Code for concrete Dataset

In [2]:
```
from ucimlrepo import fetch_ucirepo

# fetch dataset
concrete_compressive_strength = fetch_ucirepo(id=165)

# data (as pandas dataframes)
X = concrete_compressive_strength.data.features
y = concrete_compressive_strength.data.targets

# metadata
print(concrete_compressive_strength.metadata)

# variable information
print(concrete_compressive_strength.variables)
```

{'uci_id': 165, 'name': 'Concrete Compressive Strength', 'repository_url': 'http
s://archive.ics.uci.edu/dataset/165/concrete+compressive+strength', 'data_url':
'https://archive.ics.uci.edu/static/public/165/data.csv', 'abstract': 'Concrete i
s the most important material in civil engineering. The concrete compressive stre
ngth is a highly nonlinear function of age and ingredients. ', 'area': 'Physics a
nd Chemistry', 'tasks': ['Regression'], 'characteristics': ['Multivariate'], 'num
_instances': 1030, 'num_features': 8, 'feature_types': ['Real'], 'demographics':
[], 'target_col': ['Concrete compressive strength'], 'index_col': None, 'has_miss
ing_values': 'no', 'missing_values_symbol': None, 'year_of_dataset_creation': 199
8, 'last_updated': 'Sun Feb 11 2024', 'dataset_doi': '10.24432/C5PK67', 'creator
s': ['I-Cheng Yeh'], 'intro_paper': {'ID': 383, 'type': 'NATIVE', 'title': 'Model
ing of strength of high-performance concrete using artificial neural networks',
'authors': 'I. Yeh', 'venue': 'Cement and Concrete Research, Vol. 28, No. 12', 'y
ear': 1998, 'journal': None, 'DOI': '10.1016/S0008-8846(98)00165-3', 'URL': 'http
s://www.semanticscholar.org/paper/9310cae70452ea11465f338483e79cc36a68881c', 'sh
a': None, 'corpus': None, 'arxiv': None, 'mag': None, 'acl': None, 'pmid': None,
'pmcid': None}, 'additional_info': {'summary': 'Number of instances \t1030\r\nNum
ber of Attributes\t9\r\nAttribute breakdown\t8 quantitative input variables, and
1 quantitative output variable\r\nMissing Attribute Values\tNone \r\n', 'purpos
e': None, 'funded_by': None, 'instances_represent': None, 'recommended_data_split
s': None, 'sensitive_data': None, 'preprocessing_description': None, 'variable_in
fo': 'Given are the variable name, variable type, the measurement unit and a brie
f description. The concrete compressive strength is the regression problem. The o
rder of this listing corresponds to the order of numerals along the rows of the d
atabase. \r\n\r\nName -- Data Type -- Measurement -- Description\r\n\r\nCement (c
omponent 1) -- quantitative -- kg in a m3 mixture -- Input Variable\r\nBlast Furn
ace Slag (component 2) -- quantitative -- kg in a m3 mixture -- Input Variable\r
\nFly Ash (component 3) -- quantitative -- kg in a m3 mixture -- Input Variable
\r\nWater (component 4) -- quantitative -- kg in a m3 mixture -- Input Variable
\r\nSuperplasticizer (component 5) -- quantitative -- kg in a m3 mixture -- Input
Variable\r\nCoarse Aggregate (component 6) -- quantitative -- kg in a m3 mixture
-- Input Variable\r\nFine Aggregate (component 7)\t -- quantitative -- kg in a m
3 mixture -- Input Variable\r\nAge -- quantitative -- Day (1~365) -- Input Varia
ble\r\nConcrete compressive strength -- quantitative -- MPa -- Output Variable\r
\n\r\n', 'citation': None}}

```
                            name     role        type demographic description  \
0                         Cement  Feature  Continuous        None        None   
1             Blast Furnace Slag  Feature     Integer        None        None   
2                        Fly Ash  Feature  Continuous        None        None   
3                          Water  Feature  Continuous        None        None   
4               Superplasticizer  Feature  Continuous        None        None   
5               Coarse Aggregate  Feature  Continuous        None        None   
6                 Fine Aggregate  Feature  Continuous        None        None   
7                            Age  Feature     Integer        None        None   
8  Concrete compressive strength   Target  Continuous        None        None   

   units missing_values  
0  kg/m^3             no  
1  kg/m^3             no  
2  kg/m^3             no  
3  kg/m^3             no  
4  kg/m^3             no  
5  kg/m^3             no  
6  kg/m^3             no  
7     day             no  
8     MPa             no  
```

In [3]:

```
X
```

Out[3]:

	Cement	Blast Furnace Slag	Fly Ash	Water	Superplasticizer	Coarse Aggregate	Fine Aggregate	Age
0	540.0	0.0	0.0	162.0	2.5	1040.0	676.0	28
1	540.0	0.0	0.0	162.0	2.5	1055.0	676.0	28
2	332.5	142.5	0.0	228.0	0.0	932.0	594.0	270
3	332.5	142.5	0.0	228.0	0.0	932.0	594.0	365
4	198.6	132.4	0.0	192.0	0.0	978.4	825.5	360
...	...	...	...	...	...	...	...	...
1025	276.4	116.0	90.3	179.6	8.9	870.1	768.3	28
1026	322.2	0.0	115.6	196.0	10.4	817.9	813.4	28
1027	148.5	139.4	108.6	192.7	6.1	892.4	780.0	28
1028	159.1	186.7	0.0	175.6	11.3	989.6	788.9	28
1029	260.9	100.5	78.3	200.6	8.6	864.5	761.5	28

1030 rows × 8 columns

In [4]:

```
y
```

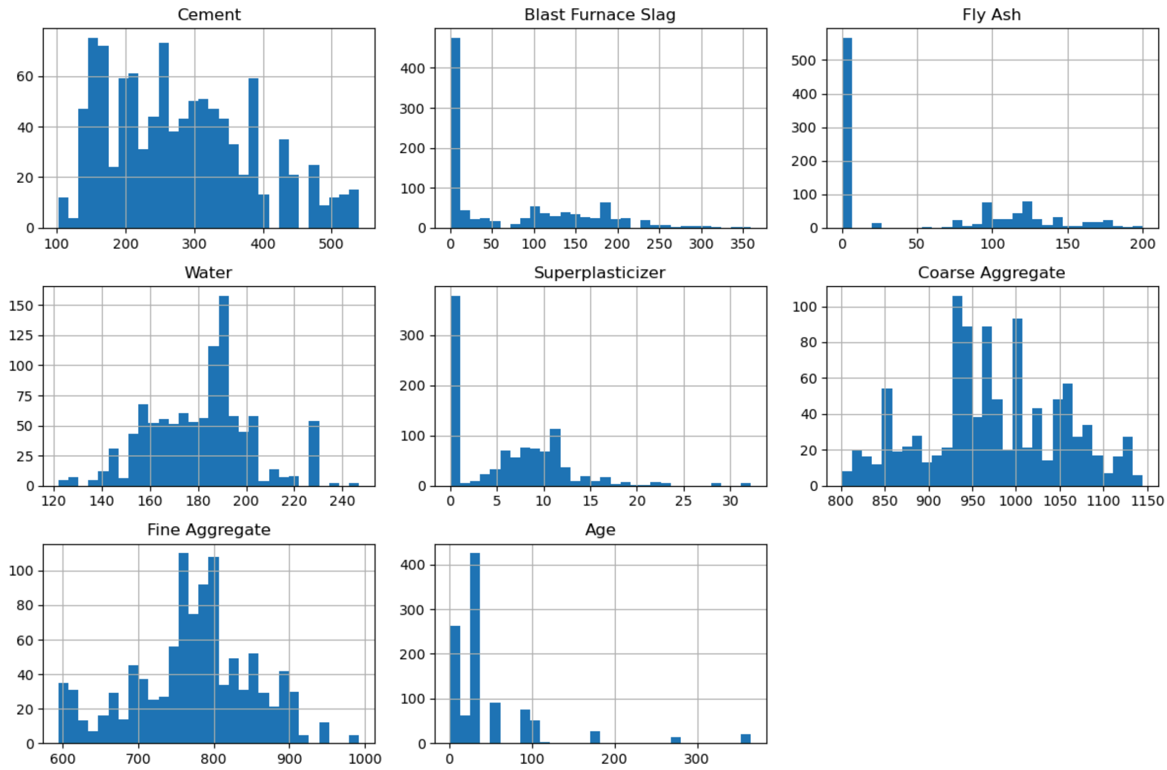
Out[4]:

	Concrete compressive strength
0	79.99
1	61.89
2	40.27
3	41.05
4	44.30
...	...
1025	44.28
1026	31.18
1027	23.70
1028	32.77
1029	32.40

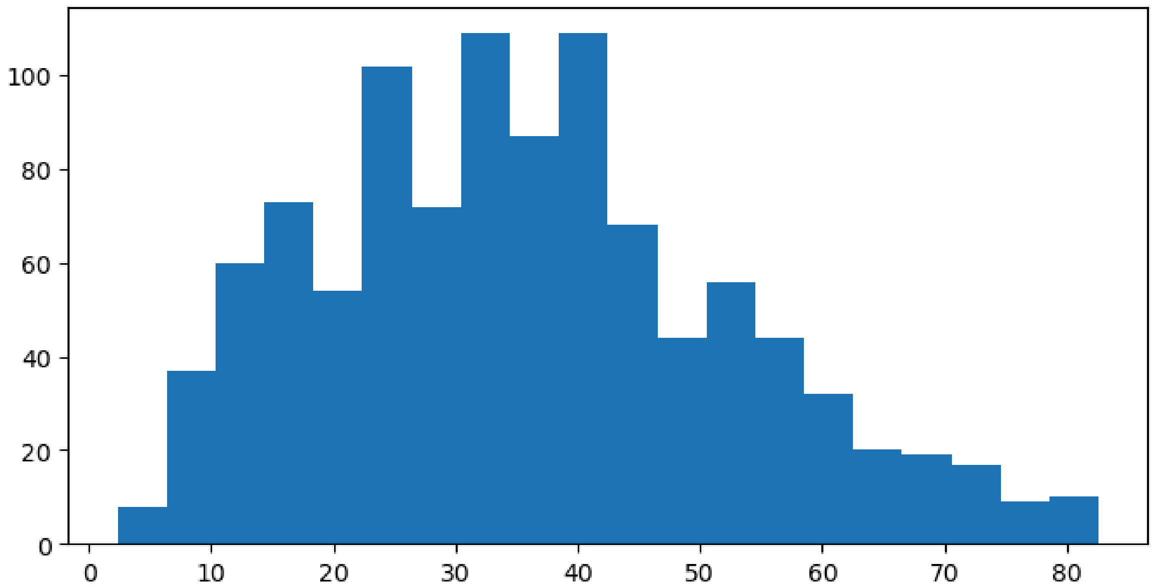
1030 rows × 1 columns

In [4]:

```
import matplotlib.pyplot as plt

X.hist(figsize=(12, 8), bins=30)
plt.tight_layout()
plt.show()
```



In [5]:
```python
import matplotlib.pyplot as plt
import seaborn as sns

plt.figure(figsize=(8, 4))
plt.hist(y, bins=20)
plt.show()

print(y.describe())
```



```
       Concrete compressive strength
count                    1030.000000
mean                       35.817961
std                        16.705742
min                         2.330000
25%                        23.710000
50%                        34.445000
75%                        46.135000
max                        82.600000
```

In [6]:
```
from autogluon.tabular import TabularPredictor
from sklearn.model_selection import train_test_split
from sklearn.metrics import r2_score

X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=42)

# AutoGluon용 데이터 준비
train_data = X_train.copy()
train_data['target'] = y_train

test_data = X_test.copy()
test_data['target'] = y_test
# AutoML 모델 학습
predictor = TabularPredictor(label='target').fit(train_data)

predictions = predictor.predict(test_data.drop(columns=['target']))
print(predictor.evaluate(test_data))
```

```
No path specified. Models will be saved in: "AutogluonModels\ag-20250609_165434"
Verbosity: 2 (Standard Logging)
=================== System Info ===================
AutoGluon Version:  1.3.1
Python Version:     3.11.7
Operating System:   Windows
Platform Machine:   AMD64
Platform Version:   10.0.26100
CPU Count:          12
Memory Avail:       6.43 GB / 15.69 GB (41.0%)
Disk Space Avail:   320.72 GB / 476.05 GB (67.4%)
===================================================
No presets specified! To achieve strong results with AutoGluon, it is recommended
to use the available presets. Defaulting to `'medium'`...
        Recommended Presets (For more details refer to https://auto.gluon.ai/stab
le/tutorials/tabular/tabular-essentials.html#presets):
        presets='experimental' : New in v1.2: Pre-trained foundation model + para
llel fits. The absolute best accuracy without consideration for inference speed.
Does not support GPU.
        presets='best'         : Maximize accuracy. Recommended for most users. U
se in competitions and benchmarks.
        presets='high'         : Strong accuracy with fast inference speed.
        presets='good'         : Good accuracy with very fast inference speed.
        presets='medium'       : Fast training time, ideal for initial prototypin
g.
Beginning AutoGluon training ...
AutoGluon will save models to "C:\Users\준서\Desktop\Jun\3-2\데과프\A5\AutogluonM
odels\ag-20250609_165434"
Train Data Rows:    772
Train Data Columns: 8
Label Column:       target
AutoGluon infers your prediction problem is: 'regression' (because dtype of label
-column == float and many unique label-values observed).
        Label info (max, min, mean, stddev): (82.6, 2.33, 35.89588, 16.78705)
        If 'regression' is not the correct problem_type, please manually specify
the problem_type parameter during Predictor init (You may specify problem_type as
one of: ['binary', 'multiclass', 'regression', 'quantile'])
Problem Type:       regression
Preprocessing data ...
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
        Available Memory:                    6574.89 MB
        Train Data (Original)  Memory Usage: 0.05 MB (0.0% of available memory)
        Inferring data type of each feature based on column values. Set feature_m
etadata_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator...
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator...
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator...
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator...
        Stage 5 Generators:
                Fitting DropDuplicatesFeatureGenerator...
        Types of features in original data (raw dtype, special dtypes):
                ('float', []) : 7 | ['Cement', 'Blast Furnace Slag', 'Fly Ash',
'Water', 'Superplasticizer', ...]
                ('int', [])   : 1 | ['Age']
        Types of features in processed data (raw dtype, special dtypes):
```

```
                ('float', []) : 7 | ['Cement', 'Blast Furnace Slag', 'Fly Ash',
'Water', 'Superplasticizer', ...]
                ('int', [])   : 1 | ['Age']
        0.2s = Fit runtime
        8 features in original data used to generate 8 features in processed dat
a.
        Train Data (Processed) Memory Usage: 0.05 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 0.21s ...
AutoGluon will gauge predictive performance using evaluation metric: 'root_mean_s
quared_error'
        This metric's sign has been flipped to adhere to being higher_is_better.
The metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
Automatically generating train/validation split with holdout_frac=0.2, Train Row
s: 617, Val Rows: 155
User-specified model hyperparameters to be fit:
{
        'NN_TORCH': [{}],
        'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {}, {'le
arning_rate': 0.03, 'num_leaves': 128, 'feature_fraction': 0.9, 'min_data_in_lea
f': 3, 'ag_args': {'name_suffix': 'Large', 'priority': 0, 'hyperparameter_tune_kw
args': None}}],
        'CAT': [{}],
        'XGB': [{}],
        'FASTAI': [{}],
        'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_
types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_su
ffix': 'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'square
d_error', 'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quan
tile']}}],
        'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_
types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_su
ffix': 'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'square
d_error', 'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quan
tile']}}],
        'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}}, {'wei
ghts': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
Fitting 11 L1 models, fit_strategy="sequential" ...
Fitting model: KNeighborsUnif ...
        -10.069  = Validation score   (-root_mean_squared_error)
        8.39s    = Training   runtime
        0.03s    = Validation runtime
Fitting model: KNeighborsDist ...
        -8.794   = Validation score   (-root_mean_squared_error)
        0.01s    = Training   runtime
        0.3s     = Validation runtime
Fitting model: LightGBMXT ...
[1000]  valid_set's rmse: 4.16861
[2000]  valid_set's rmse: 3.98106
[3000]  valid_set's rmse: 3.92662
        -3.9204  = Validation score   (-root_mean_squared_error)
        11.92s   = Training   runtime
        0.02s    = Validation runtime
Fitting model: LightGBM ...
[1000]  valid_set's rmse: 4.12691
```

```
        -4.1231  = Validation score   (-root_mean_squared_error)
        5.07s    = Training   runtime
        0.03s    = Validation runtime
Fitting model: RandomForestMSE ...
        -5.356   = Validation score   (-root_mean_squared_error)
        3.02s    = Training   runtime
        0.15s    = Validation runtime
Fitting model: CatBoost ...
        -4.002   = Validation score   (-root_mean_squared_error)
        62.65s   = Training   runtime
        0.0s     = Validation runtime
Fitting model: ExtraTreesMSE ...
        -5.0024  = Validation score   (-root_mean_squared_error)
        2.06s    = Training   runtime
        0.16s    = Validation runtime
Fitting model: NeuralNetFastAI ...
        -5.9813  = Validation score   (-root_mean_squared_error)
        9.51s    = Training   runtime
        0.02s    = Validation runtime
Fitting model: XGBoost ...
        -4.4457  = Validation score   (-root_mean_squared_error)
        2.74s    = Training   runtime
        0.02s    = Validation runtime
Fitting model: NeuralNetTorch ...
        -4.284   = Validation score   (-root_mean_squared_error)
        61.93s   = Training   runtime
        0.01s    = Validation runtime
Fitting model: LightGBMLarge ...
        -4.7878  = Validation score   (-root_mean_squared_error)
        18.45s   = Training   runtime
        0.05s    = Validation runtime
Fitting model: WeightedEnsemble_L2 ...
        Ensemble Weights: {'LightGBMXT': 0.435, 'NeuralNetTorch': 0.304, 'XGBoos
t': 0.217, 'CatBoost': 0.043}
        -3.6593  = Validation score   (-root_mean_squared_error)
        0.03s    = Training   runtime
        0.0s     = Validation runtime
AutoGluon training complete, total runtime = 189.04s ... Best model: WeightedEnse
mble_L2 | Estimated inference throughput: 3475.6 rows/s (155 batch size)
TabularPredictor saved. To load, use: predictor = TabularPredictor.load("C:\Users
\준서\Desktop\Jun\3-2\데과프\A5\AutogluonModels\ag-20250609_165434")
{'root_mean_squared_error': -4.164963114225586, 'mean_squared_error': -17.3469177
4285969, 'mean_absolute_error': -2.7846780884173485, 'r2': 0.9359588423483627, 'p
earsonr': 0.9684877125538931, 'median_absolute_error': -1.716783065795898}
```

In [7]:
```
predictor.leaderboard(test_data, silent=True)
```

Out[7]:

	model	score_test	score_val	eval_metric	pred_time_tes
0	LightGBMXT	-3.993391	-3.920355	root_mean_squared_error	0.23489
1	CatBoost	-4.135409	-4.002017	root_mean_squared_error	0.03118
2	WeightedEnsemble_L2	-4.164963	-3.659283	root_mean_squared_error	0.34990
3	LightGBM	-4.531157	-4.123069	root_mean_squared_error	0.15948
4	NeuralNetTorch	-5.019738	-4.284047	root_mean_squared_error	0.03388
5	LightGBMLarge	-5.332880	-4.787760	root_mean_squared_error	0.24262
6	XGBoost	-5.355934	-4.445678	root_mean_squared_error	0.04385
7	ExtraTreesMSE	-5.391887	-5.002444	root_mean_squared_error	0.19540
8	RandomForestMSE	-5.836087	-5.355998	root_mean_squared_error	0.31811
9	NeuralNetFastAI	-6.255705	-5.981301	root_mean_squared_error	0.09511
10	KNeighborsDist	-8.499859	-8.793971	root_mean_squared_error	0.03790
11	KNeighborsUnif	-9.653188	-10.068959	root_mean_squared_error	0.05496

In [3]:

```
from autogluon.tabular import TabularPredictor
from sklearn.model_selection import train_test_split
from sklearn.metrics import r2_score

X_train, X_test, y_train, y_test = train_test_split(X, y, random_state=42)

# AutoGluon용 데이터 준비
train_data = X_train.copy()
train_data['target'] = y_train

test_data = X_test.copy()
test_data['target'] = y_test
# AutoML 모델 학습
predictor = TabularPredictor(label='target', eval_metric='mae').fit(train_data)

predictions = predictor.predict(test_data.drop(columns=['target']))
print(predictor.evaluate(test_data))
```

```
No path specified. Models will be saved in: "AutogluonModels\ag-20250613_075441"
Verbosity: 2 (Standard Logging)
=================== System Info ===================
AutoGluon Version:  1.3.1
Python Version:     3.11.7
Operating System:   Windows
Platform Machine:   AMD64
Platform Version:   10.0.26100
CPU Count:          12
Memory Avail:       6.94 GB / 15.69 GB (44.2%)
Disk Space Avail:   317.33 GB / 476.05 GB (66.7%)
===================================================
No presets specified! To achieve strong results with AutoGluon, it is recommended
to use the available presets. Defaulting to `'medium'`...
        Recommended Presets (For more details refer to https://auto.gluon.ai/stab
le/tutorials/tabular/tabular-essentials.html#presets):
        presets='experimental' : New in v1.2: Pre-trained foundation model + para
llel fits. The absolute best accuracy without consideration for inference speed.
Does not support GPU.
        presets='best'         : Maximize accuracy. Recommended for most users. U
se in competitions and benchmarks.
        presets='high'         : Strong accuracy with fast inference speed.
        presets='good'         : Good accuracy with very fast inference speed.
        presets='medium'       : Fast training time, ideal for initial prototypin
g.
Beginning AutoGluon training ...
AutoGluon will save models to "C:\Users\준서\Desktop\Jun\3-2\데과프\A5\AutogluonM
odels\ag-20250613_075441"
Train Data Rows:    772
Train Data Columns: 8
Label Column:       target
AutoGluon infers your prediction problem is: 'regression' (because dtype of label
-column == float and many unique label-values observed).
        Label info (max, min, mean, stddev): (82.6, 2.33, 35.89588, 16.78705)
        If 'regression' is not the correct problem_type, please manually specify
the problem_type parameter during Predictor init (You may specify problem_type as
one of: ['binary', 'multiclass', 'regression', 'quantile'])
Problem Type:       regression
Preprocessing data ...
Using Feature Generators to preprocess the data ...
Fitting AutoMLPipelineFeatureGenerator...
        Available Memory:                    7108.71 MB
        Train Data (Original)  Memory Usage: 0.05 MB (0.0% of available memory)
        Inferring data type of each feature based on column values. Set feature_m
etadata_in to manually specify special dtypes of the features.
        Stage 1 Generators:
                Fitting AsTypeFeatureGenerator...
        Stage 2 Generators:
                Fitting FillNaFeatureGenerator...
        Stage 3 Generators:
                Fitting IdentityFeatureGenerator...
        Stage 4 Generators:
                Fitting DropUniqueFeatureGenerator...
        Stage 5 Generators:
                Fitting DropDuplicatesFeatureGenerator...
        Types of features in original data (raw dtype, special dtypes):
                ('float', []) : 7 | ['Cement', 'Blast Furnace Slag', 'Fly Ash',
'Water', 'Superplasticizer', ...]
                ('int', [])   : 1 | ['Age']
        Types of features in processed data (raw dtype, special dtypes):
```

```
                ('float', []) : 7 | ['Cement', 'Blast Furnace Slag', 'Fly Ash',
'Water', 'Superplasticizer', ...]
                ('int', [])   : 1 | ['Age']
        0.1s = Fit runtime
        8 features in original data used to generate 8 features in processed dat
a.
        Train Data (Processed) Memory Usage: 0.05 MB (0.0% of available memory)
Data preprocessing and feature engineering runtime = 0.14s ...
AutoGluon will gauge predictive performance using evaluation metric: 'mean_absolu
te_error'
        This metric's sign has been flipped to adhere to being higher_is_better.
The metric score can be multiplied by -1 to get the metric value.
        To change this, specify the eval_metric parameter of Predictor()
Automatically generating train/validation split with holdout_frac=0.2, Train Row
s: 617, Val Rows: 155
User-specified model hyperparameters to be fit:
{
        'NN_TORCH': [{}],
        'GBM': [{'extra_trees': True, 'ag_args': {'name_suffix': 'XT'}}, {}, {'le
arning_rate': 0.03, 'num_leaves': 128, 'feature_fraction': 0.9, 'min_data_in_lea
f': 3, 'ag_args': {'name_suffix': 'Large', 'priority': 0, 'hyperparameter_tune_kw
args': None}}],
        'CAT': [{}],
        'XGB': [{}],
        'FASTAI': [{}],
        'RF': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_
types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_su
ffix': 'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'square
d_error', 'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quan
tile']}}],
        'XT': [{'criterion': 'gini', 'ag_args': {'name_suffix': 'Gini', 'problem_
types': ['binary', 'multiclass']}}, {'criterion': 'entropy', 'ag_args': {'name_su
ffix': 'Entr', 'problem_types': ['binary', 'multiclass']}}, {'criterion': 'square
d_error', 'ag_args': {'name_suffix': 'MSE', 'problem_types': ['regression', 'quan
tile']}}],
        'KNN': [{'weights': 'uniform', 'ag_args': {'name_suffix': 'Unif'}}, {'wei
ghts': 'distance', 'ag_args': {'name_suffix': 'Dist'}}],
}
Fitting 11 L1 models, fit_strategy="sequential" ...
Fitting model: KNeighborsUnif ...
        -7.5461  = Validation score   (-mean_absolute_error)
        9.04s    = Training   runtime
        0.03s    = Validation runtime
Fitting model: KNeighborsDist ...
        -6.2843  = Validation score   (-mean_absolute_error)
        0.01s    = Training   runtime
        0.03s    = Validation runtime
Fitting model: LightGBMXT ...
[1000]  valid_set's l1: 2.77311
[2000]  valid_set's l1: 2.57863
[3000]  valid_set's l1: 2.50672
[4000]  valid_set's l1: 2.50416
[5000]  valid_set's l1: 2.50931
        -2.4943  = Validation score   (-mean_absolute_error)
        26.03s   = Training   runtime
        0.04s    = Validation runtime
Fitting model: LightGBM ...
[1000]  valid_set's l1: 2.87384
```

```
	-2.8708	 = Validation score   (-mean_absolute_error)
	6.53s	 = Training   runtime
	0.01s	 = Validation runtime
Fitting model: RandomForestMSE ...
	-3.7755	 = Validation score   (-mean_absolute_error)
	2.45s	 = Training   runtime
	0.14s	 = Validation runtime
Fitting model: CatBoost ...
	-2.5019	 = Validation score   (-mean_absolute_error)
	342.99s	 = Training   runtime
	0.03s	 = Validation runtime
Fitting model: ExtraTreesMSE ...
	-3.4915	 = Validation score   (-mean_absolute_error)
	1.48s	 = Training   runtime
	0.14s	 = Validation runtime
Fitting model: NeuralNetFastAI ...
	-4.6301	 = Validation score   (-mean_absolute_error)
	11.2s	 = Training   runtime
	0.03s	 = Validation runtime
Fitting model: XGBoost ...
	-3.1046	 = Validation score   (-mean_absolute_error)
	4.19s	 = Training   runtime
	0.02s	 = Validation runtime
Fitting model: NeuralNetTorch ...
	-2.7153	 = Validation score   (-mean_absolute_error)
	215.1s	 = Training   runtime
	0.02s	 = Validation runtime
Fitting model: LightGBMLarge ...
	-3.3194	 = Validation score   (-mean_absolute_error)
	26.65s	 = Training   runtime
	0.02s	 = Validation runtime
Fitting model: WeightedEnsemble_L2 ...
	Ensemble Weights: {'LightGBMXT': 0.4, 'CatBoost': 0.32, 'NeuralNetTorch': 
0.24, 'XGBoost': 0.04}
	-2.3455	 = Validation score   (-mean_absolute_error)
	0.24s	 = Training   runtime
	0.0s	 = Validation runtime
AutoGluon training complete, total runtime = 648.78s ... Best model: WeightedEnse
mble_L2 | Estimated inference throughput: 1397.5 rows/s (155 batch size)
TabularPredictor saved. To load, use: predictor = TabularPredictor.load("C:\Users
\준서\Desktop\Jun\3-2\데과프\A5\AutogluonModels\ag-20250613_075441")
{'mean_absolute_error': -2.517198400460472, 'root_mean_squared_error': -3.8898804
37086661, 'mean_squared_error': -15.13116981482951, 'r2': 0.9441389158622109, 'pe
arsonr': 0.9722883572733648, 'median_absolute_error': -1.5021331787109382}
```

In [4]:

```python
predictor.leaderboard(test_data, silent=True)
```

Out[4]:

	model	score_test	score_val	eval_metric	pred_time_test	pr
0	WeightedEnsemble_L2	-2.517198	-2.345524	mean_absolute_error	0.454177	
1	CatBoost	-2.631002	-2.501859	mean_absolute_error	0.151816	
2	LightGBMXT	-2.708797	-2.494265	mean_absolute_error	0.161564	
3	NeuralNetTorch	-2.922192	-2.715312	mean_absolute_error	0.033558	
4	LightGBM	-3.084810	-2.870789	mean_absolute_error	0.080194	
5	XGBoost	-3.484737	-3.104606	mean_absolute_error	0.089372	
6	LightGBMLarge	-3.589924	-3.319447	mean_absolute_error	0.114019	
7	ExtraTreesMSE	-3.877987	-3.491451	mean_absolute_error	0.416577	
8	RandomForestMSE	-4.165310	-3.775506	mean_absolute_error	0.315052	
9	NeuralNetFastAI	-4.947387	-4.630078	mean_absolute_error	0.144754	
10	KNeighborsDist	-6.281319	-6.284257	mean_absolute_error	0.048090	
11	KNeighborsUnif	-7.542481	-7.546142	mean_absolute_error	0.057068	

In [11]:

```
from sklearn.model_selection import train_test_split
from sklearn.metrics import r2_score

X_train_val, X_test, y_train_val, y_test = train_test_split(X, y, random_state=4
```

In [13]:

```
from sklearn.preprocessing import StandardScaler, MinMaxScaler
from sklearn.pipeline import Pipeline
from sklearn.model_selection import KFold, GridSearchCV
from sklearn.metrics import mean_absolute_error, make_scorer
from sklearn.neural_network import MLPRegressor
from sklearn.ensemble import RandomForestRegressor
from sklearn.neighbors import KNeighborsRegressor

pipe = Pipeline([('preprocessing', None),('regressor',RandomForestRegressor())])


# 하이퍼파라미터 그리드 정의
hyperparam_grid = [
    # MLPRegressor
    {
        'regressor': [MLPRegressor()],
        'preprocessing': [StandardScaler(), MinMaxScaler()],
        'regressor__hidden_layer_sizes': [(50,), (100,), (100, 50)],
        'regressor__learning_rate_init': [0.001, 0.01, 0.1]
    },

    # RandomForestRegressor
    {
        'regressor': [RandomForestRegressor()],
        'preprocessing': [None],  # 트리 기반이므로 스케일링 불필요
        'regressor__n_estimators': [100, 300,500],
        'regressor__max_depth': [None, 10, 30]
    },
```

```
    # KNeighborsRegressor
    {
        'regressor': [KNeighborsRegressor()],
        'preprocessing': [StandardScaler(),MinMaxScaler()],
        'regressor__n_neighbors': [3, 5, 7],
        'regressor__metric': ['minkowski'],
        'regressor__p': [1, 2],
    },
]
```

In [14]:

```
#Grid Search
kfold = KFold(n_splits=5, shuffle = True, random_state=42)
grid = GridSearchCV(pipe, hyperparam_grid, scoring = 'neg_mean_absolute_error',

grid.fit(X_train_val,y_train_val)
best_model = grid.best_estimator_
best_params = grid.best_params_

#최적 모델 정보 출력
print("Best Model:", grid.best_estimator_)
print("Best param:", grid.best_params_)
print("Best performance:", grid.best_score_)

#테스트셋 예측 및 MAE 계산
y_test_pred = grid.predict(X_test)
test_mae = mean_absolute_error(y_test, y_test_pred)

print(f"\n Test Set MAE: {test_mae:.4f}")
```

```
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Best Model: Pipeline(steps=[('preprocessing', None),
                ('regressor', RandomForestRegressor(n_estimators=300))])
Best param: {'preprocessing': None, 'regressor': RandomForestRegressor(), 'regres
sor__max_depth': None, 'regressor__n_estimators': 300}
Best performance: -3.703217729728056

 Test Set MAE: 3.7151
```

In [ ]: