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Model Report: DecisionTree

17/12/2024

Introduction

This is an automated report for the Test on Tetouan City consumption data; the DecisionTree 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:

First experiment on the dataset with Tetouan City 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

The used performance measure is the r2 measure.

Dataset setup

The baseline dataset used for these forecasts is
the 'Power consumption of Tetouan City between 2017-01-01 and 2017-12-31 in 10 minutes
resolution.' dataset: *'Power consumption of Tetouan City between 2017-01-01 and 2017-12-31 in 10 minutes
resolution. Has the weather data for temperature, humidity, wind speed and diffuse flows, as well as the
consumption data for 3 different zones in the city. For simplicity, we will only use one of the zones.'*.

The test size used for the forecasts is 0.2.

○ Dataset 1

- name: univariate_temporal

- dataset_type: univariate

- prediction_type: one_step

- components: ['one_step_target', 'temporal_features']

○ Dataset 2

- name: univariate_lagged

- dataset_type: univariate

- prediction_type: one_step

- components: ['one_step_target', 'lagged_target']

○ Dataset 3

- name: univariate_temporal_and_lagged

- dataset_type: univariate

- prediction_type: one_step

- components: ['one_step_target', 'temporal_features', 'lagged_target']

○ Dataset 4

- name: univariate_multistep_temporal

- dataset_type: univariate

- prediction_type: multistep

- components: ['multistep_target', 'temporal_features']

○

Dataset 5

- name: univariate_multistep_lagged

- dataset_type: univariate

- prediction_type: multistep

- components: ['multistep_target', 'lagged_target']

○ Dataset 6

- name: univariate_multistep_temporal_and_lagged

- dataset_type: univariate

- prediction_type: multistep

- components: ['multistep_target', 'temporal_features', 'lagged_target']

○ Dataset 7

- name: multivariate_temporal

- dataset_type: multivariate

- prediction_type: one_step

- components: ['one_step_target', 'feature_columns', 'temporal_features']

○ Dataset 8

- name: multivariate_lagged

- dataset_type: multivariate

- prediction_type: one_step

- components: ['one_step_target', 'feature_columns', 'lagged_target']

○ Dataset 9

- name: multivariate_temporal_and_lagged

- dataset_type: multivariate

- prediction_type: one_step

- components: ['one_step_target', 'feature_columns', 'temporal_features', 'lagged_target']

○

Dataset 10

- name: multivariate_multistep_temporal

- dataset_type: multivariate

- prediction_type: multistep

- components: ['multistep_target', 'feature_columns', 'temporal_features']

○ Dataset 11

- name: multivariate_multistep_lagged

- dataset_type: multivariate

- prediction_type: multistep

- components: ['multistep_target', 'feature_columns', 'lagged_target']

○ Dataset 12

- name: multivariate_multistep_temporal_and_lagged

- dataset_type: multivariate

- prediction_type: multistep

- components: ['multistep_target', 'feature_columns', 'temporal_features', 'lagged_target']

Results: DecisionTree

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.

Results for the one_step forecast.

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

Best Model performance for DecisionTree
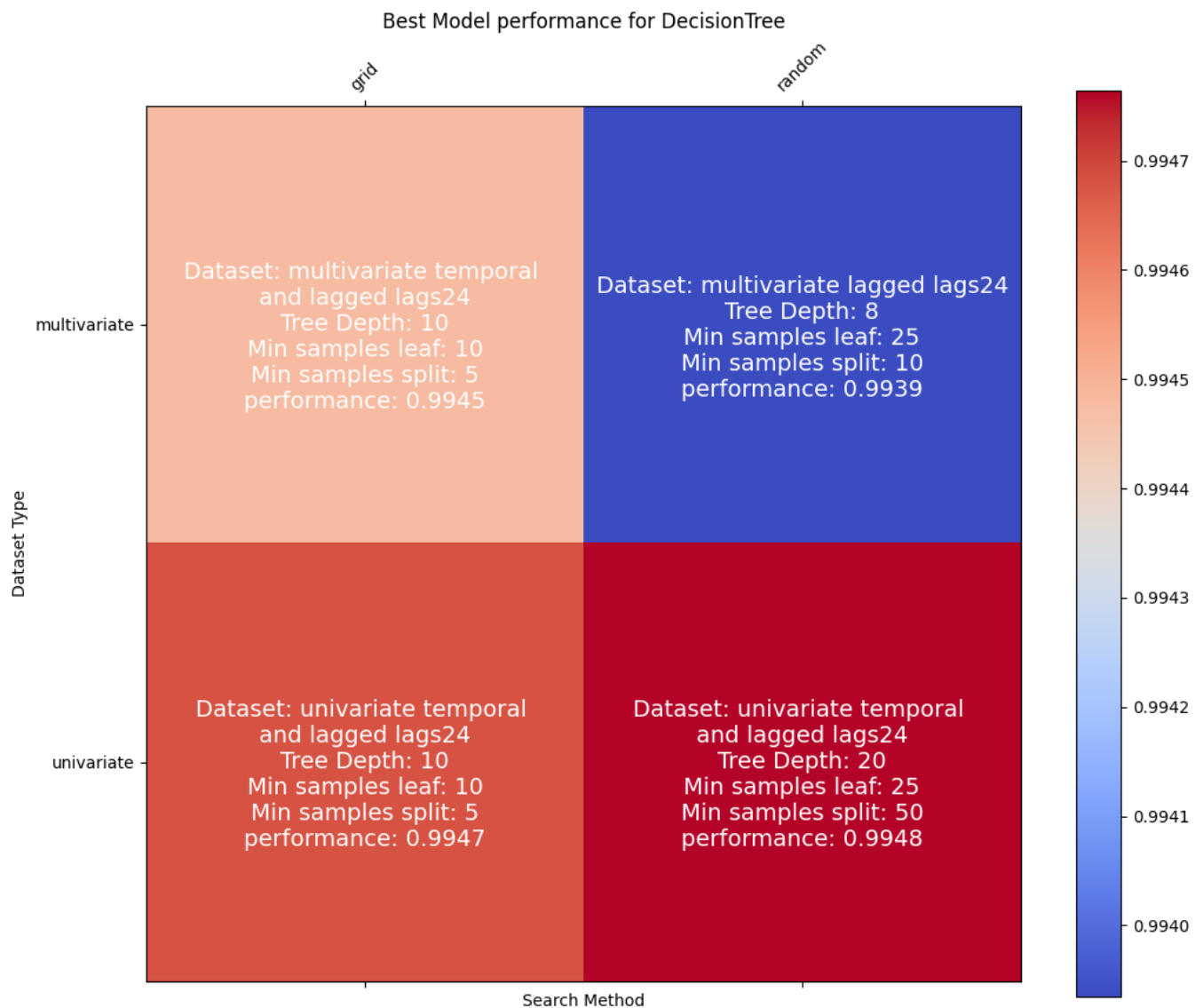
The worst results (one_step) for the different setup combinations are as follows:

