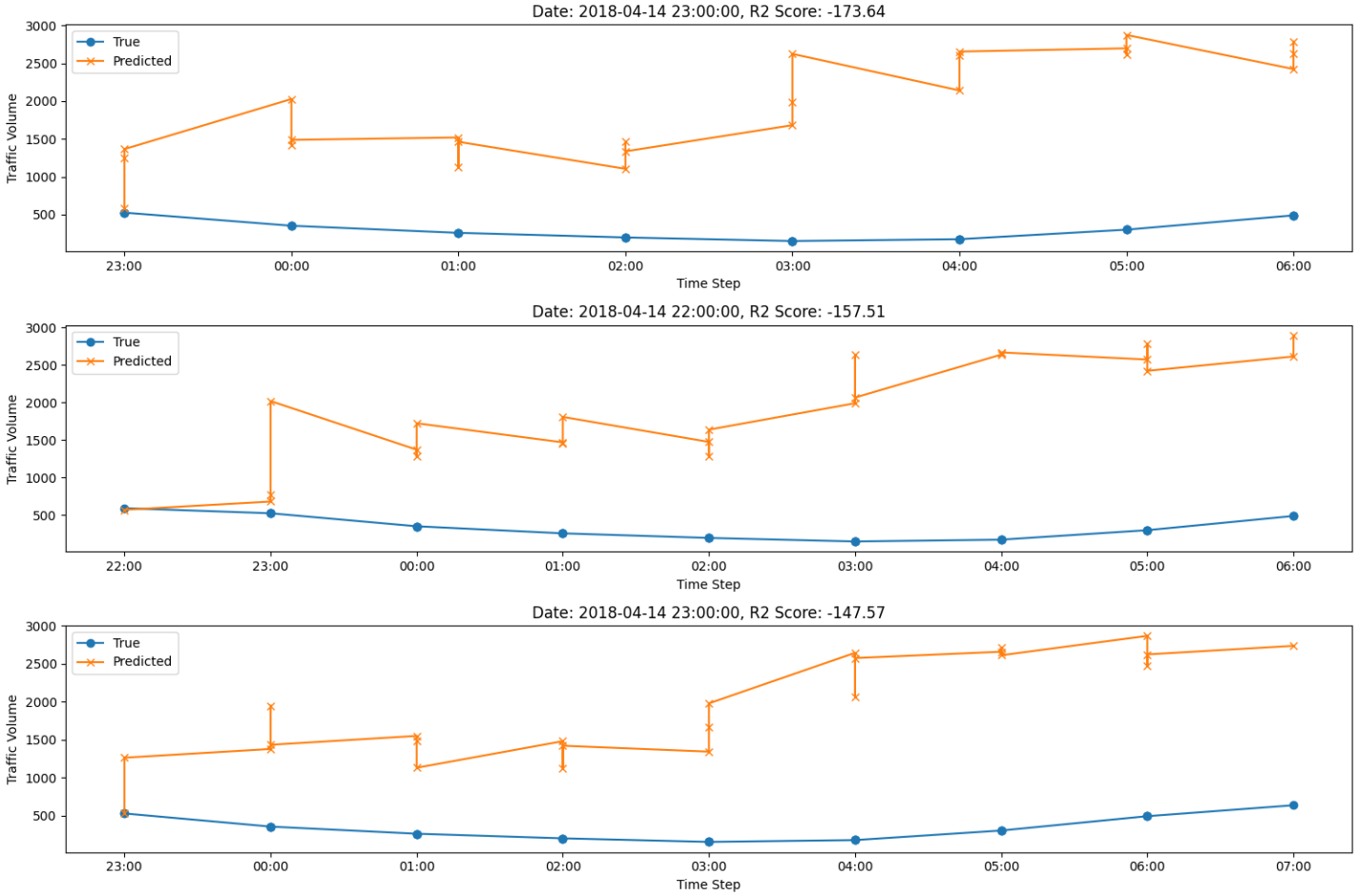
Worst predicted days for RandomForest.



