Predict Bike Sharing Demand with AutoGluon Template

Project: Predict Bike Sharing Demand with AutoGluon

This notebook is a template with each step that you need to complete for the project.

Please fill in your code where there are explicit `?` markers in the notebook. You are welcome to add more cells and code as you see fit.

Once you have completed all the code implementations, please export your notebook as a HTML file so the reviews can view your code. Make sure you have all outputs correctly outputted.

`File-> Export Notebook As... -> Export Notebook as HTML`

There is a writeup to complete as well after all code implememtation is done. Please answer all questions and attach the necessary tables and charts. You can complete the writeup in either markdown or PDF.

Completing the code template and writeup template will cover all of the rubric points for this project.

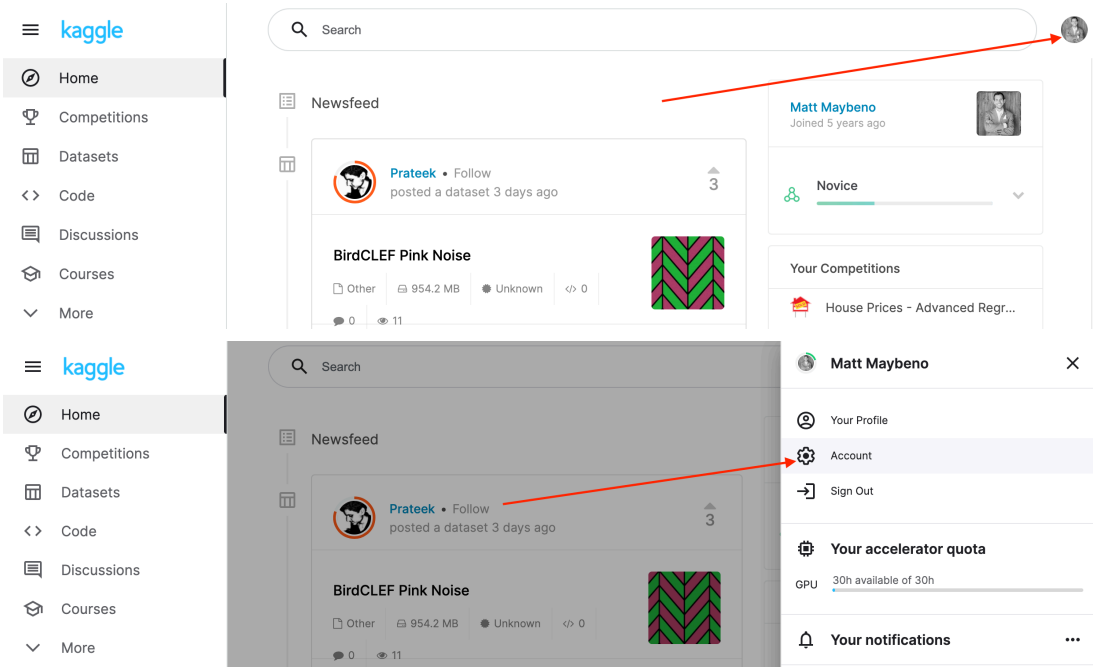
The rubric contains "Stand Out Suggestions" for enhancing the project beyond the minimum requirements. The stand out suggestions are optional. If you decide to pursue the "stand out suggestions", you can include the code in this notebook and also discuss the results in the writeup file.

Step 1: Create an account with Kaggle

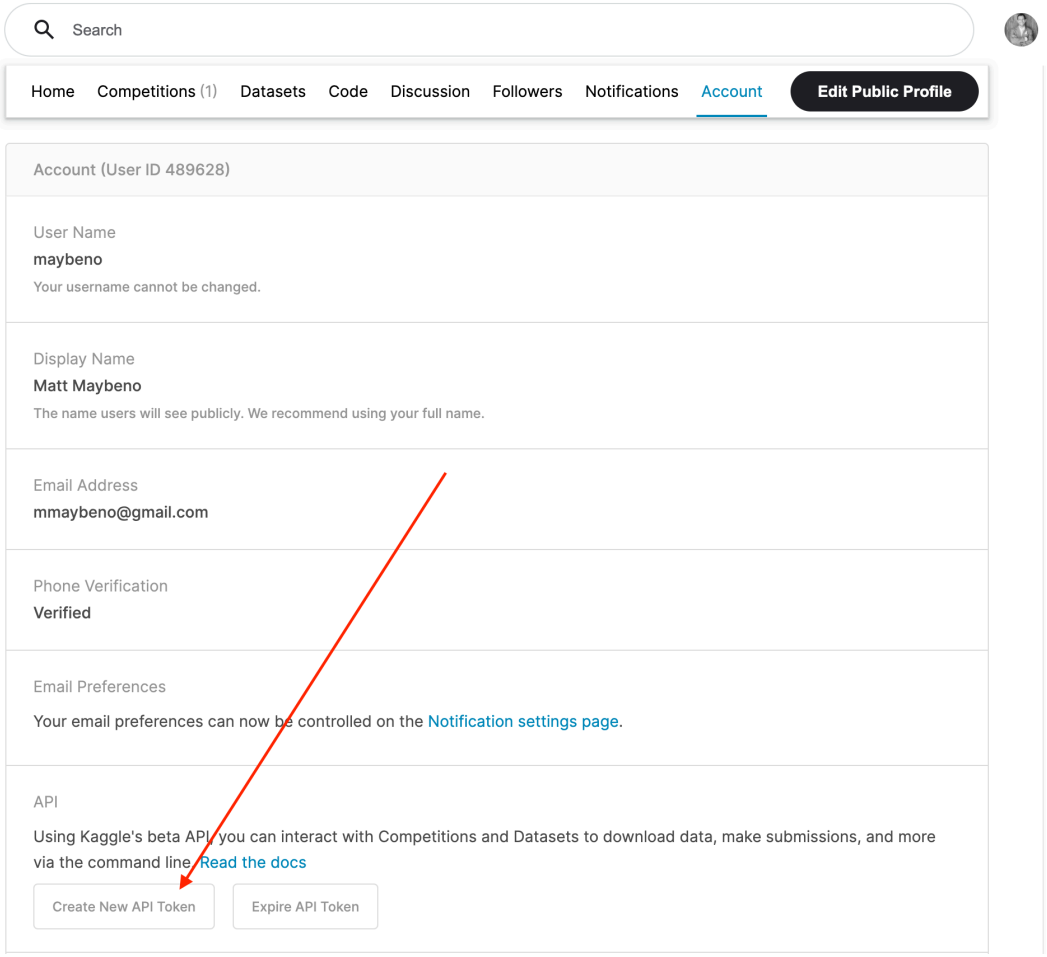
Create Kaggle Account and download API key

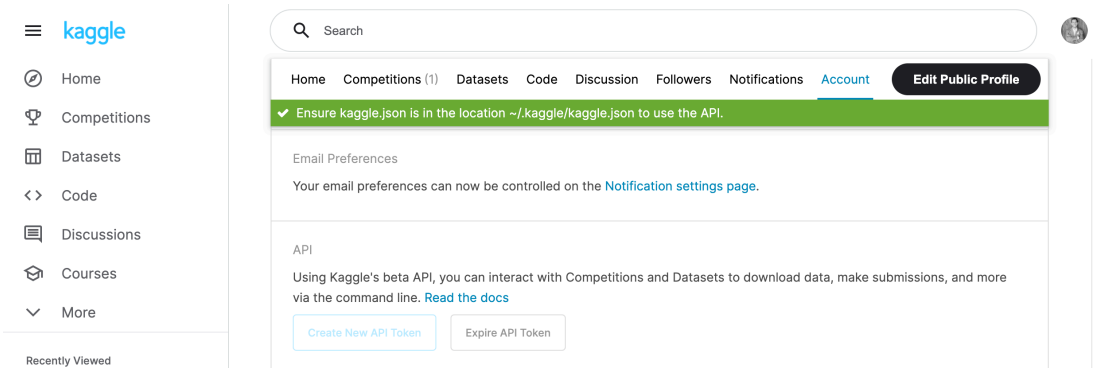
Below is example of steps to get the API username and key. Each student will have their own username and key.

1. Open account settings.

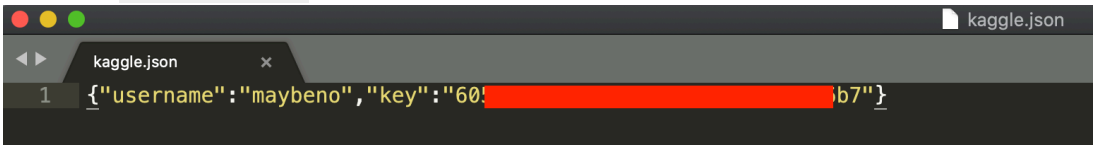


2. Scroll down to API and click Create New API Token.





3. Open up `kaggle.json` and use the username and key.



Step 2: Download the Kaggle dataset using the kaggle python library

Open up Sagemaker Studio and use starter template

1. Notebook should be using a `ml.t3.medium` instance (2 vCPU + 4 GiB)
2. Notebook should be using kernal: `Python 3 (MXNet 1.8 Python 3.7 CPU Optimized)`

Install packages

In [1]:
```
!pip install -U pip
!pip install -U setuptools wheel
!pip install -U "mxnet<2.0.0" bokeh==2.0.1
!pip install autogluon --no-cache-dir
!pip install kaggle
# Without --no-cache-dir, smaller aws instances may have trouble installing
```

```
Requirement already satisfied: pip in /opt/conda/lib/python3.10/site-packages (23.3.
2)
Collecting pip
  Downloading pip-24.1.1-py3-none-any.whl.metadata (3.6 kB)
Downloading pip-24.1.1-py3-none-any.whl (1.8 MB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.8/1.8 MB 33.9 MB/s eta 0:00:00a 0:00:0
1
Installing collected packages: pip
  Attempting uninstall: pip
    Found existing installation: pip 23.3.2
    Uninstalling pip-23.3.2:
      Successfully uninstalled pip-23.3.2
Successfully installed pip-24.1.1
Requirement already satisfied: setuptools in /opt/conda/lib/python3.10/site-packages
(69.5.1)
Collecting setuptools
  Using cached setuptools-70.1.1-py3-none-any.whl.metadata (6.0 kB)
Requirement already satisfied: wheel in /opt/conda/lib/python3.10/site-packages (0.4
3.0)
Using cached setuptools-70.1.1-py3-none-any.whl (883 kB)
Installing collected packages: setuptools
  Attempting uninstall: setuptools
    Found existing installation: setuptools 69.5.1
    Uninstalling setuptools-69.5.1:
      Successfully uninstalled setuptools-69.5.1
ERROR: pip's dependency resolver does not currently take into account all the packag
es that are installed. This behaviour is the source of the following dependency conf
licts.
dash 2.17.0 requires dash-core-components==2.0.0, which is not installed.
dash 2.17.0 requires dash-html-components==2.0.0, which is not installed.
dash 2.17.0 requires dash-table==5.0.0, which is not installed.
autogluon-common 0.8.3 requires pandas<1.6,>=1.4.1, but you have pandas 2.1.4 which
is incompatible.
autogluon-core 0.8.3 requires pandas<1.6,>=1.4.1, but you have pandas 2.1.4 which is
incompatible.
autogluon-core 0.8.3 requires scikit-learn<1.4.1,>=1.1, but you have scikit-learn 1.
4.2 which is incompatible.
autogluon-features 0.8.3 requires pandas<1.6,>=1.4.1, but you have pandas 2.1.4 whic
h is incompatible.
autogluon-features 0.8.3 requires scikit-learn<1.4.1,>=1.1, but you have scikit-lear
n 1.4.2 which is incompatible.
autogluon-multimodal 0.8.3 requires pandas<1.6,>=1.4.1, but you have pandas 2.1.4 wh
ich is incompatible.
autogluon-multimodal 0.8.3 requires pytorch-lightning<1.10.0,>=1.9.0, but you have p
ytorch-lightning 2.0.9 which is incompatible.
autogluon-multimodal 0.8.3 requires scikit-learn<1.4.1,>=1.1, but you have scikit-le
arn 1.4.2 which is incompatible.
autogluon-multimodal 0.8.3 requires torch<1.14,>=1.9, but you have torch 2.0.0.post1
04 which is incompatible.
autogluon-multimodal 0.8.3 requires torchmetrics<0.12.0,>=0.11.0, but you have torch
metrics 1.0.3 which is incompatible.
autogluon-multimodal 0.8.3 requires torchvision<0.15.0, but you have torchvision 0.1
5.2a0+ab7b3e6 which is incompatible.
autogluon-tabular 0.8.3 requires pandas<1.6,>=1.4.1, but you have pandas 2.1.4 which
is incompatible.
autogluon-tabular 0.8.3 requires scikit-learn<1.4.1,>=1.1, but you have scikit-learn
```

```
1.4.2 which is incompatible.
autogluon-timeseries 0.8.3 requires pandas<1.6,>=1.4.1, but you have pandas 2.1.4 wh
ich is incompatible.
autogluon-timeseries 0.8.3 requires pytorch-lightning<1.10.0,>=1.7.4, but you have p
ytorch-lightning 2.0.9 which is incompatible.
autogluon-timeseries 0.8.3 requires torch<1.14,>=1.9, but you have torch 2.0.0.post1
04 which is incompatible.
Successfully installed setuptools-70.1.1
Collecting mxnet<2.0.0
  Using cached mxnet-1.9.1-py3-none-manylinux2014_x86_64.whl.metadata (3.4 kB)
Collecting bokeh==2.0.1
  Using cached bokeh-2.0.1-py3-none-any.whl
Requirement already satisfied: PyYAML>=3.10 in /opt/conda/lib/python3.10/site-packag
es (from bokeh==2.0.1) (6.0.1)
Requirement already satisfied: python-dateutil>=2.1 in /opt/conda/lib/python3.10/sit
e-packages (from bokeh==2.0.1) (2.9.0)
Requirement already satisfied: Jinja2>=2.7 in /opt/conda/lib/python3.10/site-package
s (from bokeh==2.0.1) (3.1.4)
Requirement already satisfied: numpy>=1.11.3 in /opt/conda/lib/python3.10/site-packa
ges (from bokeh==2.0.1) (1.26.4)
Requirement already satisfied: pillow>=4.0 in /opt/conda/lib/python3.10/site-package
s (from bokeh==2.0.1) (10.3.0)
Requirement already satisfied: packaging>=16.8 in /opt/conda/lib/python3.10/site-pac
kages (from bokeh==2.0.1) (23.2)
Requirement already satisfied: tornado>=5 in /opt/conda/lib/python3.10/site-packages
(from bokeh==2.0.1) (6.4)
Requirement already satisfied: typing-extensions>=3.7.4 in /opt/conda/lib/python3.1
0/site-packages (from bokeh==2.0.1) (4.11.0)
Requirement already satisfied: requests<3,>=2.20.0 in /opt/conda/lib/python3.10/site
-packages (from mxnet<2.0.0) (2.31.0)
Collecting graphviz<0.9.0,>=0.8.1 (from mxnet<2.0.0)
  Using cached graphviz-0.8.4-py2.py3-none-any.whl.metadata (6.4 kB)
Requirement already satisfied: MarkupSafe>=2.0 in /opt/conda/lib/python3.10/site-pac
kages (from Jinja2>=2.7->bokeh==2.0.1) (2.1.5)
Requirement already satisfied: six>=1.5 in /opt/conda/lib/python3.10/site-packages
(from python-dateutil>=2.1->bokeh==2.0.1) (1.16.0)
Requirement already satisfied: charset-normalizer<4,>=2 in /opt/conda/lib/python3.1
0/site-packages (from requests<3,>=2.20.0->mxnet<2.0.0) (3.3.2)
Requirement already satisfied: idna<4,>=2.5 in /opt/conda/lib/python3.10/site-packag
es (from requests<3,>=2.20.0->mxnet<2.0.0) (3.7)
Requirement already satisfied: urllib3<3,>=1.21.1 in /opt/conda/lib/python3.10/site-
packages (from requests<3,>=2.20.0->mxnet<2.0.0) (1.26.18)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/lib/python3.10/site-
packages (from requests<3,>=2.20.0->mxnet<2.0.0) (2024.2.2)
Using cached mxnet-1.9.1-py3-none-manylinux2014_x86_64.whl (49.1 MB)
Using cached graphviz-0.8.4-py2.py3-none-any.whl (16 kB)
Installing collected packages: graphviz, mxnet, bokeh
  Attempting uninstall: graphviz
    Found existing installation: graphviz 0.20.3
    Uninstalling graphviz-0.20.3:
      Successfully uninstalled graphviz-0.20.3
Successfully installed bokeh-2.0.1 graphviz-0.8.4 mxnet-1.9.1
Requirement already satisfied: autogluon in /opt/conda/lib/python3.10/site-packages
(0.8.3)
Requirement already satisfied: autogluon.core==0.8.3 in /opt/conda/lib/python3.10/si
te-packages (from autogluon.core[all]==0.8.3->autogluon) (0.8.3)
```

```
Requirement already satisfied: autogluon.features==0.8.3 in /opt/conda/lib/python3.1
0/site-packages (from autogluon) (0.8.3)
Requirement already satisfied: autogluon.tabular==0.8.3 in /opt/conda/lib/python3.1
0/site-packages (from autogluon.tabular[all]==0.8.3->autogluon) (0.8.3)
Requirement already satisfied: autogluon.multimodal==0.8.3 in /opt/conda/lib/python
3.10/site-packages (from autogluon) (0.8.3)
Requirement already satisfied: autogluon.timeseries==0.8.3 in /opt/conda/lib/python
3.10/site-packages (from autogluon.timeseries[all]==0.8.3->autogluon) (0.8.3)
Requirement already satisfied: numpy<1.27,>=1.21 in /opt/conda/lib/python3.10/site-p
ackages (from autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluon) (1.26.4)
Requirement already satisfied: scipy<1.12,>=1.5.4 in /opt/conda/lib/python3.10/site-
packages (from autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluon) (1.11.
4)
Collecting scikit-learn<1.4.1,>=1.1 (from autogluon.core==0.8.3->autogluon.core[all]
==0.8.3->autogluon)
  Downloading scikit_learn-1.4.0-1-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x
86_64.whl.metadata (11 kB)
Requirement already satisfied: networkx<4,>=3.0 in /opt/conda/lib/python3.10/site-pa
ckages (from autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluon) (3.3)
Collecting pandas<1.6,>=1.4.1 (from autogluon.core==0.8.3->autogluon.core[all]==0.8.
3->autogluon)
  Downloading pandas-1.5.3-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.wh
l.metadata (11 kB)
Requirement already satisfied: tqdm<5,>=4.38 in /opt/conda/lib/python3.10/site-packa
ges (from autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluon) (4.66.4)
Requirement already satisfied: requests in /opt/conda/lib/python3.10/site-packages
(from autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluon) (2.31.0)
Requirement already satisfied: matplotlib in /opt/conda/lib/python3.10/site-packages
(from autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluon) (3.8.4)
Requirement already satisfied: boto3<2,>=1.10 in /opt/conda/lib/python3.10/site-pack
ages (from autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluon) (1.34.51)
Requirement already satisfied: autogluon.common==0.8.3 in /opt/conda/lib/python3.10/
site-packages (from autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluon)
(0.8.3)
Collecting grpcio<=1.50.0,>=1.42.0 (from autogluon.core[all]==0.8.3->autogluon)
  Downloading grpcio-1.50.0-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.w
hl.metadata (3.9 kB)
Collecting ray<2.4,>=2.3 (from ray[default]<2.4,>=2.3; extra == "all"->autogluon.cor
e[all]==0.8.3->autogluon)
  Downloading ray-2.3.1-cp310-cp310-manylinux2014_x86_64.whl.metadata (12 kB)
Collecting hyperopt<0.2.8,>=0.2.7 (from autogluon.core[all]==0.8.3->autogluon)
  Downloading hyperopt-0.2.7-py2.py3-none-any.whl.metadata (1.7 kB)
Requirement already satisfied: pydantic<2.0,>=1.10.4 in /opt/conda/lib/python3.10/si
te-packages (from autogluon.core[all]==0.8.3->autogluon) (1.10.14)
Requirement already satisfied: Pillow<11,>=10.2 in /opt/conda/lib/python3.10/site-pa
ckages (from autogluon.multimodal==0.8.3->autogluon) (10.3.0)
Requirement already satisfied: jsonschema<4.18,>=4.14 in /opt/conda/lib/python3.10/s
ite-packages (from autogluon.multimodal==0.8.3->autogluon) (4.17.3)
Requirement already satisfied: seqeval<1.3.0,>=1.2.2 in /opt/conda/lib/python3.10/si
te-packages (from autogluon.multimodal==0.8.3->autogluon) (1.2.2)
Requirement already satisfied: evaluate<0.5.0,>=0.4.0 in /opt/conda/lib/python3.10/s
ite-packages (from autogluon.multimodal==0.8.3->autogluon) (0.4.1)
Requirement already satisfied: accelerate<0.22.0,>=0.21.0 in /opt/conda/lib/python3.
10/site-packages (from autogluon.multimodal==0.8.3->autogluon) (0.21.0)
Requirement already satisfied: timm<0.10.0,>=0.9.5 in /opt/conda/lib/python3.10/site
-packages (from autogluon.multimodal==0.8.3->autogluon) (0.9.16)
```

```
Collecting torch<1.14,>=1.9 (from autogluon.multimodal==0.8.3->autogluon)
  Downloading torch-1.13.1-cp310-cp310-manylinux1_x86_64.whl.metadata (24 kB)
Collecting torchvision<0.15.0 (from autogluon.multimodal==0.8.3->autogluon)
  Downloading torchvision-0.14.1-cp310-cp310-manylinux1_x86_64.whl.metadata (11 kB)
Requirement already satisfied: scikit-image<0.20.0,>=0.19.1 in /opt/conda/lib/python
3.10/site-packages (from autogluon.multimodal==0.8.3->autogluon) (0.19.3)
Collecting pytorch-lightning<1.10.0,>=1.9.0 (from autogluon.multimodal==0.8.3->autog
luon)
  Downloading pytorch_lightning-1.9.5-py3-none-any.whl.metadata (23 kB)
Requirement already satisfied: text-unidecode<1.4,>=1.3 in /opt/conda/lib/python3.1
0/site-packages (from autogluon.multimodal==0.8.3->autogluon) (1.3)
Collecting torchmetrics<0.12.0,>=0.11.0 (from autogluon.multimodal==0.8.3->autogluo
n)
  Downloading torchmetrics-0.11.4-py3-none-any.whl.metadata (15 kB)
Requirement already satisfied: transformers<4.41.0,>=4.36.0 in /opt/conda/lib/python
3.10/site-packages (from transformers[sentencepiece]<4.41.0,>=4.36.0->autogluon.mult
imodal==0.8.3->autogluon) (4.40.2)
Requirement already satisfied: nptyping<2.5.0,>=1.4.4 in /opt/conda/lib/python3.10/s
ite-packages (from autogluon.multimodal==0.8.3->autogluon) (2.4.1)
Requirement already satisfied: omegaconf<2.3.0,>=2.1.1 in /opt/conda/lib/python3.10/
site-packages (from autogluon.multimodal==0.8.3->autogluon) (2.2.3)
Requirement already satisfied: pytorch-metric-learning<2.0,>=1.3.0 in /opt/conda/li
b/python3.10/site-packages (from autogluon.multimodal==0.8.3->autogluon) (1.7.3)
Requirement already satisfied: nlpaug<1.2.0,>=1.1.10 in /opt/conda/lib/python3.10/si
te-packages (from autogluon.multimodal==0.8.3->autogluon) (1.1.11)
Requirement already satisfied: nltk<4.0.0,>=3.4.5 in /opt/conda/lib/python3.10/site-
packages (from autogluon.multimodal==0.8.3->autogluon) (3.8.1)
Requirement already satisfied: openmim<0.4.0,>=0.3.7 in /opt/conda/lib/python3.10/si
te-packages (from autogluon.multimodal==0.8.3->autogluon) (0.3.7)
Requirement already satisfied: defusedxml<0.7.2,>=0.7.1 in /opt/conda/lib/python3.1
0/site-packages (from autogluon.multimodal==0.8.3->autogluon) (0.7.1)
Requirement already satisfied: jinja2<3.2,>=3.0.3 in /opt/conda/lib/python3.10/site-
packages (from autogluon.multimodal==0.8.3->autogluon) (3.1.4)
Requirement already satisfied: tensorboard<3,>=2.9 in /opt/conda/lib/python3.10/site
-packages (from autogluon.multimodal==0.8.3->autogluon) (2.15.2)
Requirement already satisfied: pytesseract<0.3.11,>=0.3.9 in /opt/conda/lib/python3.
10/site-packages (from autogluon.multimodal==0.8.3->autogluon) (0.3.10)
Requirement already satisfied: lightgbm<3.4,>=3.3 in /opt/conda/lib/python3.10/site-
packages (from autogluon.tabular[all]==0.8.3->autogluon) (3.3.5)
Requirement already satisfied: fastai<2.8,>=2.3.1 in /opt/conda/lib/python3.10/site-
packages (from autogluon.tabular[all]==0.8.3->autogluon) (2.7.15)
Requirement already satisfied: catboost<1.3,>=1.1 in /opt/conda/lib/python3.10/site-
packages (from autogluon.tabular[all]==0.8.3->autogluon) (1.2.5)
Requirement already satisfied: xgboost<1.8,>=1.6 in /opt/conda/lib/python3.10/site-p
ackages (from autogluon.tabular[all]==0.8.3->autogluon) (1.7.6)
Requirement already satisfied: joblib<2,>=1.1 in /opt/conda/lib/python3.10/site-pack
ages (from autogluon.timeseries==0.8.3->autogluon.timeseries[all]==0.8.3->autogluon)
(1.4.2)
Requirement already satisfied: statsmodels<0.15,>=0.13.0 in /opt/conda/lib/python3.1
0/site-packages (from autogluon.timeseries==0.8.3->autogluon.timeseries[all]==0.8.3-
>autogluon) (0.14.1)
Requirement already satisfied: gluonts<0.14,>=0.13.1 in /opt/conda/lib/python3.10/si
te-packages (from autogluon.timeseries==0.8.3->autogluon.timeseries[all]==0.8.3->aut
ogluon) (0.13.7)
Requirement already satisfied: statsforecast<1.5,>=1.4.0 in /opt/conda/lib/python3.1
0/site-packages (from autogluon.timeseries==0.8.3->autogluon.timeseries[all]==0.8.3-
```

```
>autogluon) (1.4.0)
Requirement already satisfied: mlforecast<0.7.4,>=0.7.0 in /opt/conda/lib/python3.1
0/site-packages (from autogluon.timeseries==0.8.3->autogluon.timeseries[all]==0.8.3-
>autogluon) (0.7.3)
Requirement already satisfied: ujson<6,>=5 in /opt/conda/lib/python3.10/site-package
s (from autogluon.timeseries==0.8.3->autogluon.timeseries[all]==0.8.3->autogluon)
(5.9.0)
Requirement already satisfied: psutil<6,>=5.7.3 in /opt/conda/lib/python3.10/site-pa
ckages (from autogluon.common==0.8.3->autogluon.core==0.8.3->autogluon.core[all]==0.
8.3->autogluon) (5.9.8)
Requirement already satisfied: setuptools in /opt/conda/lib/python3.10/site-packages
(from autogluon.common==0.8.3->autogluon.core==0.8.3->autogluon.core[all]==0.8.3->au
togluon) (70.1.1)
Requirement already satisfied: packaging>=20.0 in /opt/conda/lib/python3.10/site-pac
kages (from accelerate<0.22.0,>=0.21.0->autogluon.multimodal==0.8.3->autogluon) (23.
2)
Requirement already satisfied: pyyaml in /opt/conda/lib/python3.10/site-packages (fr
om accelerate<0.22.0,>=0.21.0->autogluon.multimodal==0.8.3->autogluon) (6.0.1)
Requirement already satisfied: botocore<1.35.0,>=1.34.51 in /opt/conda/lib/python3.1
0/site-packages (from boto3<2,>=1.10->autogluon.core==0.8.3->autogluon.core[all]==0.
8.3->autogluon) (1.34.51)
Requirement already satisfied: jmespath<2.0.0,>=0.7.1 in /opt/conda/lib/python3.10/s
ite-packages (from boto3<2,>=1.10->autogluon.core==0.8.3->autogluon.core[all]==0.8.3
->autogluon) (1.0.1)
Requirement already satisfied: s3transfer<0.11.0,>=0.10.0 in /opt/conda/lib/python3.
10/site-packages (from boto3<2,>=1.10->autogluon.core==0.8.3->autogluon.core[all]==
0.8.3->autogluon) (0.10.1)
Requirement already satisfied: graphviz in /opt/conda/lib/python3.10/site-packages
(from catboost<1.3,>=1.1->autogluon.tabular[all]==0.8.3->autogluon) (0.8.4)
Requirement already satisfied: plotly in /opt/conda/lib/python3.10/site-packages (fr
om catboost<1.3,>=1.1->autogluon.tabular[all]==0.8.3->autogluon) (5.22.0)
Requirement already satisfied: six in /opt/conda/lib/python3.10/site-packages (from
catboost<1.3,>=1.1->autogluon.tabular[all]==0.8.3->autogluon) (1.16.0)
Requirement already satisfied: datasets>=2.0.0 in /opt/conda/lib/python3.10/site-pac
kages (from evaluate<0.5.0,>=0.4.0->autogluon.multimodal==0.8.3->autogluon) (2.19.1)
Requirement already satisfied: dill in /opt/conda/lib/python3.10/site-packages (from
evaluate<0.5.0,>=0.4.0->autogluon.multimodal==0.8.3->autogluon) (0.3.8)
Requirement already satisfied: xxhash in /opt/conda/lib/python3.10/site-packages (fr
om evaluate<0.5.0,>=0.4.0->autogluon.multimodal==0.8.3->autogluon) (3.4.1)
Requirement already satisfied: multiprocess in /opt/conda/lib/python3.10/site-packag
es (from evaluate<0.5.0,>=0.4.0->autogluon.multimodal==0.8.3->autogluon) (0.70.16)
Requirement already satisfied: fsspec>=2021.05.0 in /opt/conda/lib/python3.10/site-p
ackages (from fsspec[http]>=2021.05.0->evaluate<0.5.0,>=0.4.0->autogluon.multimodal=
=0.8.3->autogluon) (2023.6.0)
Requirement already satisfied: huggingface-hub>=0.7.0 in /opt/conda/lib/python3.10/s
ite-packages (from evaluate<0.5.0,>=0.4.0->autogluon.multimodal==0.8.3->autogluon)
(0.23.0)
Requirement already satisfied: responses<0.19 in /opt/conda/lib/python3.10/site-pack
ages (from evaluate<0.5.0,>=0.4.0->autogluon.multimodal==0.8.3->autogluon) (0.18.0)
Requirement already satisfied: pip in /opt/conda/lib/python3.10/site-packages (from
fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autogluon) (24.1.1)
Requirement already satisfied: fastdownload<2,>=0.0.5 in /opt/conda/lib/python3.10/s
ite-packages (from fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autogluon) (0.
0.7)
Requirement already satisfied: fastcore<1.6,>=1.5.29 in /opt/conda/lib/python3.10/si
te-packages (from fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autogluon) (1.
```

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5.35)
Requirement already satisfied: fastprogress>=0.2.4 in /opt/conda/lib/python3.10/site
-packages (from fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autogluon) (1.0.
3)
Requirement already satisfied: spacy<4 in /opt/conda/lib/python3.10/site-packages (f
rom fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autogluon) (3.7.3)
Requirement already satisfied: toolz~=0.10 in /opt/conda/lib/python3.10/site-package
s (from gluonts<0.14,>=0.13.1->autogluon.timeseries==0.8.3->autogluon.timeseries[al
l]==0.8.3->autogluon) (0.12.1)
Requirement already satisfied: typing-extensions~=4.0 in /opt/conda/lib/python3.10/s
ite-packages (from gluonts<0.14,>=0.13.1->autogluon.timeseries==0.8.3->autogluon.tim
eseries[all]==0.8.3->autogluon) (4.11.0)
Requirement already satisfied: future in /opt/conda/lib/python3.10/site-packages (fr
om hyperopt<0.2.8,>=0.2.7->autogluon.core[all]==0.8.3->autogluon) (1.0.0)
Requirement already satisfied: cloudpickle in /opt/conda/lib/python3.10/site-package
s (from hyperopt<0.2.8,>=0.2.7->autogluon.core[all]==0.8.3->autogluon) (2.2.1)
Collecting py4j (from hyperopt<0.2.8,>=0.2.7->autogluon.core[all]==0.8.3->autogluon)
  Downloading py4j-0.10.9.7-py2.py3-none-any.whl.metadata (1.5 kB)
Requirement already satisfied: MarkupSafe>=2.0 in /opt/conda/lib/python3.10/site-pac
kages (from jinja2<3.2,>=3.0.3->autogluon.multimodal==0.8.3->autogluon) (2.1.5)
Requirement already satisfied: attrs>=17.4.0 in /opt/conda/lib/python3.10/site-packa
ges (from jsonschema<4.18,>=4.14->autogluon.multimodal==0.8.3->autogluon) (23.2.0)
Requirement already satisfied: pyrsistent!=0.17.0,!=0.17.1,!=0.17.2,>=0.14.0 in /op
t/conda/lib/python3.10/site-packages (from jsonschema<4.18,>=4.14->autogluon.multimo
dal==0.8.3->autogluon) (0.20.0)
Requirement already satisfied: wheel in /opt/conda/lib/python3.10/site-packages (fro
m lightgbm<3.4,>=3.3->autogluon.tabular[all]==0.8.3->autogluon) (0.43.0)
Requirement already satisfied: numba in /opt/conda/lib/python3.10/site-packages (fro
m mlforecast<0.7.4,>=0.7.0->autogluon.timeseries==0.8.3->autogluon.timeseries[all]==
0.8.3->autogluon) (0.59.1)
Requirement already satisfied: window-ops in /opt/conda/lib/python3.10/site-packages
(from mlforecast<0.7.4,>=0.7.0->autogluon.timeseries==0.8.3->autogluon.timeseries[al
l]==0.8.3->autogluon) (0.0.15)
Requirement already satisfied: gdown>=4.0.0 in /opt/conda/lib/python3.10/site-packag
es (from nlpaug<1.2.0,>=1.1.10->autogluon.multimodal==0.8.3->autogluon) (5.2.0)
Requirement already satisfied: click in /opt/conda/lib/python3.10/site-packages (fro
m nltk<4.0.0,>=3.4.5->autogluon.multimodal==0.8.3->autogluon) (8.1.7)
Requirement already satisfied: regex>=2021.8.3 in /opt/conda/lib/python3.10/site-pac
kages (from nltk<4.0.0,>=3.4.5->autogluon.multimodal==0.8.3->autogluon) (2024.5.10)
Requirement already satisfied: antlr4-python3-runtime==4.9.* in /opt/conda/lib/pytho
n3.10/site-packages (from omegaconf<2.3.0,>=2.1.1->autogluon.multimodal==0.8.3->auto
gluon) (4.9.3)
Requirement already satisfied: colorama in /opt/conda/lib/python3.10/site-packages
(from openmim<0.4.0,>=0.3.7->autogluon.multimodal==0.8.3->autogluon) (0.4.6)
Requirement already satisfied: model-index in /opt/conda/lib/python3.10/site-package
s (from openmim<0.4.0,>=0.3.7->autogluon.multimodal==0.8.3->autogluon) (0.1.11)
Requirement already satisfied: rich in /opt/conda/lib/python3.10/site-packages (from
openmim<0.4.0,>=0.3.7->autogluon.multimodal==0.8.3->autogluon) (13.7.1)
Requirement already satisfied: tabulate in /opt/conda/lib/python3.10/site-packages
(from openmim<0.4.0,>=0.3.7->autogluon.multimodal==0.8.3->autogluon) (0.9.0)
Requirement already satisfied: python-dateutil>=2.8.1 in /opt/conda/lib/python3.10/s
ite-packages (from pandas<1.6,>=1.4.1->autogluon.core==0.8.3->autogluon.core[all]==
0.8.3->autogluon) (2.9.0)
Requirement already satisfied: pytz>=2020.1 in /opt/conda/lib/python3.10/site-packag
es (from pandas<1.6,>=1.4.1->autogluon.core==0.8.3->autogluon.core[all]==0.8.3->auto
gluon) (2023.3)
```

```
Requirement already satisfied: lightning-utilities>=0.6.0.post0 in /opt/conda/lib/py
thon3.10/site-packages (from pytorch-lightning<1.10.0,>=1.9.0->autogluon.multimodal=
=0.8.3->autogluon) (0.11.2)
Requirement already satisfied: filelock in /opt/conda/lib/python3.10/site-packages
(from ray<2.4,>=2.3->ray[default]<2.4,>=2.3; extra == "all"->autogluon.core[all]==0.
8.3->autogluon) (3.14.0)
Requirement already satisfied: msgpack<2.0.0,>=1.0.0 in /opt/conda/lib/python3.10/si
te-packages (from ray<2.4,>=2.3->ray[default]<2.4,>=2.3; extra == "all"->autogluon.c
ore[all]==0.8.3->autogluon) (1.0.7)
Requirement already satisfied: protobuf!=3.19.5,>=3.15.3 in /opt/conda/lib/python3.1
0/site-packages (from ray<2.4,>=2.3->ray[default]<2.4,>=2.3; extra == "all"->autoglu
on.core[all]==0.8.3->autogluon) (4.24.4)
Requirement already satisfied: aiosignal in /opt/conda/lib/python3.10/site-packages
(from ray<2.4,>=2.3->ray[default]<2.4,>=2.3; extra == "all"->autogluon.core[all]==0.
8.3->autogluon) (1.3.1)
Requirement already satisfied: frozenlist in /opt/conda/lib/python3.10/site-packages
(from ray<2.4,>=2.3->ray[default]<2.4,>=2.3; extra == "all"->autogluon.core[all]==0.
8.3->autogluon) (1.4.1)
Collecting virtualenv>=20.0.24 (from ray<2.4,>=2.3->ray[default]<2.4,>=2.3; extra ==
"all"->autogluon.core[all]==0.8.3->autogluon)
  Downloading virtualenv-20.26.3-py3-none-any.whl.metadata (4.5 kB)
Requirement already satisfied: aiohttp>=3.7 in /opt/conda/lib/python3.10/site-packag
es (from ray[default]<2.4,>=2.3; extra == "all"->autogluon.core[all]==0.8.3->autoglu
on) (3.9.5)
Collecting aiohttp-cors (from ray[default]<2.4,>=2.3; extra == "all"->autogluon.core
[all]==0.8.3->autogluon)
  Downloading aiohttp_cors-0.7.0-py3-none-any.whl.metadata (20 kB)
Collecting colorful (from ray[default]<2.4,>=2.3; extra == "all"->autogluon.core[al
l]==0.8.3->autogluon)
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Collecting py-spy>=0.2.0 (from ray[default]<2.4,>=2.3; extra == "all"->autogluon.cor
e[all]==0.8.3->autogluon)
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metadata (16 kB)
Collecting gpustat>=1.0.0 (from ray[default]<2.4,>=2.3; extra == "all"->autogluon.co
re[all]==0.8.3->autogluon)
  Downloading gpustat-1.1.1.tar.gz (98 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 98.1/98.1 kB 73.2 MB/s eta 0:00:00
  Installing build dependencies ... done
  Getting requirements to build wheel ... done
  Preparing metadata (pyproject.toml) ... done
Collecting opencensus (from ray[default]<2.4,>=2.3; extra == "all"->autogluon.core[a
ll]==0.8.3->autogluon)
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0.8.3->autogluon) (0.20.0)
Requirement already satisfied: smart-open in /opt/conda/lib/python3.10/site-packages
(from ray[default]<2.4,>=2.3; extra == "all"->autogluon.core[all]==0.8.3->autogluon)
(5.2.1)
Collecting tensorboardX>=1.9 (from ray[tune]<2.4,>=2.3; extra == "all"->autogluon.co
re[all]==0.8.3->autogluon)
  Downloading tensorboardX-2.6.2.2-py2.py3-none-any.whl.metadata (5.8 kB)
Requirement already satisfied: charset-normalizer<4,>=2 in /opt/conda/lib/python3.1
0/site-packages (from requests->autogluon.core==0.8.3->autogluon.core[all]==0.8.3->a
utogluon) (3.3.2)
```

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Requirement already satisfied: idna<4,>=2.5 in /opt/conda/lib/python3.10/site-packag
es (from requests->autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluon) (3.
7)
Requirement already satisfied: urllib3<3,>=1.21.1 in /opt/conda/lib/python3.10/site-
packages (from requests->autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluo
n) (1.26.18)
Requirement already satisfied: certifi>=2017.4.17 in /opt/conda/lib/python3.10/site-
packages (from requests->autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluo
n) (2024.2.2)
Requirement already satisfied: imageio>=2.4.1 in /opt/conda/lib/python3.10/site-pack
ages (from scikit-image<0.20.0,>=0.19.1->autogluon.multimodal==0.8.3->autogluon) (2.
34.1)
Requirement already satisfied: tifffile>=2019.7.26 in /opt/conda/lib/python3.10/site
-packages (from scikit-image<0.20.0,>=0.19.1->autogluon.multimodal==0.8.3->autogluo
n) (2024.5.10)
Requirement already satisfied: PyWavelets>=1.1.1 in /opt/conda/lib/python3.10/site-p
ackages (from scikit-image<0.20.0,>=0.19.1->autogluon.multimodal==0.8.3->autogluon)
(1.4.1)
Requirement already satisfied: threadpoolctl>=2.0.0 in /opt/conda/lib/python3.10/sit
e-packages (from scikit-learn<1.4.1,>=1.1->autogluon.core==0.8.3->autogluon.core[al
l]==0.8.3->autogluon) (3.5.0)
Requirement already satisfied: patsy>=0.5.4 in /opt/conda/lib/python3.10/site-packag
es (from statsmodels<0.15,>=0.13.0->autogluon.timeseries==0.8.3->autogluon.timeserie
s[all]==0.8.3->autogluon) (0.5.6)
Requirement already satisfied: absl-py>=0.4 in /opt/conda/lib/python3.10/site-packag
es (from tensorboard<3,>=2.9->autogluon.multimodal==0.8.3->autogluon) (2.1.0)
Requirement already satisfied: google-auth<3,>=1.6.3 in /opt/conda/lib/python3.10/si
te-packages (from tensorboard<3,>=2.9->autogluon.multimodal==0.8.3->autogluon) (2.2
9.0)
Requirement already satisfied: google-auth-oauthlib<2,>=0.5 in /opt/conda/lib/python
3.10/site-packages (from tensorboard<3,>=2.9->autogluon.multimodal==0.8.3->autogluo
n) (1.2.0)
Requirement already satisfied: markdown>=2.6.8 in /opt/conda/lib/python3.10/site-pac
kages (from tensorboard<3,>=2.9->autogluon.multimodal==0.8.3->autogluon) (3.6)
Requirement already satisfied: tensorboard-data-server<0.8.0,>=0.7.0 in /opt/conda/l
ib/python3.10/site-packages (from tensorboard<3,>=2.9->autogluon.multimodal==0.8.3->
autogluon) (0.7.0)
Requirement already satisfied: werkzeug>=1.0.1 in /opt/conda/lib/python3.10/site-pac
kages (from tensorboard<3,>=2.9->autogluon.multimodal==0.8.3->autogluon) (3.0.3)
Requirement already satisfied: safetensors in /opt/conda/lib/python3.10/site-package
s (from timm<0.10.0,>=0.9.5->autogluon.multimodal==0.8.3->autogluon) (0.4.3)
Collecting nvidia-cuda-runtime-cu11==11.7.99 (from torch<1.14,>=1.9->autogluon.multi
modal==0.8.3->autogluon)
  Downloading nvidia_cuda_runtime_cu11-11.7.99-py3-none-manylinux1_x86_64.whl.metada
ta (1.6 kB)
Collecting nvidia-cudnn-cu11==8.5.0.96 (from torch<1.14,>=1.9->autogluon.multimodal=
=0.8.3->autogluon)
  Downloading nvidia_cudnn_cu11-8.5.0.96-2-py3-none-manylinux1_x86_64.whl.metadata
(1.6 kB)
Collecting nvidia-cublas-cu11==11.10.3.66 (from torch<1.14,>=1.9->autogluon.multimod
al==0.8.3->autogluon)
  Downloading nvidia_cublas_cu11-11.10.3.66-py3-none-manylinux1_x86_64.whl.metadata
(1.6 kB)
Collecting nvidia-cuda-nvrtc-cu11==11.7.99 (from torch<1.14,>=1.9->autogluon.multimo
dal==0.8.3->autogluon)
  Downloading nvidia_cuda_nvrtc_cu11-11.7.99-2-py3-none-manylinux1_x86_64.whl.metada
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ta (1.5 kB)
Requirement already satisfied: tokenizers<0.20,>=0.19 in /opt/conda/lib/python3.10/s
ite-packages (from transformers<4.41.0,>=4.36.0->transformers[sentencepiece]<4.41.0,
>=4.36.0->autogluon.multimodal==0.8.3->autogluon) (0.19.1)
Requirement already satisfied: sentencepiece!=0.1.92,>=0.1.91 in /opt/conda/lib/pyth
on3.10/site-packages (from transformers[sentencepiece]<4.41.0,>=4.36.0->autogluon.mu
ltimodal==0.8.3->autogluon) (0.1.99)
Requirement already satisfied: contourpy>=1.0.1 in /opt/conda/lib/python3.10/site-pa
ckages (from matplotlib->autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluo
n) (1.2.1)
Requirement already satisfied: cycler>=0.10 in /opt/conda/lib/python3.10/site-packag
es (from matplotlib->autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluon)
(0.12.1)
Requirement already satisfied: fonttools>=4.22.0 in /opt/conda/lib/python3.10/site-p
ackages (from matplotlib->autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autoglu
on) (4.51.0)
Requirement already satisfied: kiwisolver>=1.3.1 in /opt/conda/lib/python3.10/site-p
ackages (from matplotlib->autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autoglu
on) (1.4.5)
Requirement already satisfied: pyparsing>=2.3.1 in /opt/conda/lib/python3.10/site-pa
ckages (from matplotlib->autogluon.core==0.8.3->autogluon.core[all]==0.8.3->autogluo
n) (3.1.2)
Requirement already satisfied: multidict<7.0,>=4.5 in /opt/conda/lib/python3.10/site
-packages (from aiohttp>=3.7->ray[default]<2.4,>=2.3; extra == "all"->autogluon.core
[all]==0.8.3->autogluon) (6.0.5)
Requirement already satisfied: yarl<2.0,>=1.0 in /opt/conda/lib/python3.10/site-pack
ages (from aiohttp>=3.7->ray[default]<2.4,>=2.3; extra == "all"->autogluon.core[all]
==0.8.3->autogluon) (1.9.4)
Requirement already satisfied: async-timeout<5.0,>=4.0 in /opt/conda/lib/python3.10/
site-packages (from aiohttp>=3.7->ray[default]<2.4,>=2.3; extra == "all"->autogluon.
core[all]==0.8.3->autogluon) (4.0.3)
Requirement already satisfied: pyarrow>=12.0.0 in /opt/conda/lib/python3.10/site-pac
kages (from datasets>=2.0.0->evaluate<0.5.0,>=0.4.0->autogluon.multimodal==0.8.3->au
togluon) (15.0.0)
Requirement already satisfied: pyarrow-hotfix in /opt/conda/lib/python3.10/site-pack
ages (from datasets>=2.0.0->evaluate<0.5.0,>=0.4.0->autogluon.multimodal==0.8.3->aut
ogluon) (0.6)
Requirement already satisfied: beautifulsoup4 in /opt/conda/lib/python3.10/site-pack
ages (from gdown>=4.0.0->nlpaug<1.2.0,>=1.1.10->autogluon.multimodal==0.8.3->autoglu
on) (4.12.3)
Requirement already satisfied: cachetools<6.0,>=2.0.0 in /opt/conda/lib/python3.10/s
ite-packages (from google-auth<3,>=1.6.3->tensorboard<3,>=2.9->autogluon.multimodal=
=0.8.3->autogluon) (5.3.3)
Requirement already satisfied: pyasn1-modules>=0.2.1 in /opt/conda/lib/python3.10/si
te-packages (from google-auth<3,>=1.6.3->tensorboard<3,>=2.9->autogluon.multimodal==
0.8.3->autogluon) (0.4.0)
Requirement already satisfied: rsa<5,>=3.1.4 in /opt/conda/lib/python3.10/site-packa
ges (from google-auth<3,>=1.6.3->tensorboard<3,>=2.9->autogluon.multimodal==0.8.3->a
utogluon) (4.9)
Requirement already satisfied: requests-oauthlib>=0.7.0 in /opt/conda/lib/python3.1
0/site-packages (from google-auth-oauthlib<2,>=0.5->tensorboard<3,>=2.9->autogluon.m
ultimodal==0.8.3->autogluon) (2.0.0)
Collecting nvidia-ml-py>=11.450.129 (from gpustat>=1.0.0->ray[default]<2.4,>=2.3; ex
tra == "all"->autogluon.core[all]==0.8.3->autogluon)
  Downloading nvidia_ml_py-12.555.43-py3-none-any.whl.metadata (8.6 kB)
Collecting blessed>=1.17.1 (from gpustat>=1.0.0->ray[default]<2.4,>=2.3; extra == "a
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ll"->autogluon.core[all]==0.8.3->autogluon)
  Downloading blessed-1.20.0-py2.py3-none-any.whl.metadata (13 kB)
Requirement already satisfied: llvmlite<0.43,>=0.42.0dev0 in /opt/conda/lib/python3.
10/site-packages (from numba->mlforecast<0.7.4,>=0.7.0->autogluon.timeseries==0.8.3-
>autogluon.timeseries[all]==0.8.3->autogluon) (0.42.0)
Requirement already satisfied: spacy-legacy<3.1.0,>=3.0.11 in /opt/conda/lib/python
3.10/site-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3-
>autogluon) (3.0.12)
Requirement already satisfied: spacy-loggers<2.0.0,>=1.0.0 in /opt/conda/lib/python
3.10/site-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3-
>autogluon) (1.0.5)
Requirement already satisfied: murmurhash<1.1.0,>=0.28.0 in /opt/conda/lib/python3.1
0/site-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->au
togluon) (1.0.10)
Requirement already satisfied: cymem<2.1.0,>=2.0.2 in /opt/conda/lib/python3.10/site
-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autogluo
n) (2.0.8)
Requirement already satisfied: preshed<3.1.0,>=3.0.2 in /opt/conda/lib/python3.10/si
te-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autogl
uon) (3.0.9)
Requirement already satisfied: thinc<8.3.0,>=8.2.2 in /opt/conda/lib/python3.10/site
-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autogluo
n) (8.2.3)
Requirement already satisfied: wasabi<1.2.0,>=0.9.1 in /opt/conda/lib/python3.10/sit
e-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autoglu
on) (1.1.2)
Requirement already satisfied: srsly<3.0.0,>=2.4.3 in /opt/conda/lib/python3.10/site
-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autogluo
n) (2.4.8)
Requirement already satisfied: catalogue<2.1.0,>=2.0.6 in /opt/conda/lib/python3.10/
site-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->auto
gluon) (2.0.10)
Requirement already satisfied: weasel<0.4.0,>=0.1.0 in /opt/conda/lib/python3.10/sit
e-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autoglu
on) (0.3.4)
Requirement already satisfied: typer<0.10.0,>=0.3.0 in /opt/conda/lib/python3.10/sit
e-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->autoglu
on) (0.9.4)
Requirement already satisfied: langcodes<4.0.0,>=3.2.0 in /opt/conda/lib/python3.10/
site-packages (from spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.8.3->auto
gluon) (3.4.0)
Collecting distlib<1,>=0.3.7 (from virtualenv>=20.0.24->ray<2.4,>=2.3->ray[default]<
2.4,>=2.3; extra == "all"->autogluon.core[all]==0.8.3->autogluon)
  Downloading distlib-0.3.8-py2.py3-none-any.whl.metadata (5.1 kB)
Requirement already satisfied: platformdirs<5,>=3.9.1 in /opt/conda/lib/python3.10/s
ite-packages (from virtualenv>=20.0.24->ray<2.4,>=2.3->ray[default]<2.4,>=2.3; extra
== "all"->autogluon.core[all]==0.8.3->autogluon) (4.2.1)
Requirement already satisfied: ordered-set in /opt/conda/lib/python3.10/site-package
s (from model-index->openmim<0.4.0,>=0.3.7->autogluon.multimodal==0.8.3->autogluon)
(4.1.0)
Collecting opencensus-context>=0.1.3 (from opencensus->ray[default]<2.4,>=2.3; extra
== "all"->autogluon.core[all]==0.8.3->autogluon)
  Downloading opencensus_context-0.1.3-py2.py3-none-any.whl.metadata (3.3 kB)
Collecting google-api-core<3.0.0,>=1.0.0 (from opencensus->ray[default]<2.4,>=2.3; e
xtra == "all"->autogluon.core[all]==0.8.3->autogluon)
  Downloading google_api_core-2.19.1-py3-none-any.whl.metadata (2.7 kB)
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Requirement already satisfied: tenacity>=6.2.0 in /opt/conda/lib/python3.10/site-pac
kages (from plotly->catboost<1.3,>=1.1->autogluon.tabular[all]==0.8.3->autogluon)
(8.3.0)
Requirement already satisfied: markdown-it-py>=2.2.0 in /opt/conda/lib/python3.10/si
te-packages (from rich->openmim<0.4.0,>=0.3.7->autogluon.multimodal==0.8.3->autogluo
n) (3.0.0)
Requirement already satisfied: pygments<3.0.0,>=2.13.0 in /opt/conda/lib/python3.10/
site-packages (from rich->openmim<0.4.0,>=0.3.7->autogluon.multimodal==0.8.3->autogl
uon) (2.18.0)
Requirement already satisfied: wcwidth>=0.1.4 in /opt/conda/lib/python3.10/site-pack
ages (from blessed>=1.17.1->gpustat>=1.0.0->ray[default]<2.4,>=2.3; extra == "all"->
autogluon.core[all]==0.8.3->autogluon) (0.2.13)
Collecting googleapis-common-protos<2.0.dev0,>=1.56.2 (from google-api-core<3.0.0,>=
1.0.0->opencensus->ray[default]<2.4,>=2.3; extra == "all"->autogluon.core[all]==0.8.
3->autogluon)
  Downloading googleapis_common_protos-1.63.2-py2.py3-none-any.whl.metadata (1.5 kB)
Collecting proto-plus<2.0.0dev,>=1.22.3 (from google-api-core<3.0.0,>=1.0.0->opencen
sus->ray[default]<2.4,>=2.3; extra == "all"->autogluon.core[all]==0.8.3->autogluon)
  Downloading proto_plus-1.24.0-py3-none-any.whl.metadata (2.2 kB)
Requirement already satisfied: language-data>=1.2 in /opt/conda/lib/python3.10/site-
packages (from langcodes<4.0.0,>=3.2.0->spacy<4->fastai<2.8,>=2.3.1->autogluon.tabul
ar[all]==0.8.3->autogluon) (1.2.0)
Requirement already satisfied: mdurl~=0.1 in /opt/conda/lib/python3.10/site-packages
(from markdown-it-py>=2.2.0->rich->openmim<0.4.0,>=0.3.7->autogluon.multimodal==0.8.
3->autogluon) (0.1.2)
Requirement already satisfied: pyasn1<0.7.0,>=0.4.6 in /opt/conda/lib/python3.10/sit
e-packages (from pyasn1-modules>=0.2.1->google-auth<3,>=1.6.3->tensorboard<3,>=2.9->
autogluon.multimodal==0.8.3->autogluon) (0.6.0)
Requirement already satisfied: oauthlib>=3.0.0 in /opt/conda/lib/python3.10/site-pac
kages (from requests-oauthlib>=0.7.0->google-auth-oauthlib<2,>=0.5->tensorboard<3,>=
2.9->autogluon.multimodal==0.8.3->autogluon) (3.2.2)
Requirement already satisfied: blis<0.8.0,>=0.7.8 in /opt/conda/lib/python3.10/site-
packages (from thinc<8.3.0,>=8.2.2->spacy<4->fastai<2.8,>=2.3.1->autogluon.tabular[a
ll]==0.8.3->autogluon) (0.7.10)
Requirement already satisfied: confection<1.0.0,>=0.0.1 in /opt/conda/lib/python3.1
0/site-packages (from thinc<8.3.0,>=8.2.2->spacy<4->fastai<2.8,>=2.3.1->autogluon.ta
bular[all]==0.8.3->autogluon) (0.1.4)
Requirement already satisfied: cloudpathlib<0.17.0,>=0.7.0 in /opt/conda/lib/python
3.10/site-packages (from weasel<0.4.0,>=0.1.0->spacy<4->fastai<2.8,>=2.3.1->autogluo
n.tabular[all]==0.8.3->autogluon) (0.16.0)
Requirement already satisfied: soupsieve>1.2 in /opt/conda/lib/python3.10/site-packa
ges (from beautifulsoup4->gdown>=4.0.0->nlpaug<1.2.0,>=1.1.10->autogluon.multimodal=
=0.8.3->autogluon) (2.5)
Requirement already satisfied: PySocks!=1.5.7,>=1.5.6 in /opt/conda/lib/python3.10/s
ite-packages (from requests[socks]->gdown>=4.0.0->nlpaug<1.2.0,>=1.1.10->autogluon.m
ultimodal==0.8.3->autogluon) (1.7.1)
Requirement already satisfied: marisa-trie>=0.7.7 in /opt/conda/lib/python3.10/site-
packages (from language-data>=1.2->langcodes<4.0.0,>=3.2.0->spacy<4->fastai<2.8,>=2.
3.1->autogluon.tabular[all]==0.8.3->autogluon) (1.1.0)
Downloading grpcio-1.50.0-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl
(4.7 MB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 4.7/4.7 MB 114.4 MB/s eta 0:00:00a 0:00:
01
Downloading hyperopt-0.2.7-py2.py3-none-any.whl (1.6 MB)
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Downloading pandas-1.5.3-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86_64.whl
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(12.1 MB)
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0:01
Downloading pytorch_lightning-1.9.5-py3-none-any.whl (829 kB)
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Downloading ray-2.3.1-cp310-cp310-manylinux2014_x86_64.whl (58.5 MB)
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00:01
Downloading scikit_learn-1.4.0-1-cp310-cp310-manylinux_2_17_x86_64.manylinux2014_x86
_64.whl (12.1 MB)
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0:01
Downloading torch-1.13.1-cp310-cp310-manylinux1_x86_64.whl (887.5 MB)
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100:01
Downloading nvidia_cublas_cu11-11.10.3.66-py3-none-manylinux1_x86_64.whl (317.1 MB)
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Downloading nvidia_cuda_nvrtc_cu11-11.7.99-2-py3-none-manylinux1_x86_64.whl (21.0 M
B)
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Downloading nvidia_cuda_runtime_cu11-11.7.99-py3-none-manylinux1_x86_64.whl (849 kB)
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Downloading nvidia_cudnn_cu11-8.5.0.96-2-py3-none-manylinux1_x86_64.whl (557.1 MB)
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100:01
Downloading torchmetrics-0.11.4-py3-none-any.whl (519 kB)
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Downloading torchvision-0.14.1-cp310-cp310-manylinux1_x86_64.whl (24.2 MB)
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Downloading py_spy-0.3.14-py2.py3-none-manylinux_2_5_x86_64.manylinux1_x86_64.whl
(3.0 MB)
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Downloading tensorboardX-2.6.2.2-py2.py3-none-any.whl (101 kB)
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Downloading virtualenv-20.26.3-py3-none-any.whl (5.7 MB)
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Downloading aiohttp_cors-0.7.0-py3-none-any.whl (27 kB)
Downloading colorful-0.5.6-py2.py3-none-any.whl (201 kB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 201.4/201.4 kB 254.6 MB/s eta 0:00:00
Downloading opencensus-0.11.4-py2.py3-none-any.whl (128 kB)
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Downloading py4j-0.10.9.7-py2.py3-none-any.whl (200 kB)
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Downloading blessed-1.20.0-py2.py3-none-any.whl (58 kB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 58.4/58.4 kB 227.6 MB/s eta 0:00:00
Downloading distlib-0.3.8-py2.py3-none-any.whl (468 kB)
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Downloading google_api_core-2.19.1-py3-none-any.whl (139 kB)
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Downloading nvidia_ml_py-12.555.43-py3-none-any.whl (39 kB)
Downloading opencensus_context-0.1.3-py2.py3-none-any.whl (5.1 kB)
Downloading googleapis_common_protos-1.63.2-py2.py3-none-any.whl (220 kB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 220.0/220.0 kB 243.4 MB/s eta 0:00:00
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Downloading proto_plus-1.24.0-py3-none-any.whl (50 kB)
   ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 50.1/50.1 kB 257.4 MB/s eta 0:00:00
Building wheels for collected packages: gpustat
  Building wheel for gpustat (pyproject.toml) ... done
  Created wheel for gpustat: filename=gpustat-1.1.1-py3-none-any.whl size=26534 sha2
56=abfe95c76e5f9e93cdf1e41e879e4b58ff3f3b74558db4773b725669d90ad9dc
  Stored in directory: /tmp/pip-ephem-wheel-cache-iivujf9c/wheels/ec/d7/80/a71ba3540
900e1f276bcae685efd8e590c810d2108b95f1e47
Successfully built gpustat
Installing collected packages: py4j, py-spy, opencensus-context, nvidia-ml-py, distl
ib, colorful, virtualenv, tensorboardX, proto-plus, nvidia-cuda-runtime-cu11, nvidia
-cuda-nvrtc-cu11, nvidia-cublas-cu11, grpcio, googleapis-common-protos, blessed, sci
kit-learn, ray, pandas, nvidia-cudnn-cu11, hyperopt, gpustat, torch, google-api-cor
e, aiohttp-cors, torchvision, torchmetrics, opencensus, pytorch-lightning
  Attempting uninstall: grpcio
    Found existing installation: grpcio 1.59.3
    Uninstalling grpcio-1.59.3:
      Successfully uninstalled grpcio-1.59.3
  Attempting uninstall: scikit-learn
    Found existing installation: scikit-learn 1.4.2
    Uninstalling scikit-learn-1.4.2:
      Successfully uninstalled scikit-learn-1.4.2
  Attempting uninstall: pandas
    Found existing installation: pandas 2.1.4
    Uninstalling pandas-2.1.4:
      Successfully uninstalled pandas-2.1.4
  Attempting uninstall: torch
    Found existing installation: torch 2.0.0.post104
    Uninstalling torch-2.0.0.post104:
      Successfully uninstalled torch-2.0.0.post104
  Attempting uninstall: torchvision
    Found existing installation: torchvision 0.15.2a0+ab7b3e6
    Uninstalling torchvision-0.15.2a0+ab7b3e6:
      Successfully uninstalled torchvision-0.15.2a0+ab7b3e6
  Attempting uninstall: torchmetrics
    Found existing installation: torchmetrics 1.0.3
    Uninstalling torchmetrics-1.0.3:
      Successfully uninstalled torchmetrics-1.0.3
  Attempting uninstall: pytorch-lightning
    Found existing installation: pytorch-lightning 2.0.9
    Uninstalling pytorch-lightning-2.0.9:
      Successfully uninstalled pytorch-lightning-2.0.9
Successfully installed aiohttp-cors-0.7.0 blessed-1.20.0 colorful-0.5.6 distlib-0.3.
8 google-api-core-2.19.1 googleapis-common-protos-1.63.2 gpustat-1.1.1 grpcio-1.50.0
hyperopt-0.2.7 nvidia-cublas-cu11-11.10.3.66 nvidia-cuda-nvrtc-cu11-11.7.99 nvidia-c
uda-runtime-cu11-11.7.99 nvidia-cudnn-cu11-8.5.0.96 nvidia-ml-py-12.555.43 opencensu
s-0.11.4 opencensus-context-0.1.3 pandas-1.5.3 proto-plus-1.24.0 py-spy-0.3.14 py4j-
0.10.9.7 pytorch-lightning-1.9.5 ray-2.3.1 scikit-learn-1.4.0 tensorboardX-2.6.2.2 t
orch-1.13.1 torchmetrics-0.11.4 torchvision-0.14.1 virtualenv-20.26.3
Collecting kaggle
  Downloading kaggle-1.6.14.tar.gz (82 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 82.1/82.1 kB 15.0 MB/s eta 0:00:00
  Preparing metadata (setup.py) ... done
Requirement already satisfied: six>=1.10 in /opt/conda/lib/python3.10/site-packages
(from kaggle) (1.16.0)
Requirement already satisfied: certifi>=2023.7.22 in /opt/conda/lib/python3.10/site-
```

```
packages (from kaggle) (2024.2.2)
Requirement already satisfied: python-dateutil in /opt/conda/lib/python3.10/site-pac
kages (from kaggle) (2.9.0)
Requirement already satisfied: requests in /opt/conda/lib/python3.10/site-packages
(from kaggle) (2.31.0)
Requirement already satisfied: tqdm in /opt/conda/lib/python3.10/site-packages (from
kaggle) (4.66.4)
Requirement already satisfied: python-slugify in /opt/conda/lib/python3.10/site-pack
ages (from kaggle) (8.0.4)
Requirement already satisfied: urllib3 in /opt/conda/lib/python3.10/site-packages (f
rom kaggle) (1.26.18)
Requirement already satisfied: bleach in /opt/conda/lib/python3.10/site-packages (fr
om kaggle) (6.1.0)
Requirement already satisfied: webencodings in /opt/conda/lib/python3.10/site-packag
es (from bleach->kaggle) (0.5.1)
Requirement already satisfied: text-unidecode>=1.3 in /opt/conda/lib/python3.10/site
-packages (from python-slugify->kaggle) (1.3)
Requirement already satisfied: charset-normalizer<4,>=2 in /opt/conda/lib/python3.1
0/site-packages (from requests->kaggle) (3.3.2)
Requirement already satisfied: idna<4,>=2.5 in /opt/conda/lib/python3.10/site-packag
es (from requests->kaggle) (3.7)
Building wheels for collected packages: kaggle
  Building wheel for kaggle (setup.py) ... done
  Created wheel for kaggle: filename=kaggle-1.6.14-py3-none-any.whl size=105118 sha2
56=309f91a2932237e1e60f85a86f900205096323b6e741b033a53537e896c94ce3
  Stored in directory: /home/sagemaker-user/.cache/pip/wheels/d7/54/06/8a8f40cb39536
605feb9acaacd0237a95eba39e5065e6392f4
Successfully built kaggle
Installing collected packages: kaggle
Successfully installed kaggle-1.6.14
```

Setup Kaggle API Key

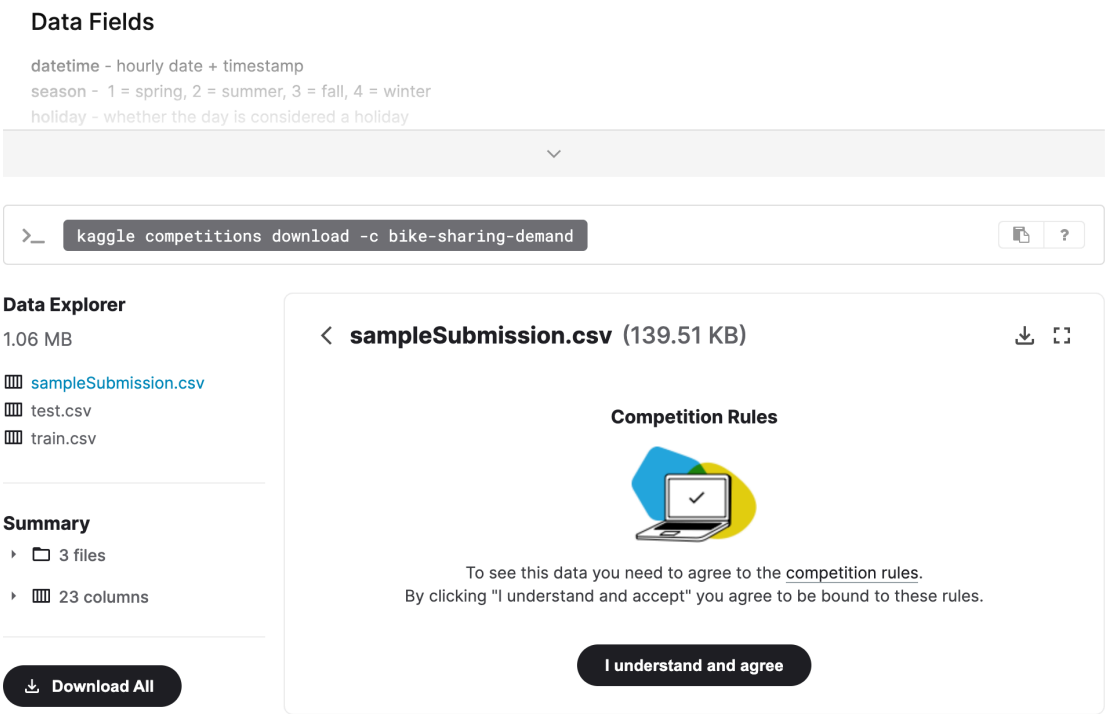
In [9]:
```
# create the .kaggle directory and an empty kaggle.json file
!mkdir -p /home/sagemaker-user/.kaggle/
!touch /home/sagemaker-user/.kaggle/kaggle.json
!chmod 600 /home/sagemaker-user/.kaggle/kaggle.json
```

