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.

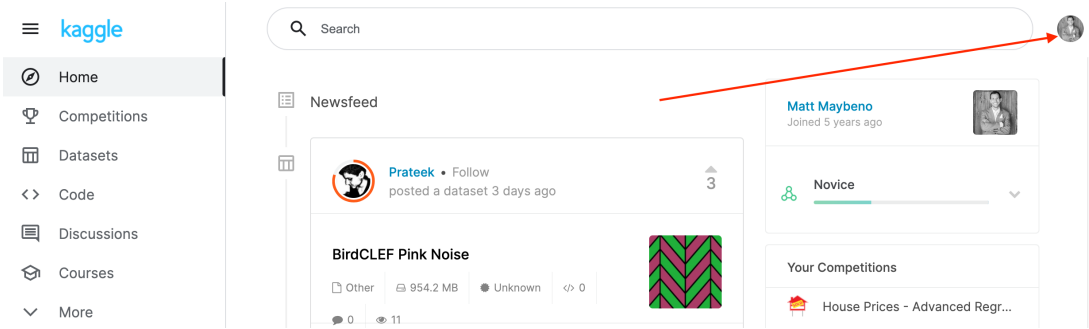
The rubric contains "Stand Out Suggestions" for enhancing the project beyond the minimum requirements. The stand out suggestions are optional. If you decide to pursue the "stand out suggestions", you can include the code in this notebook and also discuss the results in the writeup file.

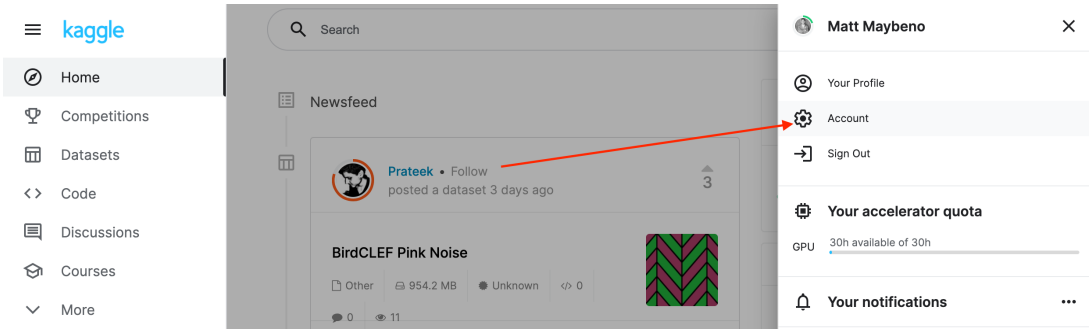
Step 1: Create an account with Kaggle

Create Kaggle Account and download API key

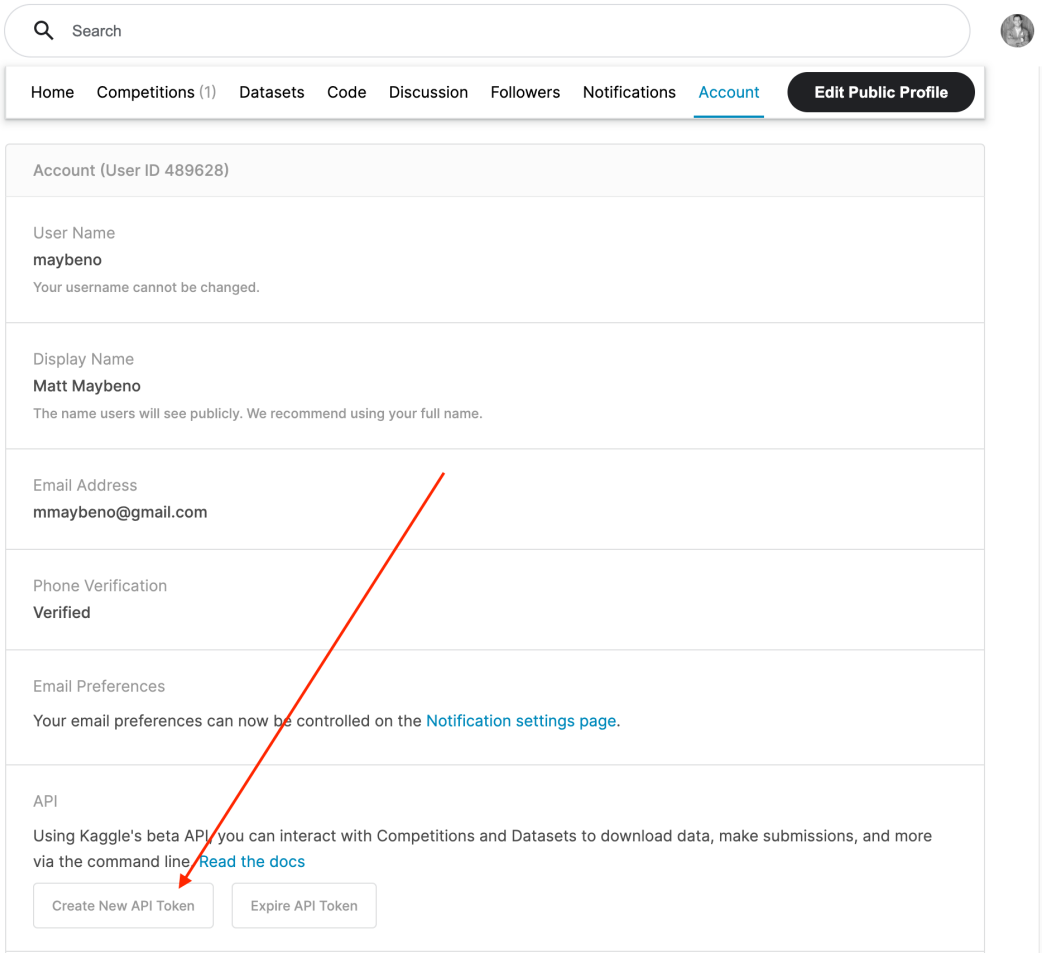
Below is example of steps to get the API username and key. Each student will have their own username and key.

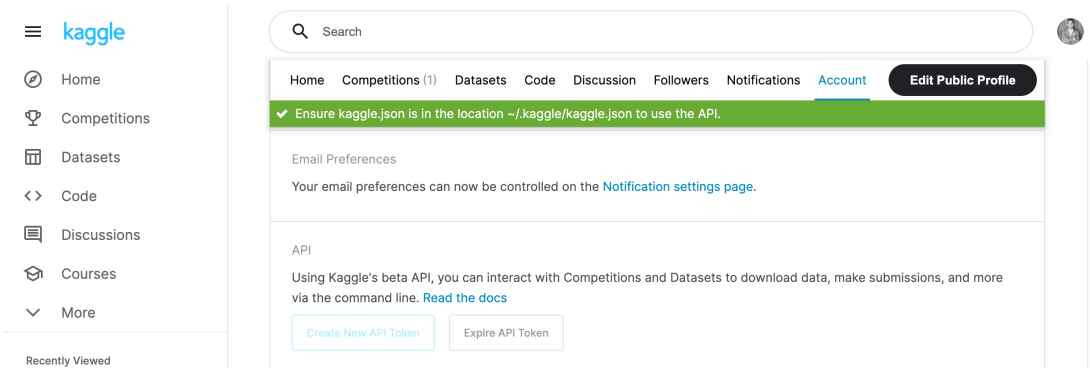
1. Open account settings.



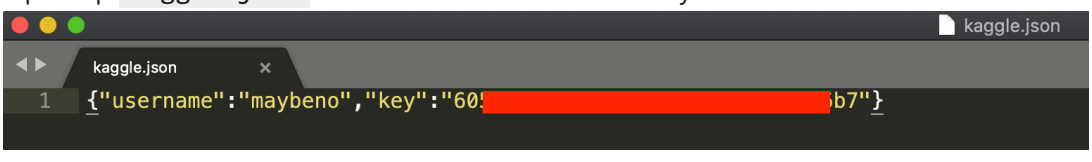


2. Scroll down to API and click Create New API Token.





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 [2]:
```
!pip install -U kaggle
```

```
Collecting kaggle
  Using cached kaggle-1.5.12.tar.gz (58 kB)
  Preparing metadata (setup.py) ... done
Requirement already satisfied: six>=1.10 in /usr/local/lib/python3.7/site-packages
(from kaggle) (1.16.0)
Requirement already satisfied: certifi in /usr/local/lib/python3.7/site-packages
(from kaggle) (2021.10.8)
Requirement already satisfied: python-dateutil in /usr/local/lib/python3.7/site-pa
ckages (from kaggle) (2.8.2)
Requirement already satisfied: requests in /usr/local/lib/python3.7/site-packages
(from kaggle) (2.22.0)
Requirement already satisfied: tqdm in /usr/local/lib/python3.7/site-packages (fro
m kaggle) (4.39.0)
Collecting python-slugify
  Downloading python_slugify-8.0.0-py2.py3-none-any.whl (9.5 kB)
Requirement already satisfied: urllib3 in /usr/local/lib/python3.7/site-packages
(from kaggle) (1.25.11)
Collecting text-unidecode>=1.3
  Using cached text_unidecode-1.3-py2.py3-none-any.whl (78 kB)
Requirement already satisfied: idna<2.9,>=2.5 in /usr/local/lib/python3.7/site-pac
kages (from requests->kaggle) (2.8)
Requirement already satisfied: chardet<3.1.0,>=3.0.2 in /usr/local/lib/python3.7/s
ite-packages (from requests->kaggle) (3.0.4)
Using legacy 'setup.py install' for kaggle, since package 'wheel' is not installe
d.
Installing collected packages: text-unidecode, python-slugify, kaggle
    Running setup.py install for kaggle ... done
Successfully installed kaggle-1.5.12 python-slugify-8.0.0 text-unidecode-1.3
WARNING: Running pip as the 'root' user can result in broken permissions and confl
icting behaviour with the system package manager. It is recommended to use a virtu
al environment instead: https://pip.pypa.io/warnings/venv
WARNING: You are using pip version 21.3.1; however, version 23.0 is available.
You should consider upgrading via the '/usr/local/bin/python3.7 -m pip install --u
pgrade pip' command.
```

In [3]:
```
!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
# Without --no-cache-dir, smaller aws instances may have trouble installing
```

```
Requirement already satisfied: pip in /usr/local/lib/python3.7/site-packages (21.
3.1)
Collecting pip
  Downloading pip-23.0-py3-none-any.whl (2.1 MB)
     |████████████████████████████████| 2.1 MB 26.6 MB/s
Installing collected packages: pip
  Attempting uninstall: pip
    Found existing installation: pip 21.3.1
    Uninstalling pip-21.3.1:
      Successfully uninstalled pip-21.3.1
Successfully installed pip-23.0
WARNING: Running pip as the 'root' user can result in broken permissions and confl
icting behaviour with the system package manager. It is recommended to use a virtu
al environment instead: https://pip.pypa.io/warnings/venv
Requirement already satisfied: setuptools in /usr/local/lib/python3.7/site-package
s (59.4.0)
Collecting setuptools
  Downloading setuptools-67.1.0-py3-none-any.whl (1.1 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.1/1.1 MB 11.6 MB/s eta 0:00:00:00:
01
Collecting wheel
  Using cached wheel-0.38.4-py3-none-any.whl (36 kB)
Installing collected packages: wheel, setuptools
  Attempting uninstall: setuptools
    Found existing installation: setuptools 59.4.0
    Uninstalling setuptools-59.4.0:
      Successfully uninstalled setuptools-59.4.0
Successfully installed setuptools-67.1.0 wheel-0.38.4
WARNING: Running pip as the 'root' user can result in broken permissions and confl
icting behaviour with the system package manager. It is recommended to use a virtu
al environment instead: https://pip.pypa.io/warnings/venv
Collecting mxnet<2.0.0
  Using cached mxnet-1.9.1-py3-none-manylinux2014_x86_64.whl (49.1 MB)
Collecting bokeh==2.0.1
  Using cached bokeh-2.0.1.tar.gz (8.6 MB)
  Preparing metadata (setup.py) ... done
Requirement already satisfied: PyYAML>=3.10 in /usr/local/lib/python3.7/site-packa
ges (from bokeh==2.0.1) (5.4.1)
Requirement already satisfied: python-dateutil>=2.1 in /usr/local/lib/python3.7/si
te-packages (from bokeh==2.0.1) (2.8.2)
Requirement already satisfied: Jinja2>=2.7 in /usr/local/lib/python3.7/site-packag
es (from bokeh==2.0.1) (3.0.3)
Requirement already satisfied: numpy>=1.11.3 in /usr/local/lib/python3.7/site-pack
ages (from bokeh==2.0.1) (1.19.1)
Requirement already satisfied: pillow>=4.0 in /usr/local/lib/python3.7/site-packag
es (from bokeh==2.0.1) (8.4.0)
Requirement already satisfied: packaging>=16.8 in /usr/local/lib/python3.7/site-pa
ckages (from bokeh==2.0.1) (21.3)
Requirement already satisfied: tornado>=5 in /usr/local/lib/python3.7/site-package
s (from bokeh==2.0.1) (6.1)
Requirement already satisfied: typing_extensions>=3.7.4 in /usr/local/lib/python3.
7/site-packages (from bokeh==2.0.1) (4.0.1)
Requirement already satisfied: requests<3,>=2.20.0 in /usr/local/lib/python3.7/sit
e-packages (from mxnet<2.0.0) (2.22.0)
Requirement already satisfied: graphviz<0.9.0,>=0.8.1 in /usr/local/lib/python3.7/
site-packages (from mxnet<2.0.0) (0.8.4)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.7/site-pa
ckages (from Jinja2>=2.7->bokeh==2.0.1) (2.0.1)
Requirement already satisfied: pyparsing!=3.0.5,>=2.0.2 in /usr/local/lib/python3.
7/site-packages (from packaging>=16.8->bokeh==2.0.1) (3.0.6)
Requirement already satisfied: six>=1.5 in /usr/local/lib/python3.7/site-packages
(from python-dateutil>=2.1->bokeh==2.0.1) (1.16.0)
Requirement already satisfied: chardet<3.1.0,>=3.0.2 in /usr/local/lib/python3.7/s
ite-packages (from requests<3,>=2.20.0->mxnet<2.0.0) (3.0.4)
```

```
Requirement already satisfied: urllib3!=1.25.0,!=1.25.1,<1.26,>=1.21.1 in /usr/loc
al/lib/python3.7/site-packages (from requests<3,>=2.20.0->mxnet<2.0.0) (1.25.11)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/site
-packages (from requests<3,>=2.20.0->mxnet<2.0.0) (2021.10.8)
Requirement already satisfied: idna<2.9,>=2.5 in /usr/local/lib/python3.7/site-pac
kages (from requests<3,>=2.20.0->mxnet<2.0.0) (2.8)
Building wheels for collected packages: bokeh
  Building wheel for bokeh (setup.py) ... done
  Created wheel for bokeh: filename=bokeh-2.0.1-py3-none-any.whl size=9080017 sha2
56=c3bab69f453642abfaa3160db6aac3a85af82f224e5191d2f72ca0953c7000fd
  Stored in directory: /root/.cache/pip/wheels/9f/9e/ac/f24f30e119df73511fde9af8aa
747217ac8824e662037ba9a8
Successfully built bokeh
Installing collected packages: mxnet, bokeh
  Attempting uninstall: bokeh
    Found existing installation: bokeh 2.4.2
    Uninstalling bokeh-2.4.2:
      Successfully uninstalled bokeh-2.4.2
Successfully installed bokeh-2.0.1 mxnet-1.9.1
WARNING: Running pip as the 'root' user can result in broken permissions and confl
icting behaviour with the system package manager. It is recommended to use a virtu
al environment instead: https://pip.pypa.io/warnings/venv
Collecting autogluon
  Downloading autogluon-0.6.2-py3-none-any.whl (9.8 kB)
Collecting autogluon.vision==0.6.2
  Downloading autogluon.vision-0.6.2-py3-none-any.whl (49 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 49.8/49.8 kB 70.9 MB/s eta 0:00:00
Collecting autogluon.features==0.6.2
  Downloading autogluon.features-0.6.2-py3-none-any.whl (60 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 60.0/60.0 kB 169.5 MB/s eta 0:00:00
Collecting autogluon.text==0.6.2
  Downloading autogluon.text-0.6.2-py3-none-any.whl (62 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 62.1/62.1 kB 159.2 MB/s eta 0:00:00
Collecting autogluon.timeseries[all]==0.6.2
  Downloading autogluon.timeseries-0.6.2-py3-none-any.whl (103 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 103.6/103.6 kB 185.4 MB/s eta 0:00:00
Collecting autogluon.multimodal==0.6.2
  Downloading autogluon.multimodal-0.6.2-py3-none-any.whl (303 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 303.4/303.4 kB 200.3 MB/s eta 0:00:00
Collecting autogluon.core[all]==0.6.2
  Downloading autogluon.core-0.6.2-py3-none-any.whl (226 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 226.5/226.5 kB 203.0 MB/s eta 0:00:00
Collecting autogluon.tabular[all]==0.6.2
  Downloading autogluon.tabular-0.6.2-py3-none-any.whl (292 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 292.5/292.5 kB 213.6 MB/s eta 0:00:00
Collecting numpy<1.24,>=1.21
  Downloading numpy-1.21.6-cp37-cp37m-manylinux_2_12_x86_64.manylinux2010_x86_64.w
hl (15.7 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 15.7/15.7 MB 160.6 MB/s eta 0:00:00a
0:00:01
Requirement already satisfied: scikit-learn<1.2,>=1.0.0 in /usr/local/lib/python3.
7/site-packages (from autogluon.core[all]==0.6.2->autogluon) (1.0.1)
Requirement already satisfied: psutil<6,>=5.7.3 in /usr/local/lib/python3.7/site-p
ackages (from autogluon.core[all]==0.6.2->autogluon) (5.8.0)
Collecting scipy<1.10.0,>=1.5.4
  Downloading scipy-1.7.3-cp37-cp37m-manylinux_2_12_x86_64.manylinux2010_x86_64.wh
l (38.1 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 38.1/38.1 MB 156.8 MB/s eta 0:00:00a
0:00:01
Requirement already satisfied: tqdm>=4.38.0 in /usr/local/lib/python3.7/site-packa
ges (from autogluon.core[all]==0.6.2->autogluon) (4.39.0)
Requirement already satisfied: pandas!=1.4.0,<1.6,>=1.2.5 in /usr/local/lib/python
3.7/site-packages (from autogluon.core[all]==0.6.2->autogluon) (1.3.4)
Requirement already satisfied: requests in /usr/local/lib/python3.7/site-packages
```

```
(from autogluon.core[all]==0.6.2->autogluon) (2.22.0)
Requirement already satisfied: networkx<3.0,>=2.3 in /usr/local/lib/python3.7/site
-packages (from autogluon.core[all]==0.6.2->autogluon) (2.6.3)
Requirement already satisfied: boto3 in /usr/local/lib/python3.7/site-packages (fr
om autogluon.core[all]==0.6.2->autogluon) (1.20.17)
Collecting dask<=2021.11.2,>=2021.09.1
  Downloading dask-2021.11.2-py3-none-any.whl (1.0 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.0/1.0 MB 123.6 MB/s eta 0:00:00
Collecting distributed<=2021.11.2,>=2021.09.1
  Downloading distributed-2021.11.2-py3-none-any.whl (802 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 802.2/802.2 kB 131.0 MB/s eta 0:00:00
Requirement already satisfied: matplotlib in /usr/local/lib/python3.7/site-package
s (from autogluon.core[all]==0.6.2->autogluon) (3.5.0)
Collecting autogluon.common==0.6.2
  Downloading autogluon.common-0.6.2-py3-none-any.whl (44 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 44.7/44.7 kB 152.5 MB/s eta 0:00:00
Collecting ray<2.1,>=2.0
  Downloading ray-2.0.1-cp37-cp37m-manylinux2014_x86_64.whl (60.5 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 60.5/60.5 MB 161.5 MB/s eta 0:00:00a
0:00:01
Collecting hyperopt<0.2.8,>=0.2.7
  Downloading hyperopt-0.2.7-py2.py3-none-any.whl (1.6 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.6/1.6 MB 152.0 MB/s eta 0:00:00
Collecting pytorch-lightning<1.8.0,>=1.7.4
  Downloading pytorch_lightning-1.7.7-py3-none-any.whl (708 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 708.1/708.1 kB 235.0 MB/s eta 0:00:00
Collecting Pillow<=9.4.0,>=9.3.0
  Downloading Pillow-9.4.0-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.w
hl (3.3 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 3.3/3.3 MB 178.8 MB/s eta 0:00:00
Collecting smart-open<5.3.0,>=5.2.1
  Downloading smart_open-5.2.1-py3-none-any.whl (58 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 58.6/58.6 kB 160.2 MB/s eta 0:00:00
Collecting nlpaug<=1.1.10,>=1.1.10
  Downloading nlpaug-1.1.10-py3-none-any.whl (410 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 410.8/410.8 kB 224.7 MB/s eta 0:00:00
Collecting nptyping<1.5.0,>=1.4.4
  Downloading nptyping-1.4.4-py3-none-any.whl (31 kB)
Collecting torch<1.13,>=1.9
  Downloading torch-1.12.1-cp37-cp37m-manylinux1_x86_64.whl (776.3 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 776.3/776.3 MB 159.3 MB/s eta 0:00:000
0:0100:01
Collecting torchmetrics<0.9.0,>=0.8.0
  Downloading torchmetrics-0.8.2-py3-none-any.whl (409 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 409.8/409.8 kB 139.0 MB/s eta 0:00:00
Collecting accelerate<0.14,>=0.9
  Downloading accelerate-0.13.2-py3-none-any.whl (148 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 148.8/148.8 kB 202.6 MB/s eta 0:00:00
Collecting pytorch-metric-learning<1.4.0,>=1.3.0
  Downloading pytorch_metric_learning-1.3.2-py3-none-any.whl (109 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 109.4/109.4 kB 175.2 MB/s eta 0:00:00
Collecting torchvision<0.14.0
  Downloading torchvision-0.13.1-cp37-cp37m-manylinux1_x86_64.whl (19.1 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 19.1/19.1 MB 163.6 MB/s eta 0:00:00a
0:00:01
Requirement already satisfied: text-unidecode<=1.3 in /usr/local/lib/python3.7/sit
e-packages (from autogluon.multimodal==0.6.2->autogluon) (1.3)
Collecting sentencepiece<0.2.0,>=0.1.95
  Downloading sentencepiece-0.1.97-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_
x86_64.whl (1.3 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.3/1.3 MB 232.8 MB/s eta 0:00:00
Collecting albumentations<=1.2.0,>=1.1.0
  Downloading albumentations-1.2.0-py3-none-any.whl (113 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 113.5/113.5 kB 178.7 MB/s eta 0:00:00
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Collecting evaluate<=0.3.0
  Downloading evaluate-0.3.0-py3-none-any.whl (72 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 72.9/72.9 kB 168.0 MB/s eta 0:00:00
Collecting openmim<=0.2.1,>0.1.5
  Downloading openmim-0.2.1-py2.py3-none-any.whl (49 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 49.7/49.7 kB 141.9 MB/s eta 0:00:00
Collecting seqeval<=1.2.2
  Downloading seqeval-1.2.2.tar.gz (43 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 43.6/43.6 kB 119.5 MB/s eta 0:00:00
  Preparing metadata (setup.py) ... done
Collecting fairscale<=0.4.6,>=0.4.5
  Downloading fairscale-0.4.6.tar.gz (248 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 248.2/248.2 kB 214.0 MB/s eta 0:00:00
  Installing build dependencies ... done
  Getting requirements to build wheel ... done
  Installing backend dependencies ... done
  Preparing metadata (pyproject.toml) ... done
Collecting scikit-image<0.20.0,>=0.19.1
  Downloading scikit_image-0.19.3-cp37-cp37m-manylinux_2_12_x86_64.manylinux2010_x
86_64.whl (13.5 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 13.5/13.5 MB 158.2 MB/s eta 0:00:00a
0:00:01
Collecting transformers<4.24.0,>=4.23.0
  Downloading transformers-4.23.1-py3-none-any.whl (5.3 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 5.3/5.3 MB 178.6 MB/s eta 0:00:00
Collecting omegaconf<2.2.0,>=2.1.1
  Downloading omegaconf-2.1.2-py3-none-any.whl (74 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 74.7/74.7 kB 173.1 MB/s eta 0:00:00
Collecting nltk<4.0.0,>=3.4.5
  Downloading nltk-3.8.1-py3-none-any.whl (1.5 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.5/1.5 MB 227.1 MB/s eta 0:00:00
Collecting defusedxml<=0.7.1,>=0.7.1
  Downloading defusedxml-0.7.1-py2.py3-none-any.whl (25 kB)
Collecting jsonschema<=4.8.0
  Downloading jsonschema-4.8.0-py3-none-any.whl (81 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 81.4/81.4 kB 185.6 MB/s eta 0:00:00
Collecting torchtext<0.14.0
  Downloading torchtext-0.13.1-cp37-cp37m-manylinux1_x86_64.whl (1.9 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.9/1.9 MB 217.7 MB/s eta 0:00:00
Collecting timm<0.7.0
  Downloading timm-0.6.12-py3-none-any.whl (549 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 549.1/549.1 kB 221.4 MB/s eta 0:00:00
Collecting catboost<1.2,>=1.0
  Downloading catboost-1.1.1-cp37-none-manylinux1_x86_64.whl (76.6 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 76.6/76.6 MB 161.7 MB/s eta 0:00:000
0:0100:01
Collecting fastai<2.8,>=2.3.1
  Downloading fastai-2.7.10-py3-none-any.whl (240 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 240.9/240.9 kB 208.2 MB/s eta 0:00:00
Collecting xgboost<1.8,>=1.6
  Downloading xgboost-1.6.2-py3-none-manylinux2014_x86_64.whl (255.9 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 255.9/255.9 MB 149.4 MB/s eta 0:00:000
0:0100:01
Collecting lightgbm<3.4,>=3.3
  Downloading lightgbm-3.3.5-py3-none-manylinux1_x86_64.whl (2.0 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 2.0/2.0 MB 225.0 MB/s eta 0:00:00
Collecting statsmodels~=0.13.0
  Downloading statsmodels-0.13.5-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x8
6_64.whl (9.9 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 9.9/9.9 MB 164.2 MB/s eta 0:00:00a
0:00:01
Requirement already satisfied: joblib~=1.1 in /usr/local/lib/python3.7/site-packag
es (from autogluon.timeseries[all]==0.6.2->autogluon) (1.1.0)
Collecting gluonts~=0.11.0
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  Downloading gluonts-0.11.9-py3-none-any.whl (1.1 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.1/1.1 MB 226.8 MB/s eta 0:00:00
Collecting sktime<0.14,>=0.13.1
  Downloading sktime-0.13.4-py3-none-any.whl (7.0 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 7.0/7.0 MB 173.3 MB/s eta 0:00:00a
0:00:01
Collecting pmdarima~=1.8.2
  Downloading pmdarima-1.8.5-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_6
4.manylinux_2_24_x86_64.whl (1.4 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.4/1.4 MB 231.6 MB/s eta 0:00:00
Collecting tbats~=1.1
  Downloading tbats-1.1.2-py3-none-any.whl (43 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 43.8/43.8 kB 140.0 MB/s eta 0:00:00
Collecting gluoncv<0.10.6,>=0.10.5
  Downloading gluoncv-0.10.5.post0-py2.py3-none-any.whl (1.3 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 1.3/1.3 MB 195.6 MB/s eta 0:00:00
Requirement already satisfied: setuptools in /usr/local/lib/python3.7/site-package
s (from autogluon.common==0.6.2->autogluon.core[all]==0.6.2->autogluon) (67.1.0)
Requirement already satisfied: pyyaml in /usr/local/lib/python3.7/site-packages (f
rom accelerate<0.14,>=0.9->autogluon.multimodal==0.6.2->autogluon) (5.4.1)
Requirement already satisfied: packaging>=20.0 in /usr/local/lib/python3.7/site-pa
ckages (from accelerate<0.14,>=0.9->autogluon.multimodal==0.6.2->autogluon) (21.3)
Collecting qudida>=0.0.4
  Downloading qudida-0.0.4-py3-none-any.whl (3.5 kB)
Collecting opencv-python-headless>=4.1.1
  Downloading opencv_python_headless-4.7.0.68-cp37-abi3-manylinux_2_17_x86_64.many
linux2014_x86_64.whl (49.2 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 49.2/49.2 MB 166.5 MB/s eta 0:00:000
0:0100:01
Collecting albumentations<=1.2.0,>=1.1.0
  Downloading albumentations-1.1.0-py3-none-any.whl (102 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 102.4/102.4 kB 181.6 MB/s eta 0:00:00
Requirement already satisfied: six in /usr/local/lib/python3.7/site-packages (from
catboost<1.2,>=1.0->autogluon.tabular[all]==0.6.2->autogluon) (1.16.0)
Requirement already satisfied: plotly in /usr/local/lib/python3.7/site-packages (f
rom catboost<1.2,>=1.0->autogluon.tabular[all]==0.6.2->autogluon) (5.4.0)
Requirement already satisfied: graphviz in /usr/local/lib/python3.7/site-packages
(from catboost<1.2,>=1.0->autogluon.tabular[all]==0.6.2->autogluon) (0.8.4)
Requirement already satisfied: cloudpickle>=1.1.1 in /usr/local/lib/python3.7/site
-packages (from dask<=2021.11.2,>=2021.09.1->autogluon.core[all]==0.6.2->autogluo
n) (2.0.0)
Requirement already satisfied: fsspec>=0.6.0 in /usr/local/lib/python3.7/site-pack
ages (from dask<=2021.11.2,>=2021.09.1->autogluon.core[all]==0.6.2->autogluon) (20
21.11.1)
Collecting toolz>=0.8.2
  Downloading toolz-0.12.0-py3-none-any.whl (55 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 55.8/55.8 kB 131.8 MB/s eta 0:00:00
Collecting partd>=0.3.10
  Downloading partd-1.3.0-py3-none-any.whl (18 kB)
Collecting click>=6.6
  Downloading click-8.1.3-py3-none-any.whl (96 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 96.6/96.6 kB 181.3 MB/s eta 0:00:00
Collecting tblib>=1.6.0
  Downloading tblib-1.7.0-py2.py3-none-any.whl (12 kB)
Requirement already satisfied: jinja2 in /usr/local/lib/python3.7/site-packages (f
rom distributed<=2021.11.2,>=2021.09.1->autogluon.core[all]==0.6.2->autogluon) (3.
0.3)
Requirement already satisfied: tornado>=5 in /usr/local/lib/python3.7/site-package
s (from distributed<=2021.11.2,>=2021.09.1->autogluon.core[all]==0.6.2->autogluon)
(6.1)
Collecting msgpack>=0.6.0
  Downloading msgpack-1.0.4-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.
whl (299 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 299.8/299.8 kB 211.3 MB/s eta 0:00:00
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Collecting sortedcontainers!=2.0.0,!=2.0.1
  Downloading sortedcontainers-2.4.0-py2.py3-none-any.whl (29 kB)
Collecting zict>=0.1.3
  Downloading zict-2.2.0-py2.py3-none-any.whl (23 kB)
Requirement already satisfied: multiprocess in /usr/local/lib/python3.7/site-packa
ges (from evaluate<=0.3.0->autogluon.multimodal==0.6.2->autogluon) (0.70.12.2)
Collecting huggingface-hub>=0.7.0
  Downloading huggingface_hub-0.12.0-py3-none-any.whl (190 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 190.3/190.3 kB 196.6 MB/s eta 0:00:00
Collecting responses<0.19
  Downloading responses-0.18.0-py3-none-any.whl (38 kB)
Collecting tqdm>=4.38.0
  Downloading tqdm-4.64.1-py2.py3-none-any.whl (78 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 78.5/78.5 kB 182.1 MB/s eta 0:00:00
Collecting xxhash
  Downloading xxhash-3.2.0-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.w
hl (213 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 213.1/213.1 kB 207.7 MB/s eta 0:00:00
Requirement already satisfied: dill in /usr/local/lib/python3.7/site-packages (fro
m evaluate<=0.3.0->autogluon.multimodal==0.6.2->autogluon) (0.3.4)
Requirement already satisfied: importlib-metadata in /usr/local/lib/python3.7/site
-packages (from evaluate<=0.3.0->autogluon.multimodal==0.6.2->autogluon) (4.8.2)
Collecting datasets>=2.0.0
  Downloading datasets-2.9.0-py3-none-any.whl (462 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 462.8/462.8 kB 224.9 MB/s eta 0:00:00
Collecting fastdownload<2,>=0.0.5
  Downloading fastdownload-0.0.7-py3-none-any.whl (12 kB)
Collecting fastcore<1.6,>=1.4.5
  Downloading fastcore-1.5.28-py3-none-any.whl (67 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 67.6/67.6 kB 174.0 MB/s eta 0:00:00
Collecting fastprogress>=0.2.4
  Downloading fastprogress-1.0.3-py3-none-any.whl (12 kB)
Collecting spacy<4
  Downloading spacy-3.5.0-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.wh
l (6.5 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 6.5/6.5 MB 175.8 MB/s eta 0:00:00a
0:00:01
Requirement already satisfied: pip in /usr/local/lib/python3.7/site-packages (from
fastai<2.8,>=2.3.1->autogluon.tabular[all]==0.6.2->autogluon) (23.0)
Collecting yacs
  Downloading yacs-0.1.8-py3-none-any.whl (14 kB)
Collecting autocfg
  Downloading autocfg-0.0.8-py3-none-any.whl (13 kB)
Requirement already satisfied: opencv-python in /usr/local/lib/python3.7/site-pack
ages (from gluoncv<0.10.6,>=0.10.5->autogluon.vision==0.6.2->autogluon) (4.5.4.60)
Requirement already satisfied: portalocker in /usr/local/lib/python3.7/site-packag
es (from gluoncv<0.10.6,>=0.10.5->autogluon.vision==0.6.2->autogluon) (2.3.2)
Requirement already satisfied: typing-extensions~=4.0 in /usr/local/lib/python3.7/
site-packages (from gluonts~=0.11.0->autogluon.timeseries[all]==0.6.2->autogluon)
(4.0.1)
Collecting pydantic~=1.7
  Downloading pydantic-1.10.4-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_6
4.whl (3.1 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 3.1/3.1 MB 212.2 MB/s eta 0:00:00
Collecting future
  Downloading future-0.18.3.tar.gz (840 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 840.9/840.9 kB 229.6 MB/s eta 0:00:00
  Preparing metadata (setup.py) ... done
Collecting py4j
  Downloading py4j-0.10.9.7-py2.py3-none-any.whl (200 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 200.5/200.5 kB 196.1 MB/s eta 0:00:00
Requirement already satisfied: attrs>=17.4.0 in /usr/local/lib/python3.7/site-pack
ages (from jsonschema<=4.8.0->autogluon.multimodal==0.6.2->autogluon) (21.2.0)
Collecting pyrsistent!=0.17.0,!=0.17.1,!=0.17.2,>=0.14.0
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  Downloading pyrsistent-0.19.3-py3-none-any.whl (57 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 57.5/57.5 kB 164.5 MB/s eta 0:00:00
Collecting importlib-resources>=1.4.0
  Downloading importlib_resources-5.10.2-py3-none-any.whl (34 kB)
Requirement already satisfied: wheel in /usr/local/lib/python3.7/site-packages (fr
om lightgbm<3.4,>=3.3->autogluon.tabular[all]==0.6.2->autogluon) (0.38.4)
Collecting regex>=2021.8.3
  Downloading regex-2022.10.31-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_
64.whl (757 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 757.1/757.1 kB 218.7 MB/s eta 0:00:00
Collecting typish>=1.7.0
  Downloading typish-1.9.3-py3-none-any.whl (45 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 45.1/45.1 kB 138.1 MB/s eta 0:00:00
Collecting antlr4-python3-runtime==4.8
  Downloading antlr4-python3-runtime-4.8.tar.gz (112 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 112.4/112.4 kB 194.9 MB/s eta 0:00:00
  Preparing metadata (setup.py) ... done
Collecting model-index
  Downloading model_index-0.1.11-py3-none-any.whl (34 kB)
Requirement already satisfied: tabulate in /usr/local/lib/python3.7/site-packages
(from openmim<=0.2.1,>0.1.5->autogluon.multimodal==0.6.2->autogluon) (0.8.9)
Collecting rich
  Downloading rich-13.3.1-py3-none-any.whl (239 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 239.0/239.0 kB 210.2 MB/s eta 0:00:00
Requirement already satisfied: colorama in /usr/local/lib/python3.7/site-packages
(from openmim<=0.2.1,>0.1.5->autogluon.multimodal==0.6.2->autogluon) (0.4.3)
Requirement already satisfied: python-dateutil>=2.7.3 in /usr/local/lib/python3.7/
site-packages (from pandas!=1.4.0,<1.6,>=1.2.5->autogluon.core[all]==0.6.2->autogl
uon) (2.8.2)
Requirement already satisfied: pytz>=2017.3 in /usr/local/lib/python3.7/site-packa
ges (from pandas!=1.4.0,<1.6,>=1.2.5->autogluon.core[all]==0.6.2->autogluon) (202
1.3)
Requirement already satisfied: urllib3 in /usr/local/lib/python3.7/site-packages
(from pmdarima~=1.8.2->autogluon.timeseries[all]==0.6.2->autogluon) (1.25.11)
Requirement already satisfied: Cython!=0.29.18,>=0.29 in /usr/local/lib/python3.7/
site-packages (from pmdarima~=1.8.2->autogluon.timeseries[all]==0.6.2->autogluon)
(0.29.24)
Collecting pyDeprecate>=0.3.1
  Downloading pyDeprecate-0.3.2-py3-none-any.whl (10 kB)
Collecting tensorboard>=2.9.1
  Downloading tensorboard-2.11.2-py3-none-any.whl (6.0 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 6.0/6.0 MB 191.4 MB/s eta 0:00:00
Collecting virtualenv
  Downloading virtualenv-20.17.1-py3-none-any.whl (8.8 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 8.8/8.8 MB 159.4 MB/s eta 0:00:00a
0:00:01
Collecting click>=6.6
  Downloading click-8.0.4-py3-none-any.whl (97 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 97.5/97.5 kB 174.2 MB/s eta 0:00:00
Collecting frozenlist
  Downloading frozenlist-1.3.3-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.m
anylinux_2_17_x86_64.manylinux2014_x86_64.whl (148 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 148.0/148.0 kB 201.4 MB/s eta 0:00:00
Requirement already satisfied: protobuf<4.0.0,>=3.15.3 in /usr/local/lib/python3.
7/site-packages (from ray<2.1,>=2.0->autogluon.core[all]==0.6.2->autogluon) (3.19.
1)
Collecting aiosignal
  Downloading aiosignal-1.3.1-py3-none-any.whl (7.6 kB)
Collecting grpcio<=1.43.0,>=1.32.0
  Downloading grpcio-1.43.0-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.
whl (4.1 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 4.1/4.1 MB 209.9 MB/s eta 0:00:00
Collecting filelock
  Downloading filelock-3.9.0-py3-none-any.whl (9.7 kB)
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Collecting tensorboardX>=1.9
  Downloading tensorboardX-2.5.1-py2.py3-none-any.whl (125 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 125.4/125.4 kB 195.5 MB/s eta 0:00:00
Requirement already satisfied: idna<2.9,>=2.5 in /usr/local/lib/python3.7/site-pac
kages (from requests->autogluon.core[all]==0.6.2->autogluon) (2.8)
Requirement already satisfied: chardet<3.1.0,>=3.0.2 in /usr/local/lib/python3.7/s
ite-packages (from requests->autogluon.core[all]==0.6.2->autogluon) (3.0.4)
Requirement already satisfied: certifi>=2017.4.17 in /usr/local/lib/python3.7/site
-packages (from requests->autogluon.core[all]==0.6.2->autogluon) (2021.10.8)
Requirement already satisfied: imageio>=2.4.1 in /usr/local/lib/python3.7/site-pac
kages (from scikit-image<0.20.0,>=0.19.1->autogluon.multimodal==0.6.2->autogluon)
(2.13.1)
Collecting PyWavelets>=1.1.1
  Downloading PyWavelets-1.3.0-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.m
anylinux_2_12_x86_64.manylinux2010_x86_64.whl (6.4 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 6.4/6.4 MB 168.1 MB/s eta 0:00:00a
0:00:01
Collecting tifffile>=2019.7.26
  Downloading tifffile-2021.11.2-py3-none-any.whl (178 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 178.9/178.9 kB 184.4 MB/s eta 0:00:00
Requirement already satisfied: threadpoolctl>=2.0.0 in /usr/local/lib/python3.7/si
te-packages (from scikit-learn<1.2,>=1.0.0->autogluon.core[all]==0.6.2->autogluon)
(3.0.0)
Collecting deprecated>=1.2.13
  Downloading Deprecated-1.2.13-py2.py3-none-any.whl (9.6 kB)
Requirement already satisfied: numba>=0.53 in /usr/local/lib/python3.7/site-packag
es (from sktime<0.14,>=0.13.1->autogluon.timeseries[all]==0.6.2->autogluon) (0.53.
1)
Collecting patsy>=0.5.2
  Downloading patsy-0.5.3-py2.py3-none-any.whl (233 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 233.8/233.8 kB 149.2 MB/s eta 0:00:00
Collecting tokenizers!=0.11.3,<0.14,>=0.11.1
  Downloading tokenizers-0.13.2-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86
_64.whl (7.6 MB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 7.6/7.6 MB 162.8 MB/s eta 0:00:00a
0:00:01
Requirement already satisfied: botocore<1.24.0,>=1.23.17 in /usr/local/lib/python
3.7/site-packages (from boto3->autogluon.core[all]==0.6.2->autogluon) (1.23.17)
Requirement already satisfied: jmespath<1.0.0,>=0.7.1 in /usr/local/lib/python3.7/
site-packages (from boto3->autogluon.core[all]==0.6.2->autogluon) (0.10.0)
Requirement already satisfied: s3transfer<0.6.0,>=0.5.0 in /usr/local/lib/python3.
7/site-packages (from boto3->autogluon.core[all]==0.6.2->autogluon) (0.5.0)
Requirement already satisfied: cycler>=0.10 in /usr/local/lib/python3.7/site-packa
ges (from matplotlib->autogluon.core[all]==0.6.2->autogluon) (0.11.0)
Requirement already satisfied: fonttools>=4.22.0 in /usr/local/lib/python3.7/site-
packages (from matplotlib->autogluon.core[all]==0.6.2->autogluon) (4.28.2)
Requirement already satisfied: setuptools-scm>=4 in /usr/local/lib/python3.7/site-
packages (from matplotlib->autogluon.core[all]==0.6.2->autogluon) (6.3.2)
Requirement already satisfied: kiwisolver>=1.0.1 in /usr/local/lib/python3.7/site-
packages (from matplotlib->autogluon.core[all]==0.6.2->autogluon) (1.3.2)
Requirement already satisfied: pyparsing>=2.2.1 in /usr/local/lib/python3.7/site-p
ackages (from matplotlib->autogluon.core[all]==0.6.2->autogluon) (3.0.6)
Requirement already satisfied: pyarrow>=6.0.0 in /usr/local/lib/python3.7/site-pac
kages (from datasets>=2.0.0->evaluate<=0.3.0->autogluon.multimodal==0.6.2->autoglu
on) (6.0.1)
Collecting aiohttp
  Downloading aiohttp-3.8.3-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.
whl (948 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 948.0/948.0 kB 137.5 MB/s eta 0:00:00
Collecting wrapt<2,>=1.10
  Downloading wrapt-1.14.1-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.manyl
inux_2_17_x86_64.manylinux2014_x86_64.whl (75 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 75.2/75.2 kB 174.3 MB/s eta 0:00:00
Requirement already satisfied: zipp>=3.1.0 in /usr/local/lib/python3.7/site-packag
```