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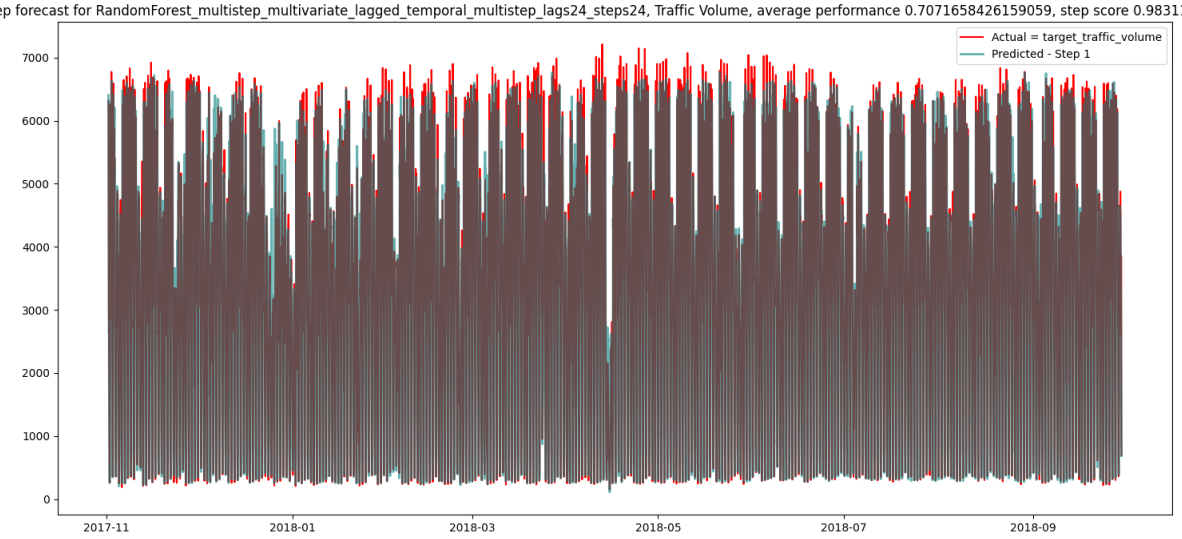
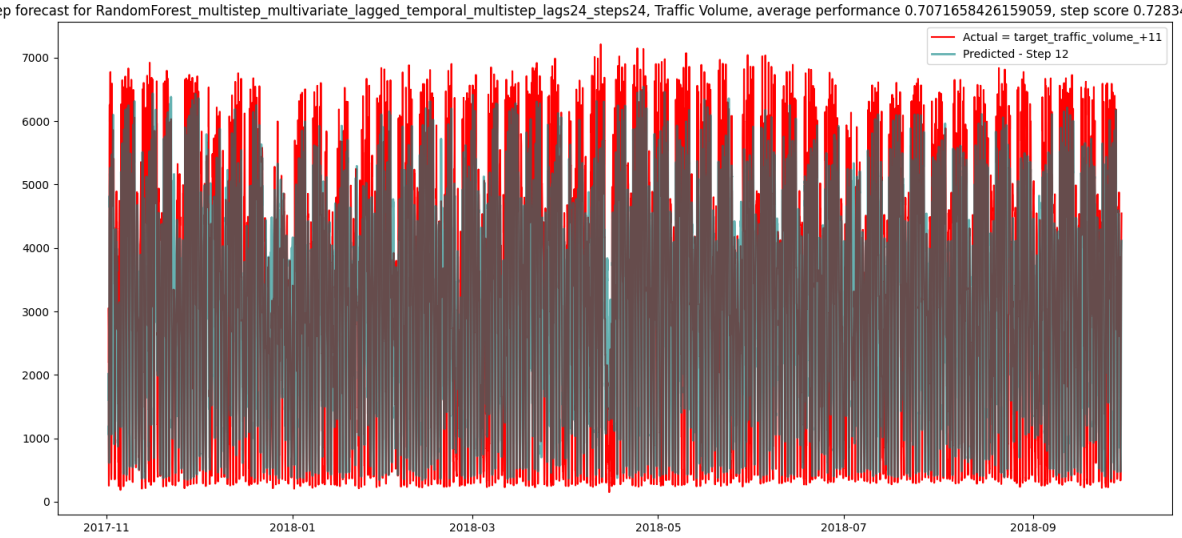
Steps plots for RandomForest forecasts over time

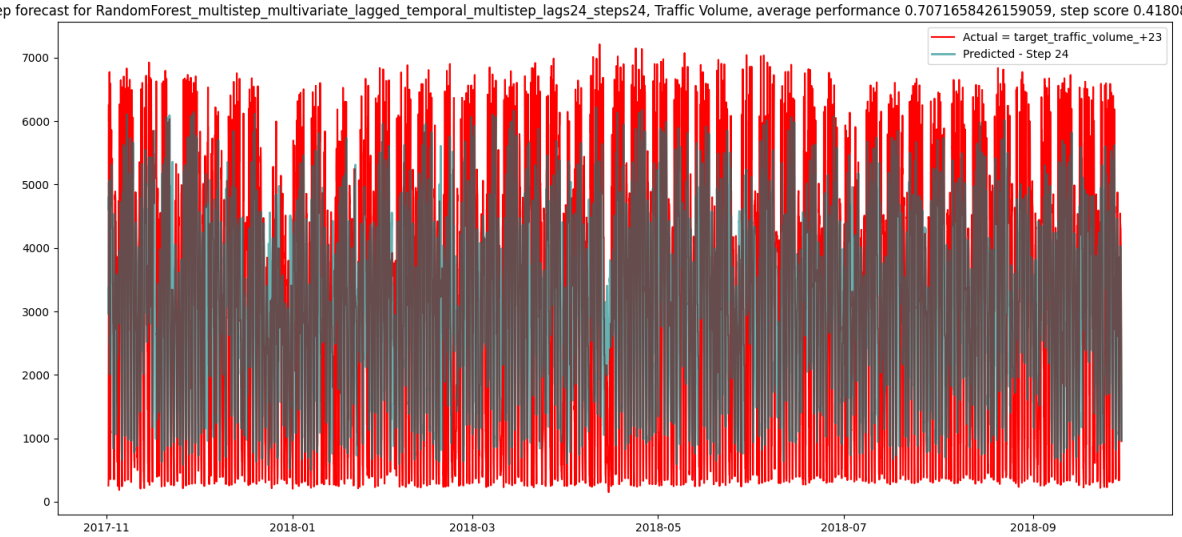
Multistep forecast for RandomForest_multistep_multivariate_lagged_temporal_multistep_lags24_steps24, Traffic