Worst Model performance for DecisionTree
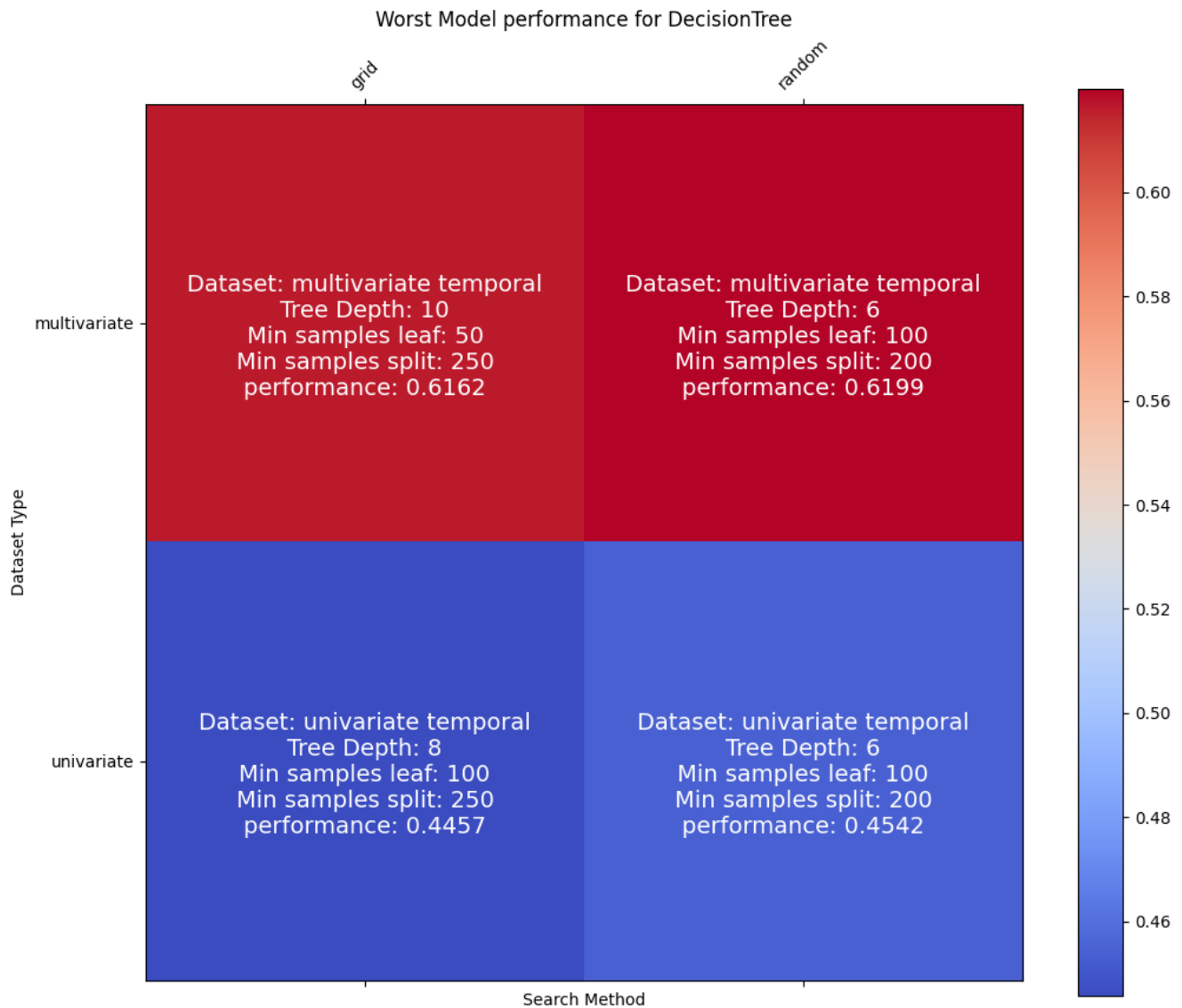
Best one_step forecast over time

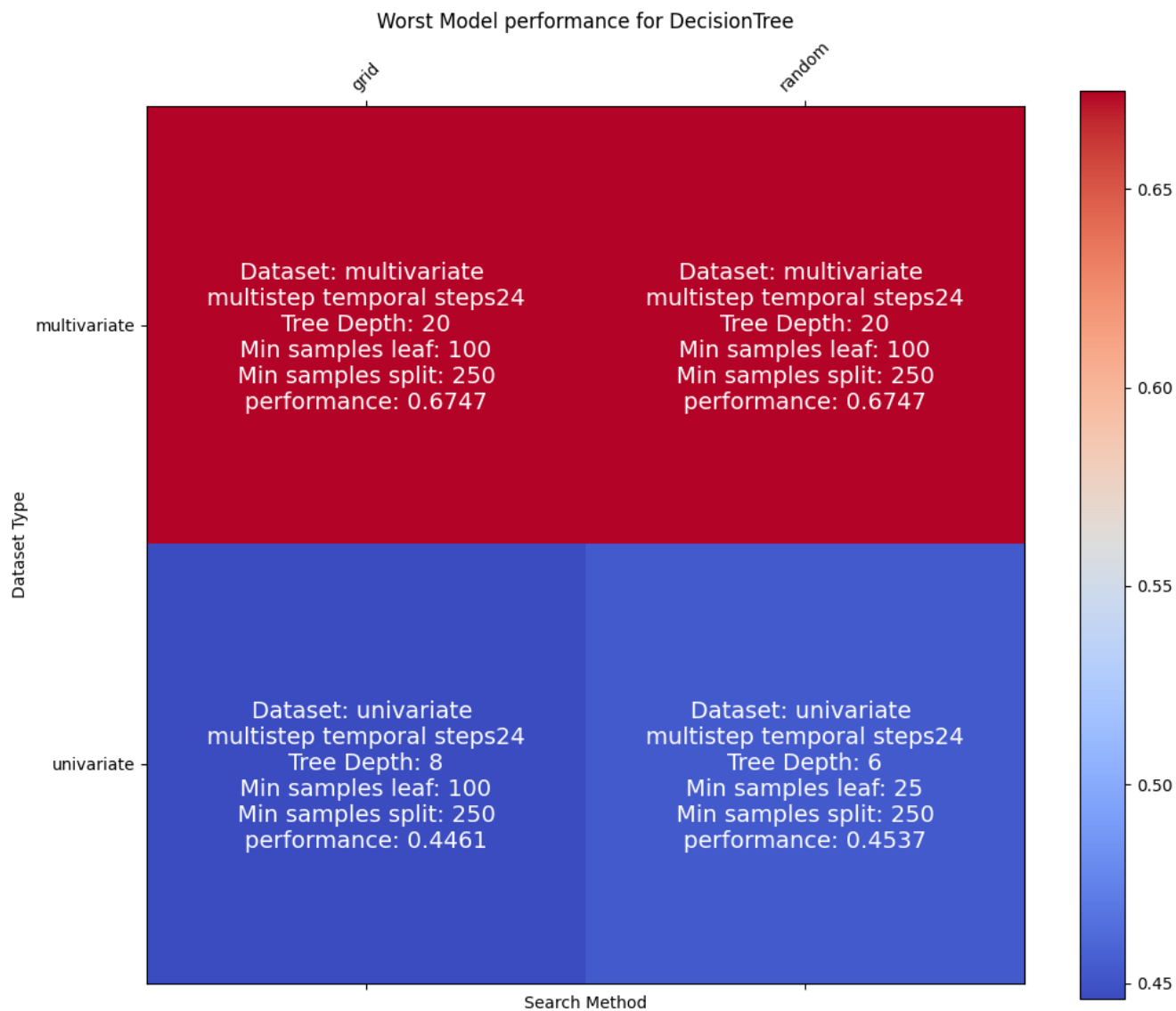Actual vs Predicted Power Consumption for DecisionTree_univariate_temporal_and_lagged_lags24, Train Score: 0.9973566132374329, Test Score: 0.9947642086251259
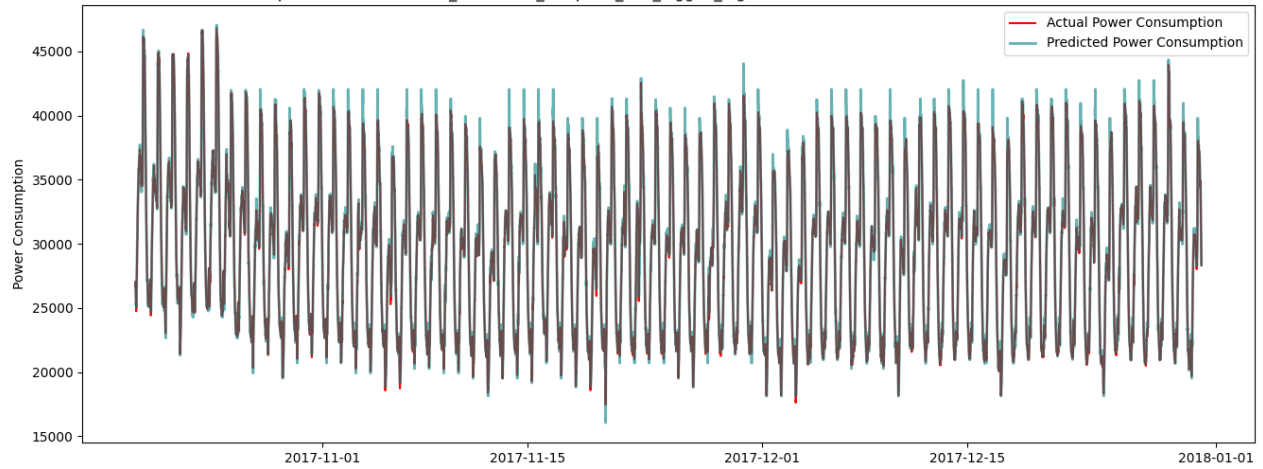
Actual vs Predicted Power Consumption for DecisionTree_univariate_temporal_and_lagged_lags24, Train Score: 0.9973566132374329, Test Score: 0.9947642086251259
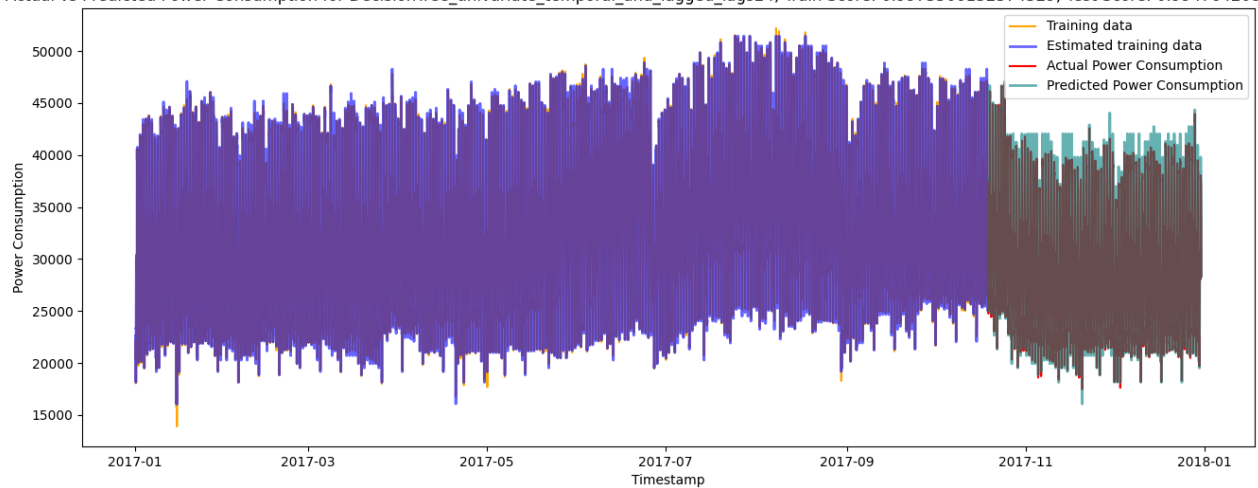
Results for the multistep forecast.