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es (from importlib-resources>=1.4.0->jsonschema<=4.8.0->autogluon.multimodal==0.6.
2->autogluon) (3.6.0)
Requirement already satisfied: llvmlite<0.37,>=0.36.0rc1 in /usr/local/lib/python
3.7/site-packages (from numba>=0.53->sktime<0.14,>=0.13.1->autogluon.timeseries[al
l]==0.6.2->autogluon) (0.36.0)
Collecting locket
  Downloading locket-1.0.0-py2.py3-none-any.whl (4.4 kB)
Collecting typing-extensions~=4.0
  Downloading typing_extensions-4.4.0-py3-none-any.whl (26 kB)
Requirement already satisfied: tomli>=1.0.0 in /usr/local/lib/python3.7/site-packa
ges (from setuptools-scm>=4->matplotlib->autogluon.core[all]==0.6.2->autogluon)
(1.2.2)
Collecting wasabi<1.2.0,>=0.9.1
  Downloading wasabi-1.1.1-py3-none-any.whl (27 kB)
Collecting murmurhash<1.1.0,>=0.28.0
  Downloading murmurhash-1.0.9-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.m
anylinux_2_17_x86_64.manylinux2014_x86_64.whl (21 kB)
Collecting pathy>=0.10.0
  Downloading pathy-0.10.1-py3-none-any.whl (48 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 48.9/48.9 kB 156.3 MB/s eta 0:00:00
Collecting catalogue<2.1.0,>=2.0.6
  Downloading catalogue-2.0.8-py3-none-any.whl (17 kB)
Collecting srsly<3.0.0,>=2.4.3
  Downloading srsly-2.4.5-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.wh
l (490 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 490.0/490.0 kB 225.3 MB/s eta 0:00:00
Collecting typer<0.8.0,>=0.3.0
  Downloading typer-0.7.0-py3-none-any.whl (38 kB)
Collecting spacy-loggers<2.0.0,>=1.0.0
  Downloading spacy_loggers-1.0.4-py3-none-any.whl (11 kB)
Collecting spacy-legacy<3.1.0,>=3.0.11
  Downloading spacy_legacy-3.0.12-py2.py3-none-any.whl (29 kB)
Collecting langcodes<4.0.0,>=3.2.0
  Downloading langcodes-3.3.0-py3-none-any.whl (181 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 181.6/181.6 kB 215.0 MB/s eta 0:00:00
Collecting cymem<2.1.0,>=2.0.2
  Downloading cymem-2.0.7-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.wh
l (36 kB)
Collecting preshed<3.1.0,>=3.0.2
  Downloading preshed-3.0.8-cp37-cp37m-manylinux_2_5_x86_64.manylinux1_x86_64.many
linux_2_17_x86_64.manylinux2014_x86_64.whl (126 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 126.6/126.6 kB 201.6 MB/s eta 0:00:00
Collecting thinc<8.2.0,>=8.1.0
  Downloading thinc-8.1.7-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.wh
l (815 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 815.9/815.9 kB 137.7 MB/s eta 0:00:00
Collecting absl-py>=0.4
  Downloading absl_py-1.4.0-py3-none-any.whl (126 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 126.5/126.5 kB 190.4 MB/s eta 0:00:00
Requirement already satisfied: werkzeug>=1.0.1 in /usr/local/lib/python3.7/site-pa
ckages (from tensorboard>=2.9.1->pytorch-lightning<1.8.0,>=1.7.4->autogluon.multim
odal==0.6.2->autogluon) (2.0.2)
Collecting tensorboard-plugin-wit>=1.6.0
  Downloading tensorboard_plugin_wit-1.8.1-py3-none-any.whl (781 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 781.3/781.3 kB 222.0 MB/s eta 0:00:00
Collecting google-auth<3,>=1.6.3
  Downloading google_auth-2.16.0-py2.py3-none-any.whl (177 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 177.8/177.8 kB 214.3 MB/s eta 0:00:00
Collecting markdown>=2.6.8
  Downloading Markdown-3.4.1-py3-none-any.whl (93 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 93.3/93.3 kB 182.8 MB/s eta 0:00:00
Collecting tensorboard-data-server<0.7.0,>=0.6.0
  Downloading tensorboard_data_server-0.6.1-py3-none-manylinux2010_x86_64.whl (4.9
MB)
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     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 4.9/4.9 MB 171.6 MB/s eta 0:00:00
Collecting google-auth-oauthlib<0.5,>=0.4.1
  Downloading google_auth_oauthlib-0.4.6-py2.py3-none-any.whl (18 kB)
Collecting heapdict
  Downloading HeapDict-1.0.1-py3-none-any.whl (3.9 kB)
Requirement already satisfied: MarkupSafe>=2.0 in /usr/local/lib/python3.7/site-pa
ckages (from jinja2->distributed<=2021.11.2,>=2021.09.1->autogluon.core[all]==0.6.
2->autogluon) (2.0.1)
Collecting ordered-set
  Downloading ordered_set-4.1.0-py3-none-any.whl (7.6 kB)
Requirement already satisfied: tenacity>=6.2.0 in /usr/local/lib/python3.7/site-pa
ckages (from plotly->catboost<1.2,>=1.0->autogluon.tabular[all]==0.6.2->autogluon)
(8.0.1)
Collecting markdown-it-py<3.0.0,>=2.1.0
  Downloading markdown_it_py-2.1.0-py3-none-any.whl (84 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 84.5/84.5 kB 181.8 MB/s eta 0:00:00
Requirement already satisfied: pygments<3.0.0,>=2.14.0 in /usr/local/lib/python3.
7/site-packages (from rich->openmim<=0.2.1,>0.1.5->autogluon.multimodal==0.6.2->au
togluon) (2.14.0)
Collecting distlib<1,>=0.3.6
  Downloading distlib-0.3.6-py2.py3-none-any.whl (468 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 468.5/468.5 kB 181.1 MB/s eta 0:00:00
Collecting importlib-metadata
  Downloading importlib_metadata-6.0.0-py3-none-any.whl (21 kB)
Collecting platformdirs<3,>=2.4
  Downloading platformdirs-2.6.2-py3-none-any.whl (14 kB)
Requirement already satisfied: rsa<5,>=3.1.4 in /usr/local/lib/python3.7/site-pack
ages (from google-auth<3,>=1.6.3->tensorboard>=2.9.1->pytorch-lightning<1.8.0,>=1.
7.4->autogluon.multimodal==0.6.2->autogluon) (4.7.2)
Collecting pyasn1-modules>=0.2.1
  Downloading pyasn1_modules-0.2.8-py2.py3-none-any.whl (155 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 155.3/155.3 kB 125.6 MB/s eta 0:00:00
Collecting cachetools<6.0,>=2.0.0
  Downloading cachetools-5.3.0-py3-none-any.whl (9.3 kB)
Collecting requests-oauthlib>=0.7.0
  Downloading requests_oauthlib-1.3.1-py2.py3-none-any.whl (23 kB)
Collecting mdurl~=0.1
  Downloading mdurl-0.1.2-py3-none-any.whl (10.0 kB)
Collecting confection<1.0.0,>=0.0.1
  Downloading confection-0.0.4-py3-none-any.whl (32 kB)
Collecting blis<0.8.0,>=0.7.8
  Downloading blis-0.7.9-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.whl
(10.2 MB)
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0:00:01
Collecting async-timeout<5.0,>=4.0.0a3
  Downloading async_timeout-4.0.2-py3-none-any.whl (5.8 kB)
Collecting yarl<2.0,>=1.0
  Downloading yarl-1.8.2-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_64.whl
(231 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 231.4/231.4 kB 214.4 MB/s eta 0:00:00
Collecting asynctest==0.13.0
  Downloading asynctest-0.13.0-py3-none-any.whl (26 kB)
Collecting charset-normalizer<3.0,>=2.0
  Downloading charset_normalizer-2.1.1-py3-none-any.whl (39 kB)
Collecting multidict<7.0,>=4.5
  Downloading multidict-6.0.4-cp37-cp37m-manylinux_2_17_x86_64.manylinux2014_x86_6
4.whl (94 kB)
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 94.8/94.8 kB 177.1 MB/s eta 0:00:00
Requirement already satisfied: pyasn1<0.5.0,>=0.4.6 in /usr/local/lib/python3.7/si
te-packages (from pyasn1-modules>=0.2.1->google-auth<3,>=1.6.3->tensorboard>=2.9.1
->pytorch-lightning<1.8.0,>=1.7.4->autogluon.multimodal==0.6.2->autogluon) (0.4.8)
Collecting oauthlib>=3.0.0
  Downloading oauthlib-3.2.2-py3-none-any.whl (151 kB)
```

```
     ━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━━ 151.7/151.7 kB 197.0 MB/s eta 0:00:00
Building wheels for collected packages: fairscale, antlr4-python3-runtime, seqeva
l, future
  Building wheel for fairscale (pyproject.toml) ... done
  Created wheel for fairscale: filename=fairscale-0.4.6-py3-none-any.whl size=3072
24 sha256=2e773b14b0d80e76e6f43d1b2437862b3f5994b7e5f8a28d2776e4360bccd471
  Stored in directory: /tmp/pip-ephem-wheel-cache-_rp2qj9h/wheels/4e/4f/0b/94c29ea
06dfad93260cb0377855f87b7b863312317a7f69fe7
  Building wheel for antlr4-python3-runtime (setup.py) ... done
  Created wheel for antlr4-python3-runtime: filename=antlr4_python3_runtime-4.8-py
3-none-any.whl size=141211 sha256=2dc88cf24925cd22f3008298a28b912c5888a7aebf8f38b5
66356ddc631e4022
  Stored in directory: /tmp/pip-ephem-wheel-cache-_rp2qj9h/wheels/ca/33/b7/3368361
25fc9bb4ceaa4376d8abca10ca8bc84ddc824baea6c
  Building wheel for seqeval (setup.py) ... done
  Created wheel for seqeval: filename=seqeval-1.2.2-py3-none-any.whl size=16164 sh
a256=3007ab2ad3c1f4d78c54077431c6e4300b71cceed32eb30d3cd7f5bdbe1c880b
  Stored in directory: /tmp/pip-ephem-wheel-cache-_rp2qj9h/wheels/05/96/ee/7cac4e7
4f3b19e3158dce26a20a1c86b3533c43ec72a549fd7
  Building wheel for future (setup.py) ... done
  Created wheel for future: filename=future-0.18.3-py3-none-any.whl size=492025 sh
a256=9e0a86fa0f6795b3271db3e4ce622c8b9cbff1776535a87742eb09935602b2f2
  Stored in directory: /tmp/pip-ephem-wheel-cache-_rp2qj9h/wheels/fa/cd/1f/c6b7b50
b564983bf3011e8fc75d06047ddc50c07f6e3660b00
Successfully built fairscale antlr4-python3-runtime seqeval future
Installing collected packages: typish, tokenizers, tensorboard-plugin-wit, sortedc
ontainers, sentencepiece, py4j, msgpack, heapdict, distlib, cymem, antlr4-python3-
runtime, zict, yacs, xxhash, wrapt, typing-extensions, tqdm, toolz, tensorboard-da
ta-server, tblib, spacy-loggers, spacy-legacy, smart-open, regex, pyrsistent, pyDe
precate, pyasn1-modules, Pillow, ordered-set, omegaconf, oauthlib, numpy, murmurha
sh, multidict, mdurl, locket, langcodes, importlib-resources, grpcio, future, froz
enlist, filelock, fastprogress, defusedxml, charset-normalizer, cachetools, autocf
g, asynctest, absl-py, yarl, wasabi, torch, tifffile, tensorboardX, scipy, respons
es, requests-oauthlib, PyWavelets, pydantic, preshed, platformdirs, patsy, partd,
opencv-python-headless, nptyping, markdown-it-py, importlib-metadata, google-auth,
fastcore, deprecated, catalogue, blis, async-timeout, aiosignal, xgboost, virtuale
nv, torchvision, torchtext, torchmetrics, statsmodels, srsly, scikit-image, rich,
nlpaug, markdown, jsonschema, hyperopt, huggingface-hub, google-auth-oauthlib, glu
onts, fastdownload, fairscale, dask, click, aiohttp, accelerate, typer, transforme
rs, timm, tensorboard, sktime, seqeval, ray, qudida, pytorch-metric-learning, pmda
rima, nltk, model-index, lightgbm, gluoncv, distributed, confection, catboost, thi
nc, tbats, pytorch-lightning, pathy, openmim, datasets, autogluon.common, albument
ations, spacy, evaluate, autogluon.features, autogluon.core, fastai, autogluon.tab
ular, autogluon.multimodal, autogluon.vision, autogluon.timeseries, autogluon.tex
t, autogluon
  Attempting uninstall: typing-extensions
    Found existing installation: typing_extensions 4.0.1
    Uninstalling typing_extensions-4.0.1:
      Successfully uninstalled typing_extensions-4.0.1
  Attempting uninstall: tqdm
    Found existing installation: tqdm 4.39.0
    Uninstalling tqdm-4.39.0:
      Successfully uninstalled tqdm-4.39.0
  Attempting uninstall: Pillow
    Found existing installation: Pillow 8.4.0
    Uninstalling Pillow-8.4.0:
      Successfully uninstalled Pillow-8.4.0
  Attempting uninstall: numpy
    Found existing installation: numpy 1.19.1
    Uninstalling numpy-1.19.1:
      Successfully uninstalled numpy-1.19.1
  Attempting uninstall: scipy
    Found existing installation: scipy 1.4.1
    Uninstalling scipy-1.4.1:
```

```
      Successfully uninstalled scipy-1.4.1
  Attempting uninstall: importlib-metadata
    Found existing installation: importlib-metadata 4.8.2
    Uninstalling importlib-metadata-4.8.2:
      Successfully uninstalled importlib-metadata-4.8.2
  Attempting uninstall: gluoncv
    Found existing installation: gluoncv 0.8.0
    Uninstalling gluoncv-0.8.0:
      Successfully uninstalled gluoncv-0.8.0
Successfully installed Pillow-9.4.0 PyWavelets-1.3.0 absl-py-1.4.0 accelerate-0.1
3.2 aiohttp-3.8.3 aiosignal-1.3.1 albumentations-1.1.0 antlr4-python3-runtime-4.8
async-timeout-4.0.2 asynctest-0.13.0 autocfg-0.0.8 autogluon-0.6.2 autogluon.commo
n-0.6.2 autogluon.core-0.6.2 autogluon.features-0.6.2 autogluon.multimodal-0.6.2 a
utogluon.tabular-0.6.2 autogluon.text-0.6.2 autogluon.timeseries-0.6.2 autogluon.v
ision-0.6.2 blis-0.7.9 cachetools-5.3.0 catalogue-2.0.8 catboost-1.1.1 charset-nor
malizer-2.1.1 click-8.0.4 confection-0.0.4 cymem-2.0.7 dask-2021.11.2 datasets-2.
9.0 defusedxml-0.7.1 deprecated-1.2.13 distlib-0.3.6 distributed-2021.11.2 evaluat
e-0.3.0 fairscale-0.4.6 fastai-2.7.10 fastcore-1.5.28 fastdownload-0.0.7 fastprogr
ess-1.0.3 filelock-3.9.0 frozenlist-1.3.3 future-0.18.3 gluoncv-0.10.5.post0 gluon
ts-0.11.9 google-auth-2.16.0 google-auth-oauthlib-0.4.6 grpcio-1.43.0 heapdict-1.
0.1 huggingface-hub-0.12.0 hyperopt-0.2.7 importlib-metadata-6.0.0 importlib-resou
rces-5.10.2 jsonschema-4.8.0 langcodes-3.3.0 lightgbm-3.3.5 locket-1.0.0 markdown-
3.4.1 markdown-it-py-2.1.0 mdurl-0.1.2 model-index-0.1.11 msgpack-1.0.4 multidict-
6.0.4 murmurhash-1.0.9 nlpaug-1.1.10 nltk-3.8.1 nptyping-1.4.4 numpy-1.21.6 oauthl
ib-3.2.2 omegaconf-2.1.2 opencv-python-headless-4.7.0.68 openmim-0.2.1 ordered-set
-4.1.0 partd-1.3.0 pathy-0.10.1 patsy-0.5.3 platformdirs-2.6.2 pmdarima-1.8.5 pres
hed-3.0.8 py4j-0.10.9.7 pyDeprecate-0.3.2 pyasn1-modules-0.2.8 pydantic-1.10.4 pyr
sistent-0.19.3 pytorch-lightning-1.7.7 pytorch-metric-learning-1.3.2 qudida-0.0.4
ray-2.0.1 regex-2022.10.31 requests-oauthlib-1.3.1 responses-0.18.0 rich-13.3.1 sc
ikit-image-0.19.3 scipy-1.7.3 sentencepiece-0.1.97 seqeval-1.2.2 sktime-0.13.4 sma
rt-open-5.2.1 sortedcontainers-2.4.0 spacy-3.5.0 spacy-legacy-3.0.12 spacy-loggers
-1.0.4 srsly-2.4.5 statsmodels-0.13.5 tbats-1.1.2 tblib-1.7.0 tensorboard-2.11.2 t
ensorboard-data-server-0.6.1 tensorboard-plugin-wit-1.8.1 tensorboardX-2.5.1 thinc
-8.1.7 tifffile-2021.11.2 timm-0.6.12 tokenizers-0.13.2 toolz-0.12.0 torch-1.12.1
torchmetrics-0.8.2 torchtext-0.13.1 torchvision-0.13.1 tqdm-4.64.1 transformers-4.
23.1 typer-0.7.0 typing-extensions-4.4.0 typish-1.9.3 virtualenv-20.17.1 wasabi-1.
1.1 wrapt-1.14.1 xgboost-1.6.2 xxhash-3.2.0 yacs-0.1.8 yarl-1.8.2 zict-2.2.0
WARNING: Running pip as the 'root' user can result in broken permissions and confl
icting behaviour with the system package manager. It is recommended to use a virtu
al environment instead: https://pip.pypa.io/warnings/venv
```

Setup Kaggle API Key

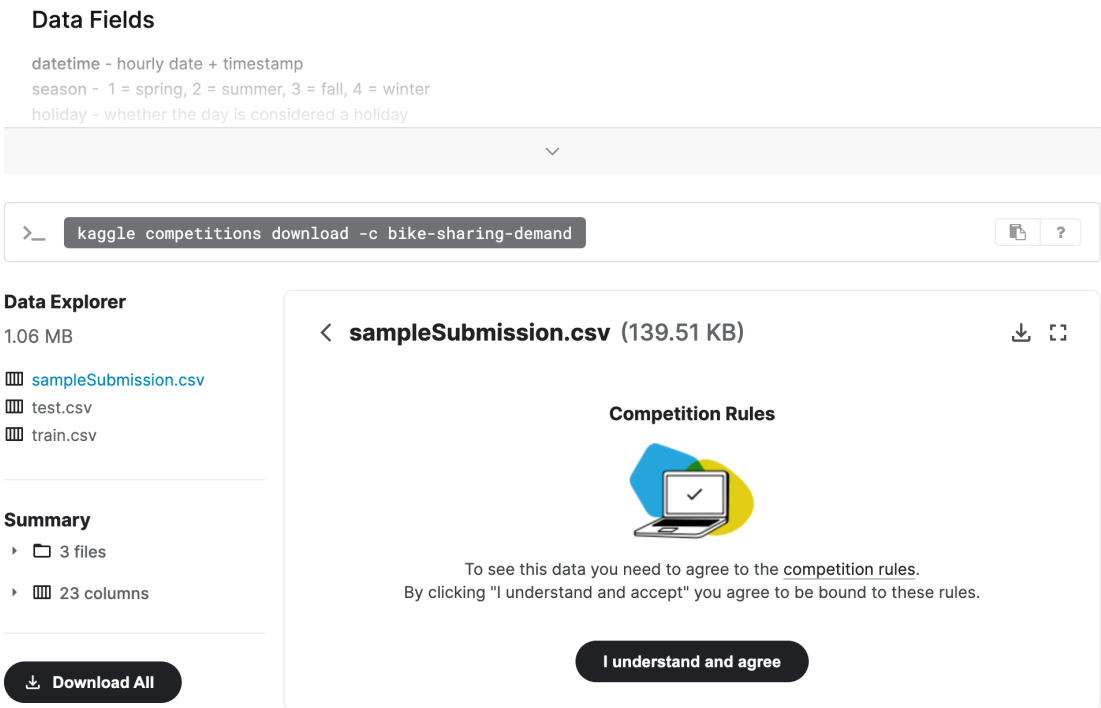
In [4]:
```
# create the .kaggle directory and an empty kaggle.json file
!mkdir -p /root/.kaggle
!touch /root/.kaggle/kaggle.json
!chmod 600 /root/.kaggle/kaggle.json
```

In [5]:
```
# Fill in your user name and key from creating the kaggle account and API token fil
import json
kaggle_username = "shadman0786"
kaggle_key = "ba2bd95715af517eb74098b94d5f4a3d"

# Save API token the kaggle.json file
with open("/root/.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 [6]:
```
# 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 /root/Project 2 re-attempt
  0%|                                               | 0.00/189k [00:00<?, ?B/s]
100%|████████████████████████████████████████| 189k/189k [00:00<00:00, 6.64MB/s]
Archive:  bike-sharing-demand.zip
  inflating: sampleSubmission.csv
  inflating: test.csv
  inflating: train.csv
```

In [7]:
```
import pandas as pd
from autogluon.tabular import TabularPredictor
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
%matplotlib inline
from datetime import datetime
import seaborn as sns
pd.options.mode.chained_assignment = None  # default='warn'
```

```
/usr/local/lib/python3.7/site-packages/tqdm/auto.py:22: TqdmWarning: IProgress not
found. Please update jupyter and ipywidgets. See https://ipywidgets.readthedocs.i
o/en/stable/user_install.html
  from .autonotebook import tqdm as notebook_tqdm
```

In [8]:
```
# 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
df_train = pd.read_csv('train.csv', parse_dates= ['datetime'])
df_train.head()
```

Out[8]:

	datetime	season	holiday	workingday	weather	temp	atemp	humidity	windspeed	casual
0	2011-01-01 00:00:00	1	0	0	1	9.84	14.395	81	0.0	3
1	2011-01-01 01:00:00	1	0	0	1	9.02	13.635	80	0.0	8
2	2011-01-01 02:00:00	1	0	0	1	9.02	13.635	80	0.0	5
3	2011-01-01 03:00:00	1	0	0	1	9.84	14.395	75	0.0	3
4	2011-01-01 04:00:00	1	0	0	1	9.84	14.395	75	0.0	0