Volume, average performance 0.7071658426159059, step score 0.9831145944308131



Multistep forecast for RandomForest_multistep_multivariate_lagged_temporal_multistep_lags24_steps24, Traffic Volume, average performance 0.7071658426159059, step score 0.7283426853092029



Multistep forecast for RandomForest_multistep_multivariate_lagged_temporal_multistep_lags24_steps24, Traffic Volume, average performance 0.7071658426159059, step score 0.4180811244131656



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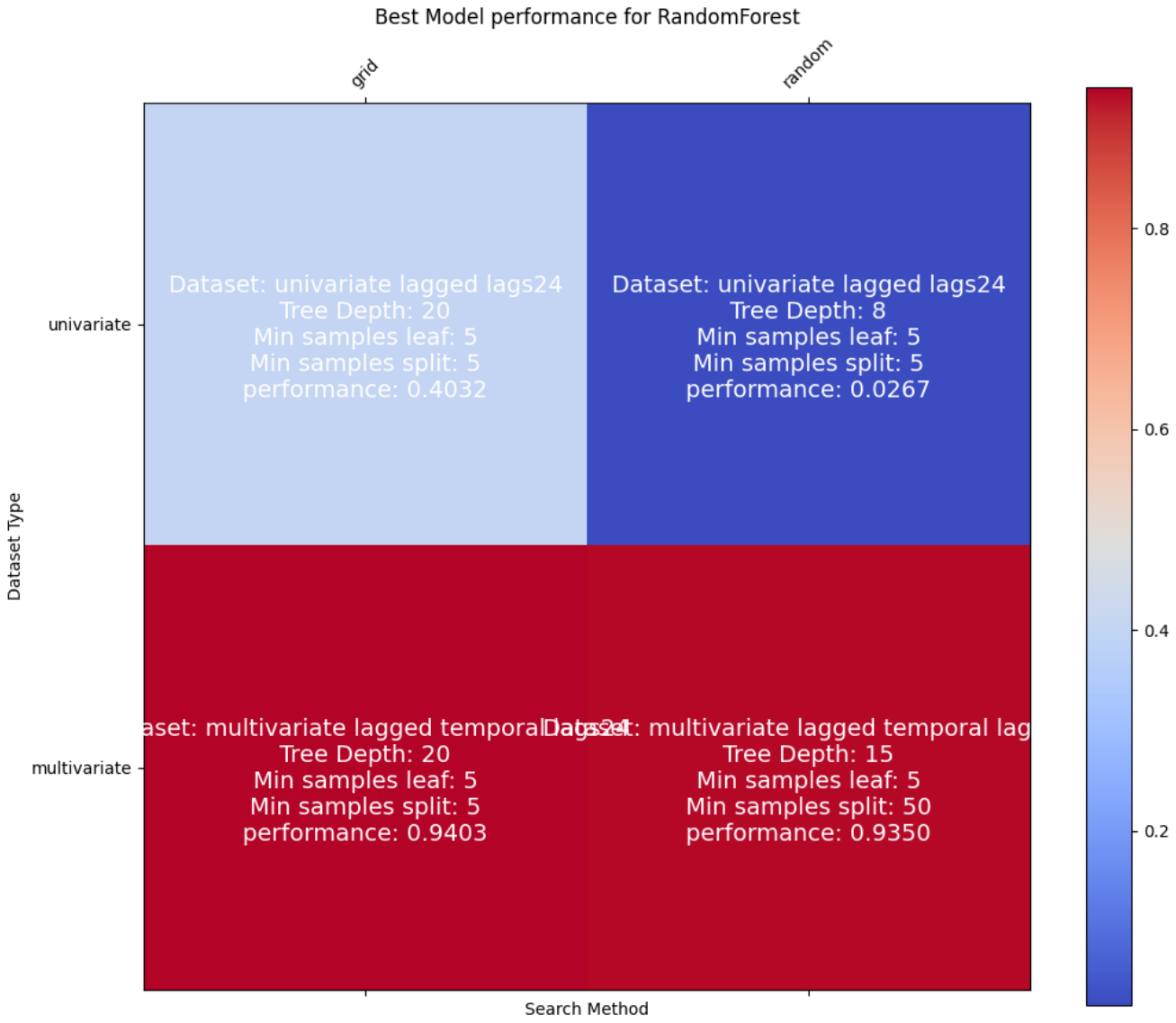
Results for the recursive forecast.