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

Best Model performance for DecisionTree
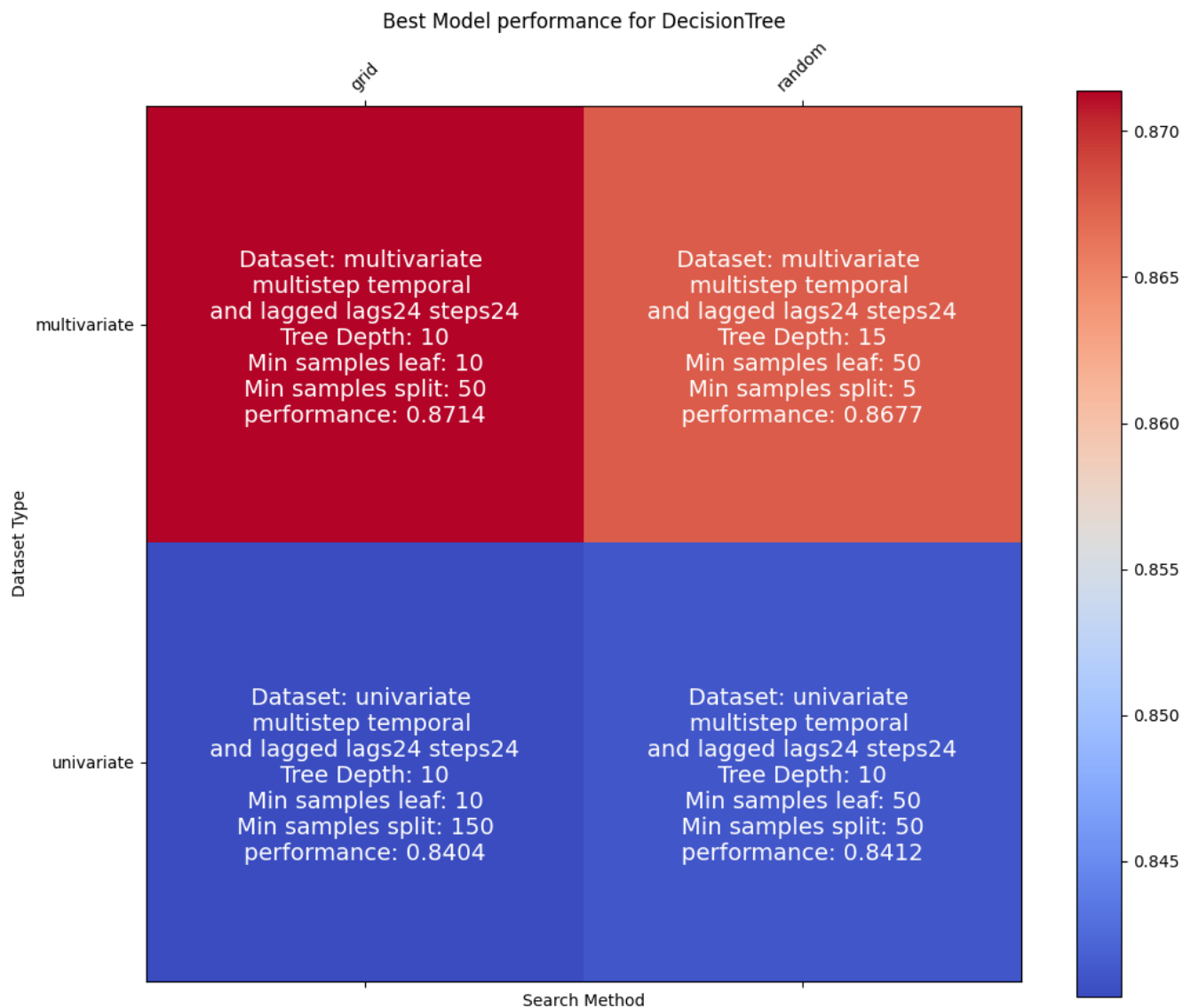
The worst results (multistep) for the different setup combinations are as follows:

Worst Model performance for DecisionTree

Dataset Type	grid	random
multivariate	Dataset: multivariate multistep temporal steps24 Tree Depth: 20 Min samples leaf: 100 Min samples split: 250 performance: 0.6747	Dataset: multivariate multistep temporal steps24 Tree Depth: 20 Min samples leaf: 100 Min samples split: 250 performance: 0.6747
univariate	Dataset: univariate multistep temporal steps24 Tree Depth: 8 Min samples leaf: 100 Min samples split: 250 performance: 0.4461	Dataset: univariate multistep temporal steps24 Tree Depth: 6 Min samples leaf: 25 Min samples split: 250 performance: 0.4537

Search Method

Best predicted days for DecisionTree.

Date: 2017-10-21 20:30:00, R2 Score: 0.99
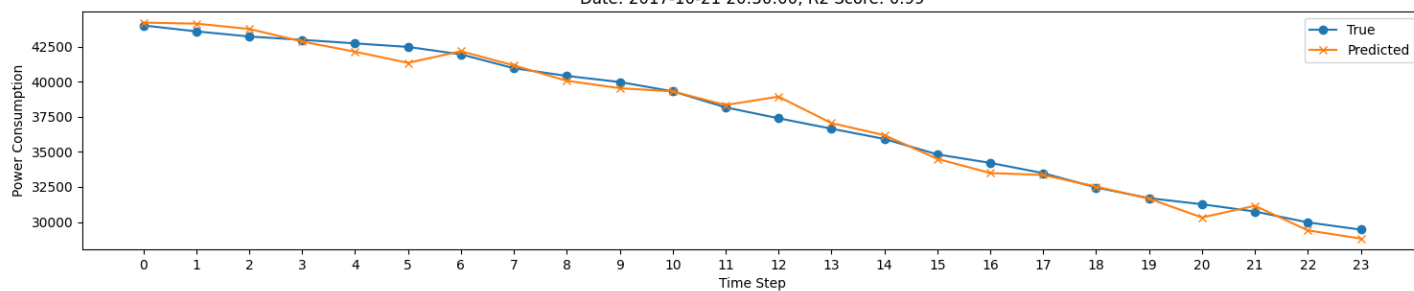
Date: 2017-11-16 23:10:00, R2 Score: 0.99
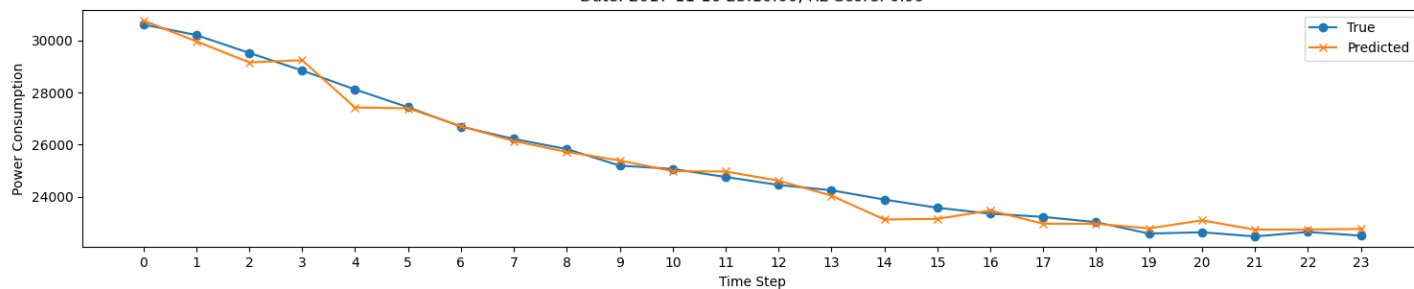
Date: 2017-10-23 19:00:00, R2 Score: 0.99
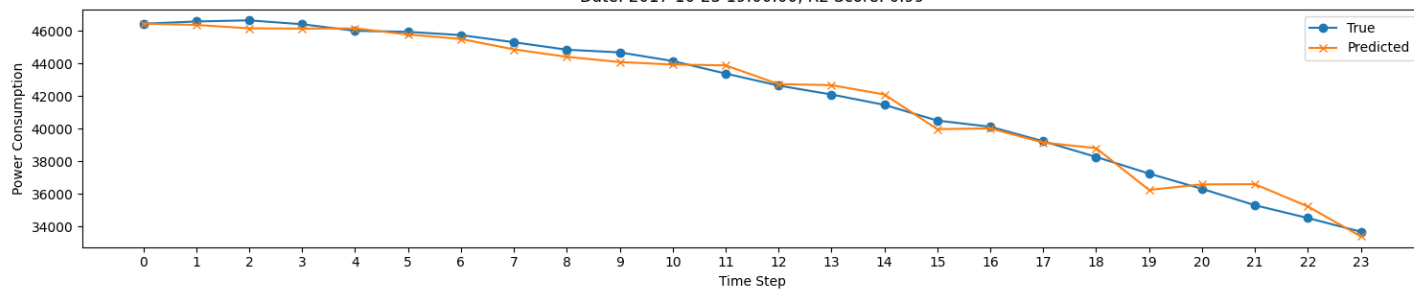
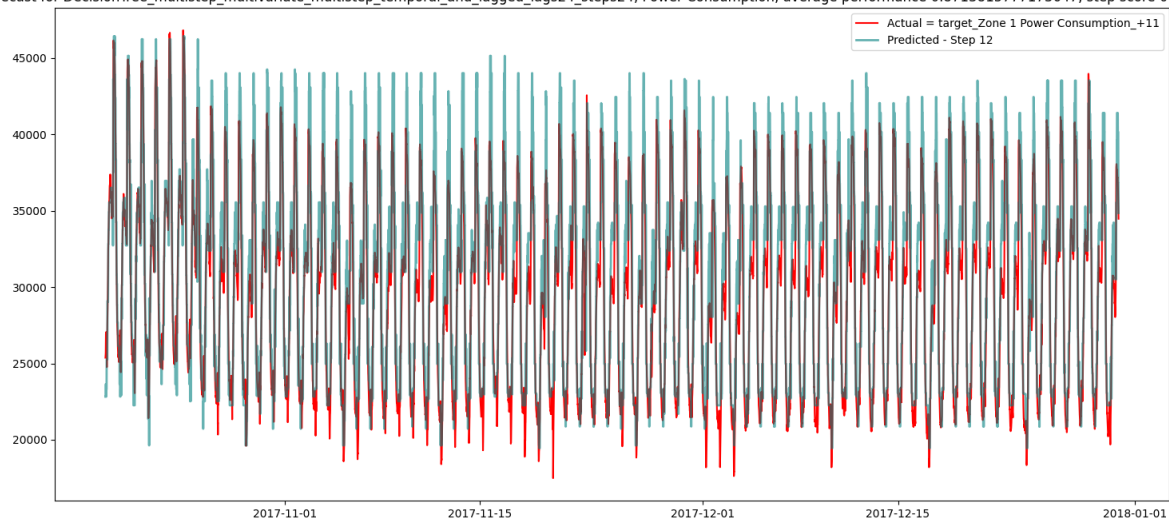*Worst predicted days for DecisionTree.*
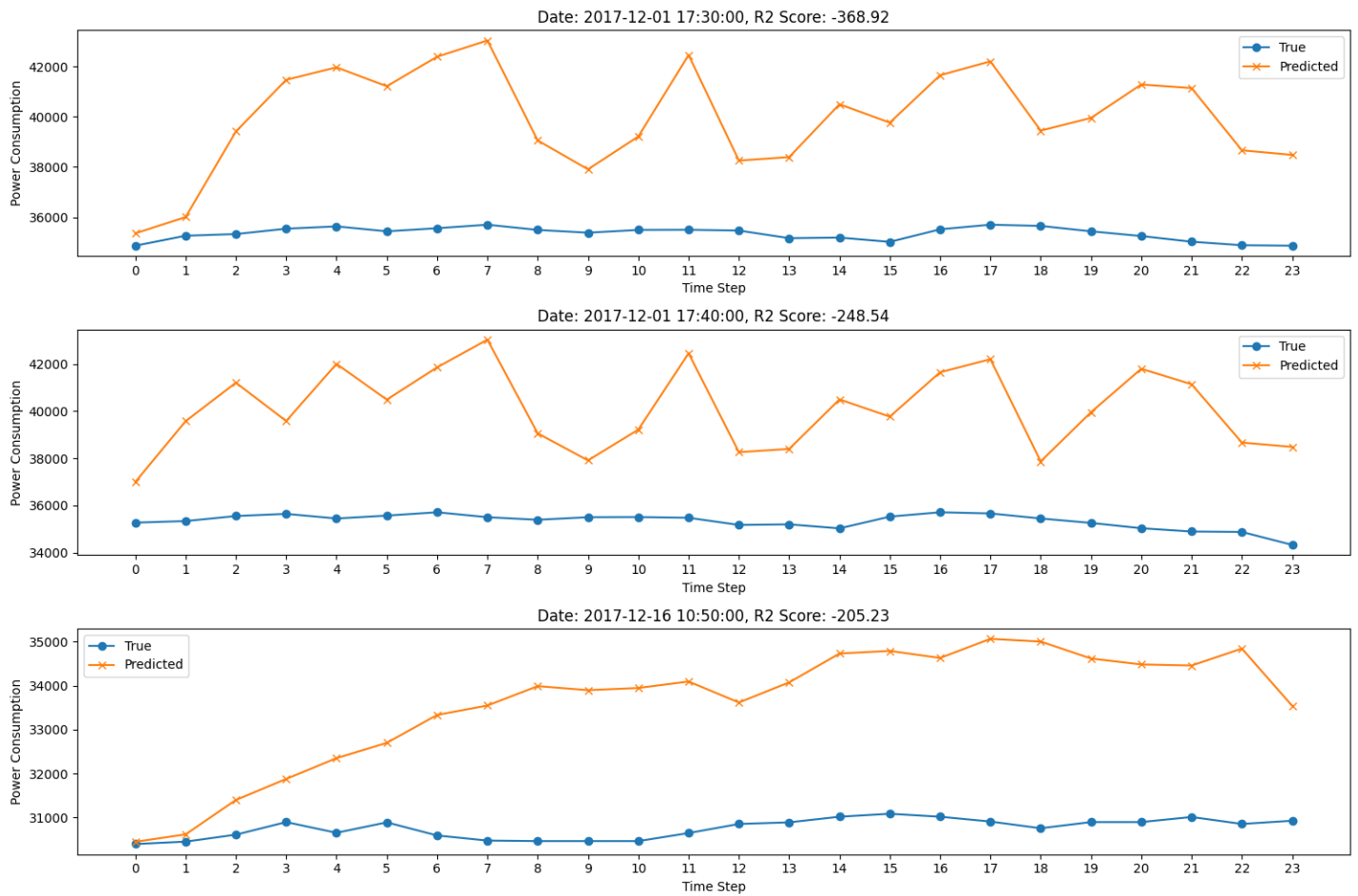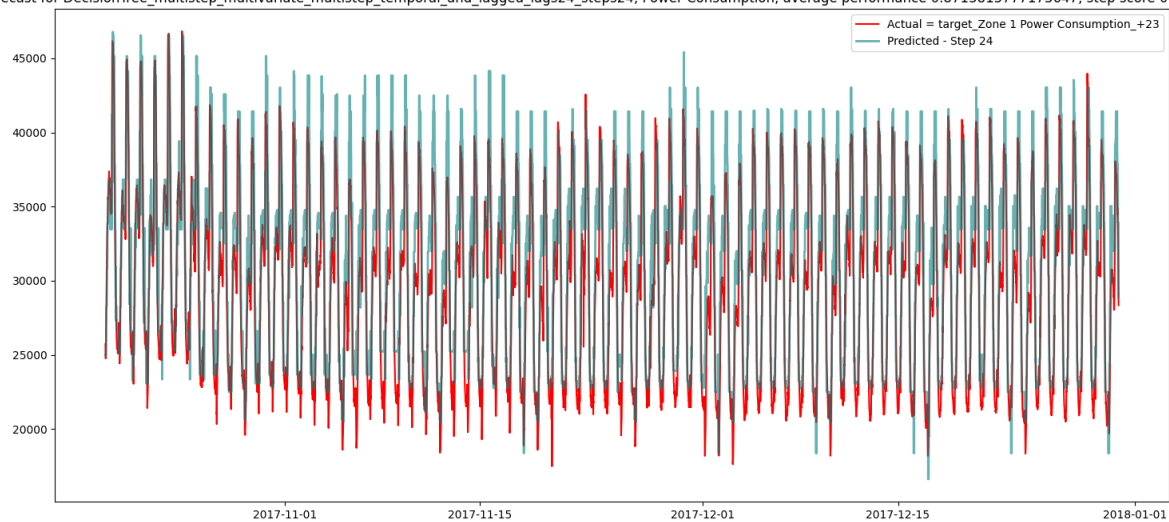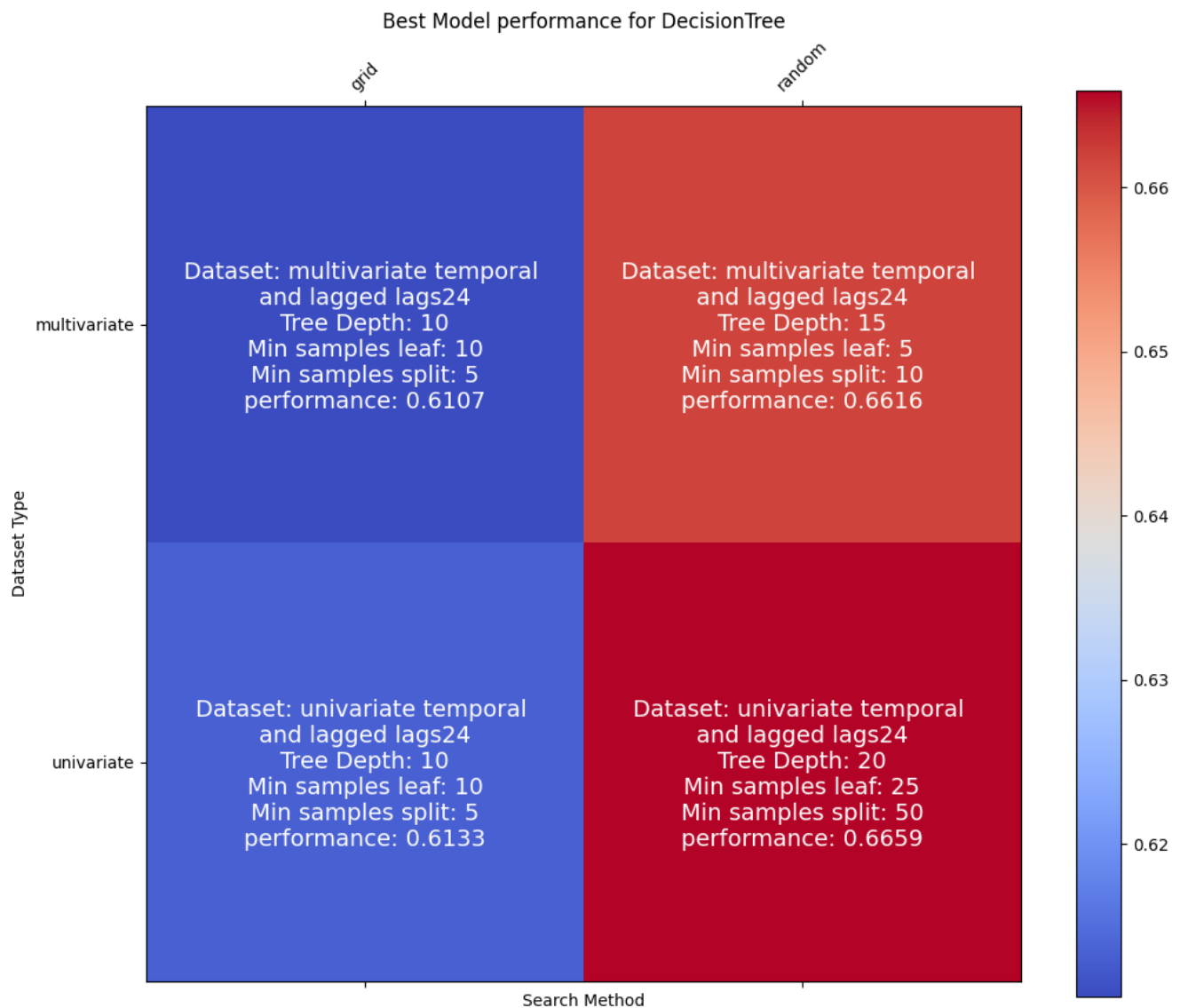
Steps plots for DecisionTree forecasts over time

Multistep forecast for DecisionTree_multistep_multivariate_multistep_temporal_and_lagged_lags24_steps24, Power Consumption, average performance 0.8713815777173647, step score 0.9946610073622831
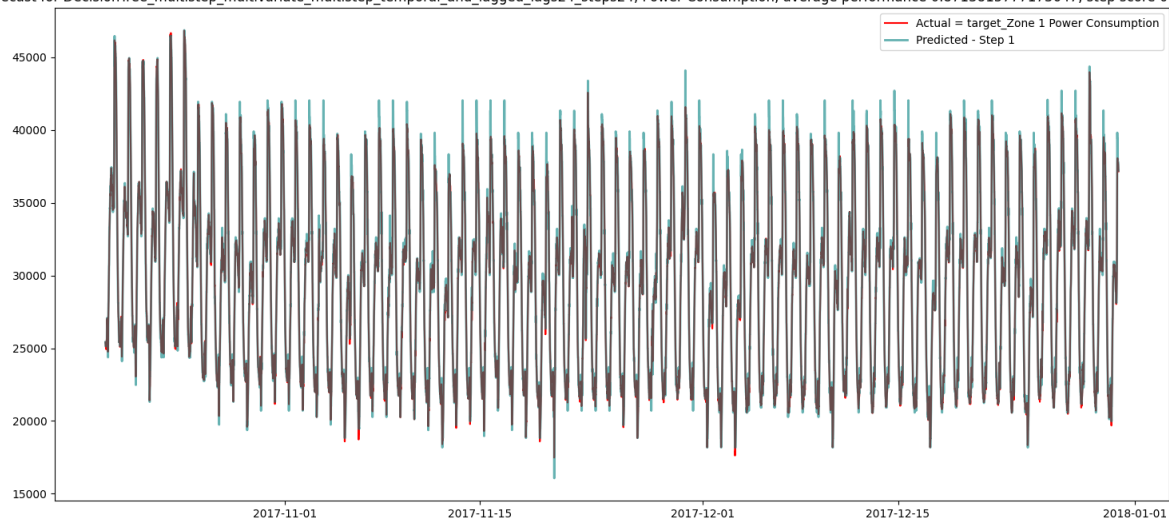
Multistep forecast for DecisionTree_multistep_multivariate_multistep_temporal_and_lagged_lags24_steps24, Power Consumption, average performance 0.8713815777173647, step score 0.8307180811628887

Multistep forecast for DecisionTree_multistep_multivariate_multistep_temporal_and_lagged_lags24_steps24, Power Consumption, average performance 0.8713815777173647, step score 0.8203734616536685
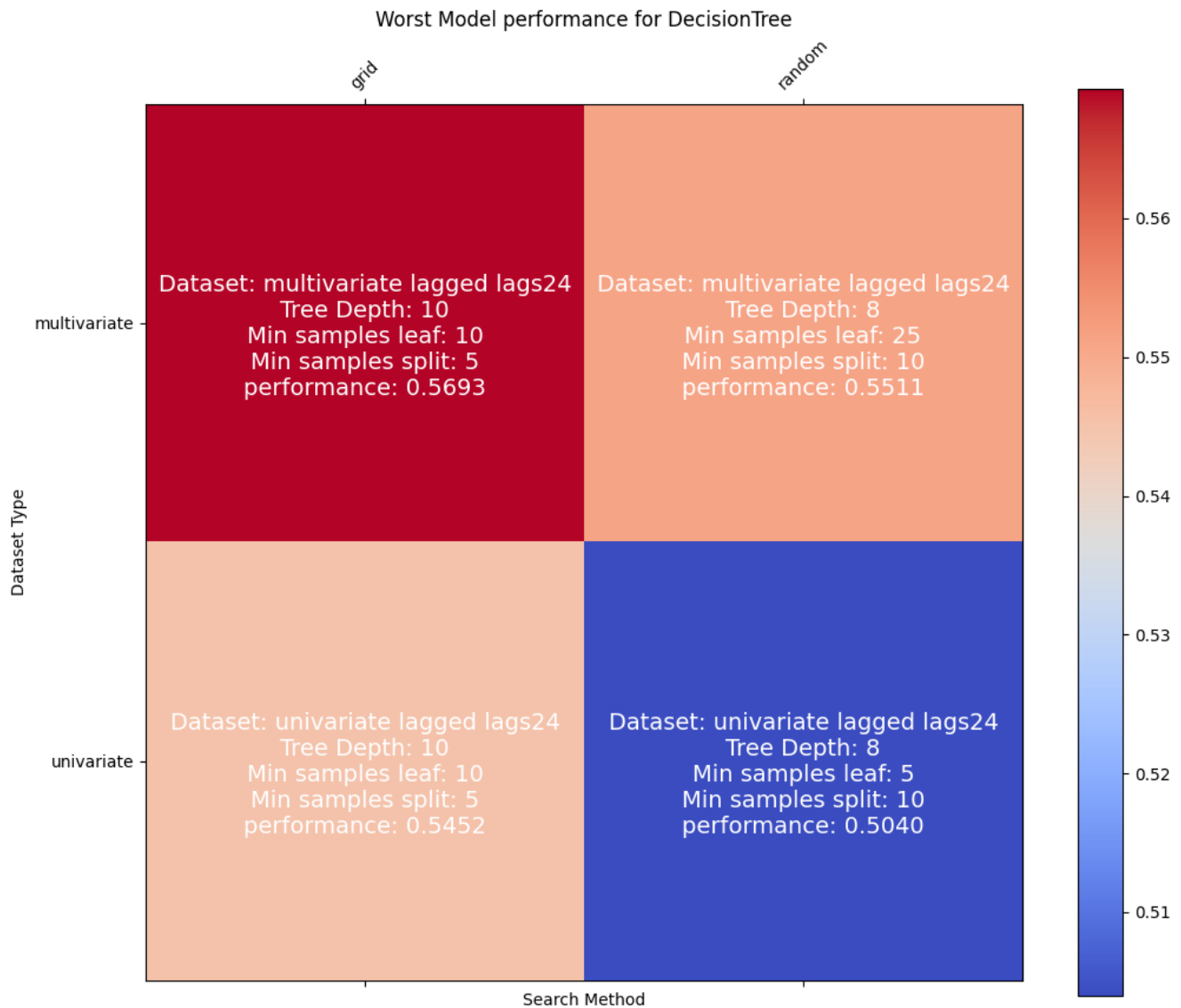
Results for the recursive forecast.

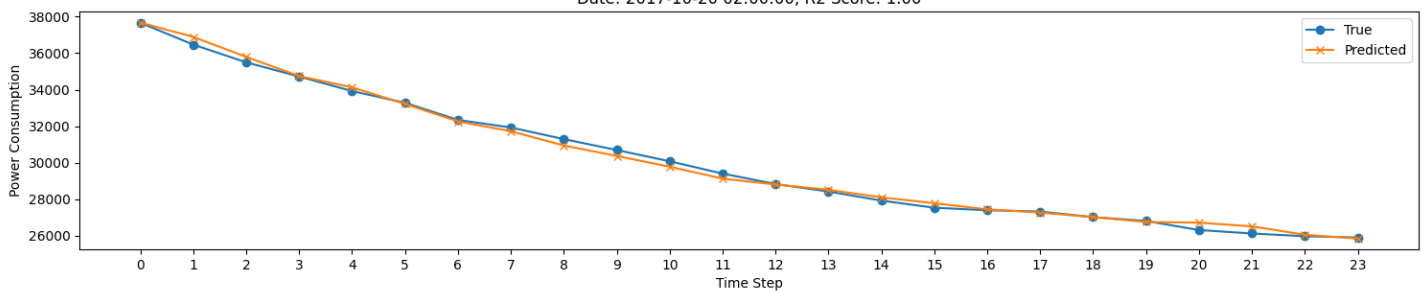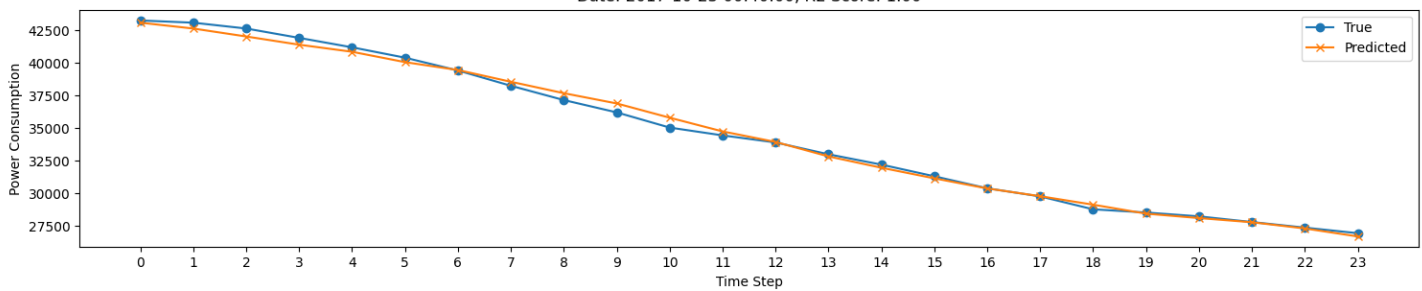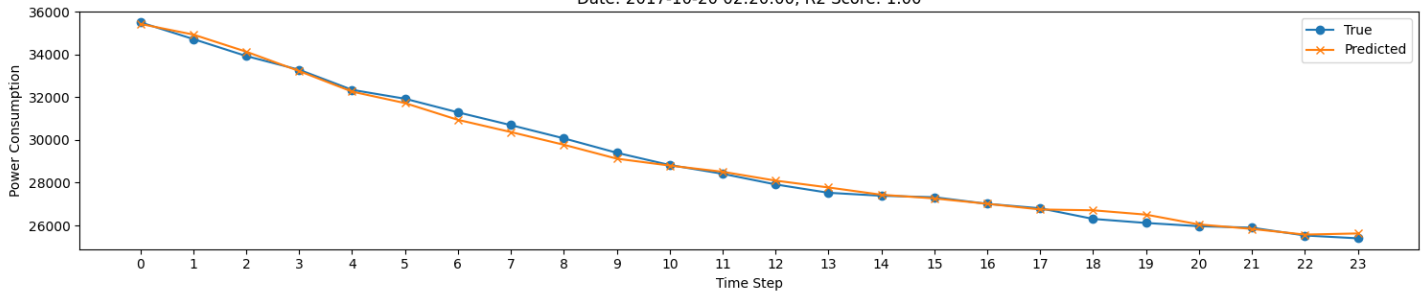*The best results (recursive) for the different setup combinations are as follows:*

Best Model performance for DecisionTree

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

Worst Model performance for DecisionTree

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Best predicted days for DecisionTree.

Worst predicted days for DecisionTree.

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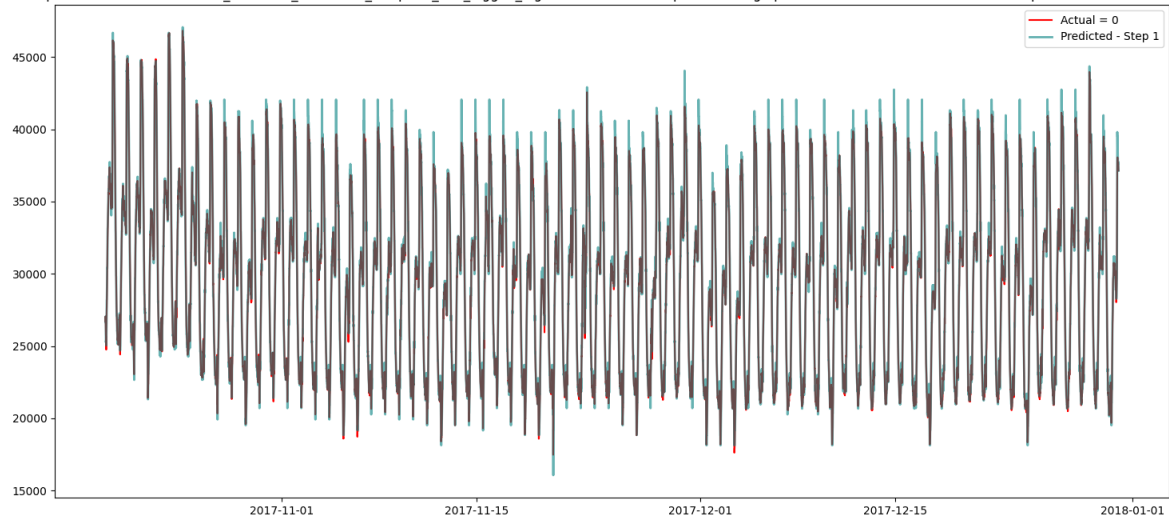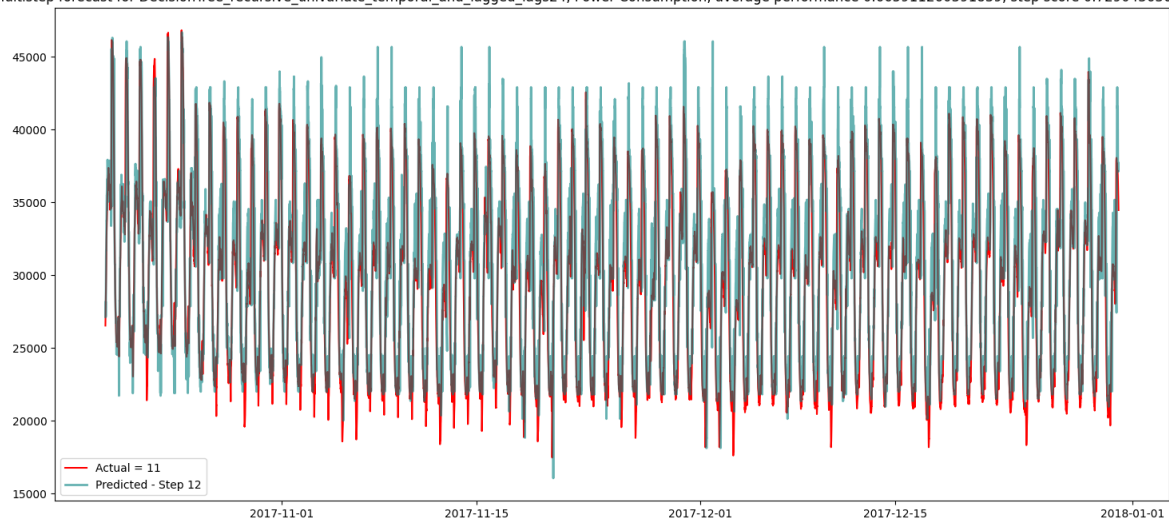## Steps plots for DecisionTree forecasts over time

Multistep forecast for DecisionTree_recursive_univariate_temporal_and_lagged_lags24, Power Consumption, average performance 0.665911260391839, step score 0.9947628943430495

Multistep forecast for DecisionTree_recursive_univariate_temporal_and_lagged_lags24, Power Consumption, average performance 0.665911260391839, step score 0.7290436367040393

Multistep forecast for DecisionTree_recursive_univariate_temporal_and_lagged_lags24, Power Consumption, average performance 0.665911260391839, step score 0.18143390530119774