MinMaxScaler

class **sklearn.preprocessing.MinMaxScaler**(*feature_range=(0, 1)*, ***, *copy=True*, *clip=False*) [source]

Transform features by scaling each feature to a given range.

This estimator scales and translates each feature individually such that it is in the given range on the training set, e.g. between zero and one.

The transformation is given by:

```
X_std = (X - X.min(axis=0)) / (X.max(axis=0) - X.min(axis=0))
X_scaled = X_std * (max - min) + min
```

where min, max = feature_range.

This transformation is often used as an alternative to zero mean, unit variance scaling.

`MinMaxScaler` doesn't reduce the effect of outliers, but it linearly scales them down into a fixed range, where the largest occurring data point corresponds to the maximum value and the smallest one corresponds to the minimum value. For an example visualization, refer to Compare MinMaxScaler with other scalers.

Read more in the User Guide.

Parameters:

feature_range : ***tuple (min, max), default=(0, 1)***

Desired range of transformed data.

copy : ***bool, default=True***

Set to False to perform inplace row normalization and avoid a copy (if the input is already a numpy array).

clip : ***bool, default=False***

Set to True to clip transformed values of held-out data to provided `feature range`.

Added in version 0.24.

Attributes:

min_ : ***ndarray of shape (n_features,)***

Per feature adjustment for minimum. Equivalent to `min - X.min(axis=0) * self.scale_`

scale_ : ***ndarray of shape (n_features,)***

Per feature relative scaling of the data. Equivalent to `(max - min) / (X.max(axis=0) - X.min(axis=0))`

> *Added in version 0.17:* *scale_* attribute.

data_min_ : ***ndarray of shape (n_features,)***

Per feature minimum seen in the data

> *Added in version 0.17:* *data_min_*

data_max_ : ***ndarray of shape (n_features,)***

Per feature maximum seen in the data

> *Added in version 0.17:* *data_max_*

data_range_ : ***ndarray of shape (n_features,)***

Per feature range `(data_max_ - data_min_)` seen in the data

> *Added in version 0.17:* *data_range_*

n_features_in_ : ***int***

Number of features seen during fit.

> *Added in version 0.24.*

n_samples_seen_ : ***int***

The number of samples processed by the estimator. It will be reset on new calls to fit, but increments across `partial_fit` calls.

feature_names_in_ : ***ndarray of shape (`n_features_in_`,)***

Names of features seen during fit. Defined only when `X` has feature names that are all strings.

> *Added in version 1.0.*

See also

`minmax_scale`
: Equivalent function without the estimator API.

Notes

NaNs are treated as missing values: disregarded in fit, and maintained in transform.

Examples

```
>>> from sklearn.preprocessing import MinMaxScaler
>>> data = [[-1, 2], [-0.5, 6], [0, 10], [1, 18]]
>>> scaler = MinMaxScaler()
>>> print(scaler.fit(data))
MinMaxScaler()
>>> print(scaler.data_max_)
[ 1. 18.]
>>> print(scaler.transform(data))
[[0.   0.  ]
 [0.25 0.25]
 [0.5  0.5 ]
 [1.   1.  ]]
>>> print(scaler.transform([[2, 2]]))
[[1.5 0. ]]
```

`fit(X, y=None)` [source]

Compute the minimum and maximum to be used for later scaling.

Parameters:

X : *array-like of shape (n_samples, n_features)*

The data used to compute the per-feature minimum and maximum used for later scaling along the features axis.

y : *None*

Ignored.

Returns:

self : *object*

Fitted scaler.

fit_transform(*X*, *y=None*, ***fit_params*) [source]

Fit to data, then transform it.

Fits transformer to `X` and `y` with optional parameters `fit_params` and returns a transformed version of `X`.

Parameters:

X : ***array-like of shape (n_samples, n_features)***

Input samples.

y : ***array-like of shape (n_samples,) or (n_samples, n_outputs), default=None***

Target values (None for unsupervised transformations).

****fit_params** : ***dict***

Additional fit parameters.

Returns:

X_new : ***ndarray array of shape (n_samples, n_features_new)***

Transformed array.

get_feature_names_out(*input_features=None*) [source]

Get output feature names for transformation.

Parameters:

input_features : ***array-like of str or None, default=None***

Input features.

- If `input_features` is `None`, then `feature_names_in_` is used as feature names in. If `feature_names_in_` is not defined, then the following input feature names are generated: `["x0", "x1", ..., "x(n_features_in_ - 1)"]`.
- If `input_features` is an array-like, then `input_features` must match `feature_names_in_` if `feature_names_in_` is defined.

Returns:

feature_names_out : ***ndarray of str objects***

Same as input features.

get_metadata_routing() [source]

Get metadata routing of this object.

Please check User Guide on how the routing mechanism works.

Returns:

routing : *MetadataRequest*

A `MetadataRequest` encapsulating routing information.

get_params(*deep=True*) [source]

Get parameters for this estimator.

Parameters:

deep : *bool, default=True*

If True, will return the parameters for this estimator and contained subobjects that are estimators.

Returns:

params : *dict*

Parameter names mapped to their values.

inverse_transform(*X*) [source]

Undo the scaling of X according to feature_range.

Parameters:

X : *array-like of shape (n_samples, n_features)*

Input data that will be transformed. It cannot be sparse.

Returns:

Xt : *ndarray of shape (n_samples, n_features)*

Transformed data.

partial_fit(*X*, *y=None*) [source]

Online computation of min and max on X for later scaling.

All of X is processed as a single batch. This is intended for cases when `fit` is not feasible due to very large number of `n_samples` or because X is read from a continuous stream.

Parameters:

X : ***array-like of shape (n_samples, n_features)***

The data used to compute the mean and standard deviation used for later scaling along the features axis.

y : ***None***

Ignored.

Returns:

self : ***object***

Fitted scaler.

`set_output(*, transform=None)` [source]

Set output container.

See Introducing the set_output API for an example on how to use the API.

Parameters:

transform : ***{"default", "pandas", "polars"}, default=None***

Configure output of `transform` and `fit_transform`.

- `"default"`: Default output format of a transformer
- `"pandas"`: DataFrame output
- `"polars"`: Polars output
- `None`: Transform configuration is unchanged

Added in version 1.4: `"polars"` option was added.

Returns:

self : ***estimator instance***

Estimator instance.

`set_params(**params)` [source]

Set the parameters of this estimator.

The method works on simple estimators as well as on nested objects (such as `Pipeline`). The latter have parameters of the form `<component>__<parameter>` so that it's possible to update each component of a nested object.

Parameters:

****params** : *dict*

Estimator parameters.

Returns:

self : ***estimator instance***

Estimator instance.

`transform(X)` [source]

Scale features of X according to feature_range.

Parameters:

X : ***array-like of shape (n_samples, n_features)***

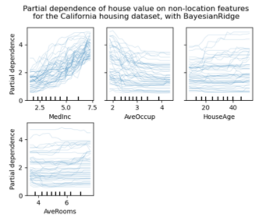
Input data that will be transformed.

Returns:

Xt : ***ndarray of shape (n_samples, n_features)***

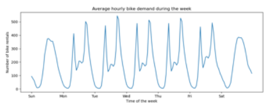
Transformed data.

Gallery examples

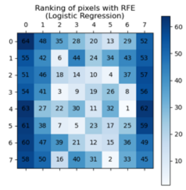


Release Highlights for scikit-learn 0.24

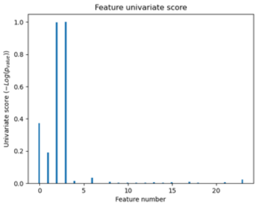
Image denoising using kernel PCA



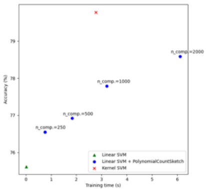
Time-related feature engineering



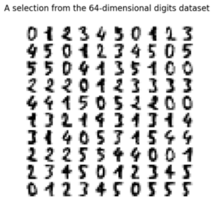
Recursive feature elimination



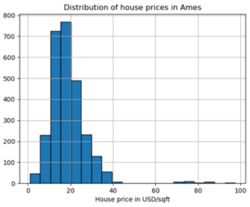
Univariate Feature Selection



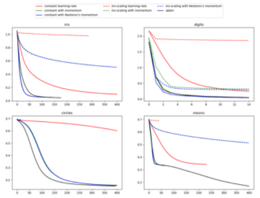
Scalable learning with polynomial kernel approximation



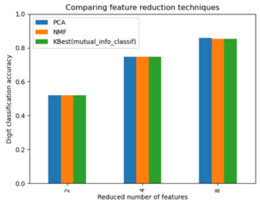
Manifold learning on handwritten digits: Locally Linear Embedding, Isomap...



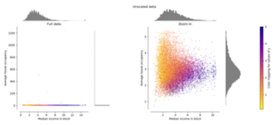
Evaluation of outlier detection estimators



Compare Stochastic learning strategies for MLPClassifier



Selecting dimensionality reduction with Pipeline and



Compare the effect of different scalers on data with outliers