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



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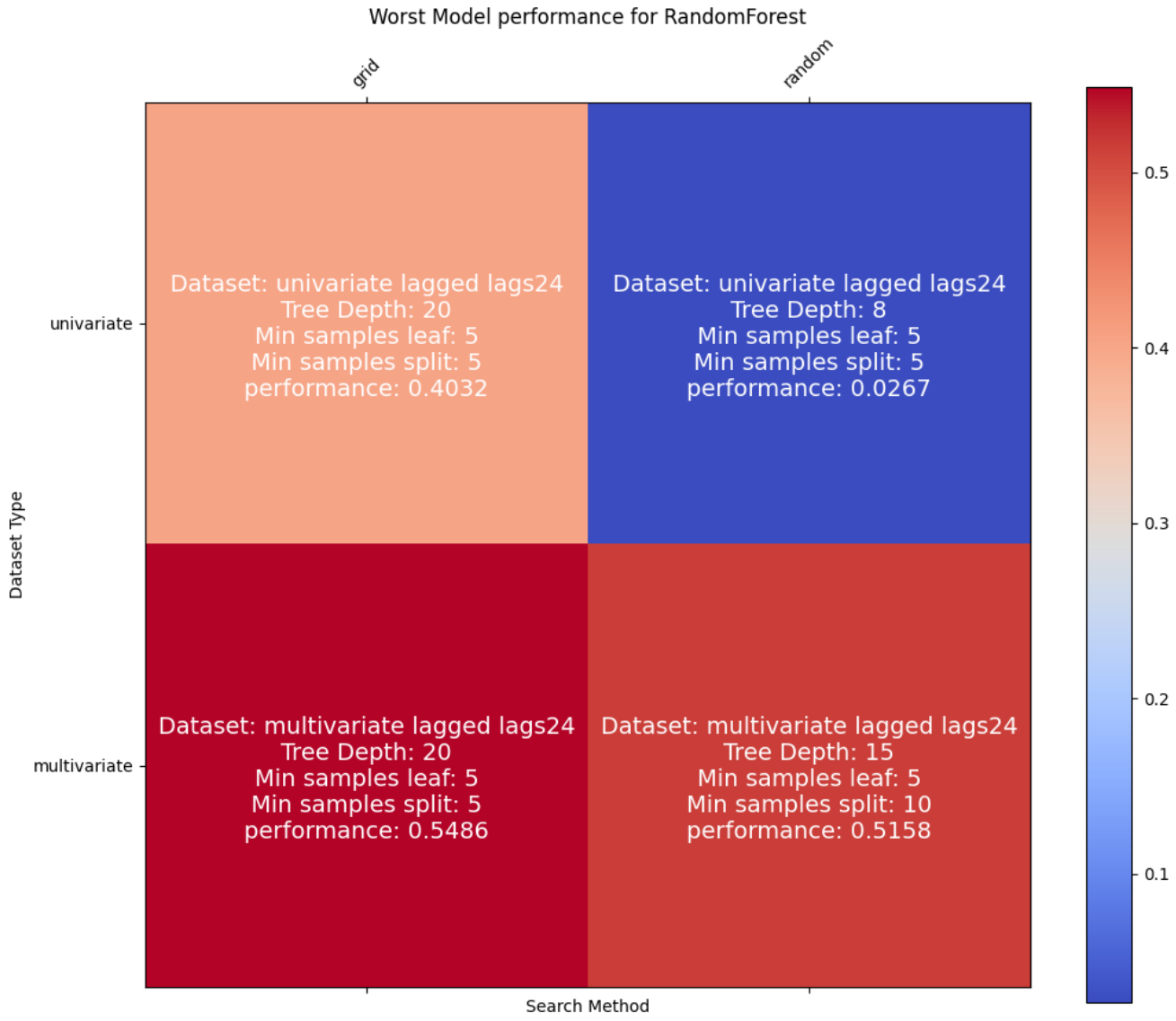
The worst results (recursive) for