EDA

In [9]:
```
df_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10886 entries, 0 to 10885
Data columns (total 12 columns):
 #   Column      Non-Null Count  Dtype         
---  ------      --------------  -----         
 0   datetime    10886 non-null  datetime64[ns]
 1   season      10886 non-null  int64         
 2   holiday     10886 non-null  int64         
 3   workingday  10886 non-null  int64         
 4   weather     10886 non-null  int64         
 5   temp        10886 non-null  float64       
 6   atemp       10886 non-null  float64       
 7   humidity    10886 non-null  int64         
 8   windspeed   10886 non-null  float64       
 9   casual      10886 non-null  int64         
 10  registered  10886 non-null  int64         
 11  count       10886 non-null  int64         
dtypes: datetime64[ns](1), float64(3), int64(8)
memory usage: 1020.7 KB
```

In [10]:
```
# Simple output of the train dataset to view some of the min/max/varition of the da
df_train.describe()
```

Out[10]:

	season	holiday	workingday	weather	temp	atemp	hu
count	10886.000000	10886.000000	10886.000000	10886.000000	10886.00000	10886.000000	10886.(
mean	2.506614	0.028569	0.680875	1.418427	20.23086	23.655084	61.8
std	1.116174	0.166599	0.466159	0.633839	7.79159	8.474601	19.2
min	1.000000	0.000000	0.000000	1.000000	0.82000	0.760000	0.(
25%	2.000000	0.000000	0.000000	1.000000	13.94000	16.665000	47.(
50%	3.000000	0.000000	1.000000	1.000000	20.50000	24.240000	62.(
75%	4.000000	0.000000	1.000000	2.000000	26.24000	31.060000	77.(
max	4.000000	1.000000	1.000000	4.000000	41.00000	45.455000	100.(

In [11]:
```
df_train.shape
```

Out[11]:
```
(10886, 12)
```

In [12]:
```
df_train.columns
```

Out[12]:
```
Index(['datetime', 'season', 'holiday', 'workingday', 'weather', 'temp',
       'atemp', 'humidity', 'windspeed', 'casual', 'registered', 'count'],
      dtype='object')
```

In [13]:
```
# Create the test pandas dataframe in pandas by reading the csv, remember to parse
df_test = pd.read_csv('test.csv', parse_dates= ['datetime'])
df_test.head()
```

Out[13]:

	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 [14]:
```
# Same thing as train and test dataset
submission = pd.read_csv('sampleSubmission.csv', parse_dates= ['datetime'])
submission.head()
```

Out[14]:

	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

In [15]:
```
df_train.drop(['casual', 'registered','datetime'], inplace = True, axis = 1)
df_test.drop(['datetime'], inplace = True, axis = 1)
```

In [16]:
```
print(df_train.shape)
print(df_test.shape)
```

```
(10886, 9)
(6493, 8)
```

In [17]:
```
df_train.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10886 entries, 0 to 10885
Data columns (total 9 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   season      10886 non-null  int64  
 1   holiday     10886 non-null  int64  
 2   workingday  10886 non-null  int64  
 3   weather     10886 non-null  int64  
 4   temp        10886 non-null  float64
 5   atemp       10886 non-null  float64
 6   humidity    10886 non-null  int64  
 7   windspeed   10886 non-null  float64
 8   count       10886 non-null  int64  
dtypes: float64(3), int64(6)
memory usage: 765.5 KB
```

In [18]:
```
df_test.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6493 entries, 0 to 6492
Data columns (total 8 columns):
 #   Column      Non-Null Count  Dtype  
---  ------      --------------  -----  
 0   season      6493 non-null   int64  
 1   holiday     6493 non-null   int64  
 2   workingday  6493 non-null   int64  
 3   weather     6493 non-null   int64  
 4   temp        6493 non-null   float64
 5   atemp       6493 non-null   float64
 6   humidity    6493 non-null   int64  
 7   windspeed   6493 non-null   float64
dtypes: float64(3), int64(5)
memory usage: 405.9 KB
```

In [19]:
```
df_train.nunique()
```

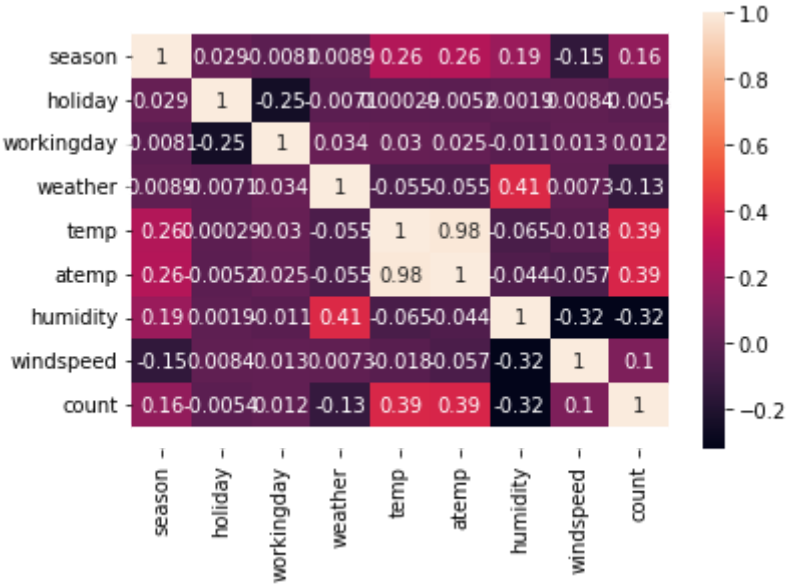
Out[19]:
```
season          4
holiday         2
workingday      2
weather         4
temp           49
atemp          60
humidity       89
windspeed      28
count         822
dtype: int64
```

In [20]:
```
# columns having nulls
df_train.isnull().sum()
# No nulls
```

Out[20]:
```
season        0
holiday       0
workingday    0
weather       0
temp          0
atemp         0
humidity      0
windspeed     0
count         0
dtype: int64
```

In [21]:
```
plot = sns.heatmap(df_train.corr(), annot = True)
bottom, top = plot.get_ylim()
plot.set_ylim(bottom + 0.5, top - 0.5)  # to rectify the top of the heatmap
```

Out[21]:
```
(9.5, -0.5)
```



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 [22]:
```
predictor = TabularPredictor(label = 'count', problem_type = 'regression', eval_me
                                              train_data = df_train
                                              , time_limit = 600
                                              , presets = 'best_quality')
```

```
No path specified. Models will be saved in: "AutogluonModels/ag-20230203_132600/"
Presets specified: ['best_quality']
Stack configuration (auto_stack=True): num_stack_levels=1, num_bag_folds=8, num_ba
g_sets=20
Beginning AutoGluon training ... Time limit = 600s
AutoGluon will save models to "AutogluonModels/ag-20230203_132600/"
AutoGluon Version:  0.6.2
Python Version:     3.7.10
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Fri Dec 9 09:57:03 UTC 2022
Train Data Rows:    10886
Train Data Columns: 8
Label Column: count
Preprocessing data ...
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
        Available Memory:                    2881.07 MB
        Train Data (Original)  Memory Usage: 0.7 MB (0.0% of available memory)
        Inferring data type of each feature based on column values. Set feature_me
tadata_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator...
                        Note: Converting 2 features to boolean dtype as they only
contain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator...
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator...
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator...
        Types of features in original data (raw dtype, special dtypes):
                ('float', []) : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])   : 5 | ['season', 'holiday', 'workingday', 'weather',
'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']
        0.1s = Fit runtime
        8 features in original data used to generate 8 features in processed data.
        Train Data (Processed) Memory Usage: 0.54 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 0.11s ...
AutoGluon will gauge predictive performance using evaluation metric: 'root_mean_sq
uared_error'
        This metric's sign has been flipped to adhere to being higher_is_better. T
he metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
AutoGluon will fit 2 stack levels (L1 to L2) ...
Fitting 11 L1 models ...
Fitting model: KNeighborsUnif_BAG_L1 ... Training model for up to 399.82s of the 5
99.88s of remaining time.
        -160.5175       = Validation score   (-root_mean_squared_error)
        0.02s    = Training   runtime
        0.1s     = Validation runtime
Fitting model: KNeighborsDist_BAG_L1 ... Training model for up to 395.49s of the 5
95.55s of remaining time.
        -169.6546       = Validation score   (-root_mean_squared_error)
        0.02s    = Training   runtime
        0.1s     = Validation runtime
Fitting model: LightGBMXT_BAG_L1 ... Training model for up to 395.13s of the 595.1
9s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
```

```
	-145.5648	= Validation score   (-root_mean_squared_error)
	33.99s	= Training   runtime
	3.15s	= Validation runtime
Fitting model: LightGBM_BAG_L1 ... Training model for up to 352.87s of the 552.93s
of remaining time.
	Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-144.5546	= Validation score   (-root_mean_squared_error)
	20.88s	= Training   runtime
	0.28s	= Validation runtime
Fitting model: RandomForestMSE_BAG_L1 ... Training model for up to 328.08s of the
528.14s of remaining time.
	-151.2687	= Validation score   (-root_mean_squared_error)
	6.06s	= Training   runtime
	0.52s	= Validation runtime
Fitting model: CatBoost_BAG_L1 ... Training model for up to 319.15s of the 519.21s
of remaining time.
	Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-144.2587	= Validation score   (-root_mean_squared_error)
	44.8s	= Training   runtime
	0.08s	= Validation runtime
Fitting model: ExtraTreesMSE_BAG_L1 ... Training model for up to 270.67s of the 47
0.73s of remaining time.
	-149.5829	= Validation score   (-root_mean_squared_error)
	3.78s	= Training   runtime
	0.52s	= Validation runtime
Fitting model: NeuralNetFastAI_BAG_L1 ... Training model for up to 264.03s of the
464.08s of remaining time.
	Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-144.9006	= Validation score   (-root_mean_squared_error)
	111.34s	= Training   runtime
	0.41s	= Validation runtime
Fitting model: XGBoost_BAG_L1 ... Training model for up to 149.06s of the 349.12s
of remaining time.
	Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-144.6679	= Validation score   (-root_mean_squared_error)
	28.42s	= Training   runtime
	0.25s	= Validation runtime
Fitting model: NeuralNetTorch_BAG_L1 ... Training model for up to 116.2s of the 31
6.26s of remaining time.
	Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	Time limit exceeded... Skipping NeuralNetTorch_BAG_L1.
Fitting model: LightGBMLarge_BAG_L1 ... Training model for up to 111.51s of the 31
1.57s of remaining time.
2023-02-03 13:30:48,940 ERROR worker.py:400 -- Unhandled error (suppress with 'RAY
_IGNORE_UNHANDLED_ERRORS=1'): The worker died unexpectedly while executing this ta
sk. Check python-core-worker-*.log files for more information.
	Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-144.1011	= Validation score   (-root_mean_squared_error)
	23.79s	= Training   runtime
	0.2s	= Validation runtime
Completed 1/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the 283.
81s of remaining time.
	-141.5971	= Validation score   (-root_mean_squared_error)
	0.85s	= Training   runtime
	0.0s	= Validation runtime
Fitting 9 L2 models ...
Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 282.88s of the 282.8
```

```
6s of remaining time.
	Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-141.0022	= Validation score   (-root_mean_squared_error)
	22.65s	= Training   runtime
	0.27s	= Validation runtime
Fitting model: LightGBM_BAG_L2 ... Training model for up to 256.57s of the 256.55s
of remaining time.
	Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-141.4485	= Validation score   (-root_mean_squared_error)
	22.49s	= Training   runtime
	0.15s	= Validation runtime
Fitting model: RandomForestMSE_BAG_L2 ... Training model for up to 230.03s of the
230.0s of remaining time.
	-141.8109	= Validation score   (-root_mean_squared_error)
	29.58s	= Training   runtime
	0.62s	= Validation runtime
Fitting model: CatBoost_BAG_L2 ... Training model for up to 197.17s of the 197.15s
of remaining time.
	Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-140.9345	= Validation score   (-root_mean_squared_error)
	40.24s	= Training   runtime
	0.04s	= Validation runtime
Fitting model: ExtraTreesMSE_BAG_L2 ... Training model for up to 152.81s of the 15
2.79s of remaining time.
	-140.0986	= Validation score   (-root_mean_squared_error)
	7.28s	= Training   runtime
	0.59s	= Validation runtime
Fitting model: NeuralNetFastAI_BAG_L2 ... Training model for up to 142.34s of the
142.31s of remaining time.
	Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-141.3893	= Validation score   (-root_mean_squared_error)
	110.28s	= Training   runtime
	0.46s	= Validation runtime
Fitting model: XGBoost_BAG_L2 ... Training model for up to 28.57s of the 28.55s of
remaining time.
	Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-141.594	= Validation score   (-root_mean_squared_error)
	32.86s	= Training   runtime
	0.19s	= Validation runtime
Completed 1/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L3 ... Training model for up to 360.0s of the -8.1
8s of remaining time.
	-139.5201	= Validation score   (-root_mean_squared_error)
	0.63s	= Training   runtime
	0.0s	= Validation runtime
AutoGluon training complete, total runtime = 609.05s ... Best model: "WeightedEnse
mble_L3"
TabularPredictor saved. To load, use: predictor = TabularPredictor.load("Autogluon
Models/ag-20230203_132600/")
```

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

In [23]:
```
predictor.fit_summary()
```

```
*** Summary of fit() ***
Estimated performance of each model:
                     model   score_val  pred_time_val    fit_time  pred_time_val_m
arginal  fit_time_marginal  stack_level  can_infer  fit_order
0      WeightedEnsemble_L3 -139.520120       7.663442  516.470248
0.001291           0.632690            3       True         19
1     ExtraTreesMSE_BAG_L2 -140.098633       6.198036  280.387270
0.586670           7.279596            2       True         16
2          CatBoost_BAG_L2 -140.934472       5.655857  313.350472
0.044491          40.242798            2       True         15
3        LightGBMXT_BAG_L2 -141.002157       5.884137  295.754022
0.272771          22.646348            2       True         12
4   NeuralNetFastAI_BAG_L2 -141.389318       6.066829  383.385278
0.455463         110.277604            2       True         17
5          LightGBM_BAG_L2 -141.448503       5.760504  295.599704
0.149137          22.492030            2       True         13
6           XGBoost_BAG_L2 -141.594041       5.801433  305.966433
0.190066          32.858759            2       True         18
7      WeightedEnsemble_L2 -141.597149       4.603240  246.972389
0.000887           0.845992            2       True         11
8   RandomForestMSE_BAG_L2 -141.810943       6.236325  302.686771
0.624958          29.579097            2       True         14
9     LightGBMLarge_BAG_L1 -144.101073       0.198558   23.790807
0.198558          23.790807            1       True         10
10         CatBoost_BAG_L1 -144.258674       0.076121   44.799281
0.076121          44.799281            1       True          6
11         LightGBM_BAG_L1 -144.554625       0.280601   20.878922
0.280601          20.878922            1       True          4
12          XGBoost_BAG_L1 -144.667870       0.250322   28.423778
0.250322          28.423778            1       True          9
13  NeuralNetFastAI_BAG_L1 -144.900580       0.407215  111.344088
0.407215         111.344088            1       True          8
14       LightGBMXT_BAG_L1 -145.564847       3.149748   33.987811
3.149748          33.987811            1       True          3
15    ExtraTreesMSE_BAG_L1 -149.582861       0.520389    3.780634
0.520389           3.780634            1       True          7
16  RandomForestMSE_BAG_L1 -151.268734       0.519190    6.057938
0.519190           6.057938            1       True          5
17   KNeighborsUnif_BAG_L1 -160.517467       0.104493    0.023532
0.104493           0.023532            1       True          1
18   KNeighborsDist_BAG_L1 -169.654635       0.104728    0.020885
0.104728           0.020885            1       True          2
Number of models trained: 19
Types of models trained:
{'StackerEnsembleModel_XGBoost', 'StackerEnsembleModel_NNFastAiTabular', 'StackerE
nsembleModel_KNN', 'StackerEnsembleModel_LGB', 'StackerEnsembleModel_XT', 'Stacker
EnsembleModel_CatBoost', 'WeightedEnsembleModel', 'StackerEnsembleModel_RF'}
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']
Plot summary of models saved to file: AutogluonModels/ag-20230203_132600/SummaryOf
Models.html
*** End of fit() summary ***
```

Out[23]:

```
{'model_types': {'KNeighborsUnif_BAG_L1': 'StackerEnsembleModel_KNN',
  'KNeighborsDist_BAG_L1': 'StackerEnsembleModel_KNN',
  'LightGBMXT_BAG_L1': 'StackerEnsembleModel_LGB',
  'LightGBM_BAG_L1': 'StackerEnsembleModel_LGB',
  'RandomForestMSE_BAG_L1': 'StackerEnsembleModel_RF',
  'CatBoost_BAG_L1': 'StackerEnsembleModel_CatBoost',
  'ExtraTreesMSE_BAG_L1': 'StackerEnsembleModel_XT',
  'NeuralNetFastAI_BAG_L1': 'StackerEnsembleModel_NNFastAiTabular',
  'XGBoost_BAG_L1': 'StackerEnsembleModel_XGBoost',
  'LightGBMLarge_BAG_L1': 'StackerEnsembleModel_LGB',
  'WeightedEnsemble_L2': 'WeightedEnsembleModel',
  'LightGBMXT_BAG_L2': 'StackerEnsembleModel_LGB',
  'LightGBM_BAG_L2': 'StackerEnsembleModel_LGB',
  'RandomForestMSE_BAG_L2': 'StackerEnsembleModel_RF',
  'CatBoost_BAG_L2': 'StackerEnsembleModel_CatBoost',
  'ExtraTreesMSE_BAG_L2': 'StackerEnsembleModel_XT',
  'NeuralNetFastAI_BAG_L2': 'StackerEnsembleModel_NNFastAiTabular',
  'XGBoost_BAG_L2': 'StackerEnsembleModel_XGBoost',
  'WeightedEnsemble_L3': 'WeightedEnsembleModel'},
 'model_performance': {'KNeighborsUnif_BAG_L1': -160.51746660830347,
  'KNeighborsDist_BAG_L1': -169.6546353414388,
  'LightGBMXT_BAG_L1': -145.56484674145977,
  'LightGBM_BAG_L1': -144.55462457563883,
  'RandomForestMSE_BAG_L1': -151.26873403494773,
  'CatBoost_BAG_L1': -144.2586738532502,
  'ExtraTreesMSE_BAG_L1': -149.58286134105248,
  'NeuralNetFastAI_BAG_L1': -144.90057960493533,
  'XGBoost_BAG_L1': -144.66786974085323,
  'LightGBMLarge_BAG_L1': -144.10107330668967,
  'WeightedEnsemble_L2': -141.59714883075202,
  'LightGBMXT_BAG_L2': -141.0021568153923,
  'LightGBM_BAG_L2': -141.4485033702621,
  'RandomForestMSE_BAG_L2': -141.81094255230005,
  'CatBoost_BAG_L2': -140.93447197268355,
  'ExtraTreesMSE_BAG_L2': -140.09863323725443,
  'NeuralNetFastAI_BAG_L2': -141.38931763471766,
  'XGBoost_BAG_L2': -141.5940411906314,
  'WeightedEnsemble_L3': -139.52012019892894},
 'model_best': 'WeightedEnsemble_L3',
 'model_paths': {'KNeighborsUnif_BAG_L1': 'AutogluonModels/ag-20230203_132600/mode
ls/KNeighborsUnif_BAG_L1/',
  'KNeighborsDist_BAG_L1': 'AutogluonModels/ag-20230203_132600/models/KNeighborsDi
st_BAG_L1/',
  'LightGBMXT_BAG_L1': 'AutogluonModels/ag-20230203_132600/models/LightGBMXT_BAG_L
1/',
  'LightGBM_BAG_L1': 'AutogluonModels/ag-20230203_132600/models/LightGBM_BAG_L1/',
  'RandomForestMSE_BAG_L1': 'AutogluonModels/ag-20230203_132600/models/RandomFores
tMSE_BAG_L1/',
  'CatBoost_BAG_L1': 'AutogluonModels/ag-20230203_132600/models/CatBoost_BAG_L1/',
  'ExtraTreesMSE_BAG_L1': 'AutogluonModels/ag-20230203_132600/models/ExtraTreesMSE
_BAG_L1/',
  'NeuralNetFastAI_BAG_L1': 'AutogluonModels/ag-20230203_132600/models/NeuralNetFa
stAI_BAG_L1/',
  'XGBoost_BAG_L1': 'AutogluonModels/ag-20230203_132600/models/XGBoost_BAG_L1/',
  'LightGBMLarge_BAG_L1': 'AutogluonModels/ag-20230203_132600/models/LightGBMLarge
_BAG_L1/',
  'WeightedEnsemble_L2': 'AutogluonModels/ag-20230203_132600/models/WeightedEnsemb
le_L2/',
  'LightGBMXT_BAG_L2': 'AutogluonModels/ag-20230203_132600/models/LightGBMXT_BAG_L
2/',
  'LightGBM_BAG_L2': 'AutogluonModels/ag-20230203_132600/models/LightGBM_BAG_L2/',
  'RandomForestMSE_BAG_L2': 'AutogluonModels/ag-20230203_132600/models/RandomFores
tMSE_BAG_L2/',
  'CatBoost_BAG_L2': 'AutogluonModels/ag-20230203_132600/models/CatBoost_BAG_L2/',
```

```
  'ExtraTreesMSE_BAG_L2': 'AutogluonModels/ag-20230203_132600/models/ExtraTreesMSE
_BAG_L2/',
  'NeuralNetFastAI_BAG_L2': 'AutogluonModels/ag-20230203_132600/models/NeuralNetFa
stAI_BAG_L2/',
  'XGBoost_BAG_L2': 'AutogluonModels/ag-20230203_132600/models/XGBoost_BAG_L2/',
  'WeightedEnsemble_L3': 'AutogluonModels/ag-20230203_132600/models/WeightedEnsemb
le_L3/'},
 'model_fit_times': {'KNeighborsUnif_BAG_L1': 0.023531675338745117,
  'KNeighborsDist_BAG_L1': 0.020885229110717773,
  'LightGBMXT_BAG_L1': 33.98781085014343,
  'LightGBM_BAG_L1': 20.87892198562622,
  'RandomForestMSE_BAG_L1': 6.0579376220703125,
  'CatBoost_BAG_L1': 44.799280643463135,
  'ExtraTreesMSE_BAG_L1': 3.7806339263916016,
  'NeuralNetFastAI_BAG_L1': 111.34408807754517,
  'XGBoost_BAG_L1': 28.42377758026123,
  'LightGBMLarge_BAG_L1': 23.790806531906128,
  'WeightedEnsemble_L2': 0.8459916114807129,
  'LightGBMXT_BAG_L2': 22.646347999572754,
  'LightGBM_BAG_L2': 22.492029666900635,
  'RandomForestMSE_BAG_L2': 29.57909655570984,
  'CatBoost_BAG_L2': 40.24279832839966,
  'ExtraTreesMSE_BAG_L2': 7.279595851898193,
  'NeuralNetFastAI_BAG_L2': 110.2776038646698,
  'XGBoost_BAG_L2': 32.85875916481018,
  'WeightedEnsemble_L3': 0.6326904296875},
 'model_pred_times': {'KNeighborsUnif_BAG_L1': 0.10449337959289551,
  'KNeighborsDist_BAG_L1': 0.10472846031188965,
  'LightGBMXT_BAG_L1': 3.149747610092163,
  'LightGBM_BAG_L1': 0.28060126304626465,
  'RandomForestMSE_BAG_L1': 0.5191903114318848,
  'CatBoost_BAG_L1': 0.07612109184265137,
  'ExtraTreesMSE_BAG_L1': 0.5203890800476074,
  'NeuralNetFastAI_BAG_L1': 0.407214879989624,
  'XGBoost_BAG_L1': 0.2503223419189453,
  'LightGBMLarge_BAG_L1': 0.19855809211730957,
  'WeightedEnsemble_L2': 0.0008866786956787109,
  'LightGBMXT_BAG_L2': 0.27277064323425293,
  'LightGBM_BAG_L2': 0.14913725852966309,
  'RandomForestMSE_BAG_L2': 0.6249582767486572,
  'CatBoost_BAG_L2': 0.04449057579040527,
  'ExtraTreesMSE_BAG_L2': 0.5866696834564209,
  'NeuralNetFastAI_BAG_L2': 0.4554626941680908,
  'XGBoost_BAG_L2': 0.19006609916687012,
  'WeightedEnsemble_L3': 0.001291036605834961},
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 '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},
  'LightGBMXT_BAG_L1': {'use_orig_features': True,
   'max_base_models': 25,
   'max_base_models_per_type': 5,
   'save_bag_folds': True},
  'LightGBM_BAG_L1': {'use_orig_features': True,
   'max_base_models': 25,
   'max_base_models_per_type': 5,
```

```
 'save_bag_folds': True},
'RandomForestMSE_BAG_L1': {'use_orig_features': True,
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 'max_base_models_per_type': 5,
 'save_bag_folds': True,
 'use_child_oof': True},
'CatBoost_BAG_L1': {'use_orig_features': True,
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 'max_base_models_per_type': 5,
 'save_bag_folds': 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},
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 'max_base_models_per_type': 5,
 'save_bag_folds': True},
'XGBoost_BAG_L1': {'use_orig_features': True,
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 'max_base_models_per_type': 5,
 'save_bag_folds': True},
'LightGBMLarge_BAG_L1': {'use_orig_features': True,
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 'max_base_models_per_type': 5,
 'save_bag_folds': True},
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 'max_base_models_per_type': 5,
 'save_bag_folds': True},
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 'save_bag_folds': True},
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 'max_base_models': 25,
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 'save_bag_folds': True,
 'use_child_oof': True},
'CatBoost_BAG_L2': {'use_orig_features': True,
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 'max_base_models_per_type': 5,
 'save_bag_folds': 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},
'NeuralNetFastAI_BAG_L2': {'use_orig_features': True,
 'max_base_models': 25,
 'max_base_models_per_type': 5,
 'save_bag_folds': True},
'XGBoost_BAG_L2': {'use_orig_features': True,
 'max_base_models': 25,
 'max_base_models_per_type': 5,
 'save_bag_folds': 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 -139.520120       7.663442  516.470248
 1     ExtraTreesMSE_BAG_L2 -140.098633       6.198036  280.387270
 2          CatBoost_BAG_L2 -140.934472       5.655857  313.350472
 3        LightGBMXT_BAG_L2 -141.002157       5.884137  295.754022
 4   NeuralNetFastAI_BAG_L2 -141.389318       6.066829  383.385278
 5          LightGBM_BAG_L2 -141.448503       5.760504  295.599704
 6           XGBoost_BAG_L2 -141.594041       5.801433  305.966433
 7      WeightedEnsemble_L2 -141.597149       4.603240  246.972389
 8   RandomForestMSE_BAG_L2 -141.810943       6.236325  302.686771
 9     LightGBMLarge_BAG_L1 -144.101073       0.198558   23.790807
 10         CatBoost_BAG_L1 -144.258674       0.076121   44.799281
 11         LightGBM_BAG_L1 -144.554625       0.280601   20.878922
 12          XGBoost_BAG_L1 -144.667870       0.250322   28.423778
 13  NeuralNetFastAI_BAG_L1 -144.900580       0.407215  111.344088
 14       LightGBMXT_BAG_L1 -145.564847       3.149748   33.987811
 15    ExtraTreesMSE_BAG_L1 -149.582861       0.520389    3.780634
 16  RandomForestMSE_BAG_L1 -151.268734       0.519190    6.057938
 17   KNeighborsUnif_BAG_L1 -160.517467       0.104493    0.023532
 18   KNeighborsDist_BAG_L1 -169.654635       0.104728    0.020885

    pred_time_val_marginal  fit_time_marginal  stack_level  can_infer  \
 0                0.001291           0.632690            3       True
 1                0.586670           7.279596            2       True
 2                0.044491          40.242798            2       True
 3                0.272771          22.646348            2       True
 4                0.455463         110.277604            2       True
 5                0.149137          22.492030            2       True
 6                0.190066          32.858759            2       True
 7                0.000887           0.845992            2       True
 8                0.624958          29.579097            2       True
 9                0.198558          23.790807            1       True
 10               0.076121          44.799281            1       True
 11               0.280601          20.878922            1       True
 12               0.250322          28.423778            1       True
 13               0.407215         111.344088            1       True
 14               3.149748          33.987811            1       True
 15               0.520389           3.780634            1       True
 16               0.519190           6.057938            1       True
 17               0.104493           0.023532            1       True
 18               0.104728           0.020885            1       True

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

Create predictions from test dataset

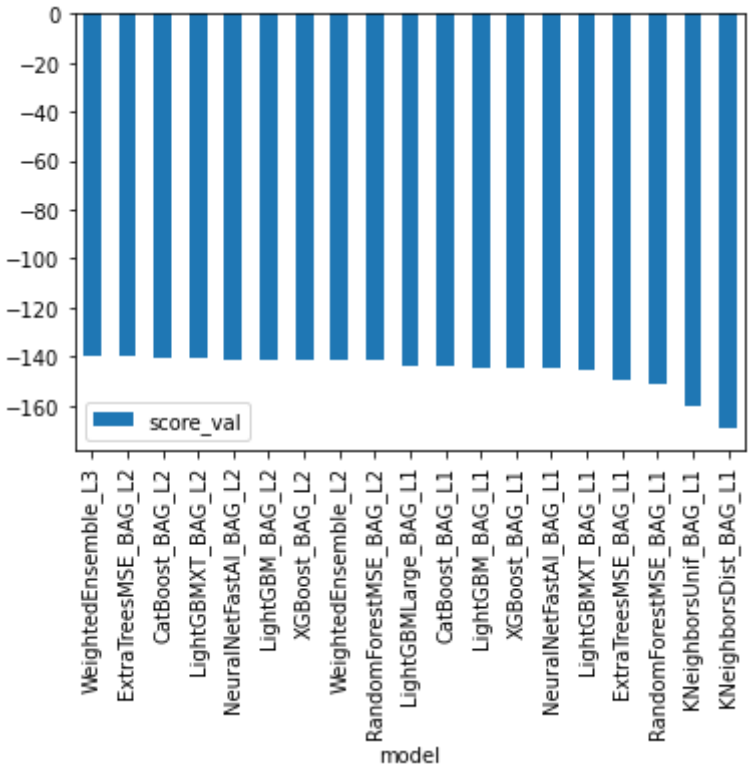
In [24]:
```
predictions = predictor.predict(df_test)
predictions.head()
```

Out[24]:
```
0    128.649979
1     70.493484
2     70.493484
3     83.208740
4     83.208740
Name: count, dtype: float32
```

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

In [25]:
```
predictor.leaderboard(silent = True).plot(kind = 'bar', x = 'model', y = 'score_va
```

Out[25]:
```
<AxesSubplot:xlabel='model'>
```



In [26]:
```
# Describe the `predictions` series to see if there are any negative values
predictions[predictions < 0].shape
```

Out[26]:
```
(0,)
```

In [28]:
```
# How many negative values do we have?
0
```

Out[28]:
```
0
```

In [ ]:
```

```

Set predictions to submission dataframe, save, and submit

In [29]:
```
submission["count"] = predictions
submission.to_csv("submission.csv", index=False)
```

In [30]:
```
!kaggle competitions submit -c bike-sharing-demand -f submission.csv -m "first raw
```

```
100%|████████████████████████████████████████| 188k/188k [00:00<00:00, 528kB/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 [31]:
```
!kaggle competitions submissions -c bike-sharing-demand | tail -n +1 | head -n 6
```

```
fileName                          date                 description
status    publicScore  privateScore
-------------------------------  -------------------  ---------------------------
-----------------------------------------  --------  -----------  ------------
submission.csv                    2023-02-03 13:38:01  first raw submission
complete  1.32787      1.32787
3 submission_hyperparameter.csv   2022-12-27 15:53:53  After hyper parameter tuning
complete  0.56110      0.56110
2 submission_new_features.csv     2022-12-27 15:14:51  2nd submission after feature
engineering and adding additional columns  complete  0.56327      0.56327
1 submission.csv                  2022-12-27 14:18:40  First submission
complete  1.32264      1.32264
```

Initial score of `1.32787`

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 [34]:
```
# Create the test pandas dataframe in pandas by reading the csv, remember to parse
df_train_2 = pd.read_csv('train.csv', parse_dates= ['datetime'])
df_train_2.head()
```

Out[34]:

	datetime	season	holiday	workingday	weather	temp	atemp	humidity	windspeed	casual
0	2011-01-01 00:00:00	1	0	0	1	9.84	14.395	81	0.0	3
1	2011-01-01 01:00:00	1	0	0	1	9.02	13.635	80	0.0	8
2	2011-01-01 02:00:00	1	0	0	1	9.02	13.635	80	0.0	5
3	2011-01-01 03:00:00	1	0	0	1	9.84	14.395	75	0.0	3
4	2011-01-01 04:00:00	1	0	0	1	9.84	14.395	75	0.0	0

In [35]:
```
# Create the test pandas dataframe in pandas by reading the csv, remember to parse
df_test_2 = pd.read_csv('test.csv', parse_dates= ['datetime'])
df_test_2.head()
```

Out[35]:

	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 [36]:
```
# create a new feature
df_train_2.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 10886 entries, 0 to 10885
Data columns (total 12 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   datetime    10886 non-null  datetime64[ns]
 1   season      10886 non-null  int64
 2   holiday     10886 non-null  int64
 3   workingday  10886 non-null  int64
 4   weather     10886 non-null  int64
 5   temp        10886 non-null  float64
 6   atemp       10886 non-null  float64
 7   humidity    10886 non-null  int64
 8   windspeed   10886 non-null  float64
 9   casual      10886 non-null  int64
 10  registered  10886 non-null  int64
 11  count       10886 non-null  int64
dtypes: datetime64[ns](1), float64(3), int64(8)
memory usage: 1020.7 KB
```

In [37]:
```
df_test_2.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6493 entries, 0 to 6492
Data columns (total 9 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   datetime    6493 non-null   datetime64[ns]
 1   season      6493 non-null   int64
 2   holiday     6493 non-null   int64
 3   workingday  6493 non-null   int64
 4   weather     6493 non-null   int64
 5   temp        6493 non-null   float64
 6   atemp       6493 non-null   float64
 7   humidity    6493 non-null   int64
 8   windspeed   6493 non-null   float64
dtypes: datetime64[ns](1), float64(3), int64(5)
memory usage: 456.7 KB
```

In [38]:
```
# Training data feature engineering
df_train_2['month'] = df_train_2['datetime'].dt.month
df_train_2['day'] = df_train_2['datetime'].dt.day
df_train_2['hour'] = df_train_2['datetime'].dt.hour
```

In [39]:
```
# Testing data feature engineering
df_test_2['month'] = df_test_2['datetime'].dt.month
df_test_2['day'] = df_test_2['datetime'].dt.day
df_test_2['hour'] = df_test_2['datetime'].dt.hour
```

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

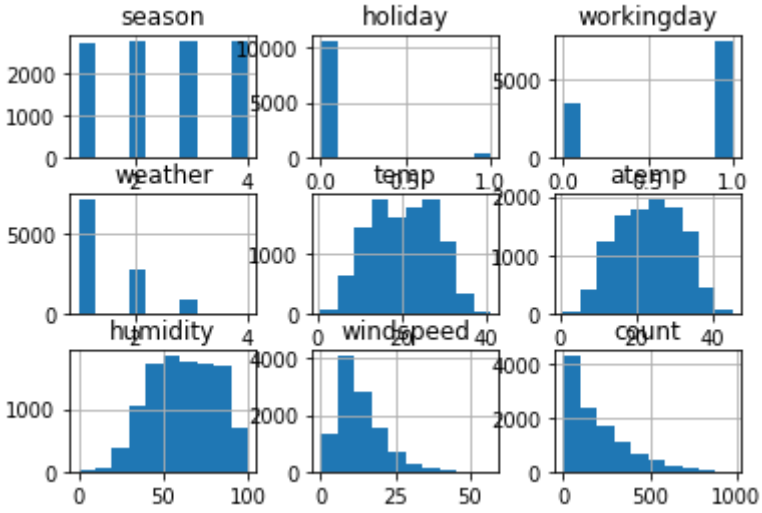
- AutoGluon originally sees these as ints, but in reality they are int representations of a category.
- Setting the dtype to category will classify these as categories in AutoGluon.

In [40]:
```
df_train_2["season"] = df_train_2.season.astype('category')
df_train_2["weather"] = df_train_2.weather.astype('category')
df_test_2["season"] = df_test_2.season.astype('category')
df_test_2["weather"] = df_train_2.weather.astype('category')
```

In [41]:
```
df_test_2.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 6493 entries, 0 to 6492
Data columns (total 12 columns):
 #   Column      Non-Null Count  Dtype
---  ------      --------------  -----
 0   datetime    6493 non-null   datetime64[ns]
 1   season      6493 non-null   category
 2   holiday     6493 non-null   int64
 3   workingday  6493 non-null   int64
 4   weather     6493 non-null   category
 5   temp        6493 non-null   float64
 6   atemp       6493 non-null   float64
 7   humidity    6493 non-null   int64
 8   windspeed   6493 non-null   float64
 9   month       6493 non-null   int64
 10  day         6493 non-null   int64
 11  hour        6493 non-null   int64
dtypes: category(2), datetime64[ns](1), float64(3), int64(6)
memory usage: 520.5 KB
```

In [42]:
```
# Create a histogram of all features to show the distribution of each one relative
df_train.hist()
plt.show()
```



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

In [43]:
```
predictor_new_features = TabularPredictor(label = 'count', problem_type = 'regress
                                          train_data = df_train_2
                                          , time_limit = 600
                                          , presets = 'best_quality')
```

```
No path specified. Models will be saved in: "AutogluonModels/ag-20230203_134406/"
Presets specified: ['best_quality']
Stack configuration (auto_stack=True): num_stack_levels=1, num_bag_folds=8, num_ba
g_sets=20
Beginning AutoGluon training ... Time limit = 600s
AutoGluon will save models to "AutogluonModels/ag-20230203_134406/"
AutoGluon Version:  0.6.2
Python Version:     3.7.10
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Fri Dec 9 09:57:03 UTC 2022
Train Data Rows:    10886
Train Data Columns: 14
Label Column: count
Preprocessing data ...
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
        Available Memory:                    1721.0 MB
        Train Data (Original)  Memory Usage: 1.07 MB (0.1% of available memory)
        Inferring data type of each feature based on column values. Set feature_me
tadata_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator...
                        Note: Converting 2 features to boolean dtype as they only
contain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator...
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator...
                Fitting CategoryFeatureGenerator...
                        Fitting CategoryMemoryMinimizeFeatureGenerator...
                Fitting DatetimeFeatureGenerator...
/usr/local/lib/python3.7/site-packages/autogluon/features/generators/datetime.py:5
9: FutureWarning: casting datetime64[ns, UTC] values to int64 with .astype(...) is
deprecated and will raise in a future version. Use .view(...) instead.
  good_rows = series[~series.isin(bad_rows)].astype(np.int64)
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator...
        Types of features in original data (raw dtype, special dtypes):
                ('category', []) : 2 | ['season', 'weather']
                ('datetime', []) : 1 | ['datetime']
                ('float', [])    : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])      : 8 | ['holiday', 'workingday', 'humidity', 'casu
al', 'registered', ...]
        Types of features in processed data (raw dtype, special dtypes):
                ('category', [])             : 2 | ['season', 'weather']
                ('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])                  : 6 | ['humidity', 'casual', 'registe
red', 'month', 'day', ...]
                ('int', ['bool'])            : 2 | ['holiday', 'workingday']
                ('int', ['datetime_as_int']) : 5 | ['datetime', 'datetime.year',
'datetime.month', 'datetime.day', 'datetime.dayofweek']
        0.2s = Fit runtime
        14 features in original data used to generate 18 features in processed dat
a.
        Train Data (Processed) Memory Usage: 1.26 MB (0.1% of available memory)
Data preprocessing and feature engineering runtime = 0.28s ...
AutoGluon will gauge predictive performance using evaluation metric: 'root_mean_sq
uared_error'
        This metric's sign has been flipped to adhere to being higher_is_better. T
he metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
AutoGluon will fit 2 stack levels (L1 to L2) ...
Fitting 11 L1 models ...
```

```
Fitting model: KNeighborsUnif_BAG_L1 ... Training model for up to 399.71s of the 5
99.72s of remaining time.
        -101.5462       = Validation score   (-root_mean_squared_error)
        0.06s    = Training   runtime
        0.1s     = Validation runtime
Fitting model: KNeighborsDist_BAG_L1 ... Training model for up to 399.27s of the 5
99.27s of remaining time.
        -84.1251        = Validation score   (-root_mean_squared_error)
        0.09s    = Training   runtime
        0.1s     = Validation runtime
Fitting model: LightGBMXT_BAG_L1 ... Training model for up to 398.81s of the 598.8
2s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -4.8182  = Validation score   (-root_mean_squared_error)
        145.82s  = Training   runtime
        40.34s   = Validation runtime
Fitting model: LightGBM_BAG_L1 ... Training model for up to 240.66s of the 440.67s
of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -3.144   = Validation score   (-root_mean_squared_error)
        47.05s   = Training   runtime
        6.32s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L1 ... Training model for up to 188.96s of the
388.97s of remaining time.
        -2.8484  = Validation score   (-root_mean_squared_error)
        13.29s   = Training   runtime
        0.5s     = Validation runtime
Fitting model: CatBoost_BAG_L1 ... Training model for up to 173.55s of the 373.56s
of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -3.1331  = Validation score   (-root_mean_squared_error)
        150.69s  = Training   runtime
        0.15s    = Validation runtime
Fitting model: ExtraTreesMSE_BAG_L1 ... Training model for up to 19.33s of the 21
9.34s of remaining time.
        -2.6656  = Validation score   (-root_mean_squared_error)
        6.63s    = Training   runtime
        0.53s    = Validation runtime
Fitting model: NeuralNetFastAI_BAG_L1 ... Training model for up to 10.36s of the 2
10.36s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -32.1345        = Validation score   (-root_mean_squared_error)
        31.68s   = Training   runtime
        0.54s    = Validation runtime
Completed 1/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the 174.
84s of remaining time.
        -2.0899  = Validation score   (-root_mean_squared_error)
        0.51s    = Training   runtime
        0.0s     = Validation runtime
Fitting 9 L2 models ...
Fitting model: LightGBMXT_BAG_L2 ... Training model for up to 174.25s of the 174.2
3s of remaining time.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -4.1773  = Validation score   (-root_mean_squared_error)
        129.75s  = Training   runtime
        17.99s   = Validation runtime
Fitting model: LightGBM_BAG_L2 ... Training model for up to 36.55s of the 36.54s o
f remaining time.
```

```
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -2.3577  = Validation score   (-root_mean_squared_error)
        26.01s   = Training   runtime
        0.45s    = Validation runtime
Fitting model: RandomForestMSE_BAG_L2 ... Training model for up to 6.83s of the 6.
81s of remaining time.
        -2.0526  = Validation score   (-root_mean_squared_error)
        21.77s   = Training   runtime
        0.43s    = Validation runtime
Completed 1/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L3 ... Training model for up to 360.0s of the -16.
14s of remaining time.
        -1.9538  = Validation score   (-root_mean_squared_error)
        0.24s    = Training   runtime
        0.0s     = Validation runtime
AutoGluon training complete, total runtime = 616.6s ... Best model: "WeightedEnsem
ble_L3"
TabularPredictor saved. To load, use: predictor = TabularPredictor.load("Autogluon
Models/ag-20230203_134406/")
```

In [44]:
```
predictor_new_features.fit_summary()
```

```
*** Summary of fit() ***
Estimated performance of each model:
                     model   score_val  pred_time_val    fit_time  pred_time_val_m
arginal  fit_time_marginal  stack_level  can_infer  fit_order
0      WeightedEnsemble_L3   -1.953834      67.449791  573.068421
0.001148           0.237311            3       True         13
1   RandomForestMSE_BAG_L2   -2.052566      49.011544  417.079877
0.429924          21.769639            2       True         12
2      WeightedEnsemble_L2   -2.089854      48.375507  395.668469
0.000934           0.508172            2       True          9
3          LightGBM_BAG_L2   -2.357728      49.033709  421.315323
0.452090          26.005085            2       True         11
4     ExtraTreesMSE_BAG_L1   -2.665590       0.526012    6.630769
0.526012           6.630769            1       True          7
5   RandomForestMSE_BAG_L1   -2.848366       0.504554   13.293609
0.504554          13.293609            1       True          5
6          CatBoost_BAG_L1   -3.133100       0.146669  150.685820
0.146669         150.685820            1       True          6
7          LightGBM_BAG_L1   -3.144000       6.315374   47.052264
6.315374          47.052264            1       True          4
8        LightGBMXT_BAG_L2   -4.177265      66.566630  525.056386               1
7.985010         129.746148            2       True         10
9        LightGBMXT_BAG_L1   -4.818207      40.339656  145.815331               4
0.339656         145.815331            1       True          3
10  NeuralNetFastAI_BAG_L1  -32.134520       0.542307   31.682505
0.542307          31.682505            1       True          8
11   KNeighborsDist_BAG_L1  -84.125061       0.103487    0.086606
0.103487           0.086606            1       True          2
12   KNeighborsUnif_BAG_L1 -101.546199       0.103560    0.063335
0.103560           0.063335            1       True          1
Number of models trained: 13
Types of models trained:
{'StackerEnsembleModel_NNFastAiTabular', 'StackerEnsembleModel_KNN', 'StackerEnsem
bleModel_LGB', 'StackerEnsembleModel_XT', 'StackerEnsembleModel_CatBoost', 'Weight
edEnsembleModel', 'StackerEnsembleModel_RF'}
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', [])                  : 6 | ['humidity', 'casual', 'registered', 'month',
'day', ...]
('int', ['bool'])            : 2 | ['holiday', 'workingday']
('int', ['datetime_as_int']) : 5 | ['datetime', 'datetime.year', 'datetime.month',
'datetime.day', 'datetime.dayofweek']
Plot summary of models saved to file: AutogluonModels/ag-20230203_134406/SummaryOf
Models.html
*** End of fit() summary ***
```

Out[44]:

```
{'model_types': {'KNeighborsUnif_BAG_L1': 'StackerEnsembleModel_KNN',
  'KNeighborsDist_BAG_L1': 'StackerEnsembleModel_KNN',
  'LightGBMXT_BAG_L1': 'StackerEnsembleModel_LGB',
  'LightGBM_BAG_L1': 'StackerEnsembleModel_LGB',
  'RandomForestMSE_BAG_L1': 'StackerEnsembleModel_RF',
  'CatBoost_BAG_L1': 'StackerEnsembleModel_CatBoost',
  'ExtraTreesMSE_BAG_L1': 'StackerEnsembleModel_XT',
  'NeuralNetFastAI_BAG_L1': 'StackerEnsembleModel_NNFastAiTabular',
  'WeightedEnsemble_L2': 'WeightedEnsembleModel',
  'LightGBMXT_BAG_L2': 'StackerEnsembleModel_LGB',
  'LightGBM_BAG_L2': 'StackerEnsembleModel_LGB',
  'RandomForestMSE_BAG_L2': 'StackerEnsembleModel_RF',
  'WeightedEnsemble_L3': 'WeightedEnsembleModel'},
 'model_performance': {'KNeighborsUnif_BAG_L1': -101.54619908446061,
  'KNeighborsDist_BAG_L1': -84.12506123181602,
  'LightGBMXT_BAG_L1': -4.818207042680357,
  'LightGBM_BAG_L1': -3.1440003004654633,
  'RandomForestMSE_BAG_L1': -2.8483664966424205,
  'CatBoost_BAG_L1': -3.133100411168543,
  'ExtraTreesMSE_BAG_L1': -2.6655899308857838,
  'NeuralNetFastAI_BAG_L1': -32.134519944923994,
  'WeightedEnsemble_L2': -2.0898542134823317,
  'LightGBMXT_BAG_L2': -4.177264592027391,
  'LightGBM_BAG_L2': -2.35772841092233,
  'RandomForestMSE_BAG_L2': -2.0525657940702415,
  'WeightedEnsemble_L3': -1.953834294138098},
 'model_best': 'WeightedEnsemble_L3',
 'model_paths': {'KNeighborsUnif_BAG_L1': 'AutogluonModels/ag-20230203_134406/mode
ls/KNeighborsUnif_BAG_L1/',
  'KNeighborsDist_BAG_L1': 'AutogluonModels/ag-20230203_134406/models/KNeighborsDi
st_BAG_L1/',
  'LightGBMXT_BAG_L1': 'AutogluonModels/ag-20230203_134406/models/LightGBMXT_BAG_L
1/',
  'LightGBM_BAG_L1': 'AutogluonModels/ag-20230203_134406/models/LightGBM_BAG_L1/',
  'RandomForestMSE_BAG_L1': 'AutogluonModels/ag-20230203_134406/models/RandomFores
tMSE_BAG_L1/',
  'CatBoost_BAG_L1': 'AutogluonModels/ag-20230203_134406/models/CatBoost_BAG_L1/',
  'ExtraTreesMSE_BAG_L1': 'AutogluonModels/ag-20230203_134406/models/ExtraTreesMSE
_BAG_L1/',
  'NeuralNetFastAI_BAG_L1': 'AutogluonModels/ag-20230203_134406/models/NeuralNetFa
stAI_BAG_L1/',
  'WeightedEnsemble_L2': 'AutogluonModels/ag-20230203_134406/models/WeightedEnsemb
le_L2/',
  'LightGBMXT_BAG_L2': 'AutogluonModels/ag-20230203_134406/models/LightGBMXT_BAG_L
2/',
  'LightGBM_BAG_L2': 'AutogluonModels/ag-20230203_134406/models/LightGBM_BAG_L2/',
  'RandomForestMSE_BAG_L2': 'AutogluonModels/ag-20230203_134406/models/RandomFores
tMSE_BAG_L2/',
  'WeightedEnsemble_L3': 'AutogluonModels/ag-20230203_134406/models/WeightedEnsemb
le_L3/'},
 'model_fit_times': {'KNeighborsUnif_BAG_L1': 0.06333494186401367,
  'KNeighborsDist_BAG_L1': 0.08660602569580078,
  'LightGBMXT_BAG_L1': 145.8153305053711,
  'LightGBM_BAG_L1': 47.05226373672485,
  'RandomForestMSE_BAG_L1': 13.293608903884888,
  'CatBoost_BAG_L1': 150.68582010269165,
  'ExtraTreesMSE_BAG_L1': 6.6307690143585205,
  'NeuralNetFastAI_BAG_L1': 31.682504892349243,
  'WeightedEnsemble_L2': 0.5081720352172852,
  'LightGBMXT_BAG_L2': 129.74614810943604,
  'LightGBM_BAG_L2': 26.00508451461792,
  'RandomForestMSE_BAG_L2': 21.769639015197754,
  'WeightedEnsemble_L3': 0.23731112480163574},
 'model_pred_times': {'KNeighborsUnif_BAG_L1': 0.1035604476928711,
```

```
 'KNeighborsDist_BAG_L1': 0.10348653793334961,
 'LightGBMXT_BAG_L1': 40.33965563774109,
 'LightGBM_BAG_L1': 6.315374374389648,
 'RandomForestMSE_BAG_L1': 0.504554033279419,
 'CatBoost_BAG_L1': 0.1466689109802246,
 'ExtraTreesMSE_BAG_L1': 0.5260121822357178,
 'NeuralNetFastAI_BAG_L1': 0.5423071384429932,
 'WeightedEnsemble_L2': 0.0009343624114990234,
 'LightGBMXT_BAG_L2': 17.985010385513306,
 'LightGBM_BAG_L2': 0.4520895481109619,
 'RandomForestMSE_BAG_L2': 0.42992448806762695,
 'WeightedEnsemble_L3': 0.0011475086212158203},
'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},
 'LightGBMXT_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True},
 'LightGBM_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': 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},
 'CatBoost_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': 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},
 'NeuralNetFastAI_BAG_L1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True},
 'WeightedEnsemble_L2': {'use_orig_features': False,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True},
 'LightGBMXT_BAG_L2': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True},
 'LightGBM_BAG_L2': {'use_orig_features': True,
  '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},
  '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   -1.953834      67.449791  573.068421
 1   RandomForestMSE_BAG_L2   -2.052566      49.011544  417.079877
 2      WeightedEnsemble_L2   -2.089854      48.375507  395.668469
 3          LightGBM_BAG_L2   -2.357728      49.033709  421.315323
 4     ExtraTreesMSE_BAG_L1   -2.665590       0.526012    6.630769
 5   RandomForestMSE_BAG_L1   -2.848366       0.504554   13.293609
 6          CatBoost_BAG_L1   -3.133100       0.146669  150.685820
 7          LightGBM_BAG_L1   -3.144000       6.315374   47.052264
 8        LightGBMXT_BAG_L2   -4.177265      66.566630  525.056386
 9        LightGBMXT_BAG_L1   -4.818207      40.339656  145.815331
 10  NeuralNetFastAI_BAG_L1  -32.134520       0.542307   31.682505
 11   KNeighborsDist_BAG_L1  -84.125061       0.103487    0.086606
 12   KNeighborsUnif_BAG_L1 -101.546199       0.103560    0.063335

     pred_time_val_marginal  fit_time_marginal  stack_level  can_infer  \
 0                 0.001148           0.237311            3       True
 1                 0.429924          21.769639            2       True
 2                 0.000934           0.508172            2       True
 3                 0.452090          26.005085            2       True
 4                 0.526012           6.630769            1       True
 5                 0.504554          13.293609            1       True
 6                 0.146669         150.685820            1       True
 7                 6.315374          47.052264            1       True
 8                17.985010         129.746148            2       True
 9                40.339656         145.815331            1       True
 10                0.542307          31.682505            1       True
 11                0.103487           0.086606            1       True
 12                0.103560           0.063335            1       True

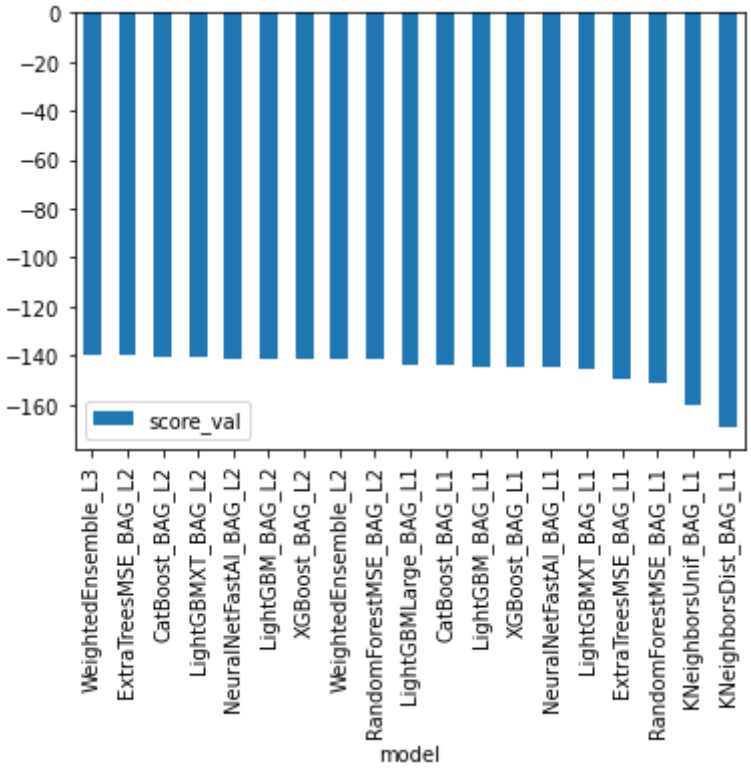
     fit_order
 0          13
 1          12
 2           9
 3          11
 4           7
 5           5
 6           6
 7           4
 8          10
 9           3
 10          8
 11          2
 12          1  }
```

In [45]:
```
predictions = predictor.predict(df_test_2)
predictions.head()
```

Out[45]:
```
0    128.649979
1     70.493484
2     70.493484
3     83.208740
4     83.208740
Name: count, dtype: float32
```

In [46]:
```
predictor.leaderboard(silent = True).plot(kind = 'bar', x = 'model', y = 'score_va
```

Out[46]:
```
<AxesSubplot:xlabel='model'>
```



In [47]:
```
# Describe the `predictions` series to see if there are any negative values
predictions[predictions < 0].shape
```

Out[47]:
```
(0,)
```

In [48]:
```
submission_new_features = pd.read_csv('sampleSubmission.csv')
submission_new_features.nunique()
```

Out[48]:
```
datetime    6493
count          1
dtype: int64
```

In [49]:
```
# Same submitting predictions
submission_new_features["count"] = predictions
submission_new_features.to_csv("submission_new_features.csv", index=False)
```

In [50]:
```
submission_new_features.nunique()
```

Out[50]:
```
datetime    6493
count       5451
dtype: int64
```

In [51]:
```
!kaggle competitions submit -c bike-sharing-demand -f submission_new_features.csv -
```

```
100%|████████████████████████████████████████| 188k/188k [00:00<00:00, 416kB/s]
Successfully submitted to Bike Sharing Demand
```

In [52]:
```
!kaggle competitions submissions -c bike-sharing-demand | tail -n +1 | head -n 6
```

```
fileName                          date                 description
status    publicScore  privateScore
-------------------------------  -------------------  ---------------------------
-----------------------------------------  --------  -----------  ------------
submission_new_features.csv       2023-02-03 13:56:48  new features
complete  1.34676      1.34676
submission.csv                    2023-02-03 13:38:01  first raw submission
complete  1.32787      1.32787
3 submission_hyperparameter.csv   2022-12-27 15:53:53  After hyper parameter tuning
complete  0.56110      0.56110
2 submission_new_features.csv     2022-12-27 15:14:51  2nd submission after feature
engineering and adding additional columns  complete  0.56327      0.56327
```

New Score of `1.34676`

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 [ ]:

In [61]:
```
import autogluon.core as ag
## From autogluon documentation
nn_options = {
    'dropout_prob': ag.space.Real(0.0, 0.5, default=0.1),  # dropout probability
}

gbm_options = {
    'num_boost_round': 100,  # number of boosting rounds
    'num_leaves': ag.space.Int(lower=26, upper=66, default=36),  # number of leaves
}

hyperparameters = {  # hyperparameters of each model type
                   'GBM': gbm_options,
                   'NN': nn_options,
                  }

num_trials = 3  # try at most 3 different hyperparameter configurations for each ty
search_strategy = 'auto'  # tune hyperparameters using Bayesian optimization routi

hyperparameter_tune_kwargs = {
    'num_trials': num_trials,
    'scheduler' : 'local',
    'searcher': search_strategy,
}

predictor_new_hpo = TabularPredictor(label='count', problem_type = 'regression', ev
    train_data = df_train_2.drop(['casual', 'registered'], axis=1),
    time_limit=600,
    hyperparameter_tune_kwargs=hyperparameter_tune_kwargs, hyperparameters=hyperpar
    presets = 'best_quality'
)
```

```
No path specified. Models will be saved in: "AutogluonModels/ag-20230203_142604/"
Presets specified: ['best_quality']
Warning: hyperparameter tuning is currently experimental and may cause the process
to hang.
Stack configuration (auto_stack=True): num_stack_levels=1, num_bag_folds=8, num_ba
g_sets=20
Beginning AutoGluon training ... Time limit = 600s
AutoGluon will save models to "AutogluonModels/ag-20230203_142604/"
AutoGluon Version:  0.6.2
Python Version:     3.7.10
Operating System:   Linux
Platform Machine:   x86_64
Platform Version:   #1 SMP Fri Dec 9 09:57:03 UTC 2022
Train Data Rows:    10886
Train Data Columns: 12
Label Column: count
Preprocessing data ...
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
        Available Memory:                    1977.86 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_me
tadata_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator...
                        Note: Converting 2 features to boolean dtype as they only
contain 2 unique values.
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator...
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator...
                Fitting CategoryFeatureGenerator...
                        Fitting CategoryMemoryMinimizeFeatureGenerator...
                Fitting DatetimeFeatureGenerator...
/usr/local/lib/python3.7/site-packages/autogluon/features/generators/datetime.py:5
9: FutureWarning: casting datetime64[ns, UTC] values to int64 with .astype(...) is
deprecated and will raise in a future version. Use .view(...) instead.
  good_rows = series[~series.isin(bad_rows)].astype(np.int64)
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator...
        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', 'mont
h', 'day', ...]
        Types of features in processed data (raw dtype, special dtypes):
                ('category', [])             : 2 | ['season', 'weather']
                ('float', [])                : 3 | ['temp', 'atemp', 'windspeed']
                ('int', [])                  : 4 | ['humidity', 'month', 'day', 'h
our']
                ('int', ['bool'])            : 2 | ['holiday', 'workingday']
                ('int', ['datetime_as_int']) : 5 | ['datetime', 'datetime.year',
'datetime.month', 'datetime.day', 'datetime.dayofweek']
        0.2s = Fit runtime
        12 features in original data used to generate 16 features in processed dat
a.
        Train Data (Processed) Memory Usage: 1.09 MB (0.1% of available memory)
Data preprocessing and feature engineering runtime = 0.24s ...
AutoGluon will gauge predictive performance using evaluation metric: 'root_mean_sq
uared_error'
        This metric's sign has been flipped to adhere to being higher_is_better. T
he metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
```

```
AutoGluon will fit 2 stack levels (L1 to L2) ...
        WARNING: "NN" model has been deprecated in v0.4.0 and renamed to "NN_MXNE
T". Starting in v0.6.0, specifying "NN" or "NN_MXNET" will raise an exception. Con
sider instead specifying "NN_TORCH".
Fitting 2 L1 models ...
Hyperparameter tuning model: LightGBM_BAG_L1 ... Tuning model for up to 179.88s of
the 599.75s of remaining time.
  0%|          | 0/3 [00:00<?, ?it/s]   Fitting 8 child models (S1F1 - S1F8) | Fit
ting with ParallelLocalFoldFittingStrategy
 33%|███       | 1/3 [00:21<00:43, 21.60s/it]  Fitting 8 child models (S1F1 - S1F
8) | Fitting with ParallelLocalFoldFittingStrategy
 67%|██████    | 2/3 [00:43<00:21, 21.76s/it]  Fitting 8 child models (S1F1 - S1F
8) | Fitting with ParallelLocalFoldFittingStrategy
100%|██████████| 3/3 [01:06<00:00, 22.14s/it]
Fitted model: LightGBM_BAG_L1/T1 ...
        -40.2554         = Validation score   (-root_mean_squared_error)
        21.56s   = Training   runtime
        0.0s     = Validation runtime
Fitted model: LightGBM_BAG_L1/T2 ...
        -38.722  = Validation score   (-root_mean_squared_error)
        21.83s   = Training   runtime
        0.0s     = Validation runtime
Fitted model: LightGBM_BAG_L1/T3 ...
        -38.4845         = Validation score   (-root_mean_squared_error)
        22.92s   = Training   runtime
        0.0s     = Validation runtime
Hyperparameter tuning model: NeuralNetMXNet_BAG_L1 ... Tuning model for up to 179.
88s of the 533.18s of remaining time.
  0%|          | 0/3 [00:00<?, ?it/s]   Fitting 8 child models (S1F1 - S1F8) | Fit
ting with ParallelLocalFoldFittingStrategy
ray::_ray_fit() (pid=11161, ip=169.255.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_n
n/mxnet/tabular_nn_mxnet.py", line 135, in _fit
    try_import_mxnet()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.p
y", line 40, in try_import_mxnet
    import mxnet as mx
  File "/usr/local/lib/python3.7/site-packages/mxnet/__init__.py", line 33, in <mo
dule>
    from . import contrib
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/__init__.py", line 3
0, in <module>
    from . import text
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/__init__.py", li
ne 23, in <module>
    from . import embedding
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/embedding.py", l
ine 37, in <module>
    from ... import numpy_extension as _mx_npx
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/__init__.py",
line 23, in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/image.py", li
ne 20, in <module>
    from ..image import *  # pylint: disable=wildcard-import, unused-wildcard-impo
rt
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/__init__.py", line 22,
in <module>
```

```
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/image.py", line 38, in
<module>
    import cv2
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 181, in <mod
ule>
    bootstrap()
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 175, in boot
strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 28, in __loa
d_extra_py_code_for_module
    py_module = importlib.import_module(module_name)
  File "/usr/local/lib/python3.7/importlib/__init__.py", line 127, in import_modul
e
    return _bootstrap._gcd_import(name[level:], package, level)
  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
Traceback (most recent call last):
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/mode
l_trial.py", line 49, in model_trial
    time_limit=time_limit,
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/mode
l_trial.py", line 101, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/stac
ker_ensemble_model.py", line 154, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagg
ed_ensemble_model.py", line 251, in _fit
    n_repeats=n_repeats, n_repeat_start=n_repeat_start, save_folds=save_bag_folds,
groups=groups, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagg
ed_ensemble_model.py", line 541, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 536, in after_all_folds_scheduled
    raise processed_exception
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 504, in after_all_folds_scheduled
    time_end_fit, predict_time, predict_1_time = self.ray.get(finished)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/client_mode_hook.py",
line 105, in wrapper
    return func(*args, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/worker.py", line 2280,
in get
    raise value.as_instanceof_cause()
ray.exceptions.RayTaskError(AttributeError): ray::_ray_fit() (pid=11161, ip=169.25
5.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_n
n/mxnet/tabular_nn_mxnet.py", line 135, in _fit
    try_import_mxnet()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.p
```

```
y", line 40, in try_import_mxnet
    import mxnet as mx
  File "/usr/local/lib/python3.7/site-packages/mxnet/__init__.py", line 33, in <mo
dule>
    from . import contrib
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/__init__.py", line 3
0, in <module>
    from . import text
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/__init__.py", li
ne 23, in <module>
    from . import embedding
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/embedding.py", l
ine 37, in <module>
    from ... import numpy_extension as _mx_npx
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/__init__.py",
line 23, in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/image.py", li
ne 20, in <module>
    from ..image import *  # pylint: disable=wildcard-import, unused-wildcard-impo
rt
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/__init__.py", line 22,
in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/image.py", line 38, in
<module>
    import cv2
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 181, in <mod
ule>
    bootstrap()
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 175, in boot
strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 28, in __loa
d_extra_py_code_for_module
    py_module = importlib.import_module(module_name)
  File "/usr/local/lib/python3.7/importlib/__init__.py", line 127, in import_modul
e
    return _bootstrap._gcd_import(name[level:], package, level)
  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
 33%|███▎      | 1/3 [00:05<00:11,  5.72s/it]2023-02-03 14:27:16,965   ERROR work
er.py:400 -- Unhandled error (suppress with 'RAY_IGNORE_UNHANDLED_ERRORS=1'): The
worker died unexpectedly while executing this task. Check python-core-worker-*.log
files for more information.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
ray::_ray_fit() (pid=11221, ip=169.255.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_n
n/mxnet/tabular_nn_mxnet.py", line 135, in _fit
    try_import_mxnet()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.p
y", line 40, in try_import_mxnet
    import mxnet as mx
  File "/usr/local/lib/python3.7/site-packages/mxnet/__init__.py", line 33, in <mo
dule>
```

```
    from . import contrib
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/__init__.py", line 3
0, in <module>
    from . import text
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/__init__.py", li
ne 23, in <module>
    from . import embedding
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/embedding.py", l
ine 37, in <module>
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line 23, in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/image.py", li
ne 20, in <module>
    from ..image import *  # pylint: disable=wildcard-import, unused-wildcard-impo
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  File "/usr/local/lib/python3.7/site-packages/mxnet/image/__init__.py", line 22,
in <module>
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  File "/usr/local/lib/python3.7/site-packages/mxnet/image/image.py", line 38, in
<module>
    import cv2
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 181, in <mod
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strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 28, in __loa
d_extra_py_code_for_module
    py_module = importlib.import_module(module_name)
  File "/usr/local/lib/python3.7/importlib/__init__.py", line 127, in import_modul
e
    return _bootstrap._gcd_import(name[level:], package, level)
  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
Traceback (most recent call last):
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/mode
l_trial.py", line 49, in model_trial
    time_limit=time_limit,
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/mode
l_trial.py", line 101, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/stac
ker_ensemble_model.py", line 154, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagg
ed_ensemble_model.py", line 251, in _fit
    n_repeats=n_repeats, n_repeat_start=n_repeat_start, save_folds=save_bag_folds,
groups=groups, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagg
ed_ensemble_model.py", line 541, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 536, in after_all_folds_scheduled
    raise processed_exception
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 504, in after_all_folds_scheduled
```

```
    time_end_fit, predict_time, predict_1_time = self.ray.get(finished)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/client_mode_hook.py",
line 105, in wrapper
    return func(*args, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/worker.py", line 2280,
in get
    raise value.as_instanceof_cause()
ray.exceptions.RayTaskError(AttributeError): ray::_ray_fit() (pid=11221, ip=169.25
5.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
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    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_n
n/mxnet/tabular_nn_mxnet.py", line 135, in _fit
    try_import_mxnet()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.p
y", line 40, in try_import_mxnet
    import mxnet as mx
  File "/usr/local/lib/python3.7/site-packages/mxnet/__init__.py", line 33, in <mo
dule>
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0, in <module>
    from . import text
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/__init__.py", li
ne 23, in <module>
    from . import embedding
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/embedding.py", l
ine 37, in <module>
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rt
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in <module>
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<module>
    import cv2
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 181, in <mod
ule>
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  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 175, in boot
strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 28, in __loa
d_extra_py_code_for_module
    py_module = importlib.import_module(module_name)
  File "/usr/local/lib/python3.7/importlib/__init__.py", line 127, in import_modul
e
    return _bootstrap._gcd_import(name[level:], package, level)
  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
 67%|██████▋   | 2/3 [00:10<00:05,  5.43s/it]2023-02-03 14:27:22,194   ERROR work
er.py:400 -- Unhandled error (suppress with 'RAY_IGNORE_UNHANDLED_ERRORS=1'): The
```

```
worker died unexpectedly while executing this task. Check python-core-worker-*.log
files for more information.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
ray::_ray_fit() (pid=11286, ip=169.255.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
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0, in <module>
    from . import text
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ine 37, in <module>
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ne 20, in <module>
    from ..image import *  # pylint: disable=wildcard-import, unused-wildcard-impo
rt
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/__init__.py", line 22,
in <module>
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  File "/usr/local/lib/python3.7/site-packages/mxnet/image/image.py", line 38, in
<module>
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ule>
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  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 175, in boot
strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 28, in __loa
d_extra_py_code_for_module
    py_module = importlib.import_module(module_name)
  File "/usr/local/lib/python3.7/importlib/__init__.py", line 127, in import_modul
e
    return _bootstrap._gcd_import(name[level:], package, level)
  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
Traceback (most recent call last):
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/mode
l_trial.py", line 49, in model_trial
    time_limit=time_limit,
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/mode
l_trial.py", line 101, in fit_and_save_model
```

```
    model.fit(**fit_args, time_limit=time_left)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/stac
ker_ensemble_model.py", line 154, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagg
ed_ensemble_model.py", line 251, in _fit
    n_repeats=n_repeats, n_repeat_start=n_repeat_start, save_folds=save_bag_folds,
groups=groups, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagg
ed_ensemble_model.py", line 541, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 536, in after_all_folds_scheduled
    raise processed_exception
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 504, in after_all_folds_scheduled
    time_end_fit, predict_time, predict_1_time = self.ray.get(finished)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/client_mode_hook.py",
line 105, in wrapper
    return func(*args, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/worker.py", line 2280,
in get
    raise value.as_instanceof_cause()
ray.exceptions.RayTaskError(AttributeError): ray::_ray_fit() (pid=11286, ip=169.25
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_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_n
n/mxnet/tabular_nn_mxnet.py", line 135, in _fit
    try_import_mxnet()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.p
y", line 40, in try_import_mxnet
    import mxnet as mx
  File "/usr/local/lib/python3.7/site-packages/mxnet/__init__.py", line 33, in <mo
dule>
    from . import contrib
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/__init__.py", line 3
0, in <module>
    from . import text
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/__init__.py", li
ne 23, in <module>
    from . import embedding
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/embedding.py", l
ine 37, in <module>
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  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/__init__.py",
line 23, in <module>
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ne 20, in <module>
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  File "/usr/local/lib/python3.7/site-packages/mxnet/image/__init__.py", line 22,
in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/image.py", line 38, in
<module>
```

```
    import cv2
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 181, in <mod
ule>
    bootstrap()
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strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
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d_extra_py_code_for_module
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  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
100%|██████████| 3/3 [00:16<00:00,  5.45s/it]
No model was trained during hyperparameter tuning NeuralNetMXNet_BAG_L1... Skippin
g this model.
Repeating k-fold bagging: 2/20
Fitting model: LightGBM_BAG_L1/T1 ... Training model for up to 316.69s of the 516.
71s of remaining time.
2023-02-03 14:27:27,580 ERROR worker.py:400 -- Unhandled error (suppress with 'RAY
_IGNORE_UNHANDLED_ERRORS=1'): ray::_ray_fit() (pid=11289, ip=169.255.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
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    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_n
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  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.p
y", line 40, in try_import_mxnet
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0, in <module>
    from . import text
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ne 23, in <module>
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  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 175, in boot
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AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
        Fitting 8 child models (S2F1 - S2F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -39.7819         = Validation score   (-root_mean_squared_error)
        39.56s   = Training   runtime
        0.15s    = Validation runtime
Fitting model: LightGBM_BAG_L1/T2 ... Training model for up to 294.63s of the 494.
64s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -38.2046         = Validation score   (-root_mean_squared_error)
        39.75s   = Training   runtime
        0.15s    = Validation runtime
Fitting model: LightGBM_BAG_L1/T3 ... Training model for up to 272.2s of the 472.2
1s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -38.0476         = Validation score   (-root_mean_squared_error)
        41.52s   = Training   runtime
        0.18s    = Validation runtime
Repeating k-fold bagging: 3/20
Fitting model: LightGBM_BAG_L1/T1 ... Training model for up to 249.66s of the 449.
68s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -39.6161         = Validation score   (-root_mean_squared_error)
        58.2s    = Training   runtime
        0.29s    = Validation runtime
Fitting model: LightGBM_BAG_L1/T2 ... Training model for up to 226.9s of the 426.9
1s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -38.1359         = Validation score   (-root_mean_squared_error)
        57.97s   = Training   runtime
        0.31s    = Validation runtime
Fitting model: LightGBM_BAG_L1/T3 ... Training model for up to 204.7s of the 404.7
2s of remaining time.
        Fitting 8 child models (S3F1 - S3F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -37.841  = Validation score   (-root_mean_squared_error)
        60.28s   = Training   runtime
        0.39s    = Validation runtime
Repeating k-fold bagging: 4/20
Fitting model: LightGBM_BAG_L1/T1 ... Training model for up to 181.86s of the 381.
88s of remaining time.
        Fitting 8 child models (S4F1 - S4F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -39.5522         = Validation score   (-root_mean_squared_error)
        76.81s   = Training   runtime
        0.44s    = Validation runtime
Fitting model: LightGBM_BAG_L1/T2 ... Training model for up to 159.11s of the 359.
```

```
13s of remaining time.
	Fitting 8 child models (S4F1 - S4F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-38.0903 	= Validation score   (-root_mean_squared_error)
	75.98s 	= Training   runtime
	0.45s 	= Validation runtime
Fitting model: LightGBM_BAG_L1/T3 ... Training model for up to 137.25s of the 337.
27s of remaining time.
	Fitting 8 child models (S4F1 - S4F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-37.7582 	= Validation score   (-root_mean_squared_error)
	78.88s 	= Training   runtime
	0.56s 	= Validation runtime
Repeating k-fold bagging: 5/20
Fitting model: LightGBM_BAG_L1/T1 ... Training model for up to 114.69s of the 314.
71s of remaining time.
	Fitting 8 child models (S5F1 - S5F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-39.5237 	= Validation score   (-root_mean_squared_error)
	95.35s 	= Training   runtime
	0.65s 	= Validation runtime
Fitting model: LightGBM_BAG_L1/T2 ... Training model for up to 92.21s of the 292.2
2s of remaining time.
	Fitting 8 child models (S5F1 - S5F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-38.0797 	= Validation score   (-root_mean_squared_error)
	93.82s 	= Training   runtime
	0.59s 	= Validation runtime
Fitting model: LightGBM_BAG_L1/T3 ... Training model for up to 70.34s of the 270.3
5s of remaining time.
	Fitting 8 child models (S5F1 - S5F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
	-37.7099 	= Validation score   (-root_mean_squared_error)
	97.56s 	= Training   runtime
	0.72s 	= Validation runtime
Completed 5/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L2 ... Training model for up to 360.0s of the 247.
82s of remaining time.
	-37.423 	= Validation score   (-root_mean_squared_error)
	0.24s 	= Training   runtime
	0.0s 	= Validation runtime
	WARNING: "NN" model has been deprecated in v0.4.0 and renamed to "NN_MXNE
T". Starting in v0.6.0, specifying "NN" or "NN_MXNET" will raise an exception. Con
sider instead specifying "NN_TORCH".
Fitting 2 L2 models ...
Hyperparameter tuning model: LightGBM_BAG_L2 ... Tuning model for up to 111.38s of
the 247.5s of remaining time.
  0%|          | 0/3 [00:00<?, ?it/s]   Fitting 8 child models (S1F1 - S1F8) | Fit
ting with ParallelLocalFoldFittingStrategy
 33%|███       | 1/3 [00:22<00:45, 22.86s/it]  Fitting 8 child models (S1F1 - S1F
8) | Fitting with ParallelLocalFoldFittingStrategy
 67%|██████    | 2/3 [00:45<00:22, 22.53s/it]  Fitting 8 child models (S1F1 - S1F
8) | Fitting with ParallelLocalFoldFittingStrategy
100%|██████████| 3/3 [01:08<00:00, 22.86s/it]
Fitted model: LightGBM_BAG_L2/T1 ...
	-36.6184 	= Validation score   (-root_mean_squared_error)
	22.83s 	= Training   runtime
	0.0s 	= Validation runtime
Fitted model: LightGBM_BAG_L2/T2 ...
	-36.2768 	= Validation score   (-root_mean_squared_error)
	22.27s 	= Training   runtime
	0.0s 	= Validation runtime
Fitted model: LightGBM_BAG_L2/T3 ...
	-36.5824 	= Validation score   (-root_mean_squared_error)
```

```
        23.37s    = Training   runtime
        0.0s      = Validation runtime
Hyperparameter tuning model: NeuralNetMXNet_BAG_L2 ... Tuning model for up to 111.
38s of the 178.8s of remaining time.
  0%|          | 0/3 [00:00<?, ?it/s]   Fitting 8 child models (S1F1 - S1F8) | Fit
ting with ParallelLocalFoldFittingStrategy
ray::_ray_fit() (pid=14930, ip=169.255.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_n
n/mxnet/tabular_nn_mxnet.py", line 135, in _fit
    try_import_mxnet()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.p
y", line 40, in try_import_mxnet
    import mxnet as mx
  File "/usr/local/lib/python3.7/site-packages/mxnet/__init__.py", line 33, in <mo
dule>
    from . import contrib
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/__init__.py", line 3
0, in <module>
    from . import text
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/__init__.py", li
ne 23, in <module>
    from . import embedding
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/embedding.py", l
ine 37, in <module>
    from ... import numpy_extension as _mx_npx
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/__init__.py",
line 23, in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/image.py", li
ne 20, in <module>
    from ..image import *  # pylint: disable=wildcard-import, unused-wildcard-impo
rt
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/__init__.py", line 22,
in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/image.py", line 38, in
<module>
    import cv2
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 181, in <mod
ule>
    bootstrap()
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 175, in boot
strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 28, in __loa
d_extra_py_code_for_module
    py_module = importlib.import_module(module_name)
  File "/usr/local/lib/python3.7/importlib/__init__.py", line 127, in import_modul
e
    return _bootstrap._gcd_import(name[level:], package, level)
  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
Traceback (most recent call last):
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/mode
l_trial.py", line 49, in model_trial
    time_limit=time_limit,
```

```
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/model_trial.py", line 101, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abstract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/stacker_ensemble_model.py", line 154, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagged_ensemble_model.py", line 251, in _fit
    n_repeats=n_repeats, n_repeat_start=n_repeat_start, save_folds=save_bag_folds, groups=groups, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagged_ensemble_model.py", line 541, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold_fitting_strategy.py", line 536, in after_all_folds_scheduled
    raise processed_exception
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold_fitting_strategy.py", line 504, in after_all_folds_scheduled
    time_end_fit, predict_time, predict_1_time = self.ray.get(finished)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/client_mode_hook.py", line 105, in wrapper
    return func(*args, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/worker.py", line 2280, in get
    raise value.as_instanceof_cause()
ray.exceptions.RayTaskError(AttributeError): ray::_ray_fit() (pid=14930, ip=169.255.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abstract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_nn/mxnet/tabular_nn_mxnet.py", line 135, in _fit
    try_import_mxnet()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.py", line 40, in try_import_mxnet
    import mxnet as mx
  File "/usr/local/lib/python3.7/site-packages/mxnet/__init__.py", line 33, in <module>
    from . import contrib
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/__init__.py", line 30, in <module>
    from . import text
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/__init__.py", line 23, in <module>
    from . import embedding
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/embedding.py", line 37, in <module>
    from ... import numpy_extension as _mx_npx
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/__init__.py", line 23, in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/image.py", line 20, in <module>
    from ..image import *  # pylint: disable=wildcard-import, unused-wildcard-import
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/__init__.py", line 22, in <module>
    from . import image
```

```
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/image.py", line 38, in
<module>
    import cv2
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 181, in <mod
ule>
    bootstrap()
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 175, in boot
strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 28, in __loa
d_extra_py_code_for_module
    py_module = importlib.import_module(module_name)
  File "/usr/local/lib/python3.7/importlib/__init__.py", line 127, in import_modul
e
    return _bootstrap._gcd_import(name[level:], package, level)
  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
 33%|███▎      | 1/3 [00:05<00:11,  5.75s/it]  Fitting 8 child models (S1F1 - S1F
8) | Fitting with ParallelLocalFoldFittingStrategy
2023-02-03 14:33:11,811 ERROR worker.py:400 -- Unhandled error (suppress with 'RAY
_IGNORE_UNHANDLED_ERRORS=1'): The worker died unexpectedly while executing this ta
sk. Check python-core-worker-*.log files for more information.
ray::_ray_fit() (pid=14987, ip=169.255.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_n
n/mxnet/tabular_nn_mxnet.py", line 135, in _fit
    try_import_mxnet()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.p
y", line 40, in try_import_mxnet
    import mxnet as mx
  File "/usr/local/lib/python3.7/site-packages/mxnet/__init__.py", line 33, in <mo
dule>
    from . import contrib
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/__init__.py", line 3
0, in <module>
    from . import text
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/__init__.py", li
ne 23, in <module>
    from . import embedding
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/embedding.py", l
ine 37, in <module>
    from ... import numpy_extension as _mx_npx
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/__init__.py",
line 23, in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/image.py", li
ne 20, in <module>
    from ..image import *  # pylint: disable=wildcard-import, unused-wildcard-impo
rt
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/__init__.py", line 22,
in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/image.py", line 38, in
<module>
    import cv2
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 181, in <mod
ule>
```

```
    bootstrap()
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 175, in boot
strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 28, in __loa
d_extra_py_code_for_module
    py_module = importlib.import_module(module_name)
  File "/usr/local/lib/python3.7/importlib/__init__.py", line 127, in import_modul
e
    return _bootstrap._gcd_import(name[level:], package, level)
  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
Traceback (most recent call last):
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/mode
l_trial.py", line 49, in model_trial
    time_limit=time_limit,
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/mode
l_trial.py", line 101, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/stac
ker_ensemble_model.py", line 154, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagg
ed_ensemble_model.py", line 251, in _fit
    n_repeats=n_repeats, n_repeat_start=n_repeat_start, save_folds=save_bag_folds,
groups=groups, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagg
ed_ensemble_model.py", line 541, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 536, in after_all_folds_scheduled
    raise processed_exception
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 504, in after_all_folds_scheduled
    time_end_fit, predict_time, predict_1_time = self.ray.get(finished)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/client_mode_hook.py",
line 105, in wrapper
    return func(*args, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/worker.py", line 2280,
in get
    raise value.as_instanceof_cause()
ray.exceptions.RayTaskError(AttributeError): ray::_ray_fit() (pid=14987, ip=169.25
5.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_n
n/mxnet/tabular_nn_mxnet.py", line 135, in _fit
    try_import_mxnet()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.p
y", line 40, in try_import_mxnet
    import mxnet as mx
  File "/usr/local/lib/python3.7/site-packages/mxnet/__init__.py", line 33, in <mo
dule>
    from . import contrib
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/__init__.py", line 3
```

```
0, in <module>
    from . import text
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/__init__.py", li
ne 23, in <module>
    from . import embedding
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/embedding.py", l
ine 37, in <module>
    from ... import numpy_extension as _mx_npx
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/__init__.py",
line 23, in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/image.py", li
ne 20, in <module>
    from ..image import *  # pylint: disable=wildcard-import, unused-wildcard-impo
rt
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/__init__.py", line 22,
in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/image.py", line 38, in
<module>
    import cv2
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 181, in <mod
ule>
    bootstrap()
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 175, in boot
strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 28, in __loa
d_extra_py_code_for_module
    py_module = importlib.import_module(module_name)
  File "/usr/local/lib/python3.7/importlib/__init__.py", line 127, in import_modul
e
    return _bootstrap._gcd_import(name[level:], package, level)
  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
 67%|██████▋   | 2/3 [00:11<00:05,  5.74s/it]2023-02-03 14:33:17,134   ERROR work
er.py:400 -- Unhandled error (suppress with 'RAY_IGNORE_UNHANDLED_ERRORS=1'): The
worker died unexpectedly while executing this task. Check python-core-worker-*.log
files for more information.
        Fitting 8 child models (S1F1 - S1F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
ray::_ray_fit() (pid=15085, ip=169.255.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_n
n/mxnet/tabular_nn_mxnet.py", line 135, in _fit
    try_import_mxnet()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.p
y", line 40, in try_import_mxnet
    import mxnet as mx
  File "/usr/local/lib/python3.7/site-packages/mxnet/__init__.py", line 33, in <mo
dule>
    from . import contrib
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/__init__.py", line 3
0, in <module>
    from . import text
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/__init__.py", li
ne 23, in <module>
```

```
    from . import embedding
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/embedding.py", l
ine 37, in <module>
    from ... import numpy_extension as _mx_npx
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/__init__.py",
line 23, in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/image.py", li
ne 20, in <module>
    from ..image import *  # pylint: disable=wildcard-import, unused-wildcard-impo
rt
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/__init__.py", line 22,
in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/image.py", line 38, in
<module>
    import cv2
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 181, in <mod
ule>
    bootstrap()
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 175, in boot
strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 28, in __loa
d_extra_py_code_for_module
    py_module = importlib.import_module(module_name)
  File "/usr/local/lib/python3.7/importlib/__init__.py", line 127, in import_modul
e
    return _bootstrap._gcd_import(name[level:], package, level)
  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
Traceback (most recent call last):
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/mode
l_trial.py", line 49, in model_trial
    time_limit=time_limit,
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/mode
l_trial.py", line 101, in fit_and_save_model
    model.fit(**fit_args, time_limit=time_left)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/stac
ker_ensemble_model.py", line 154, in _fit
    return super()._fit(X=X, y=y, time_limit=time_limit, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagg
ed_ensemble_model.py", line 251, in _fit
    n_repeats=n_repeats, n_repeat_start=n_repeat_start, save_folds=save_bag_folds,
groups=groups, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/bagg
ed_ensemble_model.py", line 541, in _fit_folds
    fold_fitting_strategy.after_all_folds_scheduled()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 536, in after_all_folds_scheduled
    raise processed_exception
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 504, in after_all_folds_scheduled
    time_end_fit, predict_time, predict_1_time = self.ray.get(finished)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/client_mode_hook.py",
line 105, in wrapper
    return func(*args, **kwargs)
  File "/usr/local/lib/python3.7/site-packages/ray/_private/worker.py", line 2280,
in get
```

```
    raise value.as_instanceof_cause()
ray.exceptions.RayTaskError(AttributeError): ray::_ray_fit() (pid=15085, ip=169.25
5.254.2)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/ensemble/fold
_fitting_strategy.py", line 375, in _ray_fit
    time_limit=time_limit_fold, **resources, **kwargs_fold)
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/models/abstract/abst
ract_model.py", line 703, in fit
    out = self._fit(**kwargs)
  File "/usr/local/lib/python3.7/site-packages/autogluon/tabular/models/tabular_n
n/mxnet/tabular_nn_mxnet.py", line 135, in _fit
    try_import_mxnet()
  File "/usr/local/lib/python3.7/site-packages/autogluon/core/utils/try_import.p
y", line 40, in try_import_mxnet
    import mxnet as mx
  File "/usr/local/lib/python3.7/site-packages/mxnet/__init__.py", line 33, in <mo
dule>
    from . import contrib
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/__init__.py", line 3
0, in <module>
    from . import text
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/__init__.py", li
ne 23, in <module>
    from . import embedding
  File "/usr/local/lib/python3.7/site-packages/mxnet/contrib/text/embedding.py", l
ine 37, in <module>
    from ... import numpy_extension as _mx_npx
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/__init__.py",
line 23, in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/numpy_extension/image.py", li
ne 20, in <module>
    from ..image import *  # pylint: disable=wildcard-import, unused-wildcard-impo
rt
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/__init__.py", line 22,
in <module>
    from . import image
  File "/usr/local/lib/python3.7/site-packages/mxnet/image/image.py", line 38, in
<module>
    import cv2
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 181, in <mod
ule>
    bootstrap()
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 175, in boot
strap
    if __load_extra_py_code_for_module("cv2", submodule, DEBUG):
  File "/usr/local/lib/python3.7/site-packages/cv2/__init__.py", line 28, in __loa
d_extra_py_code_for_module
    py_module = importlib.import_module(module_name)
  File "/usr/local/lib/python3.7/importlib/__init__.py", line 127, in import_modul
e
    return _bootstrap._gcd_import(name[level:], package, level)
  File "/usr/local/lib/python3.7/site-packages/cv2/gapi/__init__.py", line 301, in
<module>
    cv.gapi.wip.GStreamerPipeline = cv.gapi_wip_gst_GStreamerPipeline
AttributeError: module 'cv2' has no attribute 'gapi_wip_gst_GStreamerPipeline'
100%|██████████| 3/3 [00:17<00:00,  5.79s/it]
No model was trained during hyperparameter tuning NeuralNetMXNet_BAG_L2... Skippin
g this model.
Repeating k-fold bagging: 2/20
Fitting model: LightGBM_BAG_L2/T1 ... Training model for up to 161.29s of the 161.
28s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
```

```
2023-02-03 14:33:23,463 ERROR worker.py:400 -- Unhandled error (suppress with 'RAY
_IGNORE_UNHANDLED_ERRORS=1'): The worker died unexpectedly while executing this ta
sk. Check python-core-worker-*.log files for more information.
        -36.4182         = Validation score   (-root_mean_squared_error)
        42.33s   = Training   runtime
        0.15s    = Validation runtime
Fitting model: LightGBM_BAG_L2/T2 ... Training model for up to 137.71s of the 137.
69s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -36.2495         = Validation score   (-root_mean_squared_error)
        41.32s   = Training   runtime
        0.16s    = Validation runtime
Fitting model: LightGBM_BAG_L2/T3 ... Training model for up to 114.6s of the 114.5
8s of remaining time.
        Fitting 8 child models (S2F1 - S2F8) | Fitting with ParallelLocalFoldFitti
ngStrategy
        -36.3445         = Validation score   (-root_mean_squared_error)
        42.32s   = Training   runtime
        0.16s    = Validation runtime
Completed 2/20 k-fold bagging repeats ...
Fitting model: WeightedEnsemble_L3 ... Training model for up to 360.0s of the 91.4
7s of remaining time.
        -36.132  = Validation score   (-root_mean_squared_error)
        0.24s    = Training   runtime
        0.0s     = Validation runtime
AutoGluon training complete, total runtime = 508.99s ... Best model: "WeightedEnse
mble_L3"
TabularPredictor saved. To load, use: predictor = TabularPredictor.load("Autogluon
Models/ag-20230203_142604/")
```

In [62]:
```
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_L3 -36.131978       2.278151  370.613716               0.0012
45           0.236919            3       True          8
1   LightGBM_BAG_L2/T2 -36.249492       2.118849  328.060172               0.1574
10          41.324702            2       True          6
2   LightGBM_BAG_L2/T3 -36.344547       2.119495  329.052095               0.1580
57          42.316625            2       True          7
3   LightGBM_BAG_L2/T1 -36.418229       2.114458  329.064007               0.1530
20          42.328537            2       True          5
4  WeightedEnsemble_L2 -37.422973       1.311387  191.620800               0.0007
76           0.236598            2       True          4
5   LightGBM_BAG_L1/T3 -37.709946       0.724145   97.563275               0.7241
45          97.563275            1       True          3
6   LightGBM_BAG_L1/T2 -38.079656       0.586466   93.820927               0.5864
66          93.820927            1       True          2
7   LightGBM_BAG_L1/T1 -39.523687       0.650827   95.351268               0.6508
27          95.351268            1       True          1
Number of models trained: 8
Types of models trained:
{'StackerEnsembleModel_LGB', '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', 'month', 'day', 'hour']
('int', ['bool'])            : 2 | ['holiday', 'workingday']
('int', ['datetime_as_int']) : 5 | ['datetime', 'datetime.year', 'datetime.month',
'datetime.day', 'datetime.dayofweek']
Plot summary of models saved to file: AutogluonModels/ag-20230203_142604/SummaryOf
Models.html
*** End of fit() summary ***
```

Out[62]:

```
{'model_types': {'LightGBM_BAG_L1/T1': 'StackerEnsembleModel_LGB',
  'LightGBM_BAG_L1/T2': 'StackerEnsembleModel_LGB',
  'LightGBM_BAG_L1/T3': 'StackerEnsembleModel_LGB',
  'WeightedEnsemble_L2': 'WeightedEnsembleModel',
  'LightGBM_BAG_L2/T1': 'StackerEnsembleModel_LGB',
  'LightGBM_BAG_L2/T2': 'StackerEnsembleModel_LGB',
  'LightGBM_BAG_L2/T3': 'StackerEnsembleModel_LGB',
  'WeightedEnsemble_L3': 'WeightedEnsembleModel'},
 'model_performance': {'LightGBM_BAG_L1/T1': -39.52368745300766,
  'LightGBM_BAG_L1/T2': -38.079655608462986,
  'LightGBM_BAG_L1/T3': -37.70994589327663,
  'WeightedEnsemble_L2': -37.422972732383535,
  'LightGBM_BAG_L2/T1': -36.41822871361583,
  'LightGBM_BAG_L2/T2': -36.24949247548409,
  'LightGBM_BAG_L2/T3': -36.344547349634624,
  'WeightedEnsemble_L3': -36.131977818806774},
 'model_best': 'WeightedEnsemble_L3',
 'model_paths': {'LightGBM_BAG_L1/T1': '/root/Project 2 re-attempt/AutogluonModel
s/ag-20230203_142604/models/LightGBM_BAG_L1/T1/',
  'LightGBM_BAG_L1/T2': '/root/Project 2 re-attempt/AutogluonModels/ag-20230203_14
2604/models/LightGBM_BAG_L1/T2/',
  'LightGBM_BAG_L1/T3': '/root/Project 2 re-attempt/AutogluonModels/ag-20230203_14
2604/models/LightGBM_BAG_L1/T3/',
  'WeightedEnsemble_L2': 'AutogluonModels/ag-20230203_142604/models/WeightedEnsemb
le_L2/',
  'LightGBM_BAG_L2/T1': '/root/Project 2 re-attempt/AutogluonModels/ag-20230203_14
2604/models/LightGBM_BAG_L2/T1/',
  'LightGBM_BAG_L2/T2': '/root/Project 2 re-attempt/AutogluonModels/ag-20230203_14
2604/models/LightGBM_BAG_L2/T2/',
  'LightGBM_BAG_L2/T3': '/root/Project 2 re-attempt/AutogluonModels/ag-20230203_14
2604/models/LightGBM_BAG_L2/T3/',
  'WeightedEnsemble_L3': 'AutogluonModels/ag-20230203_142604/models/WeightedEnsemb
le_L3/'},
 'model_fit_times': {'LightGBM_BAG_L1/T1': 95.35126829147339,
  'LightGBM_BAG_L1/T2': 93.82092690467834,
  'LightGBM_BAG_L1/T3': 97.5632746219635,
  'WeightedEnsemble_L2': 0.23659825325012207,
  'LightGBM_BAG_L2/T1': 42.32853722572327,
  'LightGBM_BAG_L2/T2': 41.32470202445984,
  'LightGBM_BAG_L2/T3': 42.316625356674194,
  'WeightedEnsemble_L3': 0.23691916465759277},
 'model_pred_times': {'LightGBM_BAG_L1/T1': 0.6508274078369141,
  'LightGBM_BAG_L1/T2': 0.5864658355712891,
  'LightGBM_BAG_L1/T3': 0.7241449356079102,
  'WeightedEnsemble_L2': 0.0007760524749755859,
  'LightGBM_BAG_L2/T1': 0.15301990509033203,
  'LightGBM_BAG_L2/T2': 0.1574103832244873,
  'LightGBM_BAG_L2/T3': 0.15805721282958984,
  'WeightedEnsemble_L3': 0.0012454986572265625},
 'num_bag_folds': 8,
 'max_stack_level': 3,
 'model_hyperparams': {'LightGBM_BAG_L1/T1': {'use_orig_features': True,
   'max_base_models': 25,
   'max_base_models_per_type': 5,
   'save_bag_folds': True},
  'LightGBM_BAG_L1/T2': {'use_orig_features': True,
   'max_base_models': 25,
   'max_base_models_per_type': 5,
   'save_bag_folds': True},
  'LightGBM_BAG_L1/T3': {'use_orig_features': True,
   'max_base_models': 25,
   'max_base_models_per_type': 5,
   'save_bag_folds': True},
  'WeightedEnsemble_L2': {'use_orig_features': False,
```

```
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True},
 'LightGBM_BAG_L2/T1': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True},
 'LightGBM_BAG_L2/T2': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': True},
 'LightGBM_BAG_L2/T3': {'use_orig_features': True,
  'max_base_models': 25,
  'max_base_models_per_type': 5,
  'save_bag_folds': 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 -36.131978       2.278151  370.613716
1   LightGBM_BAG_L2/T2 -36.249492       2.118849  328.060172
2   LightGBM_BAG_L2/T3 -36.344547       2.119495  329.052095
3   LightGBM_BAG_L2/T1 -36.418229       2.114458  329.064007
4  WeightedEnsemble_L2 -37.422973       1.311387  191.620800
5   LightGBM_BAG_L1/T3 -37.709946       0.724145   97.563275
6   LightGBM_BAG_L1/T2 -38.079656       0.586466   93.820927
7   LightGBM_BAG_L1/T1 -39.523687       0.650827   95.351268

   pred_time_val_marginal  fit_time_marginal  stack_level  can_infer  \
0                0.001245           0.236919            3       True
1                0.157410          41.324702            2       True
2                0.158057          42.316625            2       True
3                0.153020          42.328537            2       True
4                0.000776           0.236598            2       True
5                0.724145          97.563275            1       True
6                0.586466          93.820927            1       True
7                0.650827          95.351268            1       True

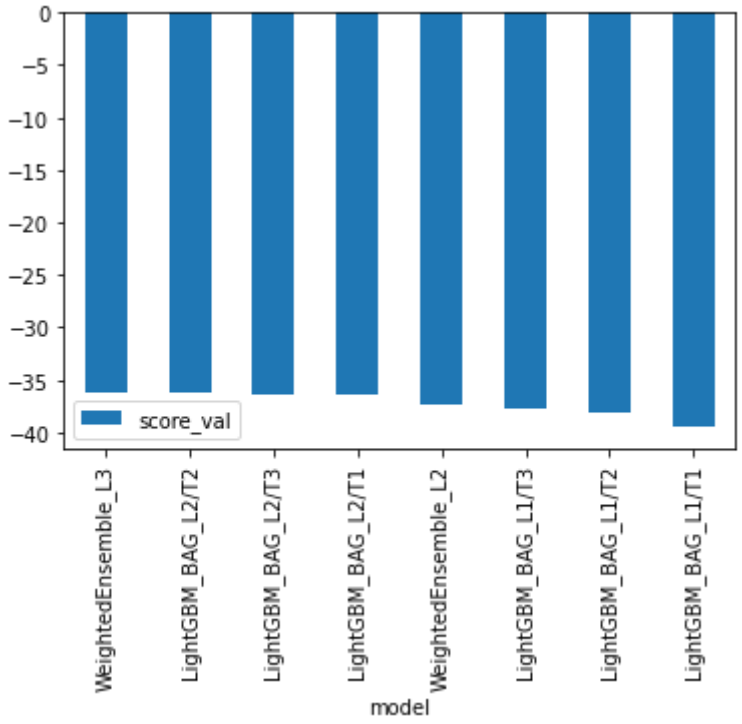
   fit_order
0          8
1          6
2          7
3          5
4          4
5          3
6          2
7          1  }
```

In [66]:
```
predictions_hpo = predictor_new_hpo.predict(df_test_2)
predictions_hpo.head()
```

Out[66]:
```
0    13.252473
1     6.492053
2     6.488379
3     6.439094
4     6.439094
Name: count, dtype: float32
```

In [67]:
```
predictor_new_hpo.leaderboard(silent = True).plot(kind = 'bar', x = 'model', y = '
```

Out[67]:
```
<AxesSubplot:xlabel='model'>
```



In [68]:
```
# Describe the `predictions` series to see if there are any negative values
predictions_hpo[predictions_hpo < 0].shape
```

Out[68]:
```
(0,)
```

In [69]:
```
submission_hyperparameter = pd.read_csv('sampleSubmission.csv')
submission_hyperparameter.nunique()
```

Out[69]:
```
datetime    6493
count          1
dtype: int64
```

In [70]:
```
# Same submitting predictions
submission_hyperparameter["count"] = predictions_hpo
submission_hyperparameter.to_csv("submission_hyperparameter.csv", index=False)
```

In [ ]:

In [ ]:

In [71]:
```
!kaggle competitions submit -c bike-sharing-demand -f submission_hyperparameter.csv
```

```
100%|████████████████████████████████████████| 188k/188k [00:00<00:00, 535kB/s]
Successfully submitted to Bike Sharing Demand
```

In [72]:
```
!kaggle competitions submissions -c bike-sharing-demand | tail -n +1 | head -n 6
```

```
fileName                          date                 description
status    publicScore  privateScore
--------------------------------  -------------------  ----------------------------
----------------------------------------  --------  -----------  ------------
submission_hyperparameter.csv     2023-02-03 14:35:04  new features with hyperparam
eters                                       complete  0.51280      0.51280
submission_new_features.csv       2023-02-03 13:56:48  new features
complete  1.34676      1.34676
submission.csv                    2023-02-03 13:38:01  first raw submission
complete  1.32787      1.32787
3 submission_hyperparameter.csv   2022-12-27 15:53:53  After hyper parameter tuning
complete  0.56110      0.56110
```

New Score of `0.51280`

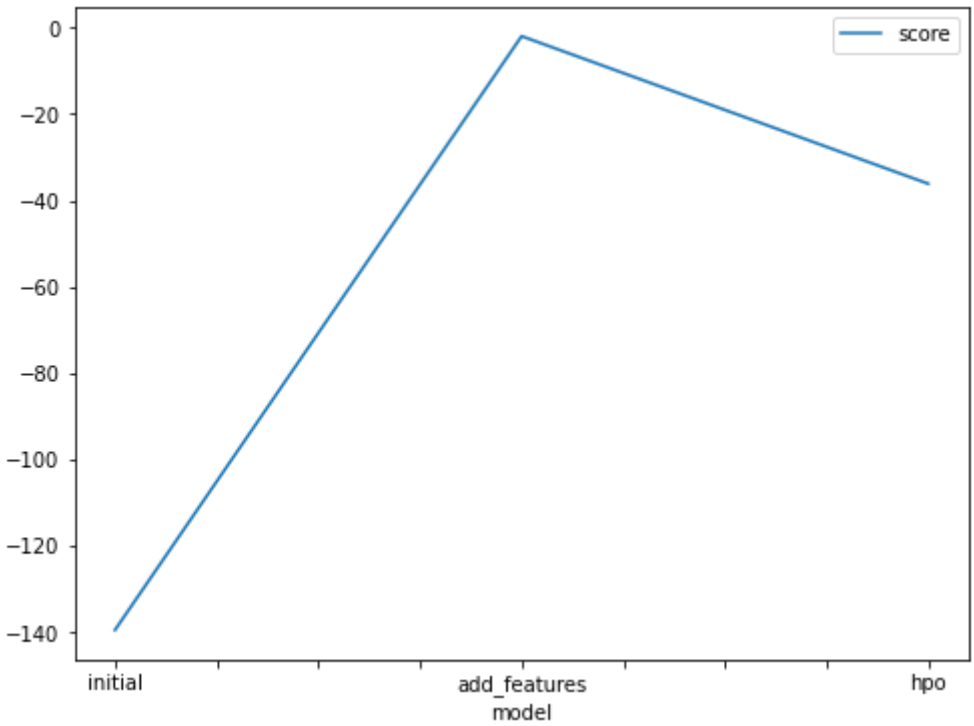
Step 7: Write a Report

Refer to the markdown file for the full report

Creating plots and table for report

In [ ]:
```
# 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", "hpo"],
        "score": [?, ?, ?]
    }
).plot(x="model", y="score", figsize=(8, 6)).get_figure()
fig.savefig('model_train_score.png')
```

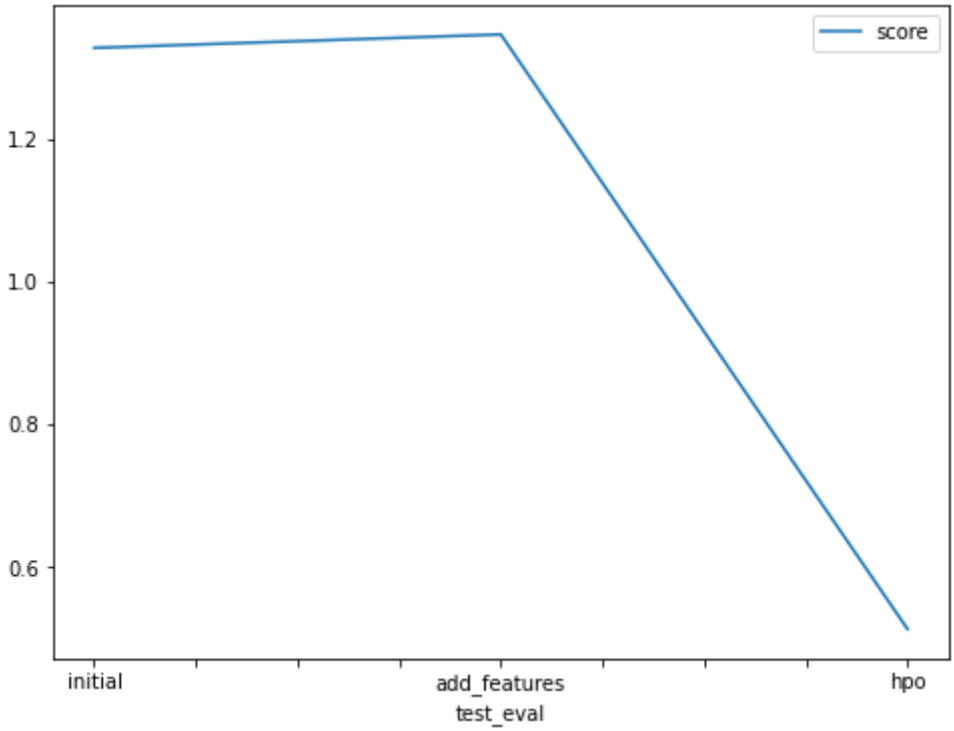
In [74]:
```
# Taking the top model score from each training run and creating a line plot to sho
# You can create these in the notebook and save them to PNG or use some other tool
fig = pd.DataFrame(
    {
        "model": ["initial", "add_features", "hpo"],
        "score": [-139.520120,   -1.953834, -36.131978 ]
    }
).plot(x="model", y="score", figsize=(8, 6)).get_figure()
fig.savefig('model_train_score.png')
```



Hyperparameter table

In [76]:
```
# Take the 3 kaggle scores and creating a line plot to show improvement
fig = pd.DataFrame(
    {
        "test_eval": ["initial", "add_features", "hpo"],
```

```
        "score": [1.32787, 1.34676, 0.51280]
    }
).plot(x="test_eval", y="score", figsize=(8, 6)).get_figure()
fig.savefig('model_test_score.png')
```



In [77]:
```
# The 3 hyperparameters we tuned with the kaggle score as the result
hyperparams_df = pd.DataFrame({
    "model": ["initial", "add_features", "hpo"],
    "hpo1": ['default_vals', 'default_vals', 'GBM: num_leaves: lower=26, upper=66'
    "hpo2": ['default_vals', 'default_vals', 'NN: dropout_prob: 0.0, 0.5'],
    "hpo3": ['default_vals', 'default_vals', 'GBM: num_boost_round: 100'],
    "score": [1.32787, 1.34676, 0.51280]
})
```

In [78]:
```
hyperparams_df
```

Out[78]:

	model	hpo1	hpo2	hpo3	score
0	initial	default_vals	default_vals	default_vals	1.32787
1	add_features	default_vals	default_vals	default_vals	1.34676
2	hpo	GBM: num_leaves: lower=26, upper=66	NN: dropout_prob: 0.0, 0.5	GBM: num_boost_round: 100	0.51280