In [10]:
```
# Fill in your user name and key from creating the kaggle account and API token fil
import json
kaggle_username = "philkim99"
kaggle_key = "3b9ed39ea57237880fda99c13955338f"

# Save API token the kaggle.json file
with open("/home/sagemaker-user/.kaggle/kaggle.json", "w") as f:
    f.write(json.dumps({"username": kaggle_username, "key": kaggle_key}))
```

Download and explore dataset

Go to the bike sharing demand competition and agree to the terms



In [11]:
```
# Download the dataset, it will be in a .zip file so you'll need to unzip it as wel
!kaggle competitions download -c bike-sharing-demand
# If you already downloaded it you can use the -o command to overwrite the file
!unzip -o bike-sharing-demand.zip
```

```
Downloading bike-sharing-demand.zip to /home/sagemaker-user
  0%|                                               | 0.00/189k [00:00<?, ?B/s]
100%|████████████████████████████████████████| 189k/189k [00:00<00:00, 49.3MB/s]
Archive:  bike-sharing-demand.zip
  inflating: sampleSubmission.csv
  inflating: test.csv
  inflating: train.csv
```

In [12]:
```
import pandas as pd
from autogluon.tabular import TabularPredictor
```

In [13]:
```
# Create the train dataset in pandas by reading the csv
# Set the parsing of the datetime column so you can use some of the `dt` features i
train = pd.read_csv('train.csv')
train.loc[:, 'datetime'] = pd.to_datetime(train.loc[:,'datetime'])
train.head()
```

```
/tmp/ipykernel_224/769579115.py:4: DeprecationWarning: In a future version, `df.iloc
[:, i] = newvals` will attempt to set the values inplace instead of always setting a
new array. To retain the old behavior, use either `df[df.columns[i]] = newvals` or,
if columns are non-unique, `df.isetitem(i, newvals)`
  train.loc[:, 'datetime'] = pd.to_datetime(train.loc[:,'datetime'])
```

Out[13]:

	datetime	season	holiday	workingday	weather	temp	atemp	humidity	windspeed
0	2011-01-01 00:00:00	1	0	0	1	9.84	14.395	81	0.0
1	2011-01-01 01:00:00	1	0	0	1	9.02	13.635	80	0.0
2	2011-01-01 02:00:00	1	0	0	1	9.02	13.635	80	0.0
3	2011-01-01 03:00:00	1	0	0	1	9.84	14.395	75	0.0
4	2011-01-01 04:00:00	1	0	0	1	9.84	14.395	75	0.0

In [14]:
```
# Simple output of the train dataset to view some of the min/max/varition of the da
train.describe()
```

Out[14]:

	season	holiday	workingday	weather	temp	atemp
count	10886.000000	10886.000000	10886.000000	10886.000000	10886.00000	10886.000000
mean	2.506614	0.028569	0.680875	1.418427	20.23086	23.655084
std	1.116174	0.166599	0.466159	0.633839	7.79159	8.474601
min	1.000000	0.000000	0.000000	1.000000	0.82000	0.760000
25%	2.000000	0.000000	0.000000	1.000000	13.94000	16.665000
50%	3.000000	0.000000	1.000000	1.000000	20.50000	24.240000
75%	4.000000	0.000000	1.000000	2.000000	26.24000	31.060000
max	4.000000	1.000000	1.000000	4.000000	41.00000	45.455000

In [19]:
```
# Create the test pandas dataframe in pandas by reading the csv, remember to parse
test = pd.read_csv('test.csv')
test.loc[:, 'datetime'] = pd.to_datetime(test.loc[:,'datetime'])
test.head()
```

```
/tmp/ipykernel_224/511788205.py:3: DeprecationWarning: In a future version, `df.iloc
[:, i] = newvals` will attempt to set the values inplace instead of always setting a
new array. To retain the old behavior, use either `df[df.columns[i]] = newvals` or,
if columns are non-unique, `df.isetitem(i, newvals)`
  test.loc[:, 'datetime'] = pd.to_datetime(test.loc[:,'datetime'])
```

Out[19]:

	datetime	season	holiday	workingday	weather	temp	atemp	humidity	windspeed
0	2011-01-20 00:00:00	1	0	1	1	10.66	11.365	56	26.0027
1	2011-01-20 01:00:00	1	0	1	1	10.66	13.635	56	0.0000
2	2011-01-20 02:00:00	1	0	1	1	10.66	13.635	56	0.0000
3	2011-01-20 03:00:00	1	0	1	1	10.66	12.880	56	11.0014
4	2011-01-20 04:00:00	1	0	1	1	10.66	12.880	56	11.0014

In [20]:
```
# Same thing as train and test dataset
submission = pd.read_csv('sampleSubmission.csv')
submission.loc[:, 'datetime'] = pd.to_datetime(submission.loc[:,'datetime'])
submission.head()
```

```
/tmp/ipykernel_224/2424775542.py:3: DeprecationWarning: In a future version, `df.iloc[:, i] = newvals` will attempt to set the values inplace instead of always setting a new array. To retain the old behavior, use either `df[df.columns[i]] = newvals` or, if columns are non-unique, `df.isetitem(i, newvals)`
  submission.loc[:, 'datetime'] = pd.to_datetime(submission.loc[:,'datetime'])
```

Out[20]:

	datetime	count
0	2011-01-20 00:00:00	0
1	2011-01-20 01:00:00	0
2	2011-01-20 02:00:00	0
3	2011-01-20 03:00:00	0
4	2011-01-20 04:00:00	0

Step 3: Train a model using AutoGluon's Tabular Prediction

Requirements:

- We are prediting `count`, so it is the label we are setting.
- Ignore `casual` and `registered` columns as they are also not present in the test dataset.

- Use the `root_mean_squared_error` as the metric to use for evaluation.
- Set a time limit of 10 minutes (600 seconds).
- Use the preset `best_quality` to focus on creating the best model.

In [16]:
```
feature_names = ['datetime','season','holiday','workingday','weather','temp','atemp
predictor = TabularPredictor(label='count',eval_metric='root_mean_squared_error').f
```

```
No path specified. Models will be saved in: "AutogluonModels/ag-20240629_004142/"
Presets specified: ['best_quality']
Stack configuration (auto_stack=True): num_stack_levels=1, num_bag_folds=8, num_bag_
sets=20
Beginning AutoGluon training ... Time limit = 600s
AutoGluon will save models to "AutogluonModels/ag-20240629_004142/"
AutoGluon Version:  0.8.3
Python Version:     3.10.14
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Fri May 31 18:15:42 UTC 2024
Disk Space Avail:   1.36 GB / 5.36 GB (25.4%)
        WARNING: Available disk space is low and there is a risk that AutoGluon will
run out of disk during fit, causing an exception.
        We recommend a minimum available disk space of 10 GB, and large datasets may
require more.
Train Data Rows:    10886
Train Data Columns: 9
Label Column: count
Preprocessing data ...
AutoGluon infers your prediction problem is: 'regression' (because dtype of label-co
lumn == int and many unique label-values observed).
        Label info (max, min, mean, stddev): (977, 1, 191.57413, 181.14445)
        If 'regression' is not the correct problem_type, please manually specify the
problem_type parameter during predictor init (You may specify problem_type as one o
f: ['binary', 'multiclass', 'regression'])
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
        Available Memory:                    2586.15 MB
        Train Data (Original)  Memory Usage: 0.78 MB (0.0% of available memory)
        Inferring data type of each feature based on column values. Set feature_meta
data_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator...
                        Note: Converting 2 features to boolean dtype as they only co
ntain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator...
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator...
                Fitting DatetimeFeatureGenerator...
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator...
        Stage 5 Generators:
                Fitting DropDuplicatesFeatureGenerator...
        Types of features in original data (raw dtype, special dtypes):
                ('datetime', []) : 1 | ['datetime']
                ('float', [])    : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])      : 5 | ['season', 'holiday', 'workingday', 'weathe
r', 'humidity']
        Types of features in processed data (raw dtype, special dtypes):
                ('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])                  : 3 | ['season', 'weather', 'humidity']
                ('int', ['bool'])            : 2 | ['holiday', 'workingday']
                ('int', ['datetime_as_int']) : 5 | ['datetime', 'datetime.year', 'da
tetime.month', 'datetime.day', 'datetime.dayofweek']
```

```
        0.1s = Fit runtime
        9 features in original data used to generate 13 features in processed data.
        Train Data (Processed) Memory Usage: 0.98 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 0.14s ...
AutoGluon will gauge predictive performance using evaluation metric: 'root_mean_squa
red_error'
        This metric's sign has been flipped to adhere to being higher_is_better. The
metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
User-specified model hyperparameters to be fit:
{
        'NN_TORCH': {},
        'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {}, 'GBMLar
ge'],
        'CAT': {},
        'XGB': {},
        'FASTAI': {},
        'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}}, {'weight
s': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
AutoGluon will fit 2 stack levels (L1 to L2) ...
Fitting 11 L1 models ...
Fitting model: KNeighborsUnif_BAG_L1 ... Training model for up to 399.81s of the 59
9.86s of remaining time.
        -101.5462       = Validation score   (-root_mean_squared_error)
        0.04s    = Training   runtime
        0.06s    = Validation runtime
Fitting model: KNeighborsDist_BAG_L1 ... Training model for up to 398.15s of the 59
8.2s of remaining time.
        -84.1251        = Validation score   (-root_mean_squared_error)
        0.04s    = Training   runtime
        0.06s    = Validation runtime
Fitting model: LightGBMXT_BAG_L1 ... Training model for up to 398.02s of the 598.07s
of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
2024-06-29 00:41:48,283 ERROR services.py:1169 -- Failed to start the dashboard , re
turn code 1
2024-06-29 00:41:48,285 ERROR services.py:1194 -- Error should be written to 'dashbo
ard.log' or 'dashboard.err'. We are printing the last 20 lines for you. See 'http
s://docs.ray.io/en/master/ray-observability/ray-logging.html#logging-directory-struc
ture' to find where the log file is.
2024-06-29 00:41:48,286 ERROR services.py:1238 --
The last 20 lines of /tmp/ray/session_2024-06-29_00-41-45_720245_224/logs/dashboard.
log (it contains the error message from the dashboard):
  File "/opt/conda/lib/python3.10/site-packages/ray/dashboard/dashboard.py", line 7
0, in run
    await self.dashboard_head.run()
```

```
  File "/opt/conda/lib/python3.10/site-packages/ray/dashboard/head.py", line 297, in
run
    modules = self._load_modules(self._modules_to_load)
  File "/opt/conda/lib/python3.10/site-packages/ray/dashboard/head.py", line 204, in
_load_modules
    head_cls_list = dashboard_utils.get_all_modules(DashboardHeadModule)
  File "/opt/conda/lib/python3.10/site-packages/ray/dashboard/utils.py", line 121, i
n get_all_modules
    importlib.import_module(name)
  File "/opt/conda/lib/python3.10/importlib/__init__.py", line 126, in import_module
    return _bootstrap._gcd_import(name[level:], package, level)
  File "<frozen importlib._bootstrap>", line 1050, in _gcd_import
  File "<frozen importlib._bootstrap>", line 1027, in _find_and_load
  File "<frozen importlib._bootstrap>", line 1006, in _find_and_load_unlocked
  File "<frozen importlib._bootstrap>", line 688, in _load_unlocked
  File "<frozen importlib._bootstrap_external>", line 883, in exec_module
  File "<frozen importlib._bootstrap>", line 241, in _call_with_frames_removed
  File "/opt/conda/lib/python3.10/site-packages/ray/dashboard/modules/dashboard_sdk.
py", line 9, in <module>
    from pkg_resources import packaging
ImportError: cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/pyt
hon3.10/site-packages/pkg_resources/__init__.py)
        Warning: Exception caused LightGBMXT_BAG_L1 to fail during training... Skipp
ing this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 520, in after_all_folds_scheduled
    ref = self._fit(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 595, in _fit
    fold_ctx_ref = self.ray.put(fold_ctx)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
```

```
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: LightGBM_BAG_L1 ... Training model for up to 391.78s of the 591.83s o
f remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBM_BAG_L1 to fail during training... Skippin
g this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
```

```
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: RandomForestMSE_BAG_L1 ... Training model for up to 391.75s of the 59
1.8s of remaining time.
        -116.5484       = Validation score   (-root_mean_squared_error)
        12.51s   = Training   runtime
        0.62s    = Validation runtime
Fitting model: CatBoost_BAG_L1 ... Training model for up to 378.06s of the 578.11s o
f remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused CatBoost_BAG_L1 to fail during training... Skippin
g this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
```

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_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: ExtraTreesMSE_BAG_L1 ... Training model for up to 378.03s of the 578.
08s of remaining time.
        -124.6007        = Validation score   (-root_mean_squared_error)
        6.4s     = Training   runtime
        0.54s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L1 ... Training model for up to 370.62s of the 57
0.67s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused NeuralNetFastAI_BAG_L1 to fail during training...
Skipping this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
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    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
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    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
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  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
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    fold_fitting_strategy.after_all_folds_scheduled()
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  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
```

```
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: XGBoost_BAG_L1 ... Training model for up to 370.59s of the 570.65s of
remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused XGBoost_BAG_L1 to fail during training... Skipping
this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
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urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
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    X = self.ray.put(self.X)
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ine 105, in wrapper
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in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
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n put_object
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_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: NeuralNetTorch_BAG_L1 ... Training model for up to 370.57s of the 57
0.62s of remaining time.
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused NeuralNetTorch_BAG_L1 to fail during training... S
kipping this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
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  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
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    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
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  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
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    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
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n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: LightGBMLarge_BAG_L1 ... Training model for up to 370.54s of the 570.
59s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBMLarge_BAG_L1 to fail during training... Sk
ipping this model.
                System error: Broken pipe
Detailed Traceback:
```

```
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
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    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
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act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
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    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Repeating k-fold bagging: 2/20
Repeating k-fold bagging: 3/20
Repeating k-fold bagging: 4/20
Repeating k-fold bagging: 5/20
Repeating k-fold bagging: 6/20
Repeating k-fold bagging: 7/20
Repeating k-fold bagging: 8/20
Repeating k-fold bagging: 9/20
Repeating k-fold bagging: 10/20
Repeating k-fold bagging: 11/20
Repeating k-fold bagging: 12/20
Repeating k-fold bagging: 13/20
Repeating k-fold bagging: 14/20
Repeating k-fold bagging: 15/20
```

```
Repeating k-fold bagging: 16/20
Repeating k-fold bagging: 17/20
Repeating k-fold bagging: 18/20
Repeating k-fold bagging: 19/20
Repeating k-fold bagging: 20/20
Completed 20/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the 570.54
s of remaining time.
        -84.1251         = Validation score   (-root_mean_squared_error)
        0.3s     = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L2 models ...
Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 570.23s of the 570.22s
of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBMXT_BAG_L2 to fail during training... Skipp
ing this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
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    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
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    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
```

```
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: LightGBM_BAG_L2 ... Training model for up to 570.19s of the 570.18s o
f remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBM_BAG_L2 to fail during training... Skippin
g this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
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  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
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    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
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    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
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    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
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    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
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    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
```

```
Fitting model: RandomForestMSE_BAG_L2 ... Training model for up to 570.15s of the 57
0.14s of remaining time.
        -53.3094         = Validation score   (-root_mean_squared_error)
        24.51s   = Training   runtime
        0.69s    = Validation runtime
Fitting model: CatBoost_BAG_L2 ... Training model for up to 544.47s of the 544.45s o
f remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused CatBoost_BAG_L2 to fail during training... Skippin
g this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
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  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: ExtraTreesMSE_BAG_L2 ... Training model for up to 544.42s of the 544.
```

```
41s of remaining time.
        -53.4514        = Validation score   (-root_mean_squared_error)
        8.23s    = Training   runtime
        0.62s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 535.14s of the 53
5.13s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused NeuralNetFastAI_BAG_L2 to fail during training...
Skipping this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: XGBoost_BAG_L2 ... Training model for up to 535.11s of the 535.1s of
remaining time.
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused XGBoost_BAG_L2 to fail during training... Skipping
this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 535.08s of the 53
5.07s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused NeuralNetTorch_BAG_L2 to fail during training... S
kipping this model.
                System error: Broken pipe
Detailed Traceback:
```

```
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 535.05s of the 535.
04s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBMLarge_BAG_L2 to fail during training... Sk
ipping this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
```

```
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Repeating k-fold bagging: 2/20
Repeating k-fold bagging: 3/20
Repeating k-fold bagging: 4/20
Repeating k-fold bagging: 5/20
Repeating k-fold bagging: 6/20
Repeating k-fold bagging: 7/20
Repeating k-fold bagging: 8/20
Repeating k-fold bagging: 9/20
Repeating k-fold bagging: 10/20
Repeating k-fold bagging: 11/20
Repeating k-fold bagging: 12/20
Repeating k-fold bagging: 13/20
Repeating k-fold bagging: 14/20
Repeating k-fold bagging: 15/20
Repeating k-fold bagging: 16/20
Repeating k-fold bagging: 17/20
Repeating k-fold bagging: 18/20
Repeating k-fold bagging: 19/20
Repeating k-fold bagging: 20/20
Completed 20/20 k-fold bagging repeats ...
```

```
Fitting model: WeightedEnsemble_L3 ... Training model for up to 360.0s of the 534.99
s of remaining time.
        -52.7302         = Validation score   (-root_mean_squared_error)
        0.15s    = Training   runtime
        0.0s     = Validation runtime
AutoGluon training complete, total runtime = 65.19s ... Best model: "WeightedEnsembl
e_L3"
TabularPredictor saved. To load, use: predictor = TabularPredictor.load("AutogluonMo
dels/ag-20240629_004142/")
```

Review AutoGluon's training run with ranking of models that did the best.

In [17]:
```
predictor.fit_summary()
```

```
*** Summary of fit() ***
Estimated performance of each model:
                   model   score_val  pred_time_val   fit_time  pred_time_val_margi
nal  fit_time_marginal  stack_level  can_infer  fit_order
0     WeightedEnsemble_L3  -52.730199       2.572405  51.884964                0.000
611           0.150183            3       True          8
1  RandomForestMSE_BAG_L2  -53.309378       1.954578  43.501362                0.685
011          24.507230            2       True          6
2    ExtraTreesMSE_BAG_L2  -53.451431       1.886783  27.227551                0.617
215           8.233419            2       True          7
3   KNeighborsDist_BAG_L1  -84.125061       0.056314   0.035129                0.056
314           0.035129            1       True          2
4     WeightedEnsemble_L2  -84.125061       0.057341   0.332376                0.001
026           0.297247            2       True          5
5   KNeighborsUnif_BAG_L1 -101.546199       0.056701   0.042490                0.056
701           0.042490            1       True          1
6  RandomForestMSE_BAG_L1 -116.548359       0.620378  12.512774                0.620
378          12.512774            1       True          3
7    ExtraTreesMSE_BAG_L1 -124.600676       0.536174   6.403739                0.536
174           6.403739            1       True          4
Number of models trained: 8
Types of models trained:
{'StackerEnsembleModel_XT', 'StackerEnsembleModel_KNN', 'StackerEnsembleModel_RF',
'WeightedEnsembleModel'}
Bagging used: True  (with 8 folds)
Multi-layer stack-ensembling used: True  (with 3 levels)
Feature Metadata (Processed):
(raw dtype, special dtypes):
('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
('int', [])                  : 3 | ['season', 'weather', 'humidity']
('int', ['bool'])            : 2 | ['holiday', 'workingday']
('int', ['datetime_as_int']) : 5 | ['datetime', 'datetime.year', 'datetime.month',
'datetime.day', 'datetime.dayofweek']
*** End of fit() summary ***
```

```
/opt/conda/lib/python3.10/site-packages/autogluon/core/utils/plots.py:169: UserWarni
ng: AutoGluon summary plots cannot be created because bokeh is not installed. To see
plots, please do: "pip install bokeh==2.0.1"
  warnings.warn('AutoGluon summary plots cannot be created because bokeh is not inst
alled. To see plots, please do: "pip install bokeh==2.0.1"')
```

Out[17]:

```
{'model_types': {'KNeighborsUnif_BAG_L1': 'StackerEnsembleModel_KNN',
  'KNeighborsDist_BAG_L1': 'StackerEnsembleModel_KNN',
  'RandomForestMSE_BAG_L1': 'StackerEnsembleModel_RF',
  'ExtraTreesMSE_BAG_L1': 'StackerEnsembleModel_XT',
  'WeightedEnsemble_L2': 'WeightedEnsembleModel',
  'RandomForestMSE_BAG_L2': 'StackerEnsembleModel_RF',
  'ExtraTreesMSE_BAG_L2': 'StackerEnsembleModel_XT',
  'WeightedEnsemble_L3': 'WeightedEnsembleModel'},
 'model_performance': {'KNeighborsUnif_BAG_L1': -101.54619908446061,
  'KNeighborsDist_BAG_L1': -84.12506123181602,
  'RandomForestMSE_BAG_L1': -116.54835939455667,
  'ExtraTreesMSE_BAG_L1': -124.60067564699747,
  'WeightedEnsemble_L2': -84.12506123181602,
  'RandomForestMSE_BAG_L2': -53.30937847291498,
  'ExtraTreesMSE_BAG_L2': -53.45143074386139,
  'WeightedEnsemble_L3': -52.730199076200954},
 'model_best': 'WeightedEnsemble_L3',
 'model_paths': {'KNeighborsUnif_BAG_L1': 'AutogluonModels/ag-20240629_004142/mode
ls/KNeighborsUnif_BAG_L1/',
  'KNeighborsDist_BAG_L1': 'AutogluonModels/ag-20240629_004142/models/KNeighborsDi
st_BAG_L1/',
  'RandomForestMSE_BAG_L1': 'AutogluonModels/ag-20240629_004142/models/RandomFores
tMSE_BAG_L1/',
  'ExtraTreesMSE_BAG_L1': 'AutogluonModels/ag-20240629_004142/models/ExtraTreesMSE
_BAG_L1/',
  'WeightedEnsemble_L2': 'AutogluonModels/ag-20240629_004142/models/WeightedEnsemb
le_L2/',
  'RandomForestMSE_BAG_L2': 'AutogluonModels/ag-20240629_004142/models/RandomFores
tMSE_BAG_L2/',
  'ExtraTreesMSE_BAG_L2': 'AutogluonModels/ag-20240629_004142/models/ExtraTreesMSE
_BAG_L2/',
  'WeightedEnsemble_L3': 'AutogluonModels/ag-20240629_004142/models/WeightedEnsemb
le_L3/'},
 'model_fit_times': {'KNeighborsUnif_BAG_L1': 0.04248976707458496,
  'KNeighborsDist_BAG_L1': 0.03512930870056152,
  'RandomForestMSE_BAG_L1': 12.512774467468262,
  'ExtraTreesMSE_BAG_L1': 6.403738975524902,
  'WeightedEnsemble_L2': 0.29724717140197754,
  'RandomForestMSE_BAG_L2': 24.507229804992676,
  'ExtraTreesMSE_BAG_L2': 8.233418703079224,
  'WeightedEnsemble_L3': 0.15018320083618164},
 'model_pred_times': {'KNeighborsUnif_BAG_L1': 0.0567014217376709,
  'KNeighborsDist_BAG_L1': 0.05631422996520996,
  'RandomForestMSE_BAG_L1': 0.620377779006958,
  'ExtraTreesMSE_BAG_L1': 0.5361740589141846,
  'WeightedEnsemble_L2': 0.0010263919830322266,
  'RandomForestMSE_BAG_L2': 0.6850109100341797,
  'ExtraTreesMSE_BAG_L2': 0.6172151565551758,
  'WeightedEnsemble_L3': 0.0006110668182373047},
 'num_bag_folds': 8,
 'max_stack_level': 3,
 'model_hyperparams': {'KNeighborsUnif_BAG_L1': {'use_orig_features': True,
   'max_base_models': 25,
   'max_base_models_per_type': 5,
   'save_bag_folds': True,
   'use_child_oof': True},
```

```
 'KNeighborsDist_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'RandomForestMSE_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'ExtraTreesMSE_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'WeightedEnsemble_L2': {'use_orig_features': False,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True},
 'RandomForestMSE_BAG_L2': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'ExtraTreesMSE_BAG_L2': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'WeightedEnsemble_L3': {'use_orig_features': False,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True}},
'leaderboard':                      model   score_val  pred_time_val   fit_time  \
0     WeightedEnsemble_L3  -52.730199       2.572405  51.884964
1  RandomForestMSE_BAG_L2  -53.309378       1.954578  43.501362
2    ExtraTreesMSE_BAG_L2  -53.451431       1.886783  27.227551
3   KNeighborsDist_BAG_L1  -84.125061       0.056314   0.035129
4     WeightedEnsemble_L2  -84.125061       0.057341   0.332376
5   KNeighborsUnif_BAG_L1 -101.546199       0.056701   0.042490
6  RandomForestMSE_BAG_L1 -116.548359       0.620378  12.512774
7    ExtraTreesMSE_BAG_L1 -124.600676       0.536174   6.403739

   pred_time_val_marginal  fit_time_marginal  stack_level  can_infer  \
0                0.000611           0.150183            3       True
1                0.685011          24.507230            2       True
2                0.617215           8.233419            2       True
3                0.056314           0.035129            1       True
4                0.001026           0.297247            2       True
5                0.056701           0.042490            1       True
6                0.620378          12.512774            1       True
7                0.536174           6.403739            1       True

   fit_order
0          8
1          6
```

```
 2          7
 3          2
 4          5
 5          1
 6          3
 7          4  }
```

Create predictions from test dataset

In [21]:
```
predictions = predictor.predict(test)
predictions.head()
```

Out[21]:
```
0    22.444073
1    41.671574
2    45.626762
3    46.568428
4    50.585464
Name: count, dtype: float32
```

NOTE: Kaggle will reject the submission if we don't set everything to be > 0.

In [22]:
```
# Describe the `predictions` series to see if there are any negative values
predictions.describe()
```

Out[22]:
```
count    6493.000000
mean      100.191887
std        90.330627
min         2.130000
25%        19.085648
50%        62.764816
75%       169.132050
max       358.224182
Name: count, dtype: float64
```

In [ ]:
```
# How many negative values do we have?
0
```

In [23]:
```
# Set them to zero
predictions[predictions<0]=0
predictions.describe()
```

Out[23]:
```
count    6493.000000
mean      100.191887
std        90.330627
min         2.130000
25%        19.085648
50%        62.764816
75%       169.132050
max       358.224182
Name: count, dtype: float64
```

Set predictions to submission dataframe, save, and submit

In [24]:
```
submission["count"] = predictions
submission.to_csv("submission.csv", index=False)
```

In [25]:
```
!kaggle competitions submit -c bike-sharing-demand -f submission.csv -m "first raw
```

```
100%|████████████████████████████████████████| 188k/188k [00:00<00:00, 709kB/s]
Successfully submitted to Bike Sharing Demand
```

View submission via the command line or in the web browser under the competition's page - `My Submissions`

In [27]:
```
!kaggle competitions submissions -c bike-sharing-demand
```

```
fileName                    date                 description
status    publicScore  privateScore
--------------------------  -------------------  ---------------------------------
-----------------------------------------------  --------  -----------  ------------
submission.csv              2024-06-29 00:47:15  first raw submission
complete  1.84007      1.84007
submission_new_hpo4.csv     2024-06-26 19:43:51  new features with hyperparameters
without presets time limit 1200 with 10 trials  complete  0.55202      0.55202
submission_new_hpo3.1.csv   2024-06-26 06:37:09  new features with hyperparameters
without presets and time limit 1200             complete  0.55016      0.55016
submission_new_hpo3.csv     2024-06-26 06:32:56  new features with hyperparameters
without presets and time limit of 1200          error
submission_new_hpo2.csv     2024-06-25 17:18:14  new features with hyperparameters
without presets                                 complete  1.83641      1.83641
submission_new_hpo.csv      2024-06-24 22:47:19  new features with hyperparameters
complete  0.6538       0.6538
submission_new_features.csv  2024-06-24 22:46:40  new features
complete  0.6538       0.6538
submission.csv              2024-06-24 22:46:05  first raw submission
complete  1.84007      1.84007
```

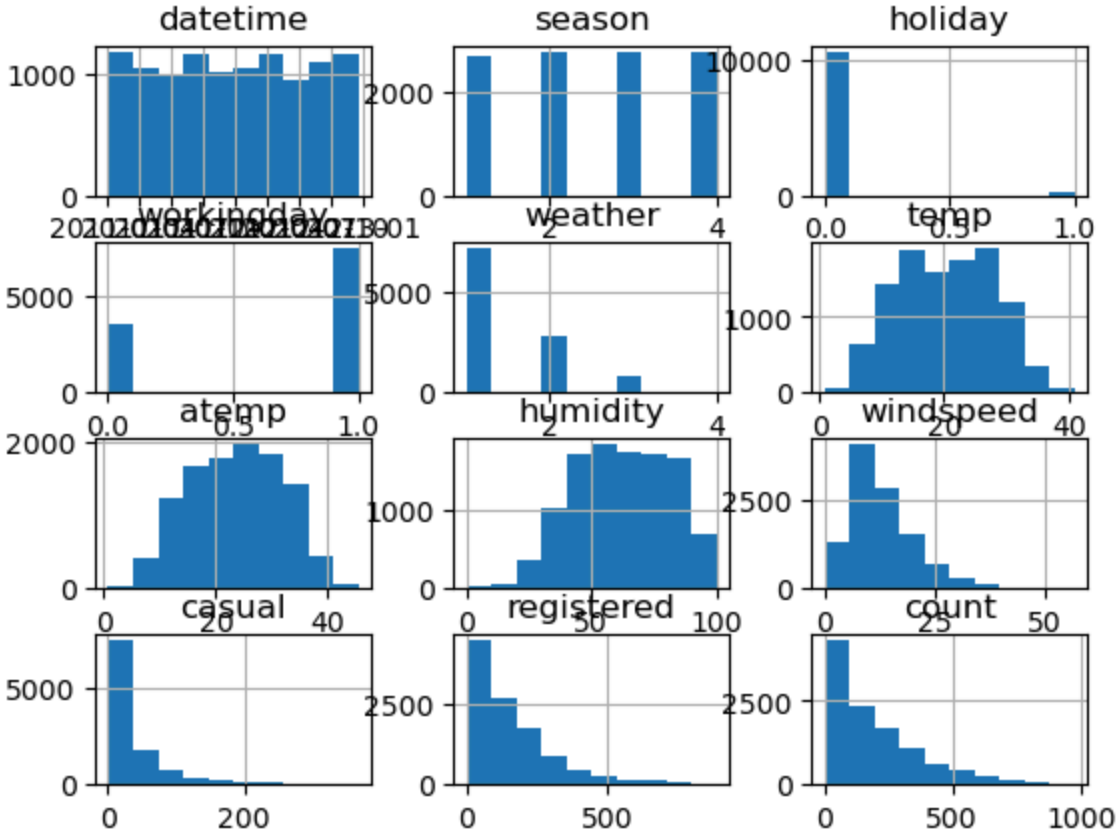
Initial score of `1.84007`

Step 4: Exploratory Data Analysis and Creating an additional feature

- Any additional feature will do, but a great suggestion would be to separate out the datetime into hour, day, or month parts.

In [28]:
```
# Create a histogram of all features to show the distribution of each one relative
train.hist()
```

Out[28]:
```
array([[<Axes: title={'center': 'datetime'}>,
        <Axes: title={'center': 'season'}>,
        <Axes: title={'center': 'holiday'}>],
       [<Axes: title={'center': 'workingday'}>,
        <Axes: title={'center': 'weather'}>,
        <Axes: title={'center': 'temp'}>],
       [<Axes: title={'center': 'atemp'}>,
        <Axes: title={'center': 'humidity'}>,
        <Axes: title={'center': 'windspeed'}>],
       [<Axes: title={'center': 'casual'}>,
        <Axes: title={'center': 'registered'}>,
        <Axes: title={'center': 'count'}>]], dtype=object)
```



In [29]:
```
# create a new feature
train['hour']= pd.DatetimeIndex(train['datetime']).hour
train['month']= pd.DatetimeIndex(train['datetime']).month
train['day']= pd.DatetimeIndex(train['datetime']).day
test['hour']= pd.DatetimeIndex(test['datetime']).hour
test['month']= pd.DatetimeIndex(test['datetime']).month
test['day']= pd.DatetimeIndex(test['datetime']).day
```

Make category types for these so models know they are not just numbers

- AutoGluon originally sees these as ints, but in reality they are int representations of a category.
- Setting the dtype to category will classify these as categories in AutoGluon.

In [30]:
```
train["season"] = train['season'].astype('category')
train["weather"] = train['weather'].astype('category')
test["season"] = test['season'].astype('category')
test["weather"] = test['weather'].astype('category')
```

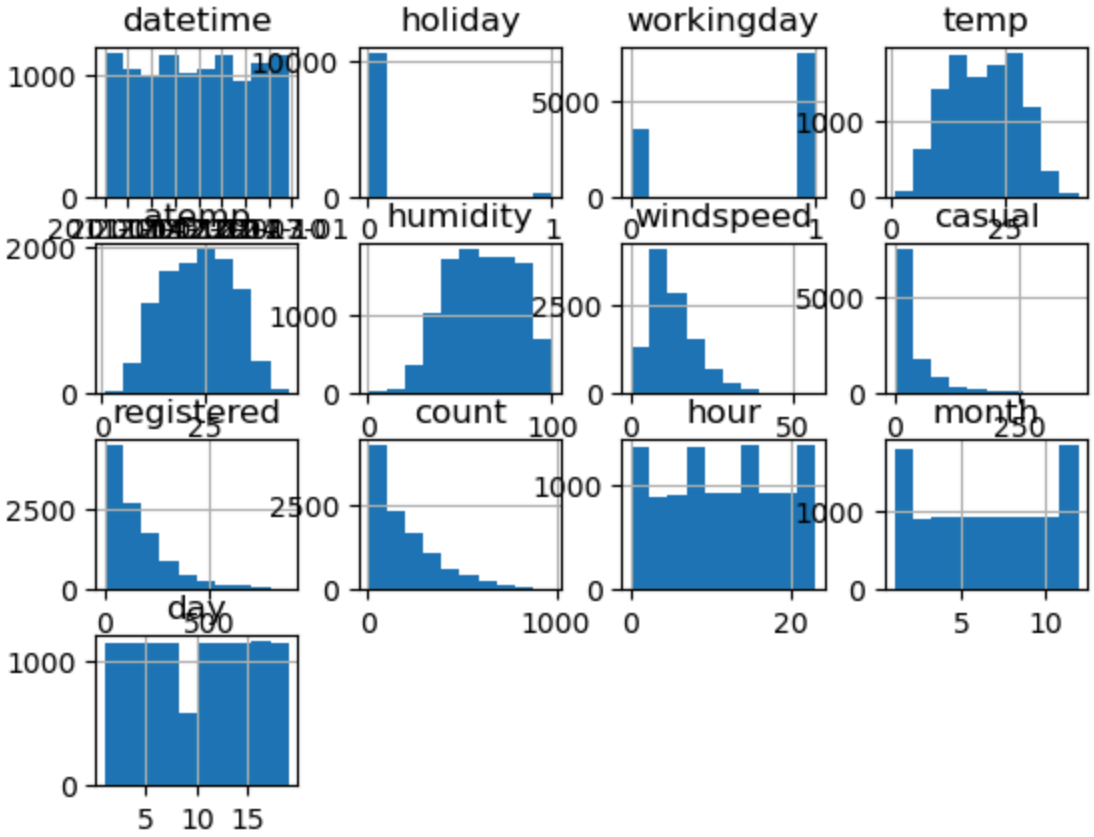
In [31]:
```
# View are new feature
train.head()
```

Out[31]:

	datetime	season	holiday	workingday	weather	temp	atemp	humidity	windspeed
0	2011-01-01 00:00:00	1	0	0	1	9.84	14.395	81	0.0
1	2011-01-01 01:00:00	1	0	0	1	9.02	13.635	80	0.0
2	2011-01-01 02:00:00	1	0	0	1	9.02	13.635	80	0.0
3	2011-01-01 03:00:00	1	0	0	1	9.84	14.395	75	0.0
4	2011-01-01 04:00:00	1	0	0	1	9.84	14.395	75	0.0

In [32]:
```
# View histogram of all features again now with the hour feature
train.hist()
```

Out[32]:
```
array([[<Axes: title={'center': 'datetime'}>,
        <Axes: title={'center': 'holiday'}>,
        <Axes: title={'center': 'workingday'}>,
        <Axes: title={'center': 'temp'}>],
       [<Axes: title={'center': 'atemp'}>,
        <Axes: title={'center': 'humidity'}>,
        <Axes: title={'center': 'windspeed'}>,
        <Axes: title={'center': 'casual'}>],
       [<Axes: title={'center': 'registered'}>,
        <Axes: title={'center': 'count'}>,
        <Axes: title={'center': 'hour'}>,
        <Axes: title={'center': 'month'}>],
       [<Axes: title={'center': 'day'}>, <Axes: >, <Axes: >, <Axes: >]],
      dtype=object)
```



Step 5: Rerun the model with the same settings as before, just with more features

In [33]:
```
feature_names = ['datetime','season','holiday','workingday','weather','temp','atemp
predictor_new_features = TabularPredictor(label='count',eval_metric='root_mean_squa
```

```
No path specified. Models will be saved in: "AutogluonModels/ag-20240629_004919/"
Presets specified: ['best_quality']
Stack configuration (auto_stack=True): num_stack_levels=1, num_bag_folds=8, num_bag_
sets=20
Beginning AutoGluon training ... Time limit = 600s
AutoGluon will save models to "AutogluonModels/ag-20240629_004919/"
AutoGluon Version:  0.8.3
Python Version:     3.10.14
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Fri May 31 18:15:42 UTC 2024
Disk Space Avail:   3.95 GB / 5.36 GB (73.7%)
        WARNING: Available disk space is low and there is a risk that AutoGluon will
run out of disk during fit, causing an exception.
        We recommend a minimum available disk space of 10 GB, and large datasets may
require more.
Train Data Rows:    10886
Train Data Columns: 12
Label Column: count
Preprocessing data ...
AutoGluon infers your prediction problem is: 'regression' (because dtype of label-co
lumn == int and many unique label-values observed).
        Label info (max, min, mean, stddev): (977, 1, 191.57413, 181.14445)
        If 'regression' is not the correct problem_type, please manually specify the
problem_type parameter during predictor init (You may specify problem_type as one o
f: ['binary', 'multiclass', 'regression'])
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
        Available Memory:                    1996.25 MB
        Train Data (Original)  Memory Usage: 0.89 MB (0.0% of available memory)
        Inferring data type of each feature based on column values. Set feature_meta
data_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator...
                        Note: Converting 2 features to boolean dtype as they only co
ntain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator...
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator...
                Fitting CategoryFeatureGenerator...
                        Fitting CategoryMemoryMinimizeFeatureGenerator...
                Fitting DatetimeFeatureGenerator...
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator...
        Stage 5 Generators:
                Fitting DropDuplicatesFeatureGenerator...
        Types of features in original data (raw dtype, special dtypes):
                ('category', []) : 2 | ['season', 'weather']
                ('datetime', []) : 1 | ['datetime']
                ('float', [])    : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])      : 6 | ['holiday', 'workingday', 'humidity', 'hour',
'day', ...]
        Types of features in processed data (raw dtype, special dtypes):
                ('category', [])             : 2 | ['season', 'weather']
                ('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
```

```
                ('int', [])                 : 4 | ['humidity', 'hour', 'day', 'mont
h']
                ('int', ['bool'])           : 2 | ['holiday', 'workingday']
                ('int', ['datetime_as_int']) : 3 | ['datetime', 'datetime.year', 'da
tetime.dayofweek']
        0.7s = Fit runtime
        12 features in original data used to generate 14 features in processed data.
        Train Data (Processed) Memory Usage: 0.92 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 0.69s ...
AutoGluon will gauge predictive performance using evaluation metric: 'root_mean_squa
red_error'
        This metric's sign has been flipped to adhere to being higher_is_better. The
metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
User-specified model hyperparameters to be fit:
{
        'NN_TORCH': {},
        'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {}, 'GBMLar
ge'],
        'CAT': {},
        'XGB': {},
        'FASTAI': {},
        'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}}, {'weight
s': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
AutoGluon will fit 2 stack levels (L1 to L2) ...
Fitting 11 L1 models ...
Fitting model: KNeighborsUnif_BAG_L1 ... Training model for up to 399.44s of the 59
9.31s of remaining time.
        -101.5462       = Validation score   (-root_mean_squared_error)
        0.03s    = Training   runtime
        0.04s    = Validation runtime
Fitting model: KNeighborsDist_BAG_L1 ... Training model for up to 399.33s of the 59
9.2s of remaining time.
        -84.1251        = Validation score   (-root_mean_squared_error)
        0.03s    = Training   runtime
        0.05s    = Validation runtime
Fitting model: LightGBMXT_BAG_L1 ... Training model for up to 399.23s of the 599.1s
of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBMXT_BAG_L1 to fail during training... Skipp
ing this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
```

```
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: LightGBM_BAG_L1 ... Training model for up to 399.2s of the 599.07s of
remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBM_BAG_L1 to fail during training... Skippin
g this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
```

```
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: RandomForestMSE_BAG_L1 ... Training model for up to 399.18s of the 59
9.04s of remaining time.
        -38.4089         = Validation score   (-root_mean_squared_error)
        14.35s   = Training   runtime
        0.57s    = Validation runtime
Fitting model: CatBoost_BAG_L1 ... Training model for up to 383.79s of the 583.66s o
f remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused CatBoost_BAG_L1 to fail during training... Skippin
g this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
```

```
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: ExtraTreesMSE_BAG_L1 ... Training model for up to 383.76s of the 583.
62s of remaining time.
        -38.51   = Validation score   (-root_mean_squared_error)
        6.48s    = Training   runtime
        0.55s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L1 ... Training model for up to 376.29s of the 57
6.16s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused NeuralNetFastAI_BAG_L1 to fail during training...
Skipping this model.
               System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
```

```
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: XGBoost_BAG_L1 ... Training model for up to 376.26s of the 576.13s of
remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused XGBoost_BAG_L1 to fail during training... Skipping
this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
```

```
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: NeuralNetTorch_BAG_L1 ... Training model for up to 376.24s of the 57
6.1s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused NeuralNetTorch_BAG_L1 to fail during training... S
kipping this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
```

```
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: LightGBMLarge_BAG_L1 ... Training model for up to 376.21s of the 576.
07s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBMLarge_BAG_L1 to fail during training... Sk
ipping this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
```

```
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Repeating k-fold bagging: 2/20
Repeating k-fold bagging: 3/20
Repeating k-fold bagging: 4/20
Repeating k-fold bagging: 5/20
Repeating k-fold bagging: 6/20
Repeating k-fold bagging: 7/20
Repeating k-fold bagging: 8/20
Repeating k-fold bagging: 9/20
Repeating k-fold bagging: 10/20
Repeating k-fold bagging: 11/20
Repeating k-fold bagging: 12/20
Repeating k-fold bagging: 13/20
Repeating k-fold bagging: 14/20
Repeating k-fold bagging: 15/20
Repeating k-fold bagging: 16/20
Repeating k-fold bagging: 17/20
Repeating k-fold bagging: 18/20
Repeating k-fold bagging: 19/20
Repeating k-fold bagging: 20/20
Completed 20/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the 576.03
s of remaining time.
        -37.094  = Validation score   (-root_mean_squared_error)
        0.24s    = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L2 models ...
Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 575.76s of the 575.76s
of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBMXT_BAG_L2 to fail during training... Skipp
ing this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
```

```
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: LightGBM_BAG_L2 ... Training model for up to 575.73s of the 575.72s o
f remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBM_BAG_L2 to fail during training... Skippin
g this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
```

```
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: RandomForestMSE_BAG_L2 ... Training model for up to 575.7s of the 57
5.7s of remaining time.
        -34.5661         = Validation score   (-root_mean_squared_error)
        26.67s   = Training   runtime
        0.61s    = Validation runtime
Fitting model: CatBoost_BAG_L2 ... Training model for up to 548.02s of the 548.01s o
f remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused CatBoost_BAG_L2 to fail during training... Skippin
g this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
```

```
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: ExtraTreesMSE_BAG_L2 ... Training model for up to 547.98s of the 547.
97s of remaining time.
        -33.7912         = Validation score   (-root_mean_squared_error)
        8.74s    = Training   runtime
        0.59s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 538.24s of the 53
8.23s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused NeuralNetFastAI_BAG_L2 to fail during training...
Skipping this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
```

```
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: XGBoost_BAG_L2 ... Training model for up to 538.2s of the 538.2s of r
emaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused XGBoost_BAG_L2 to fail during training... Skipping
this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
```

```
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: NeuralNetTorch_BAG_L2 ... Training model for up to 538.17s of the 53
8.17s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused NeuralNetTorch_BAG_L2 to fail during training... S
kipping this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
```

```
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 538.14s of the 538.
13s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBMLarge_BAG_L2 to fail during training... Sk
ipping this model.
               System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
```

```
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Repeating k-fold bagging: 2/20
Repeating k-fold bagging: 3/20
Repeating k-fold bagging: 4/20
Repeating k-fold bagging: 5/20
Repeating k-fold bagging: 6/20
Repeating k-fold bagging: 7/20
Repeating k-fold bagging: 8/20
Repeating k-fold bagging: 9/20
Repeating k-fold bagging: 10/20
Repeating k-fold bagging: 11/20
Repeating k-fold bagging: 12/20
Repeating k-fold bagging: 13/20
Repeating k-fold bagging: 14/20
Repeating k-fold bagging: 15/20
Repeating k-fold bagging: 16/20
Repeating k-fold bagging: 17/20
Repeating k-fold bagging: 18/20
Repeating k-fold bagging: 19/20
Repeating k-fold bagging: 20/20
Completed 20/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L3 ... Training model for up to 360.0s of the 538.08
s of remaining time.
        -33.7884         = Validation score   (-root_mean_squared_error)
        0.16s    = Training   runtime
        0.0s     = Validation runtime
AutoGluon training complete, total runtime = 62.1s ... Best model: "WeightedEnsemble
_L3"
TabularPredictor saved. To load, use: predictor = TabularPredictor.load("AutogluonMo
dels/ag-20240629_004919/")
```

In [34]:
```
predictor_new_features.fit_summary()
```

```
*** Summary of fit() ***
Estimated performance of each model:
                     model   score_val  pred_time_val   fit_time  pred_time_val_margi
nal  fit_time_marginal  stack_level  can_infer  fit_order
0     WeightedEnsemble_L3  -33.788423       2.414999  56.454928               0.000
575           0.156543            3       True          8
1    ExtraTreesMSE_BAG_L2  -33.791172       1.806835  29.627175               0.593
992           8.740801            2       True          7
2  RandomForestMSE_BAG_L2  -34.566123       1.820432  47.557585               0.607
588          26.671211            2       True          6
3     WeightedEnsemble_L2  -37.094038       1.169361  21.099816               0.000
722           0.243396            2       True          5
4  RandomForestMSE_BAG_L1  -38.408907       0.570371  14.353155               0.570
371          14.353155            1       True          3
5    ExtraTreesMSE_BAG_L1  -38.509984       0.552276   6.475222               0.552
276           6.475222            1       True          4
6   KNeighborsDist_BAG_L1  -84.125061       0.045992   0.028043               0.045
992           0.028043            1       True          2
7   KNeighborsUnif_BAG_L1 -101.546199       0.044205   0.029954               0.044
205           0.029954            1       True          1
Number of models trained: 8
Types of models trained:
{'StackerEnsembleModel_XT', 'StackerEnsembleModel_KNN', 'StackerEnsembleModel_RF',
'WeightedEnsembleModel'}
Bagging used: True  (with 8 folds)
Multi-layer stack-ensembling used: True  (with 3 levels)
Feature Metadata (Processed):
(raw dtype, special dtypes):
('category', [])             : 2 | ['season', 'weather']
('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
('int', [])                  : 4 | ['humidity', 'hour', 'day', 'month']
('int', ['bool'])            : 2 | ['holiday', 'workingday']
('int', ['datetime_as_int']) : 3 | ['datetime', 'datetime.year', 'datetime.dayofwee
k']
*** End of fit() summary ***
/opt/conda/lib/python3.10/site-packages/autogluon/core/utils/plots.py:169: UserWarni
ng: AutoGluon summary plots cannot be created because bokeh is not installed. To see
plots, please do: "pip install bokeh==2.0.1"
  warnings.warn('AutoGluon summary plots cannot be created because bokeh is not inst
alled. To see plots, please do: "pip install bokeh==2.0.1"')
```

Out[34]:

```
{'model_types': {'KNeighborsUnif_BAG_L1': 'StackerEnsembleModel_KNN',
  'KNeighborsDist_BAG_L1': 'StackerEnsembleModel_KNN',
  'RandomForestMSE_BAG_L1': 'StackerEnsembleModel_RF',
  'ExtraTreesMSE_BAG_L1': 'StackerEnsembleModel_XT',
  'WeightedEnsemble_L2': 'WeightedEnsembleModel',
  'RandomForestMSE_BAG_L2': 'StackerEnsembleModel_RF',
  'ExtraTreesMSE_BAG_L2': 'StackerEnsembleModel_XT',
  'WeightedEnsemble_L3': 'WeightedEnsembleModel'},
 'model_performance': {'KNeighborsUnif_BAG_L1': -101.54619908446061,
  'KNeighborsDist_BAG_L1': -84.12506123181602,
  'RandomForestMSE_BAG_L1': -38.40890681984868,
  'ExtraTreesMSE_BAG_L1': -38.50998417702855,
  'WeightedEnsemble_L2': -37.09403815618353,
  'RandomForestMSE_BAG_L2': -34.566123372046235,
  'ExtraTreesMSE_BAG_L2': -33.791171621883684,
  'WeightedEnsemble_L3': -33.788422815663765},
 'model_best': 'WeightedEnsemble_L3',
 'model_paths': {'KNeighborsUnif_BAG_L1': 'AutogluonModels/ag-20240629_004919/mode
ls/KNeighborsUnif_BAG_L1/',
  'KNeighborsDist_BAG_L1': 'AutogluonModels/ag-20240629_004919/models/KNeighborsDi
st_BAG_L1/',
  'RandomForestMSE_BAG_L1': 'AutogluonModels/ag-20240629_004919/models/RandomFores
tMSE_BAG_L1/',
  'ExtraTreesMSE_BAG_L1': 'AutogluonModels/ag-20240629_004919/models/ExtraTreesMSE
_BAG_L1/',
  'WeightedEnsemble_L2': 'AutogluonModels/ag-20240629_004919/models/WeightedEnsemb
le_L2/',
  'RandomForestMSE_BAG_L2': 'AutogluonModels/ag-20240629_004919/models/RandomFores
tMSE_BAG_L2/',
  'ExtraTreesMSE_BAG_L2': 'AutogluonModels/ag-20240629_004919/models/ExtraTreesMSE
_BAG_L2/',
  'WeightedEnsemble_L3': 'AutogluonModels/ag-20240629_004919/models/WeightedEnsemb
le_L3/'},
 'model_fit_times': {'KNeighborsUnif_BAG_L1': 0.02995443344116211,
  'KNeighborsDist_BAG_L1': 0.02804279327392578,
  'RandomForestMSE_BAG_L1': 14.35315489768982,
  'ExtraTreesMSE_BAG_L1': 6.475222110748291,
  'WeightedEnsemble_L2': 0.24339604377746582,
  'RandomForestMSE_BAG_L2': 26.671210527420044,
  'ExtraTreesMSE_BAG_L2': 8.740801095962524,
  'WeightedEnsemble_L3': 0.15654253959655762},
 'model_pred_times': {'KNeighborsUnif_BAG_L1': 0.044205427169799805,
  'KNeighborsDist_BAG_L1': 0.04599165916442871,
  'RandomForestMSE_BAG_L1': 0.5703709125518799,
  'ExtraTreesMSE_BAG_L1': 0.5522758960723877,
  'WeightedEnsemble_L2': 0.0007221698760986328,
  'RandomForestMSE_BAG_L2': 0.6075882911682129,
  'ExtraTreesMSE_BAG_L2': 0.5939915180206299,
  'WeightedEnsemble_L3': 0.0005753040313720703},
 'num_bag_folds': 8,
 'max_stack_level': 3,
 'model_hyperparams': {'KNeighborsUnif_BAG_L1': {'use_orig_features': True,
   'max_base_models': 25,
   'max_base_models_per_type': 5,
   'save_bag_folds': True,
   'use_child_oof': True},
```

```
 'KNeighborsDist_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'RandomForestMSE_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'ExtraTreesMSE_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'WeightedEnsemble_L2': {'use_orig_features': False,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True},
 'RandomForestMSE_BAG_L2': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'ExtraTreesMSE_BAG_L2': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'WeightedEnsemble_L3': {'use_orig_features': False,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True}},
'leaderboard':                      model   score_val  pred_time_val   fit_time  \
0     WeightedEnsemble_L3  -33.788423       2.414999  56.454928
1    ExtraTreesMSE_BAG_L2  -33.791172       1.806835  29.627175
2  RandomForestMSE_BAG_L2  -34.566123       1.820432  47.557585
3     WeightedEnsemble_L2  -37.094038       1.169361  21.099816
4  RandomForestMSE_BAG_L1  -38.408907       0.570371  14.353155
5    ExtraTreesMSE_BAG_L1  -38.509984       0.552276   6.475222
6   KNeighborsDist_BAG_L1  -84.125061       0.045992   0.028043
7   KNeighborsUnif_BAG_L1 -101.546199       0.044205   0.029954

   pred_time_val_marginal  fit_time_marginal  stack_level  can_infer  \
0                0.000575           0.156543            3       True
1                0.593992           8.740801            2       True
2                0.607588          26.671211            2       True
3                0.000722           0.243396            2       True
4                0.570371          14.353155            1       True
5                0.552276           6.475222            1       True
6                0.045992           0.028043            1       True
7                0.044205           0.029954            1       True

   fit_order
0          8
1          7
```

```
2          6
3          5
4          3
5          4
6          2
7          1  }
```

In [35]:
```
# Remember to set all negative values to zero
predictions_new_features = predictor_new_features.predict(test)
predictions_new_features.describe()
```

Out[35]:
```
count    6493.000000
mean      167.899963
std       145.590118
min         2.241852
25%        52.784260
50%       134.288330
75%       237.351852
max       847.304626
Name: count, dtype: float64
```

In [36]:
```
# Same submitting predictions
submission['count'] = predictions_new_features
submission.to_csv("submission_new_features.csv", index=False)
```

In [37]:
```
!kaggle competitions submit -c bike-sharing-demand -f submission_new_features.csv -
```

```
100%|████████████████████████████████████████| 188k/188k [00:00<00:00, 750kB/s]
Successfully submitted to Bike Sharing Demand
```

In [38]:
```
!kaggle competitions submissions -c bike-sharing-demand
```

```
fileName                    date                 description
status    publicScore  privateScore
--------------------------  -------------------  ---------------------------------
-----------------------------------------------  --------  -----------  ------------
submission_new_features.csv  2024-06-29 00:52:46  new features
complete  0.6538       0.6538
submission.csv              2024-06-29 00:47:15  first raw submission
complete  1.84007      1.84007
submission_new_hpo4.csv      2024-06-26 19:43:51  new features with hyperparameters
without presets time limit 1200 with 10 trials  complete  0.55202      0.55202
submission_new_hpo3.1.csv    2024-06-26 06:37:09  new features with hyperparameters
without presets and time limit 1200             complete  0.55016      0.55016
submission_new_hpo3.csv      2024-06-26 06:32:56  new features with hyperparameters
without presets and time limit of 1200          error
submission_new_hpo2.csv      2024-06-25 17:18:14  new features with hyperparameters
without presets                                 complete  1.83641      1.83641
submission_new_hpo.csv       2024-06-24 22:47:19  new features with hyperparameters
complete  0.6538       0.6538
submission_new_features.csv  2024-06-24 22:46:40  new features
complete  0.6538       0.6538
submission.csv              2024-06-24 22:46:05  first raw submission
complete  1.84007      1.84007
```

New Score of `0.6538`

Step 6: Hyper parameter optimization

- There are many options for hyper parameter optimization.
- Options are to change the AutoGluon higher level parameters or the individual model hyperparameters.
- The hyperparameters of the models themselves that are in AutoGluon. Those need the `hyperparameter` and `hyperparameter_tune_kwargs` arguments.

In [39]:
```
hyperparameter_tuning = {'num_trials': 5, 'searcher':'auto','scheduler':'local'}
predictor_new_hpo = TabularPredictor(label='count',eval_metric='root_mean_squared_e
```

```
No path specified. Models will be saved in: "AutogluonModels/ag-20240629_005620/"
Presets specified: ['best_quality']
Warning: hyperparameter tuning is currently experimental and may cause the process t
o hang.
Stack configuration (auto_stack=True): num_stack_levels=1, num_bag_folds=8, num_bag_
sets=20
Beginning AutoGluon training ... Time limit = 600s
AutoGluon will save models to "AutogluonModels/ag-20240629_005620/"
AutoGluon Version:  0.8.3
Python Version:     3.10.14
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Fri May 31 18:15:42 UTC 2024
Disk Space Avail:   2.83 GB / 5.36 GB (52.8%)
        WARNING: Available disk space is low and there is a risk that AutoGluon will
run out of disk during fit, causing an exception.
        We recommend a minimum available disk space of 10 GB, and large datasets may
require more.
Train Data Rows:    10886
Train Data Columns: 12
Label Column: count
Preprocessing data ...
AutoGluon infers your prediction problem is: 'regression' (because dtype of label-co
lumn == int and many unique label-values observed).
        Label info (max, min, mean, stddev): (977, 1, 191.57413, 181.14445)
        If 'regression' is not the correct problem_type, please manually specify the
problem_type parameter during predictor init (You may specify problem_type as one o
f: ['binary', 'multiclass', 'regression'])
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
        Available Memory:                    1906.02 MB
        Train Data (Original)  Memory Usage: 0.89 MB (0.0% of available memory)
        Inferring data type of each feature based on column values. Set feature_meta
data_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator...
                        Note: Converting 2 features to boolean dtype as they only co
ntain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator...
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator...
                Fitting CategoryFeatureGenerator...
                        Fitting CategoryMemoryMinimizeFeatureGenerator...
                Fitting DatetimeFeatureGenerator...
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator...
        Stage 5 Generators:
                Fitting DropDuplicatesFeatureGenerator...
        Types of features in original data (raw dtype, special dtypes):
                ('category', []) : 2 | ['season', 'weather']
                ('datetime', []) : 1 | ['datetime']
                ('float', [])    : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])      : 6 | ['holiday', 'workingday', 'humidity', 'hour',
'day', ...]
        Types of features in processed data (raw dtype, special dtypes):
```

```
                ('category', [])             : 2 | ['season', 'weather']
                ('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])                  : 4 | ['humidity', 'hour', 'day', 'mont
h']
                ('int', ['bool'])            : 2 | ['holiday', 'workingday']
                ('int', ['datetime_as_int']) : 3 | ['datetime', 'datetime.year', 'da
tetime.dayofweek']
        0.7s = Fit runtime
        12 features in original data used to generate 14 features in processed data.
        Train Data (Processed) Memory Usage: 0.92 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 0.69s ...
AutoGluon will gauge predictive performance using evaluation metric: 'root_mean_squa
red_error'
        This metric's sign has been flipped to adhere to being higher_is_better. The
metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
User-specified model hyperparameters to be fit:
{
        'NN_TORCH': {},
        'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {}, 'GBMLar
ge'],
        'CAT': {},
        'XGB': {},
        'FASTAI': {},
        'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}}, {'weight
s': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
AutoGluon will fit 2 stack levels (L1 to L2) ...
Fitting 11 L1 models ...
Hyperparameter tuning model: KNeighborsUnif_BAG_L1 ... Tuning model for up to 32.68s
of the 599.31s of remaining time.
        No hyperparameter search space specified for KNeighborsUnif_BAG_L1. Skipping
HPO. Will train one model based on the provided hyperparameters.
Fitted model: KNeighborsUnif_BAG_L1 ...
        -101.5462        = Validation score   (-root_mean_squared_error)
        0.09s    = Training   runtime
        0.0s     = Validation runtime
Hyperparameter tuning model: KNeighborsDist_BAG_L1 ... Tuning model for up to 32.68s
of the 599.19s of remaining time.
        No hyperparameter search space specified for KNeighborsDist_BAG_L1. Skipping
HPO. Will train one model based on the provided hyperparameters.
Fitted model: KNeighborsDist_BAG_L1 ...
        -84.1251         = Validation score   (-root_mean_squared_error)
        0.09s    = Training   runtime
        0.0s     = Validation runtime
Hyperparameter tuning model: LightGBMXT_BAG_L1 ... Tuning model for up to 32.68s of
the 599.08s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
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    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
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    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
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  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
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act_model.py", line 829, in fit
    out = self._fit(**kwargs)
```

```
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
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```
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ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
No model was trained during hyperparameter tuning LightGBMXT_BAG_L1... Skipping this
model.
Hyperparameter tuning model: LightGBM_BAG_L1 ... Tuning model for up to 32.68s of th
e 598.91s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
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ray.exceptions.RaySystemError: System error: Broken pipe
No model was trained during hyperparameter tuning LightGBM_BAG_L1... Skipping this m
odel.
Hyperparameter tuning model: RandomForestMSE_BAG_L1 ... Tuning model for up to 32.68
s of the 598.73s of remaining time.
        No hyperparameter search space specified for RandomForestMSE_BAG_L1. Skippin
g HPO. Will train one model based on the provided hyperparameters.
Fitted model: RandomForestMSE_BAG_L1 ...
        -38.4089         = Validation score   (-root_mean_squared_error)
        15.43s   = Training   runtime
```

```
        0.0s     = Validation runtime
Hyperparameter tuning model: CatBoost_BAG_L1 ... Tuning model for up to 32.68s of th
e 583.28s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
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  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
No model was trained during hyperparameter tuning CatBoost_BAG_L1... Skipping this m
odel.
Hyperparameter tuning model: ExtraTreesMSE_BAG_L1 ... Tuning model for up to 32.68s
of the 583.11s of remaining time.
        No hyperparameter search space specified for ExtraTreesMSE_BAG_L1. Skipping
HPO. Will train one model based on the provided hyperparameters.
Fitted model: ExtraTreesMSE_BAG_L1 ...
        -38.51   = Validation score   (-root_mean_squared_error)
        7.39s    = Training   runtime
```

```
        0.0s     = Validation runtime
Hyperparameter tuning model: NeuralNetFastAI_BAG_L1 ... Tuning model for up to 32.68
s of the 575.7s of remaining time.
Warning: Exception caused NeuralNetFastAI_BAG_L1 to fail during hyperparameter tunin
g... Skipping this model.
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 2003, in _train_single_full
    hpo_models, hpo_results = model.hyperparameter_tune(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1383, in hyperparameter_tune
    return self._hyperparameter_tune(hpo_executor=hpo_executor, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 200, in _hyperparameter_tune
    return super()._hyperparameter_tune(X=X, y=y, k_fold=k_fold, hpo_executor=hpo_ex
ecutor, preprocess_kwargs=preprocess_kwargs, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 1170, in _hyperparameter_tune
    hpo_executor.validate_search_space(search_space, self.name)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/hpo/executors.py", li
ne 346, in validate_search_space
    from ray.tune.search.sample import Domain
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/__init__.py", line 2, in <m
odule>
    from ray.tune.tune import run_experiments, run
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/tune.py", line 12, in <modu
le>
    from ray.air import CheckpointConfig
  File "/opt/conda/lib/python3.10/site-packages/ray/air/__init__.py", line 1, in <mo
dule>
    from ray.air.checkpoint import Checkpoint
  File "/opt/conda/lib/python3.10/site-packages/ray/air/checkpoint.py", line 22, in
<module>
    from ray.air._internal.remote_storage import (
  File "/opt/conda/lib/python3.10/site-packages/ray/air/_internal/remote_storage.p
y", line 4, in <module>
    from pkg_resources import packaging
ImportError: cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/pyt
hon3.10/site-packages/pkg_resources/__init__.py)
cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/python3.10/site-
packages/pkg_resources/__init__.py)
Hyperparameter tuning model: XGBoost_BAG_L1 ... Tuning model for up to 32.68s of the
575.66s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
```

```
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
```

```
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
```

```
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
No model was trained during hyperparameter tuning XGBoost_BAG_L1... Skipping this mo
del.
Hyperparameter tuning model: NeuralNetTorch_BAG_L1 ... Tuning model for up to 32.68s
of the 575.48s of remaining time.
Warning: Exception caused NeuralNetTorch_BAG_L1 to fail during hyperparameter tunin
g... Skipping this model.
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 2003, in _train_single_full
```

```
    hpo_models, hpo_results = model.hyperparameter_tune(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1383, in hyperparameter_tune
    return self._hyperparameter_tune(hpo_executor=hpo_executor, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 200, in _hyperparameter_tune
    return super()._hyperparameter_tune(X=X, y=y, k_fold=k_fold, hpo_executor=hpo_ex
ecutor, preprocess_kwargs=preprocess_kwargs, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 1170, in _hyperparameter_tune
    hpo_executor.validate_search_space(search_space, self.name)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/hpo/executors.py", li
ne 346, in validate_search_space
    from ray.tune.search.sample import Domain
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/__init__.py", line 2, in <m
odule>
    from ray.tune.tune import run_experiments, run
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/tune.py", line 12, in <modu
le>
    from ray.air import CheckpointConfig
  File "/opt/conda/lib/python3.10/site-packages/ray/air/__init__.py", line 1, in <mo
dule>
    from ray.air.checkpoint import Checkpoint
  File "/opt/conda/lib/python3.10/site-packages/ray/air/checkpoint.py", line 22, in
<module>
    from ray.air._internal.remote_storage import (
  File "/opt/conda/lib/python3.10/site-packages/ray/air/_internal/remote_storage.p
y", line 4, in <module>
    from pkg_resources import packaging
ImportError: cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/pyt
hon3.10/site-packages/pkg_resources/__init__.py)
cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/python3.10/site-
packages/pkg_resources/__init__.py)
Fitting model: LightGBMLarge_BAG_L1 ... Training model for up to 32.68s of the 575.4
6s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBMLarge_BAG_L1 to fail during training... Sk
ipping this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
```

```
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Repeating k-fold bagging: 2/20
Repeating k-fold bagging: 3/20
Repeating k-fold bagging: 4/20
Repeating k-fold bagging: 5/20
Repeating k-fold bagging: 6/20
Repeating k-fold bagging: 7/20
Repeating k-fold bagging: 8/20
Repeating k-fold bagging: 9/20
Repeating k-fold bagging: 10/20
Repeating k-fold bagging: 11/20
Repeating k-fold bagging: 12/20
Repeating k-fold bagging: 13/20
Repeating k-fold bagging: 14/20
Repeating k-fold bagging: 15/20
Repeating k-fold bagging: 16/20
Repeating k-fold bagging: 17/20
Repeating k-fold bagging: 18/20
Repeating k-fold bagging: 19/20
Repeating k-fold bagging: 20/20
Completed 20/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the 575.41
s of remaining time.
        -37.094  = Validation score   (-root_mean_squared_error)
        0.24s    = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L2 models ...
Hyperparameter tuning model: LightGBMXT_BAG_L2 ... Tuning model for up to 57.52s of
the 575.14s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
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    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
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    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
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    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
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    return func(*args, **kwargs)
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in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
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    self.core_worker.put_serialized_object_and_increment_local_ref(
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  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
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  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
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  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
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```
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        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
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  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
No model was trained during hyperparameter tuning LightGBMXT_BAG_L2... Skipping this
model.
Hyperparameter tuning model: LightGBM_BAG_L2 ... Tuning model for up to 57.52s of th
e 574.95s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
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        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
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    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
```