the different setup combinations are as follows:



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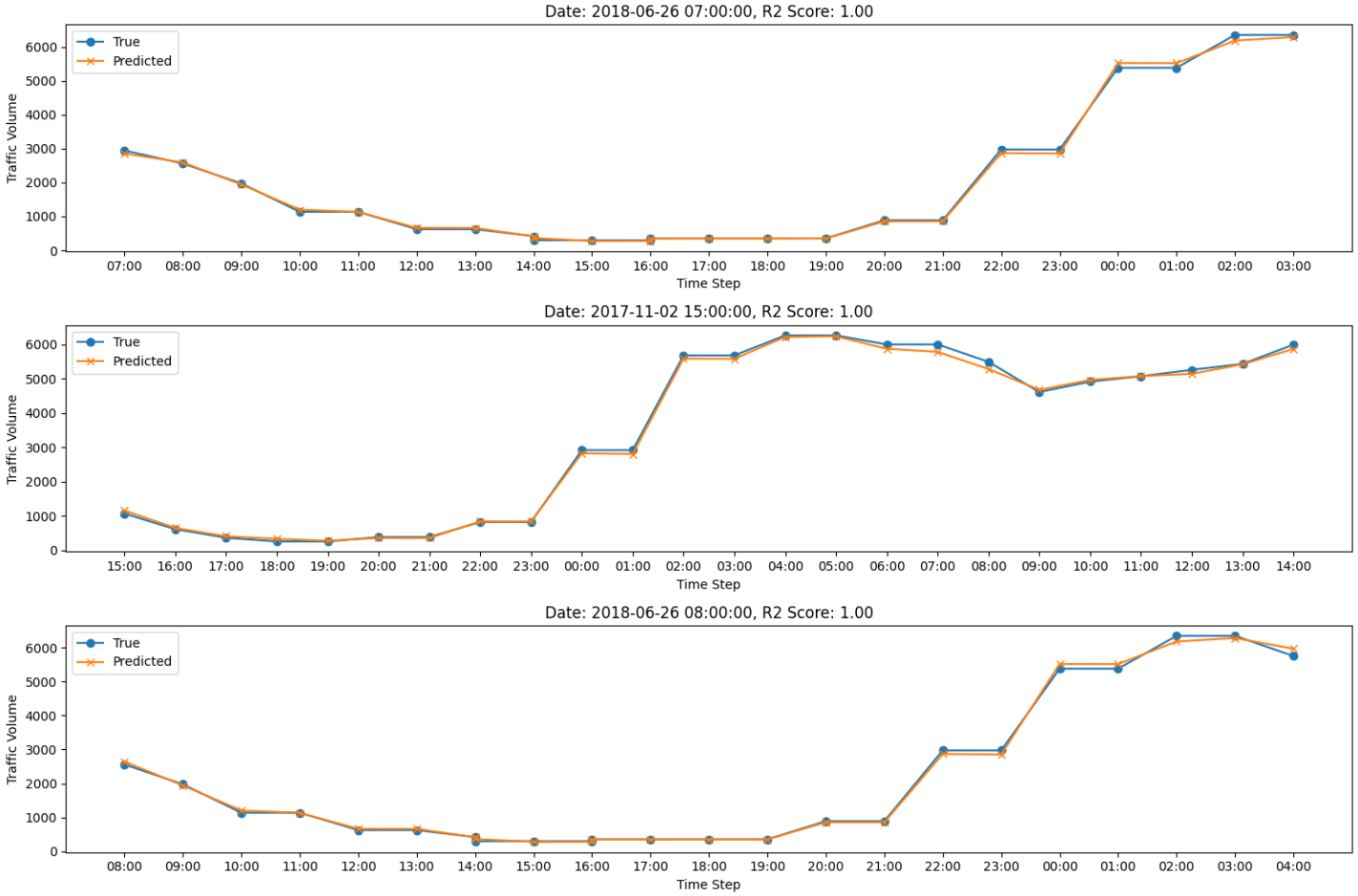
Best predicted days for RandomForest.



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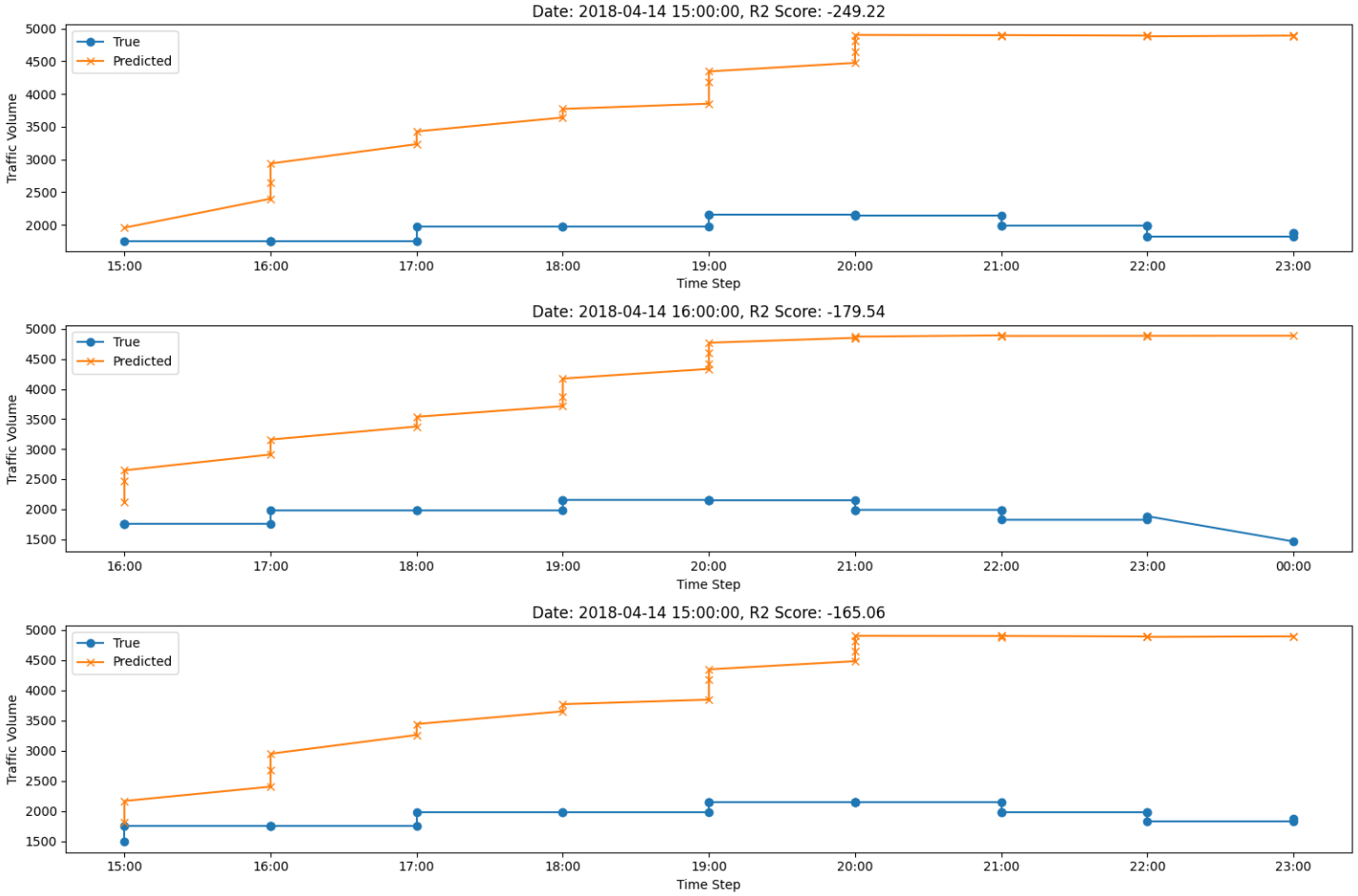
Worst predicted days for RandomForest.



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Steps plots for RandomForest forecasts over time