```
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
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    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
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    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
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    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
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    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
No model was trained during hyperparameter tuning LightGBM_BAG_L2... Skipping this m
odel.
Hyperparameter tuning model: RandomForestMSE_BAG_L2 ... Tuning model for up to 57.52
s of the 574.76s of remaining time.
        No hyperparameter search space specified for RandomForestMSE_BAG_L2. Skippin
g HPO. Will train one model based on the provided hyperparameters.
Fitted model: RandomForestMSE_BAG_L2 ...
        -34.5661         = Validation score   (-root_mean_squared_error)
        27.62s   = Training   runtime
```

```
        0.0s     = Validation runtime
Hyperparameter tuning model: CatBoost_BAG_L2 ... Tuning model for up to 57.52s of th
e 547.11s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
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    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
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    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
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    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
```

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  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
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er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
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    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
```

```
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
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  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
```

```
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
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    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
No model was trained during hyperparameter tuning CatBoost_BAG_L2... Skipping this m
odel.
Hyperparameter tuning model: ExtraTreesMSE_BAG_L2 ... Tuning model for up to 57.52s
of the 546.9s of remaining time.
        No hyperparameter search space specified for ExtraTreesMSE_BAG_L2. Skipping
HPO. Will train one model based on the provided hyperparameters.
Fitted model: ExtraTreesMSE_BAG_L2 ...
        -33.7912         = Validation score   (-root_mean_squared_error)
        9.69s    = Training   runtime
```

```
        0.0s     = Validation runtime
Hyperparameter tuning model: NeuralNetFastAI_BAG_L2 ... Tuning model for up to 57.52
s of the 537.18s of remaining time.
Warning: Exception caused NeuralNetFastAI_BAG_L2 to fail during hyperparameter tunin
g... Skipping this model.
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 2003, in _train_single_full
    hpo_models, hpo_results = model.hyperparameter_tune(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1383, in hyperparameter_tune
    return self._hyperparameter_tune(hpo_executor=hpo_executor, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 200, in _hyperparameter_tune
    return super()._hyperparameter_tune(X=X, y=y, k_fold=k_fold, hpo_executor=hpo_ex
ecutor, preprocess_kwargs=preprocess_kwargs, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 1170, in _hyperparameter_tune
    hpo_executor.validate_search_space(search_space, self.name)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/hpo/executors.py", li
ne 346, in validate_search_space
    from ray.tune.search.sample import Domain
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/__init__.py", line 2, in <m
odule>
    from ray.tune.tune import run_experiments, run
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/tune.py", line 12, in <modu
le>
    from ray.air import CheckpointConfig
  File "/opt/conda/lib/python3.10/site-packages/ray/air/__init__.py", line 1, in <mo
dule>
    from ray.air.checkpoint import Checkpoint
  File "/opt/conda/lib/python3.10/site-packages/ray/air/checkpoint.py", line 22, in
<module>
    from ray.air._internal.remote_storage import (
  File "/opt/conda/lib/python3.10/site-packages/ray/air/_internal/remote_storage.p
y", line 4, in <module>
    from pkg_resources import packaging
ImportError: cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/pyt
hon3.10/site-packages/pkg_resources/__init__.py)
cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/python3.10/site-
packages/pkg_resources/__init__.py)
Hyperparameter tuning model: XGBoost_BAG_L2 ... Tuning model for up to 57.52s of the
537.16s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
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    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
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d_ensemble_model.py", line 266, in _fit
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  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
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    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
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fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
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    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
```

```
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
```

```
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
```

```
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
System error: Broken pipe
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 37, in model_trial
    model = fit_and_save_model(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/model
_trial.py", line 96, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
No model was trained during hyperparameter tuning XGBoost_BAG_L2... Skipping this mo
del.
Hyperparameter tuning model: NeuralNetTorch_BAG_L2 ... Tuning model for up to 57.52s
of the 536.96s of remaining time.
Warning: Exception caused NeuralNetTorch_BAG_L2 to fail during hyperparameter tunin
g... Skipping this model.
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 2003, in _train_single_full
```

```
    hpo_models, hpo_results = model.hyperparameter_tune(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1383, in hyperparameter_tune
    return self._hyperparameter_tune(hpo_executor=hpo_executor, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 200, in _hyperparameter_tune
    return super()._hyperparameter_tune(X=X, y=y, k_fold=k_fold, hpo_executor=hpo_ex
ecutor, preprocess_kwargs=preprocess_kwargs, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 1170, in _hyperparameter_tune
    hpo_executor.validate_search_space(search_space, self.name)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/hpo/executors.py", li
ne 346, in validate_search_space
    from ray.tune.search.sample import Domain
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/__init__.py", line 2, in <m
odule>
    from ray.tune.tune import run_experiments, run
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/tune.py", line 12, in <modu
le>
    from ray.air import CheckpointConfig
  File "/opt/conda/lib/python3.10/site-packages/ray/air/__init__.py", line 1, in <mo
dule>
    from ray.air.checkpoint import Checkpoint
  File "/opt/conda/lib/python3.10/site-packages/ray/air/checkpoint.py", line 22, in
<module>
    from ray.air._internal.remote_storage import (
  File "/opt/conda/lib/python3.10/site-packages/ray/air/_internal/remote_storage.p
y", line 4, in <module>
    from pkg_resources import packaging
ImportError: cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/pyt
hon3.10/site-packages/pkg_resources/__init__.py)
cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/python3.10/site-
packages/pkg_resources/__init__.py)
Fitting model: LightGBMLarge_BAG_L2 ... Training model for up to 57.52s of the 536.9
3s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitting
Strategy
        Warning: Exception caused LightGBMLarge_BAG_L2 to fail during training... Sk
ipping this model.
                System error: Broken pipe
Detailed Traceback:
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1733, in _train_and_save
    model = self._train_single(X, y, model, X_val, y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 1684, in _train_single
    model = model.fit(X=X, y=y, X_val=X_val, y_val=y_val, total_resources=total_reso
urces, **model_fit_kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 829, in fit
    out = self._fit(**kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/stack
er_ensemble_model.py", line 169, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
```

```
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 266, in _fit
    self._fit_folds(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/bagge
d_ensemble_model.py", line 592, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 514, in after_all_folds_scheduled
    X, y, X_pseudo, y_pseudo = self._prepare_data()
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/ensemble/fold_
fitting_strategy.py", line 703, in _prepare_data
    X = self.ray.put(self.X)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/client_mode_hook.py", l
ine 105, in wrapper
    return func(*args, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 2452,
in put
    object_ref = worker.put_object(value, owner_address=serialize_owner_address)
  File "/opt/conda/lib/python3.10/site-packages/ray/_private/worker.py", line 621, i
n put_object
    self.core_worker.put_serialized_object_and_increment_local_ref(
  File "python/ray/_raylet.pyx", line 1780, in ray._raylet.CoreWorker.put_serialized
_object_and_increment_local_ref
  File "python/ray/_raylet.pyx", line 1669, in ray._raylet.CoreWorker._create_put_bu
ffer
  File "python/ray/_raylet.pyx", line 209, in ray._raylet.check_status
ray.exceptions.RaySystemError: System error: Broken pipe
Repeating k-fold bagging: 2/20
Repeating k-fold bagging: 3/20
Repeating k-fold bagging: 4/20
Repeating k-fold bagging: 5/20
Repeating k-fold bagging: 6/20
Repeating k-fold bagging: 7/20
Repeating k-fold bagging: 8/20
Repeating k-fold bagging: 9/20
Repeating k-fold bagging: 10/20
Repeating k-fold bagging: 11/20
Repeating k-fold bagging: 12/20
Repeating k-fold bagging: 13/20
Repeating k-fold bagging: 14/20
Repeating k-fold bagging: 15/20
Repeating k-fold bagging: 16/20
Repeating k-fold bagging: 17/20
Repeating k-fold bagging: 18/20
Repeating k-fold bagging: 19/20
Repeating k-fold bagging: 20/20
Completed 20/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L3 ... Training model for up to 360.0s of the 536.87
s of remaining time.
        -33.7884         = Validation score   (-root_mean_squared_error)
        0.15s    = Training   runtime
        0.0s     = Validation runtime
AutoGluon training complete, total runtime = 63.3s ... Best model: "WeightedEnsemble
_L3"
TabularPredictor saved. To load, use: predictor = TabularPredictor.load("AutogluonMo
dels/ag-20240629_005620/")
```

In [40]:
```
predictor_new_hpo.fit_summary()
```

```
*** Summary of fit() ***
Estimated performance of each model:
                     model   score_val  pred_time_val   fit_time  pred_time_val_margi
nal  fit_time_marginal  stack_level  can_infer  fit_order
0     WeightedEnsemble_L3  -33.788423       0.001545  60.470902                0.000
706           0.148906            3       True          8
1    ExtraTreesMSE_BAG_L2  -33.791172       0.000680  32.698148                0.000
163           9.688753            2       True          7
2  RandomForestMSE_BAG_L2  -34.566123       0.000677  50.633243                0.000
160          27.623847            2       True          6
3     WeightedEnsemble_L2  -37.094038       0.001134  23.155139                0.000
697           0.239579            2       True          5
4  RandomForestMSE_BAG_L1  -38.408907       0.000176  15.430540                0.000
176          15.430540            1       True          3
5    ExtraTreesMSE_BAG_L1  -38.509984       0.000154   7.392467                0.000
154           7.392467            1       True          4
6   KNeighborsDist_BAG_L1  -84.125061       0.000106   0.092553                0.000
106           0.092553            1       True          2
7   KNeighborsUnif_BAG_L1 -101.546199       0.000080   0.093835                0.000
080           0.093835            1       True          1
Number of models trained: 8
Types of models trained:
{'StackerEnsembleModel_XT', 'StackerEnsembleModel_KNN', 'StackerEnsembleModel_RF',
'WeightedEnsembleModel'}
Bagging used: True  (with 8 folds)
Multi-layer stack-ensembling used: True  (with 3 levels)
Feature Metadata (Processed):
(raw dtype, special dtypes):
('category', [])             : 2 | ['season', 'weather']
('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
('int', [])                  : 4 | ['humidity', 'hour', 'day', 'month']
('int', ['bool'])            : 2 | ['holiday', 'workingday']
('int', ['datetime_as_int']) : 3 | ['datetime', 'datetime.year', 'datetime.dayofwee
k']
*** End of fit() summary ***
/opt/conda/lib/python3.10/site-packages/autogluon/core/utils/plots.py:169: UserWarni
ng: AutoGluon summary plots cannot be created because bokeh is not installed. To see
plots, please do: "pip install bokeh==2.0.1"
  warnings.warn('AutoGluon summary plots cannot be created because bokeh is not inst
alled. To see plots, please do: "pip install bokeh==2.0.1"')
```

Out[40]:

```
{'model_types': {'KNeighborsUnif_BAG_L1': 'StackerEnsembleModel_KNN',
  'KNeighborsDist_BAG_L1': 'StackerEnsembleModel_KNN',
  'RandomForestMSE_BAG_L1': 'StackerEnsembleModel_RF',
  'ExtraTreesMSE_BAG_L1': 'StackerEnsembleModel_XT',
  'WeightedEnsemble_L2': 'WeightedEnsembleModel',
  'RandomForestMSE_BAG_L2': 'StackerEnsembleModel_RF',
  'ExtraTreesMSE_BAG_L2': 'StackerEnsembleModel_XT',
  'WeightedEnsemble_L3': 'WeightedEnsembleModel'},
 'model_performance': {'KNeighborsUnif_BAG_L1': -101.54619908446061,
  'KNeighborsDist_BAG_L1': -84.12506123181602,
  'RandomForestMSE_BAG_L1': -38.40890681984868,
  'ExtraTreesMSE_BAG_L1': -38.50998417702855,
  'WeightedEnsemble_L2': -37.09403815618353,
  'RandomForestMSE_BAG_L2': -34.566123372046235,
  'ExtraTreesMSE_BAG_L2': -33.791171621883684,
  'WeightedEnsemble_L3': -33.788422815663765},
 'model_best': 'WeightedEnsemble_L3',
 'model_paths': {'KNeighborsUnif_BAG_L1': 'AutogluonModels/ag-20240629_005620/mode
ls/KNeighborsUnif_BAG_L1/',
  'KNeighborsDist_BAG_L1': 'AutogluonModels/ag-20240629_005620/models/KNeighborsDi
st_BAG_L1/',
  'RandomForestMSE_BAG_L1': 'AutogluonModels/ag-20240629_005620/models/RandomFores
tMSE_BAG_L1/',
  'ExtraTreesMSE_BAG_L1': 'AutogluonModels/ag-20240629_005620/models/ExtraTreesMSE
_BAG_L1/',
  'WeightedEnsemble_L2': 'AutogluonModels/ag-20240629_005620/models/WeightedEnsemb
le_L2/',
  'RandomForestMSE_BAG_L2': 'AutogluonModels/ag-20240629_005620/models/RandomFores
tMSE_BAG_L2/',
  'ExtraTreesMSE_BAG_L2': 'AutogluonModels/ag-20240629_005620/models/ExtraTreesMSE
_BAG_L2/',
  'WeightedEnsemble_L3': 'AutogluonModels/ag-20240629_005620/models/WeightedEnsemb
le_L3/'},
 'model_fit_times': {'KNeighborsUnif_BAG_L1': 0.09383487701416016,
  'KNeighborsDist_BAG_L1': 0.09255290031433105,
  'RandomForestMSE_BAG_L1': 15.430540323257446,
  'ExtraTreesMSE_BAG_L1': 7.392467021942139,
  'WeightedEnsemble_L2': 0.2395787239074707,
  'RandomForestMSE_BAG_L2': 27.623847484588623,
  'ExtraTreesMSE_BAG_L2': 9.688753128051758,
  'WeightedEnsemble_L3': 0.14890599250793457},
 'model_pred_times': {'KNeighborsUnif_BAG_L1': 7.987022399902344e-05,
  'KNeighborsDist_BAG_L1': 0.00010585784912109375,
  'RandomForestMSE_BAG_L1': 0.00017642974853515625,
  'ExtraTreesMSE_BAG_L1': 0.0001544952392578125,
  'WeightedEnsemble_L2': 0.0006968975067138672,
  'RandomForestMSE_BAG_L2': 0.00015997886657714844,
  'ExtraTreesMSE_BAG_L2': 0.00016307830810546875,
  'WeightedEnsemble_L3': 0.000705718994140625},
 'num_bag_folds': 8,
 'max_stack_level': 3,
 'model_hyperparams': {'KNeighborsUnif_BAG_L1': {'use_orig_features': True,
   'max_base_models': 25,
   'max_base_models_per_type': 5,
   'save_bag_folds': True,
   'use_child_oof': True},
```

```
 'KNeighborsDist_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'RandomForestMSE_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'ExtraTreesMSE_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'WeightedEnsemble_L2': {'use_orig_features': False,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True},
 'RandomForestMSE_BAG_L2': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'ExtraTreesMSE_BAG_L2': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True,
  'use_child_oof': True},
 'WeightedEnsemble_L3': {'use_orig_features': False,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True}},
'leaderboard':                      model   score_val  pred_time_val   fit_time  \
0     WeightedEnsemble_L3  -33.788423       0.001545  60.470902
1    ExtraTreesMSE_BAG_L2  -33.791172       0.000680  32.698148
2  RandomForestMSE_BAG_L2  -34.566123       0.000677  50.633243
3     WeightedEnsemble_L2  -37.094038       0.001134  23.155139
4  RandomForestMSE_BAG_L1  -38.408907       0.000176  15.430540
5    ExtraTreesMSE_BAG_L1  -38.509984       0.000154   7.392467
6   KNeighborsDist_BAG_L1  -84.125061       0.000106   0.092553
7   KNeighborsUnif_BAG_L1 -101.546199       0.000080   0.093835

   pred_time_val_marginal  fit_time_marginal  stack_level  can_infer  \
0                0.000706           0.148906            3       True
1                0.000163           9.688753            2       True
2                0.000160          27.623847            2       True
3                0.000697           0.239579            2       True
4                0.000176          15.430540            1       True
5                0.000154           7.392467            1       True
6                0.000106           0.092553            1       True
7                0.000080           0.093835            1       True

   fit_order
0          8
1          7
```

```
2          6
3          5
4          3
5          4
6          2
7          1  }
```

In [41]:
```
# Remember to set all negative values to zero
predictions_new_hpo = predictor_new_hpo.predict(test)
predictions_new_hpo[predictions_new_hpo<0]=0
predictions_new_hpo.describe()
```

Out[41]:
```
count    6493.000000
mean      167.899963
std       145.590118
min         2.241852
25%        52.784260
50%       134.288330
75%       237.351852
max       847.304626
Name: count, dtype: float64
```

In [42]:
```
# Same submitting predictions
submission["count"] = predictions_new_hpo
submission.to_csv("submission_new_hpo1.csv", index=False)
```

In [43]:
```
!kaggle competitions submit -c bike-sharing-demand -f submission_new_hpo1.csv -m "n
```

```
100%|████████████████████████████████████████| 188k/188k [00:00<00:00, 720kB/s]
Successfully submitted to Bike Sharing Demand
```

In [44]:
```
!kaggle competitions submissions -c bike-sharing-demand
```

```
fileName                    date                 description
status    publicScore  privateScore
--------------------------  -------------------  ---------------------------------
-------------------------------------------  --------  -----------  ------------
submission_new_hpo1.csv     2024-06-29 01:06:08  new features with hyperparameters
complete  0.6538       0.6538
submission_new_features.csv  2024-06-29 00:52:46  new features
complete  0.6538       0.6538
submission.csv              2024-06-29 00:47:15  first raw submission
complete  1.84007      1.84007
submission_new_hpo4.csv     2024-06-26 19:43:51  new features with hyperparameters
without presets time limit 1200 with 10 trials  complete  0.55202      0.55202
submission_new_hpo3.1.csv   2024-06-26 06:37:09  new features with hyperparameters
without presets and time limit 1200             complete  0.55016      0.55016
submission_new_hpo3.csv     2024-06-26 06:32:56  new features with hyperparameters
without presets and time limit of 1200          error
submission_new_hpo2.csv     2024-06-25 17:18:14  new features with hyperparameters
without presets                                 complete  1.83641      1.83641
submission_new_hpo.csv      2024-06-24 22:47:19  new features with hyperparameters
complete  0.6538       0.6538
submission_new_features.csv  2024-06-24 22:46:40  new features
complete  0.6538       0.6538
submission.csv              2024-06-24 22:46:05  first raw submission
complete  1.84007      1.84007
```

New Score of `0.6538`

In [45]:
```
hyperparameter_tuning = {'num_trials': 5, 'searcher':'auto','scheduler':'local'}
predictor_new_hpo = TabularPredictor(label='count',eval_metric='root_mean_squared_e
```

```
No path specified. Models will be saved in: "AutogluonModels/ag-20240629_010842/"
Warning: hyperparameter tuning is currently experimental and may cause the process t
o hang.
Beginning AutoGluon training ... Time limit = 600s
AutoGluon will save models to "AutogluonModels/ag-20240629_010842/"
AutoGluon Version:  0.8.3
Python Version:     3.10.14
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Fri May 31 18:15:42 UTC 2024
Disk Space Avail:   1.70 GB / 5.36 GB (31.7%)
        WARNING: Available disk space is low and there is a risk that AutoGluon will
run out of disk during fit, causing an exception.
        We recommend a minimum available disk space of 10 GB, and large datasets may
require more.
Train Data Rows:    10886
Train Data Columns: 12
Label Column: count
Preprocessing data ...
AutoGluon infers your prediction problem is: 'regression' (because dtype of label-co
lumn == int and many unique label-values observed).
        Label info (max, min, mean, stddev): (977, 1, 191.57413, 181.14445)
        If 'regression' is not the correct problem_type, please manually specify the
problem_type parameter during predictor init (You may specify problem_type as one o
f: ['binary', 'multiclass', 'regression'])
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
        Available Memory:                    1873.62 MB
        Train Data (Original)  Memory Usage: 0.89 MB (0.0% of available memory)
        Inferring data type of each feature based on column values. Set feature_meta
data_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator...
                        Note: Converting 2 features to boolean dtype as they only co
ntain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator...
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator...
                Fitting CategoryFeatureGenerator...
                        Fitting CategoryMemoryMinimizeFeatureGenerator...
                Fitting DatetimeFeatureGenerator...
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator...
        Stage 5 Generators:
                Fitting DropDuplicatesFeatureGenerator...
        Types of features in original data (raw dtype, special dtypes):
                ('category', []) : 2 | ['season', 'weather']
                ('datetime', []) : 1 | ['datetime']
                ('float', [])    : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])      : 6 | ['holiday', 'workingday', 'humidity', 'hour',
'day', ...]
        Types of features in processed data (raw dtype, special dtypes):
                ('category', [])             : 2 | ['season', 'weather']
                ('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])                  : 4 | ['humidity', 'hour', 'day', 'mont
```

```
h']
                ('int', ['bool'])            : 2 | ['holiday', 'workingday']
                ('int', ['datetime_as_int']) : 3 | ['datetime', 'datetime.year', 'da
tetime.dayofweek']
        1.2s = Fit runtime
        12 features in original data used to generate 14 features in processed data.
        Train Data (Processed) Memory Usage: 0.92 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 1.22s ...
AutoGluon will gauge predictive performance using evaluation metric: 'root_mean_squa
red_error'
        This metric's sign has been flipped to adhere to being higher_is_better. The
metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
Automatically generating train/validation split with holdout_frac=0.2, Train Rows: 8
708, Val Rows: 2178
User-specified model hyperparameters to be fit:
{
        'NN_TORCH': {},
        'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {}, 'GBMLar
ge'],
        'CAT': {},
        'XGB': {},
        'FASTAI': {},
        'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}}, {'weight
s': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
Fitting 11 L1 models ...
Hyperparameter tuning model: KNeighborsUnif ... Tuning model for up to 48.99s of the
598.78s of remaining time.
        No hyperparameter search space specified for KNeighborsUnif. Skipping HPO. W
ill train one model based on the provided hyperparameters.
Fitted model: KNeighborsUnif ...
        -112.7699        = Validation score   (-root_mean_squared_error)
        0.01s    = Training   runtime
        0.04s    = Validation runtime
Hyperparameter tuning model: KNeighborsDist ... Tuning model for up to 48.99s of the
598.7s of remaining time.
        No hyperparameter search space specified for KNeighborsDist. Skipping HPO. W
ill train one model based on the provided hyperparameters.
Fitted model: KNeighborsDist ...
        -94.4881         = Validation score   (-root_mean_squared_error)
        0.01s    = Training   runtime
        0.05s    = Validation runtime
Hyperparameter tuning model: LightGBMXT ... Tuning model for up to 48.99s of the 59
8.62s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
[1000]  valid_set's rmse: 38.9452
[2000]  valid_set's rmse: 37.364
[3000]  valid_set's rmse: 36.9659
[4000]  valid_set's rmse: 36.8379
[1000]  valid_set's rmse: 39.8959
[2000]  valid_set's rmse: 39.0178
[1000]  valid_set's rmse: 39.9303
[2000]  valid_set's rmse: 37.8254
[3000]  valid_set's rmse: 37.3539
[4000]  valid_set's rmse: 37.2214
[5000]  valid_set's rmse: 37.1468
[6000]  valid_set's rmse: 37.1929
[1000]  valid_set's rmse: 72.9677
[2000]  valid_set's rmse: 56.5467
[3000]  valid_set's rmse: 49.794
[4000]  valid_set's rmse: 45.5941
[5000]  valid_set's rmse: 43.0338
        Ran out of time, early stopping on iteration 5952. Best iteration is:
        [5952]  valid_set's rmse: 41.4911
        Stopping HPO to satisfy time limit...
Fitted model: LightGBMXT/T1 ...
        -36.834  = Validation score   (-root_mean_squared_error)
        6.94s    = Training   runtime
        1.05s    = Validation runtime
Fitted model: LightGBMXT/T2 ...
        -38.9713         = Validation score   (-root_mean_squared_error)
        6.37s    = Training   runtime
        0.9s     = Validation runtime
Fitted model: LightGBMXT/T3 ...
        -37.1458         = Validation score   (-root_mean_squared_error)
        12.52s   = Training   runtime
        2.19s    = Validation runtime
Fitted model: LightGBMXT/T4 ...
        -41.4911         = Validation score   (-root_mean_squared_error)
        13.68s   = Training   runtime
        3.34s    = Validation runtime
Hyperparameter tuning model: LightGBM ... Tuning model for up to 48.99s of the 544.7
4s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
[1000]  valid_set's rmse: 36.7319
[1000]  valid_set's rmse: 35.8159
[1000]  valid_set's rmse: 36.3022
[1000]  valid_set's rmse: 37.5457
[2000]  valid_set's rmse: 36.2032
[3000]  valid_set's rmse: 35.9107
[4000]  valid_set's rmse: 35.7999
[5000]  valid_set's rmse: 35.7535
[6000]  valid_set's rmse: 35.7726
```

```
Fitted model: LightGBM/T1 ...
        -36.5891         = Validation score   (-root_mean_squared_error)
        2.42s    = Training   runtime
        0.4s     = Validation runtime
Fitted model: LightGBM/T2 ...
        -35.7653         = Validation score   (-root_mean_squared_error)
        2.58s    = Training   runtime
        0.22s    = Validation runtime
Fitted model: LightGBM/T3 ...
        -36.1582         = Validation score   (-root_mean_squared_error)
        2.42s    = Training   runtime
        0.31s    = Validation runtime
Fitted model: LightGBM/T4 ...
        -35.7474         = Validation score   (-root_mean_squared_error)
        14.15s   = Training   runtime
        1.99s    = Validation runtime
Fitted model: LightGBM/T5 ...
        -36.4931         = Validation score   (-root_mean_squared_error)
        1.59s    = Training   runtime
        0.12s    = Validation runtime
Hyperparameter tuning model: RandomForestMSE ... Tuning model for up to 48.99s of th
e 515.06s of remaining time.
        No hyperparameter search space specified for RandomForestMSE. Skipping HPO.
Will train one model based on the provided hyperparameters.
Fitted model: RandomForestMSE ...
        -40.0061         = Validation score   (-root_mean_squared_error)
        11.5s    = Training   runtime
        0.52s    = Validation runtime
Hyperparameter tuning model: CatBoost ... Tuning model for up to 48.99s of the 502.5
9s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
        Ran out of time, early stopping on iteration 4762.
        Stopping HPO to satisfy time limit...
Fitted model: CatBoost/T1 ...
        -36.5314        = Validation score   (-root_mean_squared_error)
        44.15s   = Training   runtime
        0.02s    = Validation runtime
Hyperparameter tuning model: ExtraTreesMSE ... Tuning model for up to 48.99s of the
458.34s of remaining time.
        No hyperparameter search space specified for ExtraTreesMSE. Skipping HPO. Wi
ll train one model based on the provided hyperparameters.
Fitted model: ExtraTreesMSE ...
        -39.5895        = Validation score   (-root_mean_squared_error)
        5.3s     = Training   runtime
        0.6s     = Validation runtime
Hyperparameter tuning model: NeuralNetFastAI ... Tuning model for up to 48.99s of th
e 451.71s of remaining time.
Warning: Exception caused NeuralNetFastAI to fail during hyperparameter tuning... Sk
ipping this model.
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 2018, in _train_single_full
    hpo_models, hpo_results = model.hyperparameter_tune(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1383, in hyperparameter_tune
    return self._hyperparameter_tune(hpo_executor=hpo_executor, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1397, in _hyperparameter_tune
    hpo_executor.validate_search_space(search_space, self.name)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/hpo/executors.py", li
ne 346, in validate_search_space
    from ray.tune.search.sample import Domain
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/__init__.py", line 2, in <m
odule>
    from ray.tune.tune import run_experiments, run
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/tune.py", line 12, in <modu
le>
    from ray.air import CheckpointConfig
  File "/opt/conda/lib/python3.10/site-packages/ray/air/__init__.py", line 1, in <mo
dule>
    from ray.air.checkpoint import Checkpoint
  File "/opt/conda/lib/python3.10/site-packages/ray/air/checkpoint.py", line 22, in
<module>
    from ray.air._internal.remote_storage import (
  File "/opt/conda/lib/python3.10/site-packages/ray/air/_internal/remote_storage.p
y", line 4, in <module>
    from pkg_resources import packaging
ImportError: cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/pyt
hon3.10/site-packages/pkg_resources/__init__.py)
cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/python3.10/site-
packages/pkg_resources/__init__.py)
Hyperparameter tuning model: XGBoost ... Tuning model for up to 48.99s of the 451.69
s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
Fitted model: XGBoost/T1 ...
        -38.092  = Validation score   (-root_mean_squared_error)
        3.67s    = Training   runtime
        0.17s    = Validation runtime
Fitted model: XGBoost/T2 ...
        -37.4097         = Validation score   (-root_mean_squared_error)
        2.82s    = Training   runtime
        0.11s    = Validation runtime
Fitted model: XGBoost/T3 ...
        -37.2823         = Validation score   (-root_mean_squared_error)
        8.15s    = Training   runtime
        0.86s    = Validation runtime
Fitted model: XGBoost/T4 ...
        -41.3376         = Validation score   (-root_mean_squared_error)
        17.71s   = Training   runtime
        0.88s    = Validation runtime
Fitted model: XGBoost/T5 ...
        -41.4834         = Validation score   (-root_mean_squared_error)
        4.45s    = Training   runtime
        0.18s    = Validation runtime
Hyperparameter tuning model: NeuralNetTorch ... Tuning model for up to 48.99s of the
411.96s of remaining time.
Warning: Exception caused NeuralNetTorch to fail during hyperparameter tuning... Ski
pping this model.
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 2018, in _train_single_full
    hpo_models, hpo_results = model.hyperparameter_tune(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1383, in hyperparameter_tune
    return self._hyperparameter_tune(hpo_executor=hpo_executor, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1397, in _hyperparameter_tune
    hpo_executor.validate_search_space(search_space, self.name)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/hpo/executors.py", li
ne 346, in validate_search_space
    from ray.tune.search.sample import Domain
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/__init__.py", line 2, in <m
odule>
    from ray.tune.tune import run_experiments, run
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/tune.py", line 12, in <modu
le>
    from ray.air import CheckpointConfig
  File "/opt/conda/lib/python3.10/site-packages/ray/air/__init__.py", line 1, in <mo
dule>
    from ray.air.checkpoint import Checkpoint
  File "/opt/conda/lib/python3.10/site-packages/ray/air/checkpoint.py", line 22, in
<module>
    from ray.air._internal.remote_storage import (
  File "/opt/conda/lib/python3.10/site-packages/ray/air/_internal/remote_storage.p
y", line 4, in <module>
    from pkg_resources import packaging
ImportError: cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/pyt
hon3.10/site-packages/pkg_resources/__init__.py)
cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/python3.10/site-
packages/pkg_resources/__init__.py)
```

```
Fitting model: LightGBMLarge ... Training model for up to 48.99s of the 411.94s of r
emaining time.
        -35.0844         = Validation score   (-root_mean_squared_error)
        2.94s    = Training   runtime
        0.26s    = Validation runtime
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the 391.5s
of remaining time.
        -34.2075         = Validation score   (-root_mean_squared_error)
        0.84s    = Training   runtime
        0.0s     = Validation runtime
AutoGluon training complete, total runtime = 209.38s ... Best model: "WeightedEnsemb
le_L2"
TabularPredictor saved. To load, use: predictor = TabularPredictor.load("AutogluonMo
dels/ag-20240629_010842/")
```

In [46]:
```
predictor_new_hpo.fit_summary()
```

```
*** Summary of fit() ***
Estimated performance of each model:
                  model   score_val  pred_time_val   fit_time  pred_time_val_margina
l  fit_time_marginal  stack_level  can_infer  fit_order
0   WeightedEnsemble_L2  -34.207489       2.263919  82.162068               0.00069
0           0.843168            2       True         21
1         LightGBMLarge  -35.084407       0.263573   2.938447               0.26357
3           2.938447            1       True         20
2           LightGBM/T4  -35.747401       1.990670  14.149861               1.99067
0          14.149861            1       True         10
3           LightGBM/T2  -35.765268       0.221374   2.575164               0.22137
4           2.575164            1       True          8
4           LightGBM/T3  -36.158163       0.308155   2.420655               0.30815
5           2.420655            1       True          9
5           LightGBM/T5  -36.493051       0.121306   1.592378               0.12130
6           1.592378            1       True         11
6           CatBoost/T1  -36.531368       0.022509  44.153498               0.02250
9          44.153498            1       True         13
7           LightGBM/T1  -36.589119       0.397103   2.423986               0.39710
3           2.423986            1       True          7
8         LightGBMXT/T1  -36.833995       1.052897   6.941349               1.05289
7           6.941349            1       True          3
9         LightGBMXT/T3  -37.145831       2.188134  12.515064               2.18813
4          12.515064            1       True          5
10           XGBoost/T3  -37.282276       0.856408   8.148040               0.85640
8           8.148040            1       True         17
11           XGBoost/T2  -37.409687       0.112180   2.818005               0.11218
0           2.818005            1       True         16
12           XGBoost/T1  -38.092021       0.166291   3.670173               0.16629
1           3.670173            1       True         15
13        LightGBMXT/T2  -38.971321       0.902107   6.369536               0.90210
7           6.369536            1       True          4
14        ExtraTreesMSE  -39.589513       0.603049   5.303775               0.60304
9           5.303775            1       True         14
15      RandomForestMSE  -40.006063       0.524974  11.504908               0.52497
4          11.504908            1       True         12
16           XGBoost/T4  -41.337639       0.876129  17.712285               0.87612
9          17.712285            1       True         18
17           XGBoost/T5  -41.483395       0.180387   4.447352               0.18038
7           4.447352            1       True         19
18        LightGBMXT/T4  -41.491107       3.335140  13.678113               3.33514
0          13.678113            1       True          6
19       KNeighborsDist  -94.488129       0.046515   0.013943               0.04651
5           0.013943            1       True          2
20       KNeighborsUnif -112.769894       0.044655   0.014467               0.04465
5           0.014467            1       True          1
Number of models trained: 21
Types of models trained:
{'LGBModel', 'XGBoostModel', 'CatBoostModel', 'KNNModel', 'WeightedEnsembleModel',
'XTModel', 'RFModel'}
Bagging used: False
Multi-layer stack-ensembling used: False
Feature Metadata (Processed):
(raw dtype, special dtypes):
('category', [])            : 2 | ['season', 'weather']
('float', [])               : 3 | ['temp', 'atemp', 'windspeed']
```

```
('int', [])                  : 4 | ['humidity', 'hour', 'day', 'month']
('int', ['bool'])            : 2 | ['holiday', 'workingday']
('int', ['datetime_as_int']) : 3 | ['datetime', 'datetime.year', 'datetime.dayofwee
k']
*** End of fit() summary ***
```

```
/opt/conda/lib/python3.10/site-packages/autogluon/core/utils/plots.py:169: UserWarni
ng: AutoGluon summary plots cannot be created because bokeh is not installed. To see
plots, please do: "pip install bokeh==2.0.1"
  warnings.warn('AutoGluon summary plots cannot be created because bokeh is not inst
alled. To see plots, please do: "pip install bokeh==2.0.1"')
```

Out[46]:

```
{'model_types': {'KNeighborsUnif': 'KNNModel',
  'KNeighborsDist': 'KNNModel',
  'LightGBMXT/T1': 'LGBModel',
  'LightGBMXT/T2': 'LGBModel',
  'LightGBMXT/T3': 'LGBModel',
  'LightGBMXT/T4': 'LGBModel',
  'LightGBM/T1': 'LGBModel',
  'LightGBM/T2': 'LGBModel',
  'LightGBM/T3': 'LGBModel',
  'LightGBM/T4': 'LGBModel',
  'LightGBM/T5': 'LGBModel',
  'RandomForestMSE': 'RFModel',
  'CatBoost/T1': 'CatBoostModel',
  'ExtraTreesMSE': 'XTModel',
  'XGBoost/T1': 'XGBoostModel',
  'XGBoost/T2': 'XGBoostModel',
  'XGBoost/T3': 'XGBoostModel',
  'XGBoost/T4': 'XGBoostModel',
  'XGBoost/T5': 'XGBoostModel',
  'LightGBMLarge': 'LGBModel',
  'WeightedEnsemble_L2': 'WeightedEnsembleModel'},
 'model_performance': {'KNeighborsUnif': -112.76989371124893,
  'KNeighborsDist': -94.48812854475563,
  'LightGBMXT/T1': -36.83399474584801,
  'LightGBMXT/T2': -38.97132067022775,
  'LightGBMXT/T3': -37.145830994027925,
  'LightGBMXT/T4': -41.49110709304629,
  'LightGBM/T1': -36.58911918516296,
  'LightGBM/T2': -35.76526801995583,
  'LightGBM/T3': -36.15816307842204,
  'LightGBM/T4': -35.74740145763318,
  'LightGBM/T5': -36.493050503047705,
  'RandomForestMSE': -40.00606251680132,
  'CatBoost/T1': -36.531367589140864,
  'ExtraTreesMSE': -39.58951319045792,
  'XGBoost/T1': -38.09202133426703,
  'XGBoost/T2': -37.409687451082696,
  'XGBoost/T3': -37.282275566366096,
  'XGBoost/T4': -41.337639480265665,
  'XGBoost/T5': -41.48339491566752,
  'LightGBMLarge': -35.08440731837606,
  'WeightedEnsemble_L2': -34.20748862341364},
 'model_best': 'WeightedEnsemble_L2',
 'model_paths': {'KNeighborsUnif': 'AutogluonModels/ag-20240629_010842/models/KNei
ghborsUnif/',
  'KNeighborsDist': 'AutogluonModels/ag-20240629_010842/models/KNeighborsDist/',
  'LightGBMXT/T1': 'AutogluonModels/ag-20240629_010842/models/LightGBMXT/T1/',
  'LightGBMXT/T2': 'AutogluonModels/ag-20240629_010842/models/LightGBMXT/T2/',
  'LightGBMXT/T3': 'AutogluonModels/ag-20240629_010842/models/LightGBMXT/T3/',
  'LightGBMXT/T4': 'AutogluonModels/ag-20240629_010842/models/LightGBMXT/T4/',
  'LightGBM/T1': 'AutogluonModels/ag-20240629_010842/models/LightGBM/T1/',
  'LightGBM/T2': 'AutogluonModels/ag-20240629_010842/models/LightGBM/T2/',
  'LightGBM/T3': 'AutogluonModels/ag-20240629_010842/models/LightGBM/T3/',
  'LightGBM/T4': 'AutogluonModels/ag-20240629_010842/models/LightGBM/T4/',
  'LightGBM/T5': 'AutogluonModels/ag-20240629_010842/models/LightGBM/T5/',
  'RandomForestMSE': 'AutogluonModels/ag-20240629_010842/models/RandomForestMSE/',
```

```
  'CatBoost/T1': 'AutogluonModels/ag-20240629_010842/models/CatBoost/T1/',
  'ExtraTreesMSE': 'AutogluonModels/ag-20240629_010842/models/ExtraTreesMSE/',
  'XGBoost/T1': 'AutogluonModels/ag-20240629_010842/models/XGBoost/T1/',
  'XGBoost/T2': 'AutogluonModels/ag-20240629_010842/models/XGBoost/T2/',
  'XGBoost/T3': 'AutogluonModels/ag-20240629_010842/models/XGBoost/T3/',
  'XGBoost/T4': 'AutogluonModels/ag-20240629_010842/models/XGBoost/T4/',
  'XGBoost/T5': 'AutogluonModels/ag-20240629_010842/models/XGBoost/T5/',
  'LightGBMLarge': 'AutogluonModels/ag-20240629_010842/models/LightGBMLarge/',
  'WeightedEnsemble_L2': 'AutogluonModels/ag-20240629_010842/models/WeightedEnsemb
le_L2/'},
 'model_fit_times': {'KNeighborsUnif': 0.014467239379882812,
  'KNeighborsDist': 0.013942956924438477,
  'LightGBMXT/T1': 6.941349029541016,
  'LightGBMXT/T2': 6.369536399841309,
  'LightGBMXT/T3': 12.515063762664795,
  'LightGBMXT/T4': 13.678112745285034,
  'LightGBM/T1': 2.4239859580993652,
  'LightGBM/T2': 2.5751640796661377,
  'LightGBM/T3': 2.4206552505493164,
  'LightGBM/T4': 14.149861335754395,
  'LightGBM/T5': 1.5923779010772705,
  'RandomForestMSE': 11.504908323287964,
  'CatBoost/T1': 44.15349793434143,
  'ExtraTreesMSE': 5.303775310516357,
  'XGBoost/T1': 3.670173406600952,
  'XGBoost/T2': 2.818005323410034,
  'XGBoost/T3': 8.14803957939148,
  'XGBoost/T4': 17.712285041809082,
  'XGBoost/T5': 4.447351932525635,
  'LightGBMLarge': 2.938446521759033,
  'WeightedEnsemble_L2': 0.8431675434112549},
 'model_pred_times': {'KNeighborsUnif': 0.04465532302856445,
  'KNeighborsDist': 0.04651522636413574,
  'LightGBMXT/T1': 1.0528972148895264,
  'LightGBMXT/T2': 0.9021074771881104,
  'LightGBMXT/T3': 2.1881344318389893,
  'LightGBMXT/T4': 3.3351402282714844,
  'LightGBM/T1': 0.39710283279418945,
  'LightGBM/T2': 0.2213735580444336,
  'LightGBM/T3': 0.3081550598144531,
  'LightGBM/T4': 1.9906699657440186,
  'LightGBM/T5': 0.12130594253540039,
  'RandomForestMSE': 0.5249736309051514,
  'CatBoost/T1': 0.022509336471557617,
  'ExtraTreesMSE': 0.6030490398406982,
  'XGBoost/T1': 0.1662905216217041,
  'XGBoost/T2': 0.11217951774597168,
  'XGBoost/T3': 0.8564081192016602,
  'XGBoost/T4': 0.876129150390625,
  'XGBoost/T5': 0.1803874969482422,
  'LightGBMLarge': 0.26357316970825195,
  'WeightedEnsemble_L2': 0.0006902217864990234},
 'num_bag_folds': 0,
 'max_stack_level': 2,
 'model_hyperparams': {'KNeighborsUnif': {'weights': 'uniform'},
  'KNeighborsDist': {'weights': 'distance'},
```

```
'LightGBMXT/T1': {'learning_rate': 0.05,
 'extra_trees': True,
 'feature_fraction': 1.0,
 'min_data_in_leaf': 20,
 'num_leaves': 31},
'LightGBMXT/T2': {'learning_rate': 0.06994332504138304,
 'extra_trees': True,
 'feature_fraction': 0.8872033759818312,
 'min_data_in_leaf': 5,
 'num_leaves': 83},
'LightGBMXT/T3': {'learning_rate': 0.04988344687833528,
 'extra_trees': True,
 'feature_fraction': 0.9618129346960314,
 'min_data_in_leaf': 52,
 'num_leaves': 52},
'LightGBMXT/T4': {'learning_rate': 0.006163502781172818,
 'extra_trees': True,
 'feature_fraction': 0.824383651636118,
 'min_data_in_leaf': 14,
 'num_leaves': 74},
'LightGBM/T1': {'learning_rate': 0.05,
 'feature_fraction': 1.0,
 'min_data_in_leaf': 20,
 'num_leaves': 31},
'LightGBM/T2': {'learning_rate': 0.06994332504138304,
 'feature_fraction': 0.8872033759818312,
 'min_data_in_leaf': 5,
 'num_leaves': 83},
'LightGBM/T3': {'learning_rate': 0.04988344687833528,
 'feature_fraction': 0.9618129346960314,
 'min_data_in_leaf': 52,
 'num_leaves': 52},
'LightGBM/T4': {'learning_rate': 0.006163502781172818,
 'feature_fraction': 0.824383651636118,
 'min_data_in_leaf': 14,
 'num_leaves': 74},
'LightGBM/T5': {'learning_rate': 0.10002602971711909,
 'feature_fraction': 0.8694162793303375,
 'min_data_in_leaf': 48,
 'num_leaves': 53},
'RandomForestMSE': {'n_estimators': 300,
 'max_leaf_nodes': 15000,
 'n_jobs': -1,
 'random_state': 0,
 'bootstrap': True,
 'criterion': 'squared_error'},
'CatBoost/T1': {'iterations': 10000,
 'learning_rate': 0.05,
 'random_seed': 0,
 'allow_writing_files': False,
 'eval_metric': 'RMSE',
 'depth': 6,
 'l2_leaf_reg': 3},
'ExtraTreesMSE': {'n_estimators': 300,
 'max_leaf_nodes': 15000,
 'n_jobs': -1,
```

```
 'random_state': 0,
 'bootstrap': True,
 'criterion': 'squared_error'},
'XGBoost/T1': {'n_estimators': 10000,
 'learning_rate': 0.1,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 6,
 'min_child_weight': 1,
 'colsample_bytree': 1.0},
'XGBoost/T2': {'n_estimators': 10000,
 'learning_rate': 0.06994332504138304,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 6,
 'min_child_weight': 4,
 'colsample_bytree': 0.7744067519636624},
'XGBoost/T3': {'n_estimators': 10000,
 'learning_rate': 0.023861097124304623,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 8,
 'min_child_weight': 3,
 'colsample_bytree': 0.7724415914984484},
'XGBoost/T4': {'n_estimators': 10000,
 'learning_rate': 0.13416642577896964,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 3,
 'min_child_weight': 5,
 'colsample_bytree': 0.7187936056313462},
'XGBoost/T5': {'n_estimators': 10000,
 'learning_rate': 0.09276005809908329,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 10,
 'min_child_weight': 1,
 'colsample_bytree': 0.6917207594128889},
'LightGBMLarge': {'learning_rate': 0.03,
 'num_leaves': 128,
 'feature_fraction': 0.9,
 'min_data_in_leaf': 5},
'WeightedEnsemble_L2': {'use_orig_features': False,
 'max_base_models': 25,
 'max_base_models_per_type': 5,
 'save_bag_folds': True}},
```

'leaderboard':

	model	score_val	pred_time_val	fit_time
0	WeightedEnsemble_L2	-34.207489	2.263919	82.162068
1	LightGBMLarge	-35.084407	0.263573	2.938447
2	LightGBM/T4	-35.747401	1.990670	14.149861
3	LightGBM/T2	-35.765268	0.221374	2.575164
4	LightGBM/T3	-36.158163	0.308155	2.420655
5	LightGBM/T5	-36.493051	0.121306	1.592378
6	CatBoost/T1	-36.531368	0.022509	44.153498
7	LightGBM/T1	-36.589119	0.397103	2.423986
8	LightGBMXT/T1	-36.833995	1.052897	6.941349
9	LightGBMXT/T3	-37.145831	2.188134	12.515064
10	XGBoost/T3	-37.282276	0.856408	8.148040
11	XGBoost/T2	-37.409687	0.112180	2.818005
12	XGBoost/T1	-38.092021	0.166291	3.670173
13	LightGBMXT/T2	-38.971321	0.902107	6.369536
14	ExtraTreesMSE	-39.589513	0.603049	5.303775
15	RandomForestMSE	-40.006063	0.524974	11.504908
16	XGBoost/T4	-41.337639	0.876129	17.712285
17	XGBoost/T5	-41.483395	0.180387	4.447352
18	LightGBMXT/T4	-41.491107	3.335140	13.678113
19	KNeighborsDist	-94.488129	0.046515	0.013943
20	KNeighborsUnif	-112.769894	0.044655	0.014467

	pred_time_val_marginal	fit_time_marginal	stack_level	can_infer
0	0.000690	0.843168	2	True
1	0.263573	2.938447	1	True
2	1.990670	14.149861	1	True
3	0.221374	2.575164	1	True
4	0.308155	2.420655	1	True
5	0.121306	1.592378	1	True
6	0.022509	44.153498	1	True
7	0.397103	2.423986	1	True
8	1.052897	6.941349	1	True
9	2.188134	12.515064	1	True
10	0.856408	8.148040	1	True
11	0.112180	2.818005	1	True
12	0.166291	3.670173	1	True
13	0.902107	6.369536	1	True
14	0.603049	5.303775	1	True
15	0.524974	11.504908	1	True
16	0.876129	17.712285	1	True
17	0.180387	4.447352	1	True
18	3.335140	13.678113	1	True
19	0.046515	0.013943	1	True
20	0.044655	0.014467	1	True

	fit_order
0	21
1	20
2	10
3	8
4	9
5	11
6	13
7	7
8	3

```
 9           5
 10         17
 11         16
 12         15
 13          4
 14         14
 15         12
 16         18
 17         19
 18          6
 19          2
 20          1  }
```

In [47]:
```
predictions_new_hpo = predictor_new_hpo.predict(test)
predictions_new_hpo[predictions_new_hpo<0]=0
predictions_new_hpo.describe()
```

Out[47]:
```
count    6493.000000
mean      192.124130
std       169.649185
min         0.000000
25%        50.174652
50%       152.320145
75%       281.572449
max       882.208252
Name: count, dtype: float64
```

In [48]:
```
submission["count"] = predictions_new_hpo
submission.to_csv("submission_new_hpo2.csv", index=False)
```

In [49]:
```
!kaggle competitions submit -c bike-sharing-demand -f submission_new_hpo2.csv -m "n
```

```
100%|████████████████████████████████████████| 188k/188k [00:00<00:00, 730kB/s]
Successfully submitted to Bike Sharing Demand
```

In [50]:
```
!kaggle competitions submissions -c bike-sharing-demand
```

```
fileName                    date                 description
status    publicScore  privateScore
--------------------------  -------------------  ---------------------------------
-----------------------------------------------  --------  -----------  ------------
submission_new_hpo2.csv     2024-06-29 01:17:56  new features with hyperparameters
without presets                                  complete  0.54719      0.54719
submission_new_hpo1.csv     2024-06-29 01:06:08  new features with hyperparameters
complete  0.6538       0.6538
submission_new_features.csv  2024-06-29 00:52:46  new features
complete  0.6538       0.6538
submission.csv              2024-06-29 00:47:15  first raw submission
complete  1.84007      1.84007
submission_new_hpo4.csv     2024-06-26 19:43:51  new features with hyperparameters
without presets time limit 1200 with 10 trials  complete  0.55202      0.55202
submission_new_hpo3.1.csv   2024-06-26 06:37:09  new features with hyperparameters
without presets and time limit 1200             complete  0.55016      0.55016
submission_new_hpo3.csv     2024-06-26 06:32:56  new features with hyperparameters
without presets and time limit of 1200          error
submission_new_hpo2.csv     2024-06-25 17:18:14  new features with hyperparameters
without presets                                  complete  1.83641      1.83641
submission_new_hpo.csv      2024-06-24 22:47:19  new features with hyperparameters
complete  0.6538       0.6538
submission_new_features.csv  2024-06-24 22:46:40  new features
complete  0.6538       0.6538
submission.csv              2024-06-24 22:46:05  first raw submission
complete  1.84007      1.84007
```

In [51]:
```
hyperparameter_tuning = {'num_trials': 5, 'searcher':'auto','scheduler':'local'}
predictor_new_hpo = TabularPredictor(label='count',eval_metric='root_mean_squared_e
```

```
No path specified. Models will be saved in: "AutogluonModels/ag-20240629_011948/"
Warning: hyperparameter tuning is currently experimental and may cause the process t
o hang.
Beginning AutoGluon training ... Time limit = 1200s
AutoGluon will save models to "AutogluonModels/ag-20240629_011948/"
AutoGluon Version:  0.8.3
Python Version:     3.10.14
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Fri May 31 18:15:42 UTC 2024
Disk Space Avail:   3.30 GB / 5.36 GB (61.7%)
        WARNING: Available disk space is low and there is a risk that AutoGluon will
run out of disk during fit, causing an exception.
        We recommend a minimum available disk space of 10 GB, and large datasets may
require more.
Train Data Rows:    10886
Train Data Columns: 12
Label Column: count
Preprocessing data ...
AutoGluon infers your prediction problem is: 'regression' (because dtype of label-co
lumn == int and many unique label-values observed).
        Label info (max, min, mean, stddev): (977, 1, 191.57413, 181.14445)
        If 'regression' is not the correct problem_type, please manually specify the
problem_type parameter during predictor init (You may specify problem_type as one o
f: ['binary', 'multiclass', 'regression'])
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
        Available Memory:                    1810.36 MB
        Train Data (Original)  Memory Usage: 0.89 MB (0.0% of available memory)
        Inferring data type of each feature based on column values. Set feature_meta
data_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator...
                        Note: Converting 2 features to boolean dtype as they only co
ntain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator...
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator...
                Fitting CategoryFeatureGenerator...
                        Fitting CategoryMemoryMinimizeFeatureGenerator...
                Fitting DatetimeFeatureGenerator...
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator...
        Stage 5 Generators:
                Fitting DropDuplicatesFeatureGenerator...
        Types of features in original data (raw dtype, special dtypes):
                ('category', []) : 2 | ['season', 'weather']
                ('datetime', []) : 1 | ['datetime']
                ('float', [])    : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])      : 6 | ['holiday', 'workingday', 'humidity', 'hour',
'day', ...]
        Types of features in processed data (raw dtype, special dtypes):
                ('category', [])             : 2 | ['season', 'weather']
                ('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])                  : 4 | ['humidity', 'hour', 'day', 'mont
```

```
h']
                ('int', ['bool'])            : 2 | ['holiday', 'workingday']
                ('int', ['datetime_as_int']) : 3 | ['datetime', 'datetime.year', 'da
tetime.dayofweek']
        0.6s = Fit runtime
        12 features in original data used to generate 14 features in processed data.
        Train Data (Processed) Memory Usage: 0.92 MB (0.1% of available memory)
Data preprocessing and feature engineering runtime = 0.6s ...
AutoGluon will gauge predictive performance using evaluation metric: 'root_mean_squa
red_error'
        This metric's sign has been flipped to adhere to being higher_is_better. The
metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
Automatically generating train/validation split with holdout_frac=0.2, Train Rows: 8
708, Val Rows: 2178
User-specified model hyperparameters to be fit:
{
        'NN_TORCH': {},
        'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {}, 'GBMLar
ge'],
        'CAT': {},
        'XGB': {},
        'FASTAI': {},
        'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}}, {'weight
s': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
Fitting 11 L1 models ...
Hyperparameter tuning model: KNeighborsUnif ... Tuning model for up to 98.13s of the
1199.39s of remaining time.
        No hyperparameter search space specified for KNeighborsUnif. Skipping HPO. W
ill train one model based on the provided hyperparameters.
Fitted model: KNeighborsUnif ...
        -112.7699        = Validation score   (-root_mean_squared_error)
        0.01s    = Training   runtime
        0.03s    = Validation runtime
Hyperparameter tuning model: KNeighborsDist ... Tuning model for up to 98.13s of the
1199.33s of remaining time.
        No hyperparameter search space specified for KNeighborsDist. Skipping HPO. W
ill train one model based on the provided hyperparameters.
Fitted model: KNeighborsDist ...
        -94.4881         = Validation score   (-root_mean_squared_error)
        0.01s    = Training   runtime
        0.03s    = Validation runtime
Hyperparameter tuning model: LightGBMXT ... Tuning model for up to 98.13s of the 119
9.27s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
[1000]  valid_set's rmse: 38.9452
[2000]  valid_set's rmse: 37.364
[3000]  valid_set's rmse: 36.9659
[4000]  valid_set's rmse: 36.8379
[1000]  valid_set's rmse: 39.8959
[2000]  valid_set's rmse: 39.0178
[1000]  valid_set's rmse: 39.9303
[2000]  valid_set's rmse: 37.8254
[3000]  valid_set's rmse: 37.3539
[4000]  valid_set's rmse: 37.2214
[5000]  valid_set's rmse: 37.1468
[6000]  valid_set's rmse: 37.1929
[1000]  valid_set's rmse: 72.9677
[2000]  valid_set's rmse: 56.5467
[3000]  valid_set's rmse: 49.794
[4000]  valid_set's rmse: 45.5941
[5000]  valid_set's rmse: 43.0338
[6000]  valid_set's rmse: 41.412
[7000]  valid_set's rmse: 40.2941
[8000]  valid_set's rmse: 39.5108
[9000]  valid_set's rmse: 38.8903
[10000] valid_set's rmse: 38.4381
[1000]  valid_set's rmse: 38.6622
[2000]  valid_set's rmse: 37.8864
[3000]  valid_set's rmse: 37.8281
Fitted model: LightGBMXT/T1 ...
        -36.834  = Validation score   (-root_mean_squared_error)
        6.59s    = Training   runtime
        0.99s    = Validation runtime
Fitted model: LightGBMXT/T2 ...
        -38.9713         = Validation score   (-root_mean_squared_error)
        6.12s    = Training   runtime
        0.87s    = Validation runtime
Fitted model: LightGBMXT/T3 ...
        -37.1458         = Validation score   (-root_mean_squared_error)
        12.87s   = Training   runtime
        2.19s    = Validation runtime
Fitted model: LightGBMXT/T4 ...
        -38.4381         = Validation score   (-root_mean_squared_error)
        21.88s   = Training   runtime
        7.13s    = Validation runtime
Fitted model: LightGBMXT/T5 ...
        -37.7713         = Validation score   (-root_mean_squared_error)
        5.99s    = Training   runtime
        0.99s    = Validation runtime
Hyperparameter tuning model: LightGBM ... Tuning model for up to 98.13s of the 1123.
74s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
[1000]  valid_set's rmse: 36.7319
[1000]  valid_set's rmse: 35.8159
[1000]  valid_set's rmse: 36.3022
[1000]  valid_set's rmse: 37.5457
[2000]  valid_set's rmse: 36.2032
[3000]  valid_set's rmse: 35.9107
[4000]  valid_set's rmse: 35.7999
[5000]  valid_set's rmse: 35.7535
[6000]  valid_set's rmse: 35.7726
Fitted model: LightGBM/T1 ...
        -36.5891         = Validation score   (-root_mean_squared_error)
        2.39s    = Training   runtime
        0.35s    = Validation runtime
Fitted model: LightGBM/T2 ...
        -35.7653         = Validation score   (-root_mean_squared_error)
        2.23s    = Training   runtime
        0.18s    = Validation runtime
Fitted model: LightGBM/T3 ...
        -36.1582         = Validation score   (-root_mean_squared_error)
        2.2s     = Training   runtime
        0.3s     = Validation runtime
Fitted model: LightGBM/T4 ...
        -35.7474         = Validation score   (-root_mean_squared_error)
        13.88s   = Training   runtime
        1.78s    = Validation runtime
Fitted model: LightGBM/T5 ...
        -36.4931         = Validation score   (-root_mean_squared_error)
        1.64s    = Training   runtime
        0.09s    = Validation runtime
Hyperparameter tuning model: RandomForestMSE ... Tuning model for up to 98.13s of th
e 1095.22s of remaining time.
        No hyperparameter search space specified for RandomForestMSE. Skipping HPO.
Will train one model based on the provided hyperparameters.
Fitted model: RandomForestMSE ...
        -40.0061         = Validation score   (-root_mean_squared_error)
        11.84s   = Training   runtime
        0.54s    = Validation runtime
Hyperparameter tuning model: CatBoost ... Tuning model for up to 98.13s of the 1082.
37s of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
        Ran out of time, early stopping on iteration 7888.
        Stopping HPO to satisfy time limit...
Fitted model: CatBoost/T1 ...
        -36.4757         = Validation score   (-root_mean_squared_error)
        93.25s   = Training   runtime
        0.03s    = Validation runtime
Hyperparameter tuning model: ExtraTreesMSE ... Tuning model for up to 98.13s of the
988.98s of remaining time.
        No hyperparameter search space specified for ExtraTreesMSE. Skipping HPO. Wi
ll train one model based on the provided hyperparameters.
Fitted model: ExtraTreesMSE ...
        -39.5895         = Validation score   (-root_mean_squared_error)
        5.39s    = Training   runtime
        0.53s    = Validation runtime
Hyperparameter tuning model: NeuralNetFastAI ... Tuning model for up to 98.13s of th
e 982.52s of remaining time.
Warning: Exception caused NeuralNetFastAI to fail during hyperparameter tuning... Sk
ipping this model.
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 2018, in _train_single_full
    hpo_models, hpo_results = model.hyperparameter_tune(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1383, in hyperparameter_tune
    return self._hyperparameter_tune(hpo_executor=hpo_executor, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1397, in _hyperparameter_tune
    hpo_executor.validate_search_space(search_space, self.name)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/hpo/executors.py", li
ne 346, in validate_search_space
    from ray.tune.search.sample import Domain
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/__init__.py", line 2, in <m
odule>
    from ray.tune.tune import run_experiments, run
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/tune.py", line 12, in <modu
le>
    from ray.air import CheckpointConfig
  File "/opt/conda/lib/python3.10/site-packages/ray/air/__init__.py", line 1, in <mo
dule>
    from ray.air.checkpoint import Checkpoint
  File "/opt/conda/lib/python3.10/site-packages/ray/air/checkpoint.py", line 22, in
<module>
    from ray.air._internal.remote_storage import (
  File "/opt/conda/lib/python3.10/site-packages/ray/air/_internal/remote_storage.p
y", line 4, in <module>
    from pkg_resources import packaging
ImportError: cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/pyt
hon3.10/site-packages/pkg_resources/__init__.py)
cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/python3.10/site-
packages/pkg_resources/__init__.py)
Hyperparameter tuning model: XGBoost ... Tuning model for up to 98.13s of the 982.5s
of remaining time.
  0%|          | 0/5 [00:00<?, ?it/s]
```

```
Fitted model: XGBoost/T1 ...
        -38.092  = Validation score   (-root_mean_squared_error)
        3.47s    = Training   runtime
        0.16s    = Validation runtime
Fitted model: XGBoost/T2 ...
        -37.4097         = Validation score   (-root_mean_squared_error)
        2.96s    = Training   runtime
        0.13s    = Validation runtime
Fitted model: XGBoost/T3 ...
        -37.2823         = Validation score   (-root_mean_squared_error)
        8.46s    = Training   runtime
        0.94s    = Validation runtime
Fitted model: XGBoost/T4 ...
        -41.3376         = Validation score   (-root_mean_squared_error)
        17.15s   = Training   runtime
        0.87s    = Validation runtime
Fitted model: XGBoost/T5 ...
        -41.4834         = Validation score   (-root_mean_squared_error)
        5.32s    = Training   runtime
        0.21s    = Validation runtime
Hyperparameter tuning model: NeuralNetTorch ... Tuning model for up to 98.13s of the
942.06s of remaining time.
Warning: Exception caused NeuralNetTorch to fail during hyperparameter tuning... Ski
pping this model.
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 2018, in _train_single_full
    hpo_models, hpo_results = model.hyperparameter_tune(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1383, in hyperparameter_tune
    return self._hyperparameter_tune(hpo_executor=hpo_executor, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1397, in _hyperparameter_tune
    hpo_executor.validate_search_space(search_space, self.name)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/hpo/executors.py", li
ne 346, in validate_search_space
    from ray.tune.search.sample import Domain
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/__init__.py", line 2, in <m
odule>
    from ray.tune.tune import run_experiments, run
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/tune.py", line 12, in <modu
le>
    from ray.air import CheckpointConfig
  File "/opt/conda/lib/python3.10/site-packages/ray/air/__init__.py", line 1, in <mo
dule>
    from ray.air.checkpoint import Checkpoint
  File "/opt/conda/lib/python3.10/site-packages/ray/air/checkpoint.py", line 22, in
<module>
    from ray.air._internal.remote_storage import (
  File "/opt/conda/lib/python3.10/site-packages/ray/air/_internal/remote_storage.p
y", line 4, in <module>
    from pkg_resources import packaging
ImportError: cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/pyt
hon3.10/site-packages/pkg_resources/__init__.py)
cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/python3.10/site-
packages/pkg_resources/__init__.py)
```

```
Fitting model: LightGBMLarge ... Training model for up to 98.13s of the 942.03s of r
emaining time.
        -35.0844         = Validation score   (-root_mean_squared_error)
        3.04s    = Training   runtime
        0.23s    = Validation runtime
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the 914.33
s of remaining time.
        -34.1737         = Validation score   (-root_mean_squared_error)
        0.71s    = Training   runtime
        0.0s     = Validation runtime
AutoGluon training complete, total runtime = 286.56s ... Best model: "WeightedEnsemb
le_L2"
TabularPredictor saved. To load, use: predictor = TabularPredictor.load("AutogluonMo
dels/ag-20240629_011948/")
```

In [52]:
```
predictor_new_hpo.fit_summary()
```

```
*** Summary of fit() ***
Estimated performance of each model:
                  model   score_val  pred_time_val    fit_time  pred_time_val_margin
al  fit_time_marginal  stack_level  can_infer  fit_order
0   WeightedEnsemble_L2  -34.173739       1.320474  113.280938               0.0013
29           0.712847            2       True         22
1         LightGBMLarge  -35.084407       0.225574    3.036791               0.2255
74           3.036791            1       True         21
2           LightGBM/T4  -35.747401       1.779139   13.879558               1.7791
39          13.879558            1       True         11
3           LightGBM/T2  -35.765268       0.182709    2.232391               0.1827
09           2.232391            1       True          9
4           LightGBM/T3  -36.158163       0.300105    2.197963               0.3001
05           2.197963            1       True         10
5           CatBoost/T1  -36.475744       0.033508   93.250664               0.0335
08          93.250664            1       True         14
6           LightGBM/T5  -36.493051       0.086692    1.641640               0.0866
92           1.641640            1       True         12
7           LightGBM/T1  -36.589119       0.346313    2.389995               0.3463
13           2.389995            1       True          8
8         LightGBMXT/T1  -36.833995       0.991735    6.588263               0.9917
35           6.588263            1       True          3
9         LightGBMXT/T3  -37.145831       2.189530   12.870409               2.1895
30          12.870409            1       True          5
10           XGBoost/T3  -37.282276       0.937091    8.462617               0.9370
91           8.462617            1       True         18
11           XGBoost/T2  -37.409687       0.125140    2.959192               0.1251
40           2.959192            1       True         17
12        LightGBMXT/T5  -37.771316       0.988722    5.988844               0.9887
22           5.988844            1       True          7
13           XGBoost/T1  -38.092021       0.161852    3.465902               0.1618
52           3.465902            1       True         16
14        LightGBMXT/T4  -38.438123       7.133547   21.879312               7.1335
47          21.879312            1       True          6
15        LightGBMXT/T2  -38.971321       0.867336    6.116838               0.8673
36           6.116838            1       True          4
16        ExtraTreesMSE  -39.589513       0.531406    5.386761               0.5314
06           5.386761            1       True         15
17      RandomForestMSE  -40.006063       0.542553   11.838198               0.5425
53          11.838198            1       True         13
18           XGBoost/T4  -41.337639       0.872301   17.146307               0.8723
01          17.146307            1       True         19
19           XGBoost/T5  -41.483395       0.210183    5.317004               0.2101
83           5.317004            1       True         20
20       KNeighborsDist  -94.488129       0.034696    0.012085               0.0346
96           0.012085            1       True          2
21       KNeighborsUnif -112.769894       0.034931    0.012990               0.0349
31           0.012990            1       True          1
Number of models trained: 22
Types of models trained:
{'LGBModel', 'XGBoostModel', 'CatBoostModel', 'KNNModel', 'WeightedEnsembleModel',
'XTModel', 'RFModel'}
Bagging used: False
Multi-layer stack-ensembling used: False
Feature Metadata (Processed):
(raw dtype, special dtypes):
```

```
('category', [])            : 2 | ['season', 'weather']
('float', [])               : 3 | ['temp', 'atemp', 'windspeed']
('int', [])                 : 4 | ['humidity', 'hour', 'day', 'month']
('int', ['bool'])           : 2 | ['holiday', 'workingday']
('int', ['datetime_as_int']) : 3 | ['datetime', 'datetime.year', 'datetime.dayofwee
k']
*** End of fit() summary ***
```

```
/opt/conda/lib/python3.10/site-packages/autogluon/core/utils/plots.py:169: UserWarni
ng: AutoGluon summary plots cannot be created because bokeh is not installed. To see
plots, please do: "pip install bokeh==2.0.1"
  warnings.warn('AutoGluon summary plots cannot be created because bokeh is not inst
alled. To see plots, please do: "pip install bokeh==2.0.1"')
```

Out[52]:

```
{'model_types': {'KNeighborsUnif': 'KNNModel',
  'KNeighborsDist': 'KNNModel',
  'LightGBMXT/T1': 'LGBModel',
  'LightGBMXT/T2': 'LGBModel',
  'LightGBMXT/T3': 'LGBModel',
  'LightGBMXT/T4': 'LGBModel',
  'LightGBMXT/T5': 'LGBModel',
  'LightGBM/T1': 'LGBModel',
  'LightGBM/T2': 'LGBModel',
  'LightGBM/T3': 'LGBModel',
  'LightGBM/T4': 'LGBModel',
  'LightGBM/T5': 'LGBModel',
  'RandomForestMSE': 'RFModel',
  'CatBoost/T1': 'CatBoostModel',
  'ExtraTreesMSE': 'XTModel',
  'XGBoost/T1': 'XGBoostModel',
  'XGBoost/T2': 'XGBoostModel',
  'XGBoost/T3': 'XGBoostModel',
  'XGBoost/T4': 'XGBoostModel',
  'XGBoost/T5': 'XGBoostModel',
  'LightGBMLarge': 'LGBModel',
  'WeightedEnsemble_L2': 'WeightedEnsembleModel'},
 'model_performance': {'KNeighborsUnif': -112.76989371124893,
  'KNeighborsDist': -94.48812854475563,
  'LightGBMXT/T1': -36.83399474584801,
  'LightGBMXT/T2': -38.97132067022775,
  'LightGBMXT/T3': -37.145830994027925,
  'LightGBMXT/T4': -38.43812274400068,
  'LightGBMXT/T5': -37.77131643312281,
  'LightGBM/T1': -36.58911918516296,
  'LightGBM/T2': -35.76526801995583,
  'LightGBM/T3': -36.15816307842204,
  'LightGBM/T4': -35.74740145763318,
  'LightGBM/T5': -36.493050503047705,
  'RandomForestMSE': -40.00606251680132,
  'CatBoost/T1': -36.47574361222099,
  'ExtraTreesMSE': -39.58951319045792,
  'XGBoost/T1': -38.09202133426703,
  'XGBoost/T2': -37.409687451082696,
  'XGBoost/T3': -37.282275566366096,
  'XGBoost/T4': -41.337639480265665,
  'XGBoost/T5': -41.48339491566752,
  'LightGBMLarge': -35.08440731837606,
  'WeightedEnsemble_L2': -34.17373867694434},
 'model_best': 'WeightedEnsemble_L2',
 'model_paths': {'KNeighborsUnif': 'AutogluonModels/ag-20240629_011948/models/KNei
ghborsUnif/',
  'KNeighborsDist': 'AutogluonModels/ag-20240629_011948/models/KNeighborsDist/',
  'LightGBMXT/T1': 'AutogluonModels/ag-20240629_011948/models/LightGBMXT/T1/',
  'LightGBMXT/T2': 'AutogluonModels/ag-20240629_011948/models/LightGBMXT/T2/',
  'LightGBMXT/T3': 'AutogluonModels/ag-20240629_011948/models/LightGBMXT/T3/',
  'LightGBMXT/T4': 'AutogluonModels/ag-20240629_011948/models/LightGBMXT/T4/',
  'LightGBMXT/T5': 'AutogluonModels/ag-20240629_011948/models/LightGBMXT/T5/',
  'LightGBM/T1': 'AutogluonModels/ag-20240629_011948/models/LightGBM/T1/',
  'LightGBM/T2': 'AutogluonModels/ag-20240629_011948/models/LightGBM/T2/',
  'LightGBM/T3': 'AutogluonModels/ag-20240629_011948/models/LightGBM/T3/',
```

```
  'LightGBM/T4': 'AutogluonModels/ag-20240629_011948/models/LightGBM/T4/',
  'LightGBM/T5': 'AutogluonModels/ag-20240629_011948/models/LightGBM/T5/',
  'RandomForestMSE': 'AutogluonModels/ag-20240629_011948/models/RandomForestMSE/',
  'CatBoost/T1': 'AutogluonModels/ag-20240629_011948/models/CatBoost/T1/',
  'ExtraTreesMSE': 'AutogluonModels/ag-20240629_011948/models/ExtraTreesMSE/',
  'XGBoost/T1': 'AutogluonModels/ag-20240629_011948/models/XGBoost/T1/',
  'XGBoost/T2': 'AutogluonModels/ag-20240629_011948/models/XGBoost/T2/',
  'XGBoost/T3': 'AutogluonModels/ag-20240629_011948/models/XGBoost/T3/',
  'XGBoost/T4': 'AutogluonModels/ag-20240629_011948/models/XGBoost/T4/',
  'XGBoost/T5': 'AutogluonModels/ag-20240629_011948/models/XGBoost/T5/',
  'LightGBMLarge': 'AutogluonModels/ag-20240629_011948/models/LightGBMLarge/',
  'WeightedEnsemble_L2': 'AutogluonModels/ag-20240629_011948/models/WeightedEnsemb
le_L2/'},
 'model_fit_times': {'KNeighborsUnif': 0.012989997863769531,
  'KNeighborsDist': 0.012084722518920898,
  'LightGBMXT/T1': 6.588263273239136,
  'LightGBMXT/T2': 6.116837739944458,
  'LightGBMXT/T3': 12.870408773422241,
  'LightGBMXT/T4': 21.87931180000305,
  'LightGBMXT/T5': 5.988844394683838,
  'LightGBM/T1': 2.3899946212768555,
  'LightGBM/T2': 2.232390880584717,
  'LightGBM/T3': 2.197963237762451,
  'LightGBM/T4': 13.879557847976685,
  'LightGBM/T5': 1.6416401863098145,
  'RandomForestMSE': 11.838197708129883,
  'CatBoost/T1': 93.25066423416138,
  'ExtraTreesMSE': 5.38676118850708,
  'XGBoost/T1': 3.4659016132354736,
  'XGBoost/T2': 2.9591915607452393,
  'XGBoost/T3': 8.462616920471191,
  'XGBoost/T4': 17.146307229995728,
  'XGBoost/T5': 5.317004442214966,
  'LightGBMLarge': 3.0367908477783203,
  'WeightedEnsemble_L2': 0.7128467559814453},
 'model_pred_times': {'KNeighborsUnif': 0.03493142127990723,
  'KNeighborsDist': 0.03469586372375488,
  'LightGBMXT/T1': 0.9917354583740234,
  'LightGBMXT/T2': 0.8673357963562012,
  'LightGBMXT/T3': 2.189530372619629,
  'LightGBMXT/T4': 7.133547067642212,
  'LightGBMXT/T5': 0.9887220859527588,
  'LightGBM/T1': 0.3463127613067627,
  'LightGBM/T2': 0.1827085018157959,
  'LightGBM/T3': 0.30010509490966797,
  'LightGBM/T4': 1.7791388034820557,
  'LightGBM/T5': 0.08669209480285645,
  'RandomForestMSE': 0.5425529479980469,
  'CatBoost/T1': 0.0335078239440918,
  'ExtraTreesMSE': 0.5314061641693115,
  'XGBoost/T1': 0.16185212135314941,
  'XGBoost/T2': 0.12514019012451172,
  'XGBoost/T3': 0.9370908737182617,
  'XGBoost/T4': 0.8723006248474121,
  'XGBoost/T5': 0.21018314361572266,
  'LightGBMLarge': 0.22557425498962402,
```

```
 'WeightedEnsemble_L2': 0.0013294219970703125},
'num_bag_folds': 0,
'max_stack_level': 2,
'model_hyperparams': {'KNeighborsUnif': {'weights': 'uniform'},
 'KNeighborsDist': {'weights': 'distance'},
 'LightGBMXT/T1': {'learning_rate': 0.05,
  'extra_trees': True,
  'feature_fraction': 1.0,
  'min_data_in_leaf': 20,
  'num_leaves': 31},
 'LightGBMXT/T2': {'learning_rate': 0.06994332504138304,
  'extra_trees': True,
  'feature_fraction': 0.8872033759818312,
  'min_data_in_leaf': 5,
  'num_leaves': 83},
 'LightGBMXT/T3': {'learning_rate': 0.04988344687833528,
  'extra_trees': True,
  'feature_fraction': 0.9618129346960314,
  'min_data_in_leaf': 52,
  'num_leaves': 52},
 'LightGBMXT/T4': {'learning_rate': 0.006163502781172818,
  'extra_trees': True,
  'feature_fraction': 0.824383651636118,
  'min_data_in_leaf': 14,
  'num_leaves': 74},
 'LightGBMXT/T5': {'learning_rate': 0.10002602971711909,
  'extra_trees': True,
  'feature_fraction': 0.8694162793303375,
  'min_data_in_leaf': 48,
  'num_leaves': 53},
 'LightGBM/T1': {'learning_rate': 0.05,
  'feature_fraction': 1.0,
  'min_data_in_leaf': 20,
  'num_leaves': 31},
 'LightGBM/T2': {'learning_rate': 0.06994332504138304,
  'feature_fraction': 0.8872033759818312,
  'min_data_in_leaf': 5,
  'num_leaves': 83},
 'LightGBM/T3': {'learning_rate': 0.04988344687833528,
  'feature_fraction': 0.9618129346960314,
  'min_data_in_leaf': 52,
  'num_leaves': 52},
 'LightGBM/T4': {'learning_rate': 0.006163502781172818,
  'feature_fraction': 0.824383651636118,
  'min_data_in_leaf': 14,
  'num_leaves': 74},
 'LightGBM/T5': {'learning_rate': 0.10002602971711909,
  'feature_fraction': 0.8694162793303375,
  'min_data_in_leaf': 48,
  'num_leaves': 53},
 'RandomForestMSE': {'n_estimators': 300,
  'max_leaf_nodes': 15000,
  'n_jobs': -1,
  'random_state': 0,
  'bootstrap': True,
  'criterion': 'squared_error'},
```

```
 'CatBoost/T1': {'iterations': 10000,
  'learning_rate': 0.05,
  'random_seed': 0,
  'allow_writing_files': False,
  'eval_metric': 'RMSE',
  'depth': 6,
  'l2_leaf_reg': 3},
 'ExtraTreesMSE': {'n_estimators': 300,
  'max_leaf_nodes': 15000,
  'n_jobs': -1,
  'random_state': 0,
  'bootstrap': True,
  'criterion': 'squared_error'},
 'XGBoost/T1': {'n_estimators': 10000,
  'learning_rate': 0.1,
  'n_jobs': -1,
  'proc.max_category_levels': 100,
  'objective': 'reg:squarederror',
  'booster': 'gbtree',
  'max_depth': 6,
  'min_child_weight': 1,
  'colsample_bytree': 1.0},
 'XGBoost/T2': {'n_estimators': 10000,
  'learning_rate': 0.06994332504138304,
  'n_jobs': -1,
  'proc.max_category_levels': 100,
  'objective': 'reg:squarederror',
  'booster': 'gbtree',
  'max_depth': 6,
  'min_child_weight': 4,
  'colsample_bytree': 0.7744067519636624},
 'XGBoost/T3': {'n_estimators': 10000,
  'learning_rate': 0.023861097124304623,
  'n_jobs': -1,
  'proc.max_category_levels': 100,
  'objective': 'reg:squarederror',
  'booster': 'gbtree',
  'max_depth': 8,
  'min_child_weight': 3,
  'colsample_bytree': 0.7724415914984484},
 'XGBoost/T4': {'n_estimators': 10000,
  'learning_rate': 0.13416642577896964,
  'n_jobs': -1,
  'proc.max_category_levels': 100,
  'objective': 'reg:squarederror',
  'booster': 'gbtree',
  'max_depth': 3,
  'min_child_weight': 5,
  'colsample_bytree': 0.7187936056313462},
 'XGBoost/T5': {'n_estimators': 10000,
  'learning_rate': 0.09276005809908329,
  'n_jobs': -1,
  'proc.max_category_levels': 100,
  'objective': 'reg:squarederror',
  'booster': 'gbtree',
  'max_depth': 10,
```

```
  'min_child_weight': 1,
  'colsample_bytree': 0.6917207594128889},
 'LightGBMLarge': {'learning_rate': 0.03,
  'num_leaves': 128,
  'feature_fraction': 0.9,
  'min_data_in_leaf': 5},
 'WeightedEnsemble_L2': {'use_orig_features': False,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True}},
'leaderboard':                   model   score_val  pred_time_val    fit_time  \
0   WeightedEnsemble_L2  -34.173739       1.320474  113.280938
1         LightGBMLarge  -35.084407       0.225574    3.036791
2           LightGBM/T4  -35.747401       1.779139   13.879558
3           LightGBM/T2  -35.765268       0.182709    2.232391
4           LightGBM/T3  -36.158163       0.300105    2.197963
5           CatBoost/T1  -36.475744       0.033508   93.250664
6           LightGBM/T5  -36.493051       0.086692    1.641640
7           LightGBM/T1  -36.589119       0.346313    2.389995
8         LightGBMXT/T1  -36.833995       0.991735    6.588263
9         LightGBMXT/T3  -37.145831       2.189530   12.870409
10           XGBoost/T3  -37.282276       0.937091    8.462617
11           XGBoost/T2  -37.409687       0.125140    2.959192
12        LightGBMXT/T5  -37.771316       0.988722    5.988844
13           XGBoost/T1  -38.092021       0.161852    3.465902
14        LightGBMXT/T4  -38.438123       7.133547   21.879312
15        LightGBMXT/T2  -38.971321       0.867336    6.116838
16        ExtraTreesMSE  -39.589513       0.531406    5.386761
17      RandomForestMSE  -40.006063       0.542553   11.838198
18           XGBoost/T4  -41.337639       0.872301   17.146307
19           XGBoost/T5  -41.483395       0.210183    5.317004
20       KNeighborsDist  -94.488129       0.034696    0.012085
21       KNeighborsUnif -112.769894       0.034931    0.012990

    pred_time_val_marginal  fit_time_marginal  stack_level  can_infer  \
0                 0.001329           0.712847            2       True
1                 0.225574           3.036791            1       True
2                 1.779139          13.879558            1       True
3                 0.182709           2.232391            1       True
4                 0.300105           2.197963            1       True
5                 0.033508          93.250664            1       True
6                 0.086692           1.641640            1       True
7                 0.346313           2.389995            1       True
8                 0.991735           6.588263            1       True
9                 2.189530          12.870409            1       True
10                0.937091           8.462617            1       True
11                0.125140           2.959192            1       True
12                0.988722           5.988844            1       True
13                0.161852           3.465902            1       True
14                7.133547          21.879312            1       True
15                0.867336           6.116838            1       True
16                0.531406           5.386761            1       True
17                0.542553          11.838198            1       True
18                0.872301          17.146307            1       True
19                0.210183           5.317004            1       True
20                0.034696           0.012085            1       True
```

```
21               0.034931          0.012990           1       True

    fit_order
0          22
1          21
2          11
3           9
4          10
5          14
6          12
7           8
8           3
9           5
10         18
11         17
12          7
13         16
14          6
15          4
16         15
17         13
18         19
19         20
20          2
21          1  }
```

In [53]:
```
predictions_new_hpo = predictor_new_hpo.predict(test)
predictions_new_hpo[predictions_new_hpo<0]=0
predictions_new_hpo.describe()
```

Out[53]:
```
count    6493.000000
mean      192.015060
std       169.333237
min         0.000000
25%        50.415794
50%       152.363800
75%       280.820190
max       881.277954
Name: count, dtype: float64
```

In [54]:
```
submission["count"] = predictions_new_hpo
submission.to_csv("submission_new_hpo3.csv", index=False)
```

In [55]:
```
!kaggle competitions submit -c bike-sharing-demand -f submission_new_hpo3.csv -m "n
```

```
100%|████████████████████████████████████████| 188k/188k [00:00<00:00, 719kB/s]
Successfully submitted to Bike Sharing Demand
```

In [56]:
```
!kaggle competitions submissions -c bike-sharing-demand
```

```
fileName                    date                 description
status    publicScore  privateScore
--------------------------  -------------------  -------------------------------
-------------------------------------------  --------  -----------  ------------
submission_new_hpo3.csv     2024-06-29 01:26:58  new features with hyperparameters
without presets and time limit 1200             complete  0.55429      0.55429
submission_new_hpo2.csv     2024-06-29 01:17:56  new features with hyperparameters
without presets                                 complete  0.54719      0.54719
submission_new_hpo1.csv     2024-06-29 01:06:08  new features with hyperparameters
complete  0.6538       0.6538
submission_new_features.csv  2024-06-29 00:52:46  new features
complete  0.6538       0.6538
submission.csv              2024-06-29 00:47:15  first raw submission
complete  1.84007      1.84007
submission_new_hpo4.csv     2024-06-26 19:43:51  new features with hyperparameters
without presets time limit 1200 with 10 trials  complete  0.55202      0.55202
submission_new_hpo3.1.csv   2024-06-26 06:37:09  new features with hyperparameters
without presets and time limit 1200             complete  0.55016      0.55016
submission_new_hpo3.csv     2024-06-26 06:32:56  new features with hyperparameters
without presets and time limit of 1200          error
submission_new_hpo2.csv     2024-06-25 17:18:14  new features with hyperparameters
without presets                                 complete  1.83641      1.83641
submission_new_hpo.csv      2024-06-24 22:47:19  new features with hyperparameters
complete  0.6538       0.6538
submission_new_features.csv  2024-06-24 22:46:40  new features
complete  0.6538       0.6538
submission.csv              2024-06-24 22:46:05  first raw submission
complete  1.84007      1.84007
```

In [57]:
```
hyperparameter_tuning = {'num_trials': 10, 'searcher':'auto','scheduler':'local'}
predictor_new_hpo = TabularPredictor(label='count',eval_metric='root_mean_squared_e
```

```
No path specified. Models will be saved in: "AutogluonModels/ag-20240629_012717/"
Warning: hyperparameter tuning is currently experimental and may cause the process t
o hang.
Beginning AutoGluon training ... Time limit = 1200s
AutoGluon will save models to "AutogluonModels/ag-20240629_012717/"
AutoGluon Version:  0.8.3
Python Version:     3.10.14
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Fri May 31 18:15:42 UTC 2024
Disk Space Avail:   3.72 GB / 5.36 GB (69.5%)
        WARNING: Available disk space is low and there is a risk that AutoGluon will
run out of disk during fit, causing an exception.
        We recommend a minimum available disk space of 10 GB, and large datasets may
require more.
Train Data Rows:    10886
Train Data Columns: 12
Label Column: count
Preprocessing data ...
AutoGluon infers your prediction problem is: 'regression' (because dtype of label-co
lumn == int and many unique label-values observed).
        Label info (max, min, mean, stddev): (977, 1, 191.57413, 181.14445)
        If 'regression' is not the correct problem_type, please manually specify the
problem_type parameter during predictor init (You may specify problem_type as one o
f: ['binary', 'multiclass', 'regression'])
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
        Available Memory:                    1688.12 MB
        Train Data (Original)  Memory Usage: 0.89 MB (0.1% of available memory)
        Inferring data type of each feature based on column values. Set feature_meta
data_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator...
                        Note: Converting 2 features to boolean dtype as they only co
ntain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator...
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator...
                Fitting CategoryFeatureGenerator...
                        Fitting CategoryMemoryMinimizeFeatureGenerator...
                Fitting DatetimeFeatureGenerator...
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator...
        Stage 5 Generators:
                Fitting DropDuplicatesFeatureGenerator...
        Types of features in original data (raw dtype, special dtypes):
                ('category', []) : 2 | ['season', 'weather']
                ('datetime', []) : 1 | ['datetime']
                ('float', [])    : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])      : 6 | ['holiday', 'workingday', 'humidity', 'hour',
'day', ...]
        Types of features in processed data (raw dtype, special dtypes):
                ('category', [])             : 2 | ['season', 'weather']
                ('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])                  : 4 | ['humidity', 'hour', 'day', 'mont
```

```
h']
                ('int', ['bool'])            : 2 | ['holiday', 'workingday']
                ('int', ['datetime_as_int']) : 3 | ['datetime', 'datetime.year', 'da
tetime.dayofweek']
        0.7s = Fit runtime
        12 features in original data used to generate 14 features in processed data.
        Train Data (Processed) Memory Usage: 0.92 MB (0.1% of available memory)
Data preprocessing and feature engineering runtime = 0.77s ...
AutoGluon will gauge predictive performance using evaluation metric: 'root_mean_squa
red_error'
        This metric's sign has been flipped to adhere to being higher_is_better. The
metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
Automatically generating train/validation split with holdout_frac=0.2, Train Rows: 8
708, Val Rows: 2178
User-specified model hyperparameters to be fit:
{
        'NN_TORCH': {},
        'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {}, 'GBMLar
ge'],
        'CAT': {},
        'XGB': {},
        'FASTAI': {},
        'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_typ
es': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_suffix':
'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'squared_error',
'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quantile']}}],
        'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}}, {'weight
s': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
Fitting 11 L1 models ...
Hyperparameter tuning model: KNeighborsUnif ... Tuning model for up to 98.12s of the
1199.23s of remaining time.
        No hyperparameter search space specified for KNeighborsUnif. Skipping HPO. W
ill train one model based on the provided hyperparameters.
Fitted model: KNeighborsUnif ...
        -112.7699        = Validation score   (-root_mean_squared_error)
        0.02s    = Training   runtime
        0.05s    = Validation runtime
Hyperparameter tuning model: KNeighborsDist ... Tuning model for up to 98.12s of the
1199.14s of remaining time.
        No hyperparameter search space specified for KNeighborsDist. Skipping HPO. W
ill train one model based on the provided hyperparameters.
Fitted model: KNeighborsDist ...
        -94.4881         = Validation score   (-root_mean_squared_error)
        0.02s    = Training   runtime
        0.05s    = Validation runtime
Hyperparameter tuning model: LightGBMXT ... Tuning model for up to 98.12s of the 119
9.06s of remaining time.
  0%|          | 0/10 [00:00<?, ?it/s]
```

```
[1000]  valid_set's rmse: 38.9452
[2000]  valid_set's rmse: 37.364
[3000]  valid_set's rmse: 36.9659
[4000]  valid_set's rmse: 36.8379
[1000]  valid_set's rmse: 39.8959
[2000]  valid_set's rmse: 39.0178
[1000]  valid_set's rmse: 39.9303
[2000]  valid_set's rmse: 37.8254
[3000]  valid_set's rmse: 37.3539
[4000]  valid_set's rmse: 37.2214
[5000]  valid_set's rmse: 37.1468
[6000]  valid_set's rmse: 37.1929
[1000]  valid_set's rmse: 72.9677
[2000]  valid_set's rmse: 56.5467
[3000]  valid_set's rmse: 49.794
[4000]  valid_set's rmse: 45.5941
[5000]  valid_set's rmse: 43.0338
[6000]  valid_set's rmse: 41.412
[7000]  valid_set's rmse: 40.2941
[8000]  valid_set's rmse: 39.5108
[9000]  valid_set's rmse: 38.8903
[10000] valid_set's rmse: 38.4381
[1000]  valid_set's rmse: 38.6622
[2000]  valid_set's rmse: 37.8864
[3000]  valid_set's rmse: 37.8281
[1000]  valid_set's rmse: 48.8937
[2000]  valid_set's rmse: 41.0029
[3000]  valid_set's rmse: 38.7224
[4000]  valid_set's rmse: 37.7715
[5000]  valid_set's rmse: 37.3625
[6000]  valid_set's rmse: 37.152
[7000]  valid_set's rmse: 37.0715
```

```
        Ran out of time, early stopping on iteration 7864. Best iteration is:
        [7584]  valid_set's rmse: 37.0487
        Stopping HPO to satisfy time limit...
Fitted model: LightGBMXT/T1 ...
        -36.834  = Validation score   (-root_mean_squared_error)
        6.48s    = Training   runtime
        1.0s     = Validation runtime
Fitted model: LightGBMXT/T2 ...
        -38.9713         = Validation score   (-root_mean_squared_error)
        6.32s    = Training   runtime
        0.87s    = Validation runtime
Fitted model: LightGBMXT/T3 ...
        -37.1458         = Validation score   (-root_mean_squared_error)
        12.52s   = Training   runtime
        2.27s    = Validation runtime
Fitted model: LightGBMXT/T4 ...
        -38.4381         = Validation score   (-root_mean_squared_error)
        23.27s   = Training   runtime
        6.84s    = Validation runtime
Fitted model: LightGBMXT/T5 ...
        -37.7713         = Validation score   (-root_mean_squared_error)
        6.36s    = Training   runtime
        1.11s    = Validation runtime
Fitted model: LightGBMXT/T6 ...
        -37.0487         = Validation score   (-root_mean_squared_error)
        21.68s   = Training   runtime
        7.47s    = Validation runtime
Hyperparameter tuning model: LightGBM ... Tuning model for up to 98.12s of the 1088.
22s of remaining time.
  0%|          | 0/10 [00:00<?, ?it/s]
[1000]  valid_set's rmse: 36.7319
[1000]  valid_set's rmse: 35.8159
[1000]  valid_set's rmse: 36.3022
[1000]  valid_set's rmse: 37.5457
[2000]  valid_set's rmse: 36.2032
[3000]  valid_set's rmse: 35.9107
[4000]  valid_set's rmse: 35.7999
[5000]  valid_set's rmse: 35.7535
[6000]  valid_set's rmse: 35.7726
[1000]  valid_set's rmse: 35.5496
[1000]  valid_set's rmse: 36.6114
[2000]  valid_set's rmse: 35.9794
[3000]  valid_set's rmse: 35.8731
```

```
Fitted model: LightGBM/T1 ...
        -36.5891        = Validation score   (-root_mean_squared_error)
        2.8s    = Training   runtime
        0.44s   = Validation runtime
Fitted model: LightGBM/T2 ...
        -35.7653        = Validation score   (-root_mean_squared_error)
        2.44s   = Training   runtime
        0.2s    = Validation runtime
Fitted model: LightGBM/T3 ...
        -36.1582        = Validation score   (-root_mean_squared_error)
        2.76s   = Training   runtime
        0.32s   = Validation runtime
Fitted model: LightGBM/T4 ...
        -35.7474        = Validation score   (-root_mean_squared_error)
        13.42s  = Training   runtime
        1.9s    = Validation runtime
Fitted model: LightGBM/T5 ...
        -36.4931        = Validation score   (-root_mean_squared_error)
        1.4s    = Training   runtime
        0.09s   = Validation runtime
Fitted model: LightGBM/T6 ...
        -35.5359        = Validation score   (-root_mean_squared_error)
        3.94s   = Training   runtime
        0.47s   = Validation runtime
Fitted model: LightGBM/T7 ...
        -36.0733        = Validation score   (-root_mean_squared_error)
        2.23s   = Training   runtime
        0.2s    = Validation runtime
Fitted model: LightGBM/T8 ...
        -36.7552        = Validation score   (-root_mean_squared_error)
        2.03s   = Training   runtime
        0.19s   = Validation runtime
Fitted model: LightGBM/T9 ...
        -35.8662        = Validation score   (-root_mean_squared_error)
        10.66s  = Training   runtime
        1.23s   = Validation runtime
Fitted model: LightGBM/T10 ...
        -36.7227        = Validation score   (-root_mean_squared_error)
        1.99s   = Training   runtime
        0.12s   = Validation runtime
Hyperparameter tuning model: RandomForestMSE ... Tuning model for up to 98.12s of th
e 1033.17s of remaining time.
        No hyperparameter search space specified for RandomForestMSE. Skipping HPO.
Will train one model based on the provided hyperparameters.
Fitted model: RandomForestMSE ...
        -40.0061        = Validation score   (-root_mean_squared_error)
        11.46s  = Training   runtime
        0.52s   = Validation runtime
Hyperparameter tuning model: CatBoost ... Tuning model for up to 98.12s of the 1020.
77s of remaining time.
  0%|          | 0/10 [00:00<?, ?it/s]
```

```
        Ran out of time, early stopping on iteration 7789.
        Stopping HPO to satisfy time limit...
Fitted model: CatBoost/T1 ...
        -36.477  = Validation score   (-root_mean_squared_error)
        93.24s   = Training   runtime
        0.04s    = Validation runtime
Hyperparameter tuning model: ExtraTreesMSE ... Tuning model for up to 98.12s of the
927.37s of remaining time.
        No hyperparameter search space specified for ExtraTreesMSE. Skipping HPO. Wi
ll train one model based on the provided hyperparameters.
Fitted model: ExtraTreesMSE ...
        -39.5895         = Validation score   (-root_mean_squared_error)
        5.48s    = Training   runtime
        0.51s    = Validation runtime
Hyperparameter tuning model: NeuralNetFastAI ... Tuning model for up to 98.12s of th
e 920.89s of remaining time.
Warning: Exception caused NeuralNetFastAI to fail during hyperparameter tuning... Sk
ipping this model.
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 2018, in _train_single_full
    hpo_models, hpo_results = model.hyperparameter_tune(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1383, in hyperparameter_tune
    return self._hyperparameter_tune(hpo_executor=hpo_executor, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1397, in _hyperparameter_tune
    hpo_executor.validate_search_space(search_space, self.name)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/hpo/executors.py", li
ne 346, in validate_search_space
    from ray.tune.search.sample import Domain
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/__init__.py", line 2, in <m
odule>
    from ray.tune.tune import run_experiments, run
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/tune.py", line 12, in <modu
le>
    from ray.air import CheckpointConfig
  File "/opt/conda/lib/python3.10/site-packages/ray/air/__init__.py", line 1, in <mo
dule>
    from ray.air.checkpoint import Checkpoint
  File "/opt/conda/lib/python3.10/site-packages/ray/air/checkpoint.py", line 22, in
<module>
    from ray.air._internal.remote_storage import (
  File "/opt/conda/lib/python3.10/site-packages/ray/air/_internal/remote_storage.p
y", line 4, in <module>
    from pkg_resources import packaging
ImportError: cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/pyt
hon3.10/site-packages/pkg_resources/__init__.py)
cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/python3.10/site-
packages/pkg_resources/__init__.py)
Hyperparameter tuning model: XGBoost ... Tuning model for up to 98.12s of the 920.87
s of remaining time.
  0%|          | 0/10 [00:00<?, ?it/s]
```

```
        Stopping HPO to satisfy time limit...
Fitted model: XGBoost/T1 ...
        -38.092  = Validation score   (-root_mean_squared_error)
        3.74s    = Training   runtime
        0.18s    = Validation runtime
Fitted model: XGBoost/T2 ...
        -37.4097         = Validation score   (-root_mean_squared_error)
        3.01s    = Training   runtime
        0.15s    = Validation runtime
Fitted model: XGBoost/T3 ...
        -37.2823         = Validation score   (-root_mean_squared_error)
        7.56s    = Training   runtime
        0.74s    = Validation runtime
Fitted model: XGBoost/T4 ...
        -41.3376         = Validation score   (-root_mean_squared_error)
        17.89s   = Training   runtime
        0.89s    = Validation runtime
Fitted model: XGBoost/T5 ...
        -41.4834         = Validation score   (-root_mean_squared_error)
        4.57s    = Training   runtime
        0.19s    = Validation runtime
Fitted model: XGBoost/T6 ...
        -41.7082         = Validation score   (-root_mean_squared_error)
        17.52s   = Training   runtime
        0.99s    = Validation runtime
Fitted model: XGBoost/T7 ...
        -36.5898         = Validation score   (-root_mean_squared_error)
        8.85s    = Training   runtime
        0.79s    = Validation runtime
Fitted model: XGBoost/T8 ...
        -37.6316         = Validation score   (-root_mean_squared_error)
        1.85s    = Training   runtime
        0.06s    = Validation runtime
Fitted model: XGBoost/T9 ...
        -38.4941         = Validation score   (-root_mean_squared_error)
        14.65s   = Training   runtime
        0.84s    = Validation runtime
Fitted model: XGBoost/T10 ...
        -37.64   = Validation score   (-root_mean_squared_error)
        5.2s     = Training   runtime
        0.34s    = Validation runtime
Hyperparameter tuning model: NeuralNetTorch ... Tuning model for up to 98.12s of the
829.08s of remaining time.
Warning: Exception caused NeuralNetTorch to fail during hyperparameter tuning... Ski
pping this model.
Traceback (most recent call last):
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/trainer/abstract_trai
ner.py", line 2018, in _train_single_full
    hpo_models, hpo_results = model.hyperparameter_tune(
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1383, in hyperparameter_tune
    return self._hyperparameter_tune(hpo_executor=hpo_executor, **kwargs)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/models/abstract/abstr
act_model.py", line 1397, in _hyperparameter_tune
    hpo_executor.validate_search_space(search_space, self.name)
  File "/opt/conda/lib/python3.10/site-packages/autogluon/core/hpo/executors.py", li
```

```
ne 346, in validate_search_space
    from ray.tune.search.sample import Domain
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/__init__.py", line 2, in <m
odule>
    from ray.tune.tune import run_experiments, run
  File "/opt/conda/lib/python3.10/site-packages/ray/tune/tune.py", line 12, in <modu
le>
    from ray.air import CheckpointConfig
  File "/opt/conda/lib/python3.10/site-packages/ray/air/__init__.py", line 1, in <mo
dule>
    from ray.air.checkpoint import Checkpoint
  File "/opt/conda/lib/python3.10/site-packages/ray/air/checkpoint.py", line 22, in
<module>
    from ray.air._internal.remote_storage import (
  File "/opt/conda/lib/python3.10/site-packages/ray/air/_internal/remote_storage.p
y", line 4, in <module>
    from pkg_resources import packaging
ImportError: cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/pyt
hon3.10/site-packages/pkg_resources/__init__.py)
cannot import name 'packaging' from 'pkg_resources' (/opt/conda/lib/python3.10/site-
packages/pkg_resources/__init__.py)
Fitting model: LightGBMLarge ... Training model for up to 98.12s of the 829.07s of r
emaining time.
        -35.0844         = Validation score   (-root_mean_squared_error)
        3.25s    = Training   runtime
        0.23s    = Validation runtime
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the 783.61
s of remaining time.
        -34.158  = Validation score   (-root_mean_squared_error)
        0.67s    = Training   runtime
        0.0s     = Validation runtime
AutoGluon training complete, total runtime = 417.1s ... Best model: "WeightedEnsembl
e_L2"
TabularPredictor saved. To load, use: predictor = TabularPredictor.load("AutogluonMo
dels/ag-20240629_012717/")
```

In [58]:
```
predictor_new_hpo.fit_summary()
```

```
*** Summary of fit() ***
Estimated performance of each model:
                  model   score_val  pred_time_val    fit_time  pred_time_val_margin
al  fit_time_marginal  stack_level  can_infer  fit_order
0   WeightedEnsemble_L2  -34.157986       3.083668  130.886707               0.0005
63          0.674781            2       True         33
1         LightGBMLarge  -35.084407       0.234428    3.245750               0.2344
28          3.245750            1       True         32
2           LightGBM/T6  -35.535895       0.470809    3.943258               0.4708
09          3.943258            1       True         14
3           LightGBM/T4  -35.747401       1.897607   13.419563               1.8976
07         13.419563            1       True         12
4           LightGBM/T2  -35.765268       0.196197    2.444501               0.1961
97          2.444501            1       True         10
5           LightGBM/T9  -35.866152       1.227807   10.658077               1.2278
07         10.658077            1       True         17
6           LightGBM/T7  -36.073260       0.199900    2.231859               0.1999
00          2.231859            1       True         15
7           LightGBM/T3  -36.158163       0.321429    2.758293               0.3214
29          2.758293            1       True         11
8           CatBoost/T1  -36.477011       0.038203   93.243795               0.0382
03         93.243795            1       True         20
9           LightGBM/T5  -36.493051       0.089158    1.399360               0.0891
58          1.399360            1       True         13
10          LightGBM/T1  -36.589119       0.441031    2.803530               0.4410
31          2.803530            1       True          9
11          XGBoost/T7  -36.589823       0.792741    8.848828               0.7927
41          8.848828            1       True         28
12         LightGBM/T10  -36.722739       0.122314    1.989819               0.1223
14          1.989819            1       True         18
13          LightGBM/T8  -36.755214       0.194167    2.027795               0.1941
67          2.027795            1       True         16
14        LightGBMXT/T1  -36.833995       0.996990    6.480514               0.9969
90          6.480514            1       True          3
15        LightGBMXT/T6  -37.048670       7.469049   21.682117               7.4690
49         21.682117            1       True          8
16        LightGBMXT/T3  -37.145831       2.266434   12.522931               2.2664
34         12.522931            1       True          5
17          XGBoost/T3  -37.282276       0.735572    7.557322               0.7355
72          7.557322            1       True         24
18          XGBoost/T2  -37.409687       0.153763    3.009027               0.1537
63          3.009027            1       True         23
19          XGBoost/T8  -37.631640       0.058006    1.849801               0.0580
06          1.849801            1       True         29
20         XGBoost/T10  -37.639962       0.342942    5.197793               0.3429
42          5.197793            1       True         31
21        LightGBMXT/T5  -37.771316       1.111602    6.356288               1.1116
02          6.356288            1       True          7
22          XGBoost/T1  -38.092021       0.177002    3.735222               0.1770
02          3.735222            1       True         22
23        LightGBMXT/T4  -38.438123       6.835552   23.268794               6.8355
52         23.268794            1       True          6
24          XGBoost/T9  -38.494082       0.839514   14.653902               0.8395
14         14.653902            1       True         30
25        LightGBMXT/T2  -38.971321       0.865083    6.315965               0.8650
83          6.315965            1       True          4
```

```
26        ExtraTreesMSE  -39.589513       0.512418    5.476547                0.5124
18           5.476547            1       True         21
27      RandomForestMSE  -40.006063       0.524696   11.462505                0.5246
96          11.462505            1       True         19
28           XGBoost/T4  -41.337639       0.888336   17.887226                0.8883
36          17.887226            1       True         25
29           XGBoost/T5  -41.483395       0.185056    4.566888                0.1850
56           4.566888            1       True         26
30           XGBoost/T6  -41.708157       0.990637   17.520937                0.9906
37          17.520937            1       True         27
31       KNeighborsDist  -94.488129       0.048024    0.016248                0.0480
24           0.016248            1       True          2
32       KNeighborsUnif -112.769894       0.046419    0.016603                0.0464
19           0.016603            1       True          1
Number of models trained: 33
Types of models trained:
{'LGBModel', 'XGBoostModel', 'CatBoostModel', 'KNNModel', 'WeightedEnsembleModel',
'XTModel', 'RFModel'}
Bagging used: False
Multi-layer stack-ensembling used: False
Feature Metadata (Processed):
(raw dtype, special dtypes):
('category', [])             : 2 | ['season', 'weather']
('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
('int', [])                  : 4 | ['humidity', 'hour', 'day', 'month']
('int', ['bool'])            : 2 | ['holiday', 'workingday']
('int', ['datetime_as_int']) : 3 | ['datetime', 'datetime.year', 'datetime.dayofwee
k']
*** End of fit() summary ***
/opt/conda/lib/python3.10/site-packages/autogluon/core/utils/plots.py:169: UserWarni
ng: AutoGluon summary plots cannot be created because bokeh is not installed. To see
plots, please do: "pip install bokeh==2.0.1"
  warnings.warn('AutoGluon summary plots cannot be created because bokeh is not inst
alled. To see plots, please do: "pip install bokeh==2.0.1"')
```

Out[58]:

```
{'model_types': {'KNeighborsUnif': 'KNNModel',
  'KNeighborsDist': 'KNNModel',
  'LightGBMXT/T1': 'LGBModel',
  'LightGBMXT/T2': 'LGBModel',
  'LightGBMXT/T3': 'LGBModel',
  'LightGBMXT/T4': 'LGBModel',
  'LightGBMXT/T5': 'LGBModel',
  'LightGBMXT/T6': 'LGBModel',
  'LightGBM/T1': 'LGBModel',
  'LightGBM/T2': 'LGBModel',
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  'LightGBM/T5': 'LGBModel',
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  'LightGBM/T9': 'LGBModel',
  'LightGBM/T10': 'LGBModel',
  'RandomForestMSE': 'RFModel',
  'CatBoost/T1': 'CatBoostModel',
  'ExtraTreesMSE': 'XTModel',
  'XGBoost/T1': 'XGBoostModel',
  'XGBoost/T2': 'XGBoostModel',
  'XGBoost/T3': 'XGBoostModel',
  'XGBoost/T4': 'XGBoostModel',
  'XGBoost/T5': 'XGBoostModel',
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  'XGBoost/T8': 'XGBoostModel',
  'XGBoost/T9': 'XGBoostModel',
  'XGBoost/T10': 'XGBoostModel',
  'LightGBMLarge': 'LGBModel',
  'WeightedEnsemble_L2': 'WeightedEnsembleModel'},
 'model_performance': {'KNeighborsUnif': -112.76989371124893,
  'KNeighborsDist': -94.48812854475563,
  'LightGBMXT/T1': -36.83399474584801,
  'LightGBMXT/T2': -38.97132067022775,
  'LightGBMXT/T3': -37.145830994027925,
  'LightGBMXT/T4': -38.43812274400068,
  'LightGBMXT/T5': -37.77131643312281,
  'LightGBMXT/T6': -37.048669706614554,
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  'LightGBM/T2': -35.76526801995583,
  'LightGBM/T3': -36.15816307842204,
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  'LightGBM/T8': -36.75521418914663,
  'LightGBM/T9': -35.86615215786945,
  'LightGBM/T10': -36.72273855685696,
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  'CatBoost/T1': -36.47701065294096,
  'ExtraTreesMSE': -39.58951319045792,
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  'XGBoost/T2': -37.409687451082696,
```

```
  'XGBoost/T3': -37.282275566366096,
  'XGBoost/T4': -41.337639480265665,
  'XGBoost/T5': -41.48339491566752,
  'XGBoost/T6': -41.7081567161328,
  'XGBoost/T7': -36.589822779511216,
  'XGBoost/T8': -37.63163966498247,
  'XGBoost/T9': -38.494081714350784,
  'XGBoost/T10': -37.63996166628728,
  'LightGBMLarge': -35.08440731837606,
  'WeightedEnsemble_L2': -34.15798586903732},
 'model_best': 'WeightedEnsemble_L2',
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ghborsUnif/',
  'KNeighborsDist': 'AutogluonModels/ag-20240629_012717/models/KNeighborsDist/',
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  'LightGBMXT/T2': 'AutogluonModels/ag-20240629_012717/models/LightGBMXT/T2/',
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  'LightGBMXT/T6': 'AutogluonModels/ag-20240629_012717/models/LightGBMXT/T6/',
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  'LightGBM/T5': 'AutogluonModels/ag-20240629_012717/models/LightGBM/T5/',
  'LightGBM/T6': 'AutogluonModels/ag-20240629_012717/models/LightGBM/T6/',
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  'LightGBM/T8': 'AutogluonModels/ag-20240629_012717/models/LightGBM/T8/',
  'LightGBM/T9': 'AutogluonModels/ag-20240629_012717/models/LightGBM/T9/',
  'LightGBM/T10': 'AutogluonModels/ag-20240629_012717/models/LightGBM/T10/',
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  'XGBoost/T2': 'AutogluonModels/ag-20240629_012717/models/XGBoost/T2/',
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  'XGBoost/T4': 'AutogluonModels/ag-20240629_012717/models/XGBoost/T4/',
  'XGBoost/T5': 'AutogluonModels/ag-20240629_012717/models/XGBoost/T5/',
  'XGBoost/T6': 'AutogluonModels/ag-20240629_012717/models/XGBoost/T6/',
  'XGBoost/T7': 'AutogluonModels/ag-20240629_012717/models/XGBoost/T7/',
  'XGBoost/T8': 'AutogluonModels/ag-20240629_012717/models/XGBoost/T8/',
  'XGBoost/T9': 'AutogluonModels/ag-20240629_012717/models/XGBoost/T9/',
  'XGBoost/T10': 'AutogluonModels/ag-20240629_012717/models/XGBoost/T10/',
  'LightGBMLarge': 'AutogluonModels/ag-20240629_012717/models/LightGBMLarge/',
  'WeightedEnsemble_L2': 'AutogluonModels/ag-20240629_012717/models/WeightedEnsemb
le_L2/'},
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  'KNeighborsDist': 0.016248226165771484,
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  'LightGBMXT/T2': 6.315964698791504,
  'LightGBMXT/T3': 12.522931098937988,
  'LightGBMXT/T4': 23.268794059753418,
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```

```
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 'LightGBM/T10': 1.989819049835205,
 'RandomForestMSE': 11.462504863739014,
 'CatBoost/T1': 93.24379467964172,
 'ExtraTreesMSE': 5.476546764373779,
 'XGBoost/T1': 3.735222101211548,
 'XGBoost/T2': 3.009026527404785,
 'XGBoost/T3': 7.557321786880493,
 'XGBoost/T4': 17.88722586631775,
 'XGBoost/T5': 4.566887855529785,
 'XGBoost/T6': 17.520936727523804,
 'XGBoost/T7': 8.848828077316284,
 'XGBoost/T8': 1.8498008251190186,
 'XGBoost/T9': 14.653902292251587,
 'XGBoost/T10': 5.1977927684783936,
 'LightGBMLarge': 3.2457497119903564,
 'WeightedEnsemble_L2': 0.6747806072235107},
'model_pred_times': {'KNeighborsUnif': 0.04641914367675781,
 'KNeighborsDist': 0.04802370071411133,
 'LightGBMXT/T1': 0.996990442276001,
 'LightGBMXT/T2': 0.8650825023651123,
 'LightGBMXT/T3': 2.26643443107605,
 'LightGBMXT/T4': 6.835552453994751,
 'LightGBMXT/T5': 1.1116015911102295,
 'LightGBMXT/T6': 7.4690492153167725,
 'LightGBM/T1': 0.44103121757507324,
 'LightGBM/T2': 0.1961970329284668,
 'LightGBM/T3': 0.3214294910430908,
 'LightGBM/T4': 1.897606611251831,
 'LightGBM/T5': 0.08915829658508301,
 'LightGBM/T6': 0.470808744430542,
 'LightGBM/T7': 0.19990038871765137,
 'LightGBM/T8': 0.1941666603088379,
 'LightGBM/T9': 1.227806568145752,
 'LightGBM/T10': 0.122314453125,
 'RandomForestMSE': 0.5246961116790771,
 'CatBoost/T1': 0.03820347785949707,
 'ExtraTreesMSE': 0.5124175548553467,
 'XGBoost/T1': 0.1770024299621582,
 'XGBoost/T2': 0.1537625789642334,
 'XGBoost/T3': 0.735572338104248,
 'XGBoost/T4': 0.8883357048034668,
 'XGBoost/T5': 0.18505620956420898,
 'XGBoost/T6': 0.9906370639801025,
 'XGBoost/T7': 0.7927408218383789,
 'XGBoost/T8': 0.058005571365356445,
 'XGBoost/T9': 0.8395142555236816,
 'XGBoost/T10': 0.3429415225982666,
 'LightGBMLarge': 0.23442840576171875,
 'WeightedEnsemble_L2': 0.0005626678466796875},
```

```
'num_bag_folds': 0,
'max_stack_level': 2,
'model_hyperparams': {'KNeighborsUnif': {'weights': 'uniform'},
 'KNeighborsDist': {'weights': 'distance'},
 'LightGBMXT/T1': {'learning_rate': 0.05,
  'extra_trees': True,
  'feature_fraction': 1.0,
  'min_data_in_leaf': 20,
  'num_leaves': 31},
 'LightGBMXT/T2': {'learning_rate': 0.06994332504138304,
  'extra_trees': True,
  'feature_fraction': 0.8872033759818312,
  'min_data_in_leaf': 5,
  'num_leaves': 83},
 'LightGBMXT/T3': {'learning_rate': 0.04988344687833528,
  'extra_trees': True,
  'feature_fraction': 0.9618129346960314,
  'min_data_in_leaf': 52,
  'num_leaves': 52},
 'LightGBMXT/T4': {'learning_rate': 0.006163502781172818,
  'extra_trees': True,
  'feature_fraction': 0.824383651636118,
  'min_data_in_leaf': 14,
  'num_leaves': 74},
 'LightGBMXT/T5': {'learning_rate': 0.10002602971711909,
  'extra_trees': True,
  'feature_fraction': 0.8694162793303375,
  'min_data_in_leaf': 48,
  'num_leaves': 53},
 'LightGBMXT/T6': {'learning_rate': 0.017357968430552234,
  'extra_trees': True,
  'feature_fraction': 0.9590196908843444,
  'min_data_in_leaf': 22,
  'num_leaves': 96},
 'LightGBM/T1': {'learning_rate': 0.05,
  'feature_fraction': 1.0,
  'min_data_in_leaf': 20,
  'num_leaves': 31},
 'LightGBM/T2': {'learning_rate': 0.06994332504138304,
  'feature_fraction': 0.8872033759818312,
  'min_data_in_leaf': 5,
  'num_leaves': 83},
 'LightGBM/T3': {'learning_rate': 0.04988344687833528,
  'feature_fraction': 0.9618129346960314,
  'min_data_in_leaf': 52,
  'num_leaves': 52},
 'LightGBM/T4': {'learning_rate': 0.006163502781172818,
  'feature_fraction': 0.824383651636118,
  'min_data_in_leaf': 14,
  'num_leaves': 74},
 'LightGBM/T5': {'learning_rate': 0.10002602971711909,
  'feature_fraction': 0.8694162793303375,
  'min_data_in_leaf': 48,
  'num_leaves': 53},
 'LightGBM/T6': {'learning_rate': 0.017357968430552234,
  'feature_fraction': 0.9590196908843444,
```

```
 'min_data_in_leaf': 22,
 'num_leaves': 96},
'LightGBM/T7': {'learning_rate': 0.08823152832086026,
 'feature_fraction': 0.9581549613869845,
 'min_data_in_leaf': 49,
 'num_leaves': 80},
'LightGBM/T8': {'learning_rate': 0.09533886267453755,
 'feature_fraction': 0.994654585558191,
 'min_data_in_leaf': 53,
 'num_leaves': 45},
'LightGBM/T9': {'learning_rate': 0.0077348648548282535,
 'feature_fraction': 0.9451322940716138,
 'min_data_in_leaf': 34,
 'num_leaves': 81},
'LightGBM/T10': {'learning_rate': 0.16307458477834605,
 'feature_fraction': 0.7858383218522615,
 'min_data_in_leaf': 33,
 'num_leaves': 90},
'RandomForestMSE': {'n_estimators': 300,
 'max_leaf_nodes': 15000,
 'n_jobs': -1,
 'random_state': 0,
 'bootstrap': True,
 'criterion': 'squared_error'},
'CatBoost/T1': {'iterations': 10000,
 'learning_rate': 0.05,
 'random_seed': 0,
 'allow_writing_files': False,
 'eval_metric': 'RMSE',
 'depth': 6,
 'l2_leaf_reg': 3},
'ExtraTreesMSE': {'n_estimators': 300,
 'max_leaf_nodes': 15000,
 'n_jobs': -1,
 'random_state': 0,
 'bootstrap': True,
 'criterion': 'squared_error'},
'XGBoost/T1': {'n_estimators': 10000,
 'learning_rate': 0.1,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 6,
 'min_child_weight': 1,
 'colsample_bytree': 1.0},
'XGBoost/T2': {'n_estimators': 10000,
 'learning_rate': 0.06994332504138304,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 6,
 'min_child_weight': 4,
 'colsample_bytree': 0.7744067519636624},
'XGBoost/T3': {'n_estimators': 10000,
```

```
 'learning_rate': 0.023861097124304623,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 8,
 'min_child_weight': 3,
 'colsample_bytree': 0.7724415914984484},
'XGBoost/T4': {'n_estimators': 10000,
 'learning_rate': 0.13416642577896964,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 3,
 'min_child_weight': 5,
 'colsample_bytree': 0.7187936056313462},
'XGBoost/T5': {'n_estimators': 10000,
 'learning_rate': 0.09276005809908329,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 10,
 'min_child_weight': 1,
 'colsample_bytree': 0.6917207594128889},
'XGBoost/T6': {'n_estimators': 10000,
 'learning_rate': 0.10924921900648811,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 3,
 'min_child_weight': 2,
 'colsample_bytree': 0.6963923980504149},
'XGBoost/T7': {'n_estimators': 10000,
 'learning_rate': 0.019449795636786765,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 8,
 'min_child_weight': 1,
 'colsample_bytree': 0.8240859360255985},
'XGBoost/T8': {'n_estimators': 10000,
 'learning_rate': 0.09533886267453755,
 'n_jobs': -1,
 'proc.max_category_levels': 100,
 'objective': 'reg:squarederror',
 'booster': 'gbtree',
 'max_depth': 6,
 'min_child_weight': 4,
 'colsample_bytree': 0.989309171116382},
'XGBoost/T9': {'n_estimators': 10000,
 'learning_rate': 0.07136195658560457,
 'n_jobs': -1,
```

```
  'proc.max_category_levels': 100,
  'objective': 'reg:squarederror',
  'booster': 'gbtree',
  'max_depth': 4,
  'min_child_weight': 2,
  'colsample_bytree': 0.8394397650594801},
 'XGBoost/T10': {'n_estimators': 10000,
  'learning_rate': 0.08209519615003696,
  'n_jobs': -1,
  'proc.max_category_levels': 100,
  'objective': 'reg:squarederror',
  'booster': 'gbtree',
  'max_depth': 5,
  'min_child_weight': 5,
  'colsample_bytree': 0.7686866147245053},
 'LightGBMLarge': {'learning_rate': 0.03,
  'num_leaves': 128,
  'feature_fraction': 0.9,
  'min_data_in_leaf': 5},
 'WeightedEnsemble_L2': {'use_orig_features': False,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True}},
'leaderboard':                   model   score_val  pred_time_val    fit_time  \
0   WeightedEnsemble_L2  -34.157986       3.083668  130.886707
1         LightGBMLarge  -35.084407       0.234428    3.245750
2           LightGBM/T6  -35.535895       0.470809    3.943258
3           LightGBM/T4  -35.747401       1.897607   13.419563
4           LightGBM/T2  -35.765268       0.196197    2.444501
5           LightGBM/T9  -35.866152       1.227807   10.658077
6           LightGBM/T7  -36.073260       0.199900    2.231859
7           LightGBM/T3  -36.158163       0.321429    2.758293
8           CatBoost/T1  -36.477011       0.038203   93.243795
9           LightGBM/T5  -36.493051       0.089158    1.399360
10          LightGBM/T1  -36.589119       0.441031    2.803530
11           XGBoost/T7  -36.589823       0.792741    8.848828
12         LightGBM/T10  -36.722739       0.122314    1.989819
13          LightGBM/T8  -36.755214       0.194167    2.027795
14        LightGBMXT/T1  -36.833995       0.996990    6.480514
15        LightGBMXT/T6  -37.048670       7.469049   21.682117
16        LightGBMXT/T3  -37.145831       2.266434   12.522931
17           XGBoost/T3  -37.282276       0.735572    7.557322
18           XGBoost/T2  -37.409687       0.153763    3.009027
19           XGBoost/T8  -37.631640       0.058006    1.849801
20          XGBoost/T10  -37.639962       0.342942    5.197793
21        LightGBMXT/T5  -37.771316       1.111602    6.356288
22           XGBoost/T1  -38.092021       0.177002    3.735222
23        LightGBMXT/T4  -38.438123       6.835552   23.268794
24           XGBoost/T9  -38.494082       0.839514   14.653902
25        LightGBMXT/T2  -38.971321       0.865083    6.315965
26        ExtraTreesMSE  -39.589513       0.512418    5.476547
27      RandomForestMSE  -40.006063       0.524696   11.462505
28           XGBoost/T4  -41.337639       0.888336   17.887226
29           XGBoost/T5  -41.483395       0.185056    4.566888
30           XGBoost/T6  -41.708157       0.990637   17.520937
31       KNeighborsDist  -94.488129       0.048024    0.016248
```

```
32       KNeighborsUnif -112.769894       0.046419    0.016603

    pred_time_val_marginal  fit_time_marginal  stack_level  can_infer  \
0                 0.000563           0.674781            2       True
1                 0.234428           3.245750            1       True
2                 0.470809           3.943258            1       True
3                 1.897607          13.419563            1       True
4                 0.196197           2.444501            1       True
5                 1.227807          10.658077            1       True
6                 0.199900           2.231859            1       True
7                 0.321429           2.758293            1       True
8                 0.038203          93.243795            1       True
9                 0.089158           1.399360            1       True
10                0.441031           2.803530            1       True
11                0.792741           8.848828            1       True
12                0.122314           1.989819            1       True
13                0.194167           2.027795            1       True
14                0.996990           6.480514            1       True
15                7.469049          21.682117            1       True
16                2.266434          12.522931            1       True
17                0.735572           7.557322            1       True
18                0.153763           3.009027            1       True
19                0.058006           1.849801            1       True
20                0.342942           5.197793            1       True
21                1.111602           6.356288            1       True
22                0.177002           3.735222            1       True
23                6.835552          23.268794            1       True
24                0.839514          14.653902            1       True
25                0.865083           6.315965            1       True
26                0.512418           5.476547            1       True
27                0.524696          11.462505            1       True
28                0.888336          17.887226            1       True
29                0.185056           4.566888            1       True
30                0.990637          17.520937            1       True
31                0.048024           0.016248            1       True
32                0.046419           0.016603            1       True

    fit_order
0          33
1          32
2          14
3          12
4          10
5          17
6          15
7          11
8          20
9          13
10          9
11         28
12         18
13         16
14          3
15          8
16          5
17         24
```

```
18         23
19         29
20         31
21          7
22         22
23          6
24         30
25          4
26         21
27         19
28         25
29         26
30         27
31          2
32          1  }
```

In [59]:
```
predictions_new_hpo = predictor_new_hpo.predict(test)
predictions_new_hpo[predictions_new_hpo<0]=0
predictions_new_hpo.describe()
```

Out[59]:
```
count    6493.000000
mean      192.062881
std       169.186279
min         0.000000
25%        50.702843
50%       152.553436
75%       280.856323
max       880.127563
Name: count, dtype: float64
```

In [60]:
```
submission["count"] = predictions_new_hpo
submission.to_csv("submission_new_hpo4.csv", index=False)
```

In [61]:
```
!kaggle competitions submit -c bike-sharing-demand -f submission_new_hpo4.csv -m "n
```

```
100%|████████████████████████████████████████| 188k/188k [00:00<00:00, 775kB/s]
Successfully submitted to Bike Sharing Demand
```

In [62]:
```
!kaggle competitions submissions -c bike-sharing-demand
```

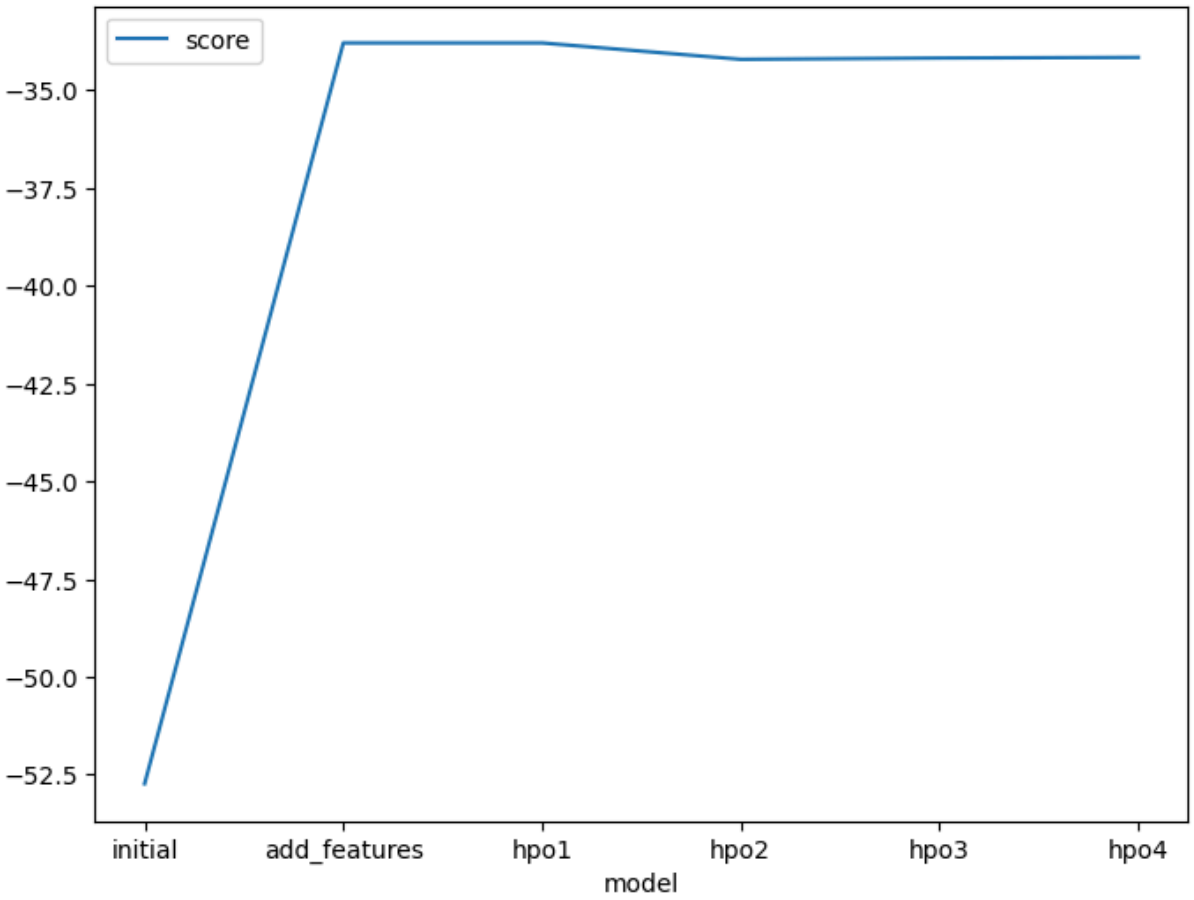
```
fileName                    date                description
status    publicScore  privateScore
--------------------------  ------------------  ---------------------------------
-------------------------------------------  --------  -----------  ------------
submission_new_hpo4.csv     2024-06-29 01:47:15  new features with hyperparameters
without presets, time limit 1200 and 10 trials  complete  0.55732      0.55732
submission_new_hpo3.csv     2024-06-29 01:26:58  new features with hyperparameters
without presets and time limit 1200             complete  0.55429      0.55429
submission_new_hpo2.csv     2024-06-29 01:17:56  new features with hyperparameters
without presets                                 complete  0.54719      0.54719
submission_new_hpo1.csv     2024-06-29 01:06:08  new features with hyperparameters
complete  0.6538       0.6538
submission_new_features.csv  2024-06-29 00:52:46  new features
complete  0.6538       0.6538
submission.csv              2024-06-29 00:47:15  first raw submission
complete  1.84007      1.84007
submission_new_hpo4.csv     2024-06-26 19:43:51  new features with hyperparameters
without presets time limit 1200 with 10 trials  complete  0.55202      0.55202
submission_new_hpo3.1.csv   2024-06-26 06:37:09  new features with hyperparameters
without presets and time limit 1200             complete  0.55016      0.55016
submission_new_hpo3.csv     2024-06-26 06:32:56  new features with hyperparameters
without presets and time limit of 1200          error
submission_new_hpo2.csv     2024-06-25 17:18:14  new features with hyperparameters
without presets                                 complete  1.83641      1.83641
submission_new_hpo.csv      2024-06-24 22:47:19  new features with hyperparameters
complete  0.6538       0.6538
submission_new_features.csv  2024-06-24 22:46:40  new features
complete  0.6538       0.6538
submission.csv              2024-06-24 22:46:05  first raw submission
complete  1.84007      1.84007
```

Step 7: Write a Report

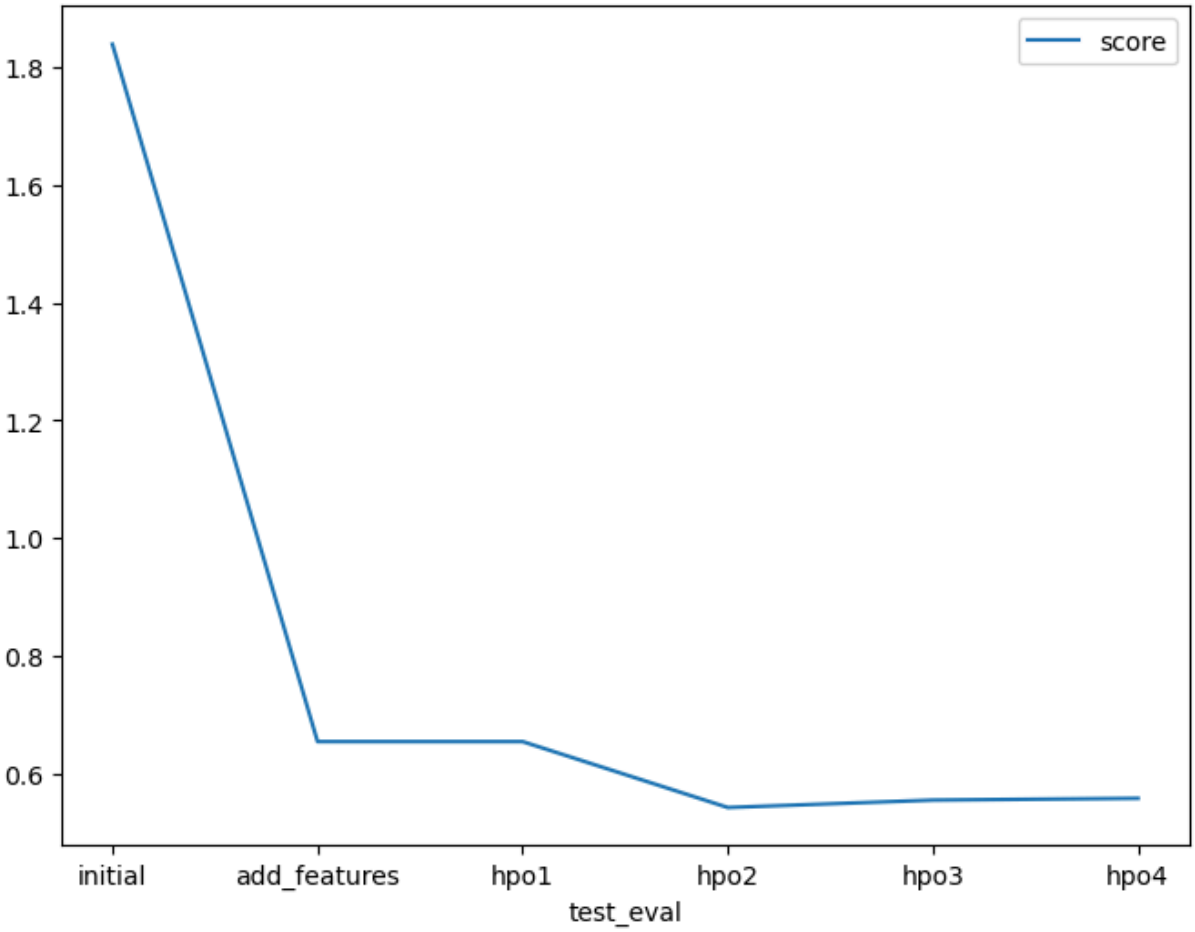
Refer to the markdown file for the full report

Creating plots and table for report

In [63]:
```
# Taking the top model score from each training run and creating a line plot to sho
# You can create these in the notebook and save them to PNG or use some other tool
fig = pd.DataFrame(
    {
        "model": ["initial", "add_features", "hpo1","hpo2","hpo3","hpo4"],
        "score": [-52.730, -33.788, -33.788,-34.2074,-34.174,-34.158]
    }
).plot(x="model", y="score", figsize=(8, 6)).get_figure()
fig.savefig('model_train_score.png')
```



In [64]:
```
# Take the 3 kaggle scores and creating a line plot to show improvement
fig = pd.DataFrame(
    {
        "test_eval": ["initial", "add_features", "hpo1","hpo2","hpo3","hpo4"],
        "score": [1.84007, 0.6538, 0.6538, 0.5417, 0.5543, 0.5573]
    }
).plot(x="test_eval", y="score", figsize=(8, 6)).get_figure()
fig.savefig('model_test_score.png')
```



Hyperparameter table

In [68]:
```
# The 3 hyperparameters we tuned with the kaggle score as the result
pd.DataFrame({
    "model": ["initial", "add_features", "hpo1", "hpo2", "hpo3", "hpo4"],
    "eval_metric": ['rmse', 'rmse', 'rmse', 'rmse', 'rmse', 'rmse'],
    "time_limit": [600, 600, 600, 600, 1200, 1200],
    "presets": ['best_quality', 'best_quality', 'best_quality', 'none', 'none', 'no
    "trials":['N/A', 'N/A', 5, 5, 5, 10],
    "score": [1.84007, 0.6538, 0.6538, 0.5417, 0.5543, 0.5573]
})
```

Out[68]:

	model	eval_metric	time_limit	presets	trials	score
0	initial	rmse	600	best_quality	N/A	1.84007
1	add_features	rmse	600	best_quality	N/A	0.65380
2	hpo1	rmse	600	best_quality	5	0.65380
3	hpo2	rmse	600	none	5	0.54170
4	hpo3	rmse	1200	none	5	0.55430
5	hpo4	rmse	1200	none	10	0.55730

In